PHASE 2 REMEDIAL ACTION HEALTH AND SAFETY PLAN FOR 2014

HUDSON RIVER PCBs SUPERFUND SITE

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LIST OF ACRONYMS

°F	Degrees Fahrenheit (°F)
µG/M3	Micrograms per Cubic Meter
ACGIH	American Conference of Governmental Industrial Hygienists
AED	Automated External Defibrillator
ANSI	American National Standards Institute
CARA	Cultural and Archaeological Resources Assessment
CAZ	Controlled Access Zone
CD	Consent Decree
CDZ	Controlled Decking Zone
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHST	Construction Health and Safety Technician
CIH	Certified Industrial Hygienist
CII	Construction Industry Institute
CM	Construction Manager
COC	Constituents of Concern
CPR	Cardiopulmonary Resuscitation
CRZ	Contamination Reduction Zone
CSP	Certified Safety Professional
dBA	Decibels on the A-scale
DEET	Diethyl Toluamide
DGPS	Differential Global Positioning System
EDC	Engineering Data Collection
eDMS	Environmental Data Management System
EHS	Environmental, Health and Safety
EMS	Emergency Medical Services
EPA	Environmental Protection Agency
EPS	Engineering Performance Standards
EZ	Exclusion Zone
FCE	Functional Capacity Examination
FWPCA	Federal Water Pollution Control Act

LIST OF ACRONYMS (CONTINUED)

GE	General Electric Company
GFI	Ground Fault Circuit Interruption
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High-Efficiency Particulate Air
JSA	Job Safety Analysis
LED	Light-Emitting Diode
LOTO	Lockout/Tagout
MG/M^3	Milligram per Cubic Meter
MOC	Management of Change
MPH	Miles per Hour
MSDS	Material Safety Data Sheet
NFPA	National Fire Protection Association
NIOSH	National Institute For Occupational Safety and Health
NOV	Notice of Violation
NRC	National Response Center
NRR	Noise Reduction Ratio
NYSCC	New York State Canal Corporation
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OHST	Occupational Health and Safety Technician
OPA	Oil Pollution Act
OSHA	Occupational Safety and Health Administration
PADI	Professional Association of Diving Instructors
PCB	Polychlorinated Biphenyl
PEL	Permissible Exposure Limit
PFD	Personal Flotation Device
PPE	Personal Protective Equipment
PRCS	Permit Required Confined Spaces
PSI	Pounds per Square Inch
PSM	Project Safety Manager
PVC	Polyvinyl Chloride

LIST OF ACRONYMS (CONTINUED)

QoLPS	Quality of Life Performance Standards
R&D	Receiving and Departure
RA	Remedial Action
RA CHASP	Remedial Action Community Health and Safety Plan
RA HASP	Remedial Action Health and Safety Plan
RAWP	Remedial Action Work Plan
RD	Remedial Design
RIP	Repair In Place
RMSF	Rocky Mountain Spotted Fever
ROD	Record of Decision
RQ	Reportable Quantity
SENRAC	Steel Erection Negotiated Rule Advisory Committee
SMS	Safety Monitor System
SOP	Standard Operating Procedures
SOW	Statement of Work
SPCC	Spill Prevention, Control and Countermeasure
SSAP	Sediment Sampling and Analysis Plan
SSHO	Site Safety and Health Officer
SSO	Site Safety Officer
SSR	Site Safety Representatives
START	Supervisory Training in Accident Reduction Techniques
SZ	Support Zone
TLV	Threshold Limit Value
TWA	Time-Weighted Average
UFPO	Underground Facilities Protection Organization
USCG	United States Coast Guard
VHF	Very High Frequency
VTS	Vessel Traffic Service

SECTION 1

INTRODUCTION

In 2005, the General Electric Company (GE) and the United States Environmental Protection Agency (EPA) executed a Consent Decree (CD) relating to the performance of the Remedial Action (RA) selected by EPA to address polychlorinated biphenyls (PCBs) in sediments of the Upper Hudson River, located in New York State, through dredging, as described in EPA's February 2002 Record of Decision (ROD) for the Hudson River PCBs Superfund Site (EPA 2002). The CD was filed in federal district court on October 6, 2005 (EPA/GE, 2005) and was approved and entered by the court as a final judgment on November 2, 2006, when it went into effect.

In accordance with the ROD and the CD, the RA was to be conducted in two phases. Phase 1 was defined as the first year of dredging and was conducted by GE in 2009. Phase 2 consists of the remainder of the dredging project. The CD provided an option to GE, following EPA's decision regarding the Performance Standards and scope of Phase 2, as to whether to elect to perform Phase 2 under the CD. After an intensive peer review process, EPA issued its decision regarding the Performance Standards and scope of Phase 2 in December 2010; and GE has elected to perform Phase 2 under the CD.

The CD includes, as Appendix B, a Statement of Work (SOW) for Remedial Action and Operations, Maintenance and Monitoring, which sets forth a number of general requirements for the RA and includes several attachments specifying requirements for various aspects of the RA. The SOW required a number of work plans, including a *Remedial Action Health and Safety Plan.* EPA issued revised versions of the SOW and its attachments for Phase 2 in December 2010. For the work to be performed in each construction year of Phase 2, Section 3.1.3 of the revised SOW requires GE to prepare, by February 15 of that year (or such alternate date as is agreed to by GE and EPA), an update to the *Remedial Action Health and Safety Plan* for such year. This *Phase 2 Remedial Action Health and Safety Plan for 2014* (2014 RA HASP) has been prepared to meet this requirement.

This 2014 RA HASP presents the health and safety plan that will govern implementation of the Phase 2 RA for the Upper Hudson River in 2014, including the following:

- Processing facility upgrades and operations;
- Dredging operations;
- Habitat construction;
- Rail yard operations;
- RA monitoring (sediment, fish, water column and Quality of Life); and
- Any other data collection activities conducted, i.e., engineering data collection, base-mapping, habitat assessment, and/or cultural resource assessment.

A separate *Phase 2 Remedial Action Community Health and Safety Plan for 2014* (2014 CHASP) (Parsons, 2014) will address community health and safety concerns and inform the community of emergency procedures during remedial activities. The 2014 CHASP will be submitted as Appendix F to the *Remedial Action Work Plan for Phase 2 Dredging and Facility Operations in 2014* (2014 RAWP) (Parsons 2014a). The 2014 CHASP will be available for review at the EPA's Hudson River Field Office at 421 Lower Main Street in Fort Edward, New York; at information repositories located in Glens Falls, Saratoga Springs, Albany, Poughkeepsie, and New York City, New York; and on the USEPA's website, available at: www.epa.gov/hudson.

If additional field activities are identified during the course of remedial activities that are not covered by this RA HASP, GE will develop and submit to the EPA, addenda to this RA HASP to cover such additional field activities. Upon EPA review of such addenda, the addenda will be available for review at the same locations noted above, and the provisions of such addenda will be implemented.

1.1 OBJECTIVES

The safety goal for the Project is zero incidents and zero injuries, with work tasks designed to minimize or eliminate hazards to personnel, equipment, the environment, and the general public. All individuals have the authority and the responsibility to stop work if hazardous activities or conditions are present. No individuals shall perform tasks that may endanger their own safety and health or that of others. In addition, each individual working on the Project is responsible for recognizing and managing changing conditions that could affect safety in the workplace.

This RA HASP outlines safety and health requirements and guidelines developed for Project work. When implemented, these requirements will help protect site personnel, visitors, the public, and the environment from exposure to potential safety and health hazards.

This RA HASP will be updated as conditions or situations change.

The objectives of this RA HASP are to:

- Identify the physical, chemical, and biological hazards potentially present during field work associated with the RA Work Plan;
- Prescribe the protective measures necessary to control those hazards;
- Define emergency procedures; and
- Prescribe training and medical qualification criteria for site personnel.

This RA HASP must be reviewed by all contractor and subcontractor managers, supervisors, foremen, and safety personnel as well all Construction Manager (CM) personnel working on the project. All other Project personnel performing field activities will receive a site-specific project safety orientation summarizing the content of the RA HASP. If requested, project personnel will be provided the time necessary to review the entire RA HASP. Visitors will also be required to

receive an abbreviated project safety orientation, in addition to being escorted by an authorized project team member when going on the site.

Each contractor is required to prepare a Contractor HASP that covers its specific scope of work unless a specific exception is approved by the CM Project Safety Manager (PSM). The Contractor HASPs shall meet the minimum requirements defined in this RA HASP and the Contract Documents. The Contractor HASPs are available on request.

1.2 SITE SETTING

The Hudson River is located in eastern New York State and flows approximately 300 miles in a generally southerly direction from its source, Lake Tear-of-the-Clouds in the Adirondack Mountains, to the Battery, located in New York City at the tip of Manhattan Island. EPA issued its ROD for the Upper Hudson River (UHR) on February 1, 2002 (EPA 2002). The UHR is defined as the section of river upstream from the Federal Dam in Troy, New York.

EPA divided the UHR into three sections (River Section 1, River Section 2, and River Section 3) for the sediment remediation activities outlined in the ROD. The location of each section is described below and presented on the Site Location Map included as Figure 1:

- River Section 1: Former location of Fort Edward Dam to Thompson Island Dam (approximately 6.3 miles)
- River Section 2: Thompson Island Dam to Northumberland Dam (approximately 5.1 miles)
- River Section 3: Northumberland Dam to the Federal Dam at Troy (approximately 29.5 miles)

As noted above, the ROD specified that the sediment remediation activities would be completed in two phases, designated Phases 1 and 2. Phase 1 is defined as the first year of dredging and was performed by GE in River Section 1 in 2009. Phase 2 includes the remaining dredging in all three UHR river sections.

1.3 ZERO INCIDENT PHILOSOPHY

This RA HASP uses the Zero Incident management approach. The safety goal for this project is zero incidents and zero injuries. The Zero Incident philosophy originated with a study by the Construction Industry Institute (CII), which identified specific control measures shown to dramatically reduce the probability of incidents. These control measures, known as Zero Incident Techniques, provide the framework for this RA HASP, and the Project Team's proactive approach to managing the interrelated areas of safety, health, environment, and risk management. The definition of an incident is any unplanned or unexpected event that results in a personal injury, property damage or environmental release. The definition of a near-miss incident is any unplanned or unexpected event that has the potential to result in a personal injury, property damage or environmental release.

To ensure the success of the safety program, the project safety culture must be dynamic and evolving. This begins with training all personnel in the foundations and philosophy of the Zero Incident Techniques during the site-specific orientation. This training lays the groundwork for a successful project by creating accountability and responsibility for the safety and risk process with all individuals. The nine focus areas for our success are:

Zero Incident Techniques: A Snapshot of What and Why		
Key Technique		**What and Why**
1	Demonstrated Management Commitment	All levels of management consistently display their commitment to the safety management process. As organization leaders, managers are role models whose actions send a strong message to employees.
2	Staffing for Safety	Each company funds a full-time lead safety person, either a site safety officer (SSO) or site safety and health officer (SSHO), in addition to site safety representatives (SSRs) as required, to assist in implementing and administering the RA HASP. The safety personnel consult with line organizations, helping to emphasize that safety is the responsibility of each employee on the project, not just the safety department.
3	Safety Planning – Pre-project/Pre-task	Planning safety into design and construction by using activity hazards analyses are key to eliminating incidents in the workplace. Planning job tasks with safety as a key component raises safety awareness of supervisors and employees. Pre-task planning improves productivity and reduces the negative impact of direct and indirect costs of incidents.
4	Safety Training and Education	Orientations and training sessions are conducted at all levels of an organization, as appropriate. Specialized training is also conducted to provide specific knowledge about hazardous work activities. Ongoing safety orientation and training gives employees the knowledge and skills to complete their job tasks without incident.
5	Worker Involvement and Participation	Empowering employees to identify hazards in the workplace is a valuable tool to increase safety awareness. Employee observation programs drive the behavior-based process. When employees identify and have the ability to correct hazards in the workplace, safety motivation and awareness increase and fewer incidents occur.
6	Recognition and Rewards	Employee recognition programs to reward and recognize employees for safe behavior can be based on individual or group accomplishments. Safe behavior is positively reinforced through management involvement, personal contact, communication, and training.
7	Subcontractor Management	Each organization must ensure that subcontractors comply with safety and health rules and regulations in accordance with contractual requirements. Careful management of subcontractor safety reduces incidents on the jobsite, which prevents injury and damage to property.
8	Incident Reporting and Investigation	Each organization must investigate incidents immediately and report to the appropriate personnel. The investigation process includes root cause determination and recommendations to prevent future

Zero Incident Techniques: A Snapshot of What and Why		
Key Technique		What and Why
		occurrences. "Near misses" are important learning experiences and will be investigated as actual incidents.
9	Drug and Alcohol Testing	Site project personnel are tested for drugs/alcohol: pre-employment, post-accident, random and reasonable suspicion. Testing employees for drugs and alcohol reduces the likelihood of serious incidents as a result of workers being impaired while working on a project.

1.4 REMEDIAL ACTION ACTIVITIES

A description of the tasks expected to be completed under this RA HASP are summarized in the following subsections. The descriptions of these potential field activities are general, since the specific field activities are described in more detail in the Contractor HASP and job safety analyses (JSAs) submitted by each contractor performing the work.

1.4.1 Processing Facility Upgrades and Repairs

Upgrades to the Sediment Processing Facility infrastructure upgrades and repairs may be made periodically to improve safety or operational efficiency or to repair equipment that has failed.

1.4.2 Processing Facility Operations

Operation of the facility includes, but is not be limited to, offloading debris and sediment from barges, separating debris and coarse material from the dredged sediment, sizing the separated debris, mechanically dewatering the fine-grained sediment prior to shipment of the sediment off site to a landfill and treating water generated from storm water and dewatering activities. The Sediment Processing Facility is designed to operate 24 hours per day, 6 to 7 days per week.

Operating the processing facility equipment involves operating and maintaining the process facility systems including the barge unloading areas, the size separation process areas, the slurry force main conveyance system, the thickening and dewatering system, the water treatment plant (process and storm water), the storm water management system, the material staging areas (management and maintenance), material handling including stockpiling, on-site transportation of coarse material, debris, and filter cake; operating and managing the decontamination station; and maintaining the haul road. The facility also has a rail yard loading area for shipment of materials.

1.4.3 Dredging Operations

Dredging operations will consist of activities related to the dredging of materials from the river and associated waterways and the subsequent backfilling and capping of the dredged areas. Dredging operations will be conducted within the river with land-based support from the Route 4 General Support Property on the east shore of the river, the Work Wharf located on the Champlain Canal on the waterfront portion of the Processing Facility, the South Thompson

Island Pool Crew Change Location south of the Crocker's reef guard gate, the Saratoga Barge Loading area located on the west shore of the river north of Schuylerville, and any additional sites, if acquired and developed to support dredging operations as work advances downstream. The dredging operations are described in the following subsections and dredging areas are shown on Figures 2a, 2b and 2c.

1.4.3.1 Dredging

The dredging operations involve clearing overhanging vegetation; removing submerged debris; dredging of targeted sediment with mechanical dredges; operating and maintaining tugs, barges, support boats, and fuel boats as needed; transporting dredged sediments to the Sediment Processing Facility; and installing resuspension controls as needed. Mechanical dredges consist of track-mounted excavators with environmental clam-shell buckets or grapples attachments secured on modular barge platforms. The dredges are moved and positioned by tugs, and secured in place by spuds. The dredges remove the targeted sediment from the river bottom and load the sediment into hopper barges. Tugs transport the hopper barges to the Sediment Processing Facility wharf for offloading and processing of the debris and sediment.

1.4.3.2 Backfill, Capping, and Shoreline Restoration

Backfill, capping, and shoreline stabilization involves the use of front-end loaders, conveyors, material barges, mechanical dredges, tugs, work boats, and other equipment for placing materials as specified in the river. Backfill and cap materials will be stockpiled and loaded at the Saratoga Barge Loading Area and any other sites that may be acquired and developed downstream to support backfill, capping and shoreline restoration. Front-end loaders and a conveyor system will be used to load the backfill and cap materials onto material barges located in the river. Backfill and cap materials are to be transported by barge to the designated areas for placement by a mechanical dredge. The Moreau Barge Loading Area is located in the Town of Moreau off County Road 29. It is accessed via Highway 197 west from Fort Edward. The area is gated and enclosed, with fencing on all non-water sides. Additional barge loading locations will be needed as dredging activities progress downstream; as the locations become known updates will be provided.

1.4.4 Habitat Construction

The habitat construction program involves planting submerged and floating aquatic vegetation (SAV), as well as riverine fringing wetland (RFW) vegetation, in areas of the Upper Hudson River that were dredged and backfilled. The work described below applies to the remaining habitat construction activities.

1.4.4.1 SAV Planting

The SAV planting portion of this program consists of the planting of submerged and floating aquatic vegetation in flowing water ranging from two to eight foot depths.

The Work Support Marina, and other downstream marina locations as needed, will be used to support the habitat construction work. During planting operations, plants will be transferred via boat from the marina to the planting location.

The planting will be conducted from an anchored dive boat using a dedicated diving team. The dive boat will contain complete dive support packages to sustain divers and associated dive tenders as set forth in ADCI and OSHA guidelines.

1.4.4.2 RFW Vegetation Planting

RFW construction areas identified in the design drawings will be planted with a mixture of wetland plants and seeds. RFW planting will occur along the river's edge, to a depth of approximately two feet below the normal river elevation.

Plant plugs will arrive at the site in flats or other containers from which they will be removed as they are planted. Plug planting consists of inserting a dibble or planting bar into the substrate, pushing it to one side to open a hole that is the size of the plug or slightly larger. The tool is typically removed as the plug is inserted into the substrate. The plug is then covered and tamped in. Tamping is typically completed by stepping around the plug prior to moving on to the next hole. Seed mixtures will be spread by hand.

Fencing will be installed during the initial growing season to deter geese and other herbivores from feeding on the plants. The fencing will be removed in the fall at the end of the growing season.

1.4.4.3 Monitoring and Replanting

Plant monitoring will be performed at regular intervals during the initial growing season. Monitoring events will be conducted by boat and may include the use of underwater video equipment. Data from the monitoring events will be used to determine where to concentrate efforts for replanting the aquatic plants, if necessary. Replanting activities will be similar to those planting activities already described in this plan.

Maintenance of the RFW areas, consisting of watering, fence repair, removal of undesirable plant species, re-seeding and re-planting will occur during the initial growing season.

1.4.5 Rail Yard Operations

Rail Yard Operations consist of activities required to load and weigh gondola rail cars with processed sediment and debris, switch cars in the rail yard using locomotives, prepare outbound unit trains for shipment to disposal facilities and receive inbound empty unit trains returning from disposal facilities. Rail yard and rail car loading area activities are described in the following subsections.

1.4.5.1 Rail Operations

The rail yard operator switches empty and loaded rail cars on and off Track 1 on Canadian Pacific Railway (CPR) property. Rail cars to be switched on and off this track consist of unit

trains up to 93 cars in length and other miscellaneous freight cars destined for the material unloading track or any other track on the project site. In addition, on CPR property, the rail yard operator is responsible for inspecting and repairing the train air supply and associated appurtenances that provide train air to the south end of the Repair In Place (RIP) tracks.

The rail yard operator switches empty and loaded rail cars on and off tracks on the project site. This includes the ladder tracks, receiving and departure (R&D) tracks, set out track, loading yard/scale lead, loading track, material track, RIP track, and engine house track. The operator performs an inspection of all inbound rail cars. The operator weighs inbound empty and outbound loaded rail cars as required. The operator assembles, inspects, and makes necessary repairs to outbound loaded rail cars to successfully perform a terminal test. The operator is responsible for inspecting and repairing all track, special track work, road crossings, car air supply, and other track and mechanical appliances.

1.4.5.2 Rail Yard Facilities

The operator inspects, maintains, and operates an engine house, track RIP and weigh-in-motion scale that support the project. The operator also maintains facilities and associated tools, machinery, heavy equipment, and automotive equipment (trucks) in a state of good repair.

1.4.5.3 Rail Car Loading Facility

Functions to be performed at the rail car loading facility include activities associated with loading rail cars. A railcar liner system involves lining of empty rail cars with a woven and coated high density polypropylene super load wrapper liner, filling the car, and then folding and securing of the super load wrapper, on loaded cars. The exterior of rail cars will be cleaned as needed, inspected, and then released to rail yard crews for movement back to rail yard.

1.4.6 Remedial Action Monitoring

Remedial action monitoring includes sediment sampling, biota (fish) monitoring, water column, Quality of Life monitoring, processing facility stormwater treatment and discharge outfall monitoring, ecological studies, and processed sediment sampling.

1.4.6.1 Sediment Sampling

Sediment sampling will be conducted in areas of the Hudson River where dredging has been performed to verify that post-dredging conditions meet the project criteria. Sediment sampling will also be conducted in additional areas targeted for dredging in future years to assist with dredge prism development. Core samples will be collected at pre-determined locations along a grid system. The core samples will be collected from a boat equipped for core sampling, using vibracoring, sonic drilling or manual coring techniques. At the end of each day, the cores will be transported to a shore-based processing facility where they will be cut into segments, placed in containers, and submitted for laboratory analysis. If subsequent dredging is performed in a dredge area, another round of sediment sampling may be performed.

1.4.6.2 Biota (Fish) Monitoring

This task involves the collection of fish tissue samples from the Hudson River for chemical analysis of PCBs. The primary collection method for the fish monitoring is electrofishing. Sampling will take place from a project vessel that has mobilized to the sampling location. An electrode is attached to the boat and extends down into the water. An electric current is transmitted from the electrode into the water, thus immobilizing any fish within range. Once the fish float to the river surface, staff then collect them with dip nets and place them in the live well of the boat.

Fish monitoring will be performed in the Upper and Lower Hudson River at the following locations:

Upper Hudson

- Feeder Dam
- Thompson Island Pool
- Northumberland/Fort Miller Pools
- Stillwater Pool

Lower Hudson

- Albany/Troy
- Catskill
- Tappan Zee area

Fish collection will be performed annually at the Upper Hudson Stations and Albany/Troy. Monitoring at Catskill and the Tappan Zee area will be performed every other year. Fish may be collected for analysis using electro-shocking equipment, nets, or by angling. Fish sampling will be conducted from an appropriately equipped boat.

1.4.6.3 Water Column Monitoring

Water sampling activities will be performed to monitor the in-river activities associated with dredging to assess achievement of the Resuspension Performance Standard and other applicable substantive water quality requirements. The water column monitoring will include the following activities.

- Near-field water column monitoring;
- Far-field water column monitoring; and
- Off-season water column monitoring.

Near-field water column monitoring will consist of deployment and operation of floating monitoring buoys located in the river in the vicinity of dredging operations. These stations will be used to collect continuous water quality data which will be transmitted routinely to an environmental data management system (eDMS). The near-field monitoring stations will be

maintained on a daily basis. Maintenance activities will include cleaning and calibration of monitoring equipment, and manual collection of water samples. Personnel will service the stations by boat. Far-field water column monitoring will involve the maintenance and operation of fixed automated water sampling stations at various locations on the Upper Hudson River. These stations will pump water from the river on a continuous basis, enabling the collection of water samples using programmable water sampling equipment at predetermined times. Additionally, these stations will be used to collect continuous water quality data which will be transmitted routinely to the eDMS. The automated samplers will be housed in the pump house located on shore. Personnel will travel to the stations in a vehicle and perform maintenance activities on a daily basis. Additionally, samples will be collected manually at Bakers Falls, Rogers Island, and Stillwater; from the Mohawk River, and from the Lower Hudson River. At Bakers Falls and the Mohawk River, samples will be collected from a bridge; Rogers Island, Stillwater and the Lower Hudson River stations will be sampled using a boat. Control measures for working on a bridge are described in Section 4.22. Samples will also be collected manually if an automated water sampling station becomes inoperative; these samples will be obtained either from near-by bridges or by boat, depending on safety conditions.

Off-season water column monitoring will be performed at for the three automated far-field monitoring stations. This monitoring will begin after dredging operations have been suspended for the year in the fall, and will continue until operations begin the following spring.

1.4.6.4 Quality-of-Life (QOL) Monitoring

This task involves monitoring of ambient air, noise, odor, opacity, light, and meteorological conditions to assess achievement of the Quality of Life Performance Standards (QoLPS) established by EPA for the Hudson River dredging project. Specific field tasks include the following:

- Air Sampling: This task involves driving to designated project monitoring locations at the sediment processing facility and along the dredging corridor and setting up air sampling media at monitoring stations (low and high volume). Following a pre-determined period of time, employees will return to the sampling locations and remove a filter/foam sample from the air sampling device. The sample is then packaged and sent via express courier to an analytical laboratory for the required analyses.
- Noise Monitoring: This task involves driving to designated project monitoring locations and installing noise monitoring meters to measure noise levels at a specified location, to be determined on an as-needed basis. Typically the noise meters are set on a tripod and data is logged and downloaded onto a computer for specified time intervals.
- Odor Monitoring: This task involves driving to locations adjacent to the river and using a handheld hydrogen sulfide monitoring device to measure odor levels at a specified location, to be determined on an as-needed basis.

- Opacity Monitoring: This task involves driving to locations associated with construction/dredging activities and visually observing exhaust from specific pieces of equipment. This monitoring is performed on an as-needed basis.
- Light Monitoring: This task involves driving to designated project monitoring locations and using a handheld light monitoring device to measure light levels at a specified location, to be determined on an as-needed basis.
- Meteorological Monitoring: This task involves driving to the Sediment Processing Facility, connecting a computer to a meteorological tower, and downloading weather data from the tower.

1.4.6.5 Sediment Processing Facility Storm Water and Treatment Plant Discharge Monitoring

This task involves the sample collection of processed discharge water from the treatment facility or storm water from three outfall locations at the Sediment Processing Facility. The discharge samples are generally collected every day during which sediment is processed and water released (samples are collected using an ISCO composite sampler or as a grab sample taken directly from a sample port in the discharge piping). Depending on the outfall and specific discharge rates, grab samples are collected of overflowing water. The samples are packaged and shipped to an off-site laboratory for analysis (via express courier).

1.4.6.6 Processed Sediment PCB Sampling

This task involves the collection of sediment samples at the sediment processing facility following dewatering and prior to shipment off-site. The samples are collected using hand tools and packaged for shipment to an off-site laboratory for PCB analysis.

1.5 REMEDIAL DESIGN SUPPORT ACTIVITIES

A description of other investigative activities that may be performed prior to or during the course of operations is summarized in the following subsections. The descriptions of these potential field activities are general, since the specific field activities are described in more detail in various data collection work plans developed in support of the design and investigation efforts.

1.5.1 Engineering Data Collection

Potential support activities involving engineering data collection include debris and obstruction surveying, geotechnical characterization of sediments, sub-bottom physical characterization and backfill source material identification and characterization.

1.5.1.1 Debris and Obstruction Survey

In-river surveys may be conducted to identify the types and locations of debris and obstructions on the river bottom. This information would be used to evaluate river bottom conditions, which will be important in the RA dredging activities.

Debris and obstruction survey activities may employ a combination of on water geophysical techniques, including side-scan sonar, multi-beam sonar, sub-bottom profiling, use of a marine magnetometer, and/or use of a submerged video camera.

The field work associated with this activity will include use of survey vessels. In addition, a vessel may be used to collect underwater video via remote video equipment or underwater video may be collected using divers with video equipment. Divers will use standard self-contained underwater breathing apparatus (SCUBA) and/or snorkel equipment.

1.5.1.2 Geotechnical Characterization of Sediments

Geotechnical characterization of sediments may be conducted to supplement the geotechnical information obtained during the Sediment Sampling and Analysis Program (SSAP). These activities may include collecting additional sediment samples and submitting them for analysis of geotechnical parameters. The activities may also include other geotechnical tests.

The field work associated with this activity may include collecting sediment cores using vessels and equipment similar to those used for sediment coring activities, but also may include using other types of field equipment from the vessels to measure sediment properties in place.

1.5.1.3 Sub-Bottom Physical Characterization

Sub-bottom physical characterization may be conducted to learn more about the sub-bottom sediment, i.e., located below the sediment surface, in river areas designated for dredging. This characterization would provide geotechnical information on the makeup and integrity of the sub-grade conditions. This information may be used for developing the design for dredging, anchoring, spud setting, and the installation of other structures, e.g., sheet piling, deemed necessary for the remediation activities.

These sub-bottom physical characterization activities may include additional geophysical survey activities, e.g., sub-bottom profiling, and advancing soil borings into the river bottom to collect soil samples for laboratory analysis of geotechnical properties such as grain size, bulk density, and moisture content. The field work could consist of using the geophysical survey vessels and sediment coring procedure described above, as well as using barge-mounted drill rigs to collect deeper samples of underlying material.

1.5.1.4 Backfill Source Material Identification and Characterization

This task involved backfill source material identification and characterization activities for the design activities. For the most part, the field work for this activity has already been completed. However, additional field work may be necessary to identify supplemental sources. The field work would include collecting soil samples at potential borrow sources (some sources may be several miles from the river) and packaging and shipping the samples to laboratories for analytical testing.

1.5.1.5 Base-Mapping

This task involved developing a base map of the Upper Hudson River for the design activities. For the most part, the field work for this activity has already been completed. However, additional field work may be necessary to develop additional detailed mapping in certain areas, e.g., near shoreline areas, etc., where surveyors may collect location-specific survey data, i.e., horizontal and vertical coordinates to develop mapping information. These efforts would be performed by documenting features by boat or walking on shore.

1.5.1.6 Habitat Assessment

Additional habitat assessment activities may be conducted for one of more of the following habitat types present within the Upper Hudson River ecosystem:

1. Unconsolidated river bottom habitats;
2. Aquatic vegetation beds;
3. Shoreline habitats (including maintained and natural shorelines); and
4. Wetland habitats, notably RFW habitat.

The data collection methods to be used for habitat assessment efforts would include:

- Using a boat for personnel transport to document field conditions;
- Conducting an underwater inspection using standard scuba and/or snorkel equipment;
- Collecting sediment samples using clear Lexan tubes to visually inspect sediments and obtain samples for laboratory analysis;
- Collecting submerged aquatic and wetland vegetation for laboratory analysis;
- Verifying field position using a differential global positioning system (DGPS);
- Visually identifying fringing wetlands and wetland sediment conditions;
- Visually identifying other riverine hydrogeomorphic subclasses of wetlands, if potentially impacted by dredging activities;
- Identifying and documenting the presence or signs of wildlife;
- Measuring light attenuation using hand-held instrumentation such as quantum sensors;
- Measuring river velocity using a hand-held velocity meter; and
- Documenting the shoreline using tape measure, inclinometer, video tape, and digital camera.

1.5.1.7 Cultural and Archaeological Resources Assessment

Additional cultural and archaeological assessment (CARA) activities will likely be conducted in certain areas during the Remedial Action to assess potential in-river or upland cultural or archaeological resources that may be impacted by dredging or related operations. CARA field activities may include sediment coring, side-scan surveys, bathymetric surveys, magnetometer surveys, test pit installation, and scuba diving and/or snorkeling for data

verification and possible discovery of resources. The details of this work will be specified in work plans or reports submitted to EPA.

1.6 SCHEDULE FOR FIELD ACTIVITIES

The schedule for field activities will be discussed in the Remedial Action Work Plan for Dredging and Facility Operations to be submitted to EPA in conjunction with this RA HASP. Construction field activities will typically occur six days per week, between dawn and dusk. Dredging and processing operations will typically occur six days per week, 24 hours per day, with maintenance being performed on the seventh day.

SECTION 2

SITE SAFETY PERSONNEL

2.1 CONTACT INFORMATION FOR SITE SAFETY PERSONNEL

The project team shall implement a safety program that ensures the safety of all project employees, contractors, visitors, and others involved in the project. The site is defined as the processing/operations facility, rail yard, wharf, small craft marinas, project-specific parking areas, contractor laydown areas and any river section where project related activities or equipment are involved, e.g., dredging, moving barge, etc. The names and contact information for lead site safety personnel are presented in Attachment A. As lead site safety personnel and phone numbers are added or changed during the course of RA activities, modifications to this list will be provided to EPA for posting at the USEPA's Hudson River Field Office. This information will be available in all areas where RA activities are taking place.

2.2 LEAD SITE SAFETY PERSONNEL

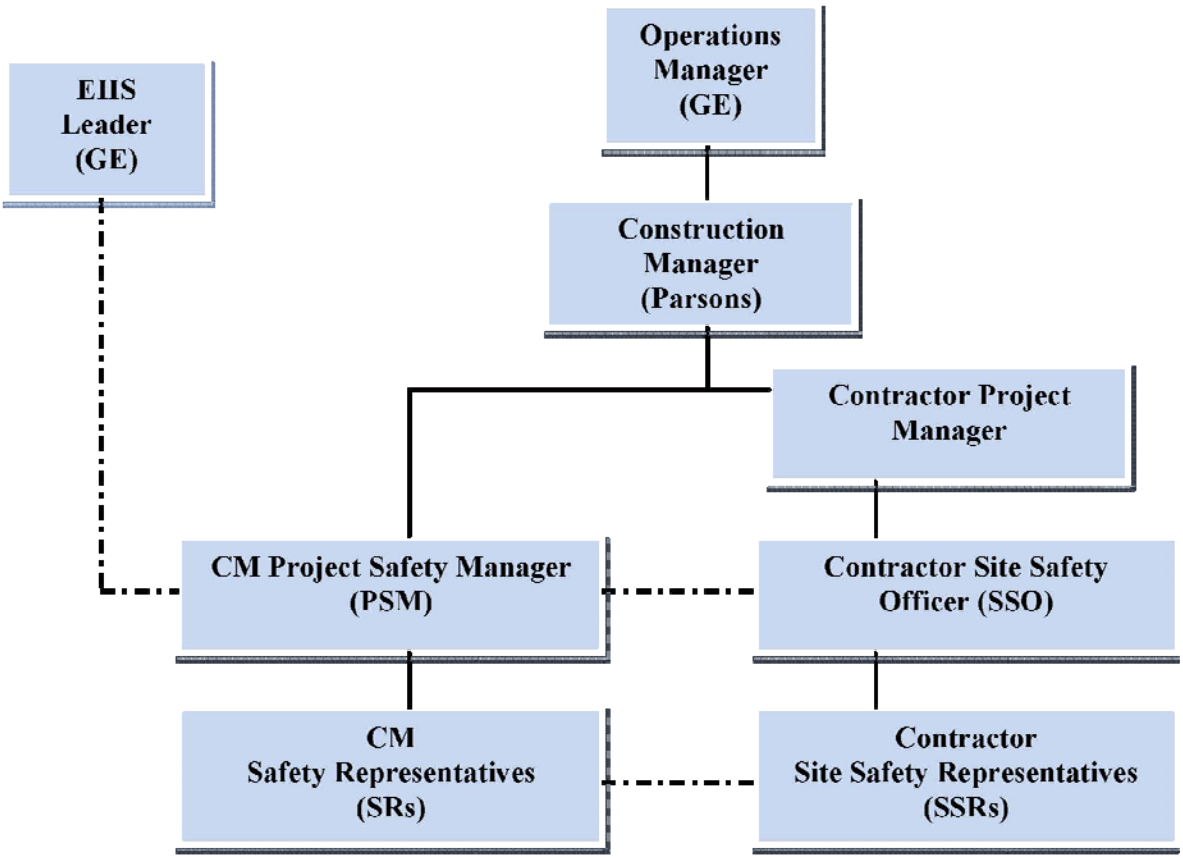
The following two organization charts outline the overall project safety organization and chain of command for the site safety personnel.

The roles of the lead site safety personnel — the CM project safety manager (PSM) and CM safety representatives — as they relate to the health and safety issues, are outlined below. The PSM will be supported by the different CM safety representatives, including SSRs, for each type of field activity.

The CM's role in implementing a safety program includes the following responsibilities:

- Provide leadership by demonstrating a personal commitment to safety at all times;
- Provide hands-on participation in the development and implementation of the RA HASP;
- Develop incentive/reward programs to recognize safety achievements;
- Establish a disciplinary program for unsafe behavior; and
- Meet safety targets.

RA HASP
PROJECT SAFETY ORGANIZATION



2.2.1 Project Safety Manager (for CM)

The CM PSM or designee will be available on site whenever field activities are occurring. The PSM will confirm that all site personnel are familiar with the provisions of this RA HASP and the 2014 CHASP; and that workers understand the hazards that they may encounter and the procedures for mitigating those hazards, e.g., safe work practices, and personal protective equipment (PPE). The PSM will also serve as the emergency response liaison and incident commander, in addition to being the primary contact with GE and regulatory agencies for health and safety issues. The roles and responsibilities of the PSM shall include but may not be limited to the following:

- Be the most visible leader for the project's zero incident safety culture and lead the jobsite in the belief that all incidents are preventable and a zero incidents goal is attainable;
- Act as the incident commander for project emergencies that are handled internally. In the event of an emergency requiring external emergency response, the first responding

agency's lead officer will become the incident commander when he or she arrives on site. The PSM will serve as liaison to the external incident commander, as appropriate;

- Ensure preparedness for emergency responses to incidents and that project personnel are adequately trained in the emergency response plan procedures;
- Inform appropriate authorities and response agencies in the event of a spill that poses a potential hazard to the public;
- Release a Stop Work order issued by the CM after the conditions that initiated the order are corrected. The CM will issue an authorization to proceed after receipt of the release from the PSM and any other required conditions have been met;
- Maintain, update, and implement the RA HASP;
- Approve any changes to the RA HASP due to modifications of procedures or newly proposed site activities;
- Ensure that personnel assigned to the project have appropriate training certifications and medical clearance;
- Ensure controlled substance and alcohol testing is completed for all workers prior to starting work;
- Assess site security and control procedures that address the health and safety of the public and non-authorized personnel who may visit the work sites;
- Work with GE's health and safety personnel to inform personnel of any site-specific practices and procedures that must be followed in addition to the provisions of this RA HASP;
- Display leadership in all RA HASP activities and confirm regulatory compliance by subordinates/team members;
- Coordinate with the SSRs on matters relating to work site activities, ongoing and/or planned, to verify that adequate consideration is given to maximum employee health and safety protection and compliance with applicable local, state, and federal regulations;
- Consult with SSRs and project team members on matters relating to suspending site activities in the event of an emergency; and
- Verify that corrective actions resulting from deficiencies identified by audit and observation are implemented and effective. Reviews are conducted regularly; deficiencies, if any, are identified; issues are tracked to closure; improvements are made to prevent potential hazards; and mitigation measures are implemented as a result of these reviews.

Audits will include the inspection and assessment provisions set forth above, as well as a brief summary report noting any deviations from this RA HASP and corrective actions that may be necessary to promote the health and safety of workers and the public.

While field activities are underway, the PSM will be either on site or available via cellular phone should an emergency arise. While off site, the PSM will designate an alternate to be the primary point of contact for daily health and safety issues. This person will be identified during the daily health and safety briefings.

The PSM will work with the CM to address any community health and safety issues. The PSM will be a board-certified safety professional (CSP) or certified industrial hygienist (CIH), as well as will have completed Occupational Safety and Health Administration (OSHA) 40-hour hazardous waste operations (HAZWOPER) training (29 CFR 1910.120), additional 8-Hour HAZWOPER Supervisor Training and current eight-hour annual refresher. In addition, the PSM will have current training in first aid and cardiopulmonary resuscitation (CPR).

2.2.2 Safety Representatives (for CM)

CM safety representatives (SRs) will be responsible for managing on-site health and safety activities and will provide support to the PSM on health and safety issues that relate to their tasks. Additional responsibilities for the CM safety representative include but shall not be limited to the following:

- Be a visible leader for the project's zero incident safety culture and carry out tasks with the belief that all incidents are preventable and a zero incidents goal is attainable;
- Implement the RA HASP;
- Suspend field work by issuing a Stop Work order in an emergency or if unsafe work conditions exist;
- Review and audit contractor safety protocols and procedures, e.g., Job Safety analysis (JSA), as necessary for field work;
- Initiate emergency response plan procedures as necessary;
- Provide site-specific project orientation to field workers and verify that all personnel know who to contact and what to do in the event of an emergency at each work site;
- Audit the health and safety practices and procedures within the work zones/areas on a continuous basis and work with contractor to adapt practices and procedures to changing circumstances (encourage the safety system to be a living and organic system that adapts to changes);
- Be a resource for leading the daily health and safety briefings and encourage personnel to raise safety concerns. Work with individuals to address any specific health and safety issues that may be raised at meetings and ensure that they are aware that they can refuse to do unsafe tasks or activities and that they can do so without fear of reprisal or dismissal (otherwise known as their "stop work authority");
- Inspect the site work zones/areas, i.e., construction, processing/operations, dredging, to verify that adequate hazard communication measures are in place; and

- Inspect the site work zones/areas to verify that proper procedures are in place and are being followed for decontamination and that the support zone (SZ), contamination reduction zone (CRZ), and exclusion zone (EZ) are clearly delineated.

CM safety representatives involved with the processing facility or dredging operations will have completed the required OSHA 40-hour HAZWOPER training (29 CFR 1910.120) and current eight-hour annual refresher. CM safety representatives involved with the construction of the processing facility or rail yard will have a 30-hour OSHA construction safety certification, or certification as a CSP or construction health and safety technician (CHST). CM safety representatives involved with the processing or dredging operations will have a 30-hour OSHA construction safety certification, or certification as a CSP, CIH, or occupational health and safety technician (OHST). In addition, all CM safety representatives will have current training in first aid and CPR.

Additional responsibilities of the CM PSM, safety representatives, and site supervisors related to emergency response are described in Section 10.

2.2.3 Site Safety Officer / Site Safety and Health Officer (for Contractor)

Contractor SSO or SSHO will be responsible for all on-site health and safety activities that relate to their scope of work, and will have the authority to suspend such activities in the event of an emergency or unsafe working conditions. The SSO or SSHO may not be assigned collateral duties for conducting noise, light, or odor monitoring, other than that required by OSHA worker exposure requirements, unless prior written approval has been obtained for the CM. The SSO or SSHO will be the primary point of contact for all field personnel and visitors observing field activities, and has direct responsibility for the implementation and administration of the contractor's RA HASP. Specifically, the SSO or SSHO will be responsible for the following:

- Be a local leader for the project's zero incident safety culture and lead their workers in the belief that all incidents are preventable and a zero incidents goal is attainable;
- Enforce all health and safety rules and regulations within the scope of this RA HASP;
- Enforce all health and safety processes, procedures and actions within the scope of their approved Contractor HASP;
- Lead the daily health and safety briefings and encourage personnel to raise safety concerns and then work with them to address any specific health and safety issues that may be raised at those meetings;
- Ensure that the workers are aware that they can refuse to do unsafe tasks or activities; and that they can do so without fear of reprisal or dismissal (otherwise known as their "stop work authority");
- Conduct and document health and safety audits;
- Coordinate with the PSM and the CM SSR on matters pertaining to project health and safety;

- Evaluate field activities to detect unsafe acts and conditions and develop solutions that address the root cause of the unsafe act or condition;
- Verify that incidents are properly reported, investigated, and closed out in accordance with Project requirements;
- Track the status and the closure of corrective actions developed from incident investigations and audits;
- Lead the rewards and recognition initiatives sponsored by the Contractor;
- Educate employees regarding the zero incident safety culture, applicable work practices, procedures, rules, and regulations;
- Participate in Quarterly Safety Summits to review project safety statistics, audit results, and compliance with project safety metrics.
- Be a mentor, facilitator, and encourager of workers in being responsible for their own and their colleague's safety;
- Perform and document periodic audits of compliance with JSAs, health and safety processes, procedures and actions detailed in the approved Contractor HASP to identify any deficiencies and develop solutions that are compliant and correctly address the safety concern;
- Educate employees on applicable emergency contingency plans;
- Report all incidents and injuries to the project manager, PSM, and appropriate safety representative; and
- Share with project manager, PSM, safety accomplishments, solutions, and achievements, so that they can be passed onto other parts of the project.

Contractor SSO or SSHO will also be available to assist in addressing community health and safety issues.

The SSO involved with construction, habitat or rail activities shall, in addition to the activity type specific requirements, have a minimum of 10 years of safety experience of a progressive nature with at least 5 years of experience on similar projects, and shall possess one of the following certifications:

- CSP
- CIH
- CHST
- OHST

The SSHO involved with processing and dredging activities shall have a minimum of 10 years of safety experience of a progressive nature with at least 5 years of experience on similar projects, will have completed the required OSHA 40-hour HAZWOPER training (29 CFR 1910.120), additional eight-hour HAZWOPER supervisor training, and current eight-hour annual refresher, and shall possess one of the following certifications:

- CSP
- CIH
- CHST
- OHST

The SSO or SSHO involved with monitoring and consultant field activities shall have a minimum of 5 years of safety and project experience of a progressive nature with at least 2 years of experience on similar projects, will have completed the required OSHA 40-hour HAZWOPER training (29 CFR 1926.65), additional eight-hour HAZWOPER supervisor training, current eight-hour annual refresher.

The SSO involved with rail yard operations will have familiarity with and a working knowledge of all applicable Federal Railroad regulations and shall have a minimum of 10 years of railroad and safety experience of a progressive nature. The rail yard operations SSO shall have formal documentation training for competent person status for the following areas:

- 49 CFR 209, Railroad Safety Enforcement
- 49 CFR 211, Rules of Practice
- 49 CFR 214, Railroad Workplace Safety
- 49 CFR 217, Efficiency Testing
- 49 CFR 228, Hours of Service Act
- 49 CFR 225, Accident/Incident Reporting
- 49 CFE 213, Track Safety Standards
- 49 CFE 215, Freight Car Safety Standards
- 49 CFR 229, Locomotive Safety Standards
- 49 CFR 231, Railroad Safety Appliances
- 49 CFRR 232, Brake Systems Safety Standards
- Knowledge of Operating Rules and Practices
  - Railway Safety Operating Rules: N.O.R.A.C. (soon GCOR)
  - Canadian Pacific Interchange Rules
  - HAZ MAT Qualified
  - Homeland Security and TSA Qualified
  - Qualified in the requirements of a conductor (49 CFR 243)
  - Qualified in the requirements of an engineer (49 CFE 241)

2.2.4 Site Safety Representative (for Contractor)

Contractor site safety representatives (SSRs) will be responsible for implementing on-site health and safety activities and will provide support to the SSO or SSHO on health and safety issues that relate to their tasks. Additional responsibilities for the Contractor SSRs include but shall not be limited to the following:

- Review safety protocols and procedures, e.g., Job Safety analysis (JSA), as necessary for field work;

- Observe the work being performed to verify that it is performed in accordance with the developed safety protocols and procedures;
- Make observations regarding behavioral safety performance and make corrections as necessary to assure compliance;
- Mentor and train workers in safely performing work tasks;
- Notify the SSO/SSHO of any trends of concern or deficiencies observed in the safety culture or program;
- Participate in focused inspections;
- Observe workers for signs and symptoms of chemical exposure, heat/cold stress, fatigue, etc.;
- Initiate emergency response plan procedures as necessary;
- Verify that all personnel know who to contact and what to do in the event of an emergency at each work area;
- Follow-up and conduct investigations on all incidents and near-miss incidents, share conclusions and findings with workers during daily tool-box meetings, or initiate safety work stand-downs to communicate important findings;
- Ensure PPE is available for workers and ensure that workers are aware of the availability; and
- Inspect the site work zones/areas and equipment to verify that JSAs, health and safety processes, procedures and actions detailed in the approved Contractor HASP are being correctly implemented.

A SSR involved with construction activities or habitat shall have a minimum of five years of safety experience of a progressive nature with at least two years of experience on similar projects, and will have completed a 30-hour OSHA Construction Safety course or equivalent. Each SSR involved with construction, habitat or rail activities shall have formal documented safety training for competent person status for the following 8 areas of competency, based on the Contractor scope of work and the SSRs assigned responsibility:

- Excavation (29 CFR 1926 Subpart P);
- Scaffolding (29 CFR 1926 Subpart L);
- Fall protection (29 CFR 1926 Subpart M);
- Manlifts (29 CFR 1910 Subpart F);
- Material Handling (29 CFR 1910 Subpart N);
- Hazardous energy (29 CFR 1910.147);
- Confined space (29 CFR 1910.146); and
- Hazardous Waste Operations and Emergency Response (29 CFR 1926.65).

All SSRs involved with processing and dredging activities shall have a minimum of 5 years of safety experience of a progressive nature with at least 2 years of experience on similar

projects, will have completed the required OSHA 40-hour HAZWOPER training (29 CFR 1910.120), current eight-hour annual refresher, have completed a 30-hour OSHA Construction Safety course or equivalent, and have current first aid and CPR training. Each SSR will also have formal documented safety training for competent person status for at least the following five areas of competency:

- Hazardous Waste Operations (29 CFR 1910.120);
- Personal Protective Equipment (29 CFR 1910 Subpart I);
- Machinery and Machine Guarding (29 CFR 1910 Subpart O);
- Commercial Diving Operations (29 CFR 1910 Subpart T), and
- Materials Handling and Storage (29 CFR 1910 Subpart N).

The SSRs involved with habitat planting and plant supply will have completed the required OSHA 40-hour HAZWOPER training (29 CFR 1926.65), and current eight-hour annual refresher training and will have formal documented safety training for competent person status for at least the following areas:

- Commercial Diving Operations (29 CFR 1910 Subpart T), if driving activities are to be performed by the Contractor; and
- Hazardous Waste Operations (29 CFR 1910.120).

All SSRs involved with monitoring and consultant field activities shall have a minimum of five years of safety and field experience of a progressive nature with at least two years of experience on similar projects, will have completed the OSHA 40-hour HAZWOPER training (29 CFR 1910.120), current eight-hour annual refresher, and current first aid and CPR training. Each SSR involved with monitoring and design activities shall have formal documented safety training for competent person status for the following 4 areas of competency, based on the Contractor scope of work and the SSR's assigned responsibility:

- Material Handling (29 CFR 1910 Subpart N);
- Personal Protective Equipment (29 CFR 1910 Subpart I);
- Confined Space (29 CFR 1910.146); and
- Hazardous Waste Operations and Emergency Response (29 CFR 1926.65).

The SSR involved with rail operations will have familiarity with and a working knowledge of all relevant Federal regulations and shall have a minimum of 5 years of railroad and safety experience of a progressive nature. The SSO shall have formal documented training for competent person status for the following areas:

- 49 CFR 209, Railroad Safety Enforcement
- 49 CFR 211, Rules of Practice
- 49 CFR 214, Railroad Workplace Safety
- 49 CFR 217, Efficiency Testing
- 49 CFR 228, Hours of Service Act

- 49 CFR 225, Accident/Incident Reporting
- 49 CFE 213, Track Safety Standards
- 49 CFE 215, Freight Car Safety Standards
- 49 CFR 229, Locomotive Safety Standards
- 49 CFR 231, Railroad Safety Appliances
- 49 CFRR 232, Brake Systems Safety Standards
- Knowledge of Operating Rules and Practices
  - Railway Safety
  - Operating Rules: N.O.R.A.C. (soon GCOR)
  - Canadian Pacific Interchange Rules
  - HAZ MAT Qualified
  - Homeland security and TSA Qualified
  - Qualified in the requirements of a conductor (49 CFR 243)

Contractors shall provide at least two individuals current in CPR/first aid training for each work area during every shift, including each individual manned barge/dredge. Where an automated external defibrillator (AED) is required in a work area or dredge, at least two individuals per shift per AED equipped work area or dredge must be trained in its use. Each dredge plant operating on the river, each dive platform, and the size separation area, water treatment plant building, dewatering building and rail service building of the Processing Facility shall have an AED provided by the contractors. Training certificates are to be current when working on the project. Contractors shall identify and certify competent persons as defined by OSHA for work or task requiring that level of qualification or supervision. The personnel identified shall be present on the project when work requiring the competent person is taking place.

2.2.5 Project Workers

Every project worker on the jobsite (from GE management to Contractor worker) is responsible for safety. These responsibilities include:

- To commit to the project zero incident culture and to believe that all incidents are preventable and zero incidents are attainable;
- To exercise your “Stop Work Authority” (i.e., implementing a Stop Work or Safety Stop) which means that you suspend a task or operation if an unsafe behavior or condition is observed. Stop Works can be implemented by anyone on the Project without fear of repercussion to report all Safety Stops, near misses, injuries, and property damage incidents to management/supervision;
- To participate in daily tool box meetings and to share opinions or ideas on better safe work practices;
- To adhere to the buddy system at all times;
- To follow all procedures identified in the RA HASP, Contractor HASP, or as may be communicated to you by supervisory staff;

- To be receptive to training in safer work practices; and
- To be tolerant towards your co-workers and open to their views and suggestions pertaining to safer work practices, even if they are different from what you are used to doing.

2.2.6 Processing/Operations Facility, Dredging, Habitat Construction, Monitoring and Design Personnel

All contractor and subcontractor personnel involved with the processing/operations facility, dredging operations or habitat construction that have the potential to be exposed to hazardous substances or health hazards will be required to provide proof of OSHA 40-hour HAZWOPER training (29 CFR 1910.120) and current refresher, and a written statement of medical clearance to wear a respirator. All personnel will be made aware of the provisions of this RA HASP and will be required to sign the HASP acknowledgment (Attachment B). This documentation will be maintained by each contractor subject to audit by the CM.

All contractor processing/operations facility, dredging, monitoring, design and habitat construction personnel working on the project who have the potential to be exposed to hazardous substances or health hazards will be required to have a medical evaluation certifying their physical fitness for hazardous waste site operations (29 CFR 1910.120(f)). At a minimum, this evaluation will comply with OSHA's Respiratory Protection Standard, 29 CFR 1910.134. Workers who will be performing diving must also be in compliance with OSHA's Commercial Diving Operations (29 CFR 1910 Subpart T) requirements.

All project personnel will be required to attend the daily health and safety and project coordination meeting to be eligible to work on the site that shift. At this meeting, personnel will sign in with the site supervisor (or designee), who will verify the status of employee credentials and distribute the daily sign-in sheets to appropriate project personnel.

Contractors are responsible for the ultimate health and safety of their employees that will participate in RA work activities. This RA HASP represents the minimum acceptable health and safety standards to be followed on the project. Contractors shall develop a contractor HASP that mandates additional health and safety protection measures for their employees.

SECTION 3

SITE LAYOUT AND CONTROL PLAN

3.1 GENERAL

The Hudson River is located in eastern New York State and flows approximately 300 miles in a generally southerly direction from its source, Lake Tear-of-the-Clouds in the Adirondack Mountains, to the Battery, located in New York City at the tip of Manhattan Island. The Upper Hudson River (UHR) is defined as the section of river upstream from the Federal Dam in Troy, New York.

The Upper Hudson River is divided into three sections (River Section 1, River Section 2, and River Section 3) for the sediment remediation activities. The location of each section is described below and presented on the Site Location Map included as Figure 1:

- **River Section 1:** From the former location of the Fort Edward Dam to Thompson Island Dam (approximately 6.3 miles).
- **River Section 2**: From the Thompson Island Dam to the Northumberland Dam (approximately 5.1 miles).
- **River Section 3**: From the Northumberland Dam to the Federal Dam at Troy (approximately 29.5 miles).

The land-based properties currently being used to support the project are described below. As the dredging activities progress further south, additional properties will be developed to provide river access for workers, allow for equipment mobilization and stage backfill/cap materials. The site layout and control plan will be updated as these additional properties are identified.

3.1.1 Sediment Processing Facility

The Sediment Processing Facility is located between the Champlain Canal (approximately 1.9 miles north of Lock 7) and the main Canadian Pacific rail line in Fort Edward, New York. The purpose of the Sediment Processing Facility is to offload debris and sediment from barges, separate debris and coarse material from the dredged sediment, mechanically dewater the fine-grained sediment prior to shipment of the sediment off site to a landfill, and treat water generated from stormwater and dewatering activities. Figure 3 is a layout of the processing facility, e.g., processing areas, the barge unloading areas, and the rail yard, which will be fenced and gated on all non-water sides.

The Sediment Processing Facility is accessed via a two-mile access road that connects the existing truck route on New York State Route 196 in the Town of Kingsbury, New York, to the northern boundary of the facility (Main Access Road). During an emergency, the Main Access Road will be supplemented by the East Access Road, which is located along the southern boundary of the site and connects to East Street in Fort Edward. The Sediment Processing

Facility is fenced and gated on all non-water sides. Chain link fencing has also been installed around certain interior portions of the Sediment Processing Facility to restrict unauthorized access. Entry points are either locked or staffed by security personnel to restrict access and minimize potential public trespass.

Entry points will either be locked or staffed by security personnel to restrict access and minimize potential public trespass. Anyone wishing to enter the site will be required to inform the security guard the purpose of the visit and the name of a project contact person (if applicable). Workers will be provided with personal ID badges to access either the facility site, support marina or both. The security guard will also have a list of project personnel with phone numbers or radio contact information. If an individual attempting to enter the site does not have a personal ID badge, then the security guard will notify the appropriate project personnel for site access approval. Workers and visitors authorized to access the site must show proper identification and sign in and out. Visitors authorized to access the site shall be escorted by project personnel at all times.

3.1.2 General Support Property

The General Support Property is located on the east shore of the Hudson River at approximately RM 192.5 and approximately 3 miles south of Fort Edward and is accessed via Route 4. The General Support Property was established to provide an equipment staging and support area for the dredging project. It serves as a support area for maintenance of the dredging equipment during the dredging season, and it is used to store marine equipment, e.g., Flexi-floats, tugboats, dock parts, during the off-season. Figure 4 presents the general support property, which is gated and locked.

3.1.3 South Thompson Island Pool Crew Change Location

The South Thompson Island Pool (TIP) Crew Change Location is located between Route 4 and the land-cut portion of the NYSCC Champlain Canal just south of the Crocker's Reef Guard Gate. The South TIP Crew Change Location was established to provide a parking location and dock for Dredge and Tug Crews working in the southern section of Thompson Island Pool.

3.1.4 Saratoga Barge Loading Area

The Saratoga Barge Loading Area (SBLA) is located at 165 Route 4 North, roughly two miles north of the town Schuylerville on the west bank of the Hudson River. The site consists of a material staging area, a truck scale, a loading platform, a conveyor, field trailers, and existing site buildings. The SBLA is used for staging gravel, sand and rock backfill and capping materials that will be placed in the Hudson River to restore and protect areas that were dredged. Backfill and cap materials are loaded onto transport barges that are docked along the shore at this site via a conveyor or heavy construction equipment. Field offices supporting the project and the dredging contractor are located in trailers and buildings located on the site. The site is enclosed by chain link fencing. Figure 5 presents the Saratoga Barge Loading Area.

3.2 RIVER WORK

Field work that requires using vessels in the river will be coordinated with the New York State Canal Corporation (NYSCC), which operates the Champlain Canal System; the United States Coast Guard (USCG), which has jurisdiction of the waterway; and work will also be overseen by USEPA or its designee. All vessels associated with the field activities will monitor the following marine band channels: Channel 13 (Locks & Bridges, hailing frequency), Channel 16 (Emergency), and Channel 18A (Vessel Traffic Service).

While performing field work within the designated navigational channel proper, the boats will provide signage to clearly denote the passing side. Vessels associated with the field activities will adhere to standard NYSCC and USCG navigation laws. Vessel movement will stop when visibility is below 500 feet, except barges, for which movement will stop when visibility is below 2,000 feet.

For field efforts that require the use of divers, appropriate protocols, e.g., dive flags and signs, will be used to alert boaters where diving operations are underway. These flags and signs must be visible to vessel traffic from both directions. A secondary method to monitor boater activity is required to protect divers, i.e. spotters. Dive plans have to be submitted to the CM and approved before any diving activity can take place.

The dredging contractor is required to develop a lock transit safety plan in conjunction with NYSCC to address safe lock passage procedures, potential lock and vessel contact and spills inside the lock area.

Contractors shall conduct vessel safety inspections prior to being used on the project and monthly thereafter. Inspections forms shall comply with applicable regulations as determined by the size of the vessel.

Contractors shall comply with the Water Operations Permit, Float Plan and Field Activities Tracking Standard Operating Procedure (SOP) for any field activities within six feet of or on water bodies including rivers, streams, creeks, canals, storm water basins, and swamps. This SOP and associated forms are included in Attachment C.

SECTION 4

POTENTIAL HEALTH AND SAFETY HAZARDS AND CONTROLS

4.1 FIELD HAZARDS AND CONTROL MEASURES

The following sections discuss general safety and health hazards associated with the specific field activities of the RA Work Plans and support activities. The descriptions of these field activities are general, since the specific field activities will be described in more detail in the contractor HASP submitted by each contractor performing the work. Each contractor HASP will specify minimum procedures for controlling the hazards associated with the various field activities.

Minimum control measures and procedures to be used on the project are detailed in Section 4.2 – General Hazard and Control Measures. In this section, the overall guidelines on when and how to develop a job safety analysis (JSA) for specific tasks are discussed. Sections 4.3 through 4.23 specifically address procedures and control measures for water safety, lockout/tagout, (LOTO) fire prevention/hot work permits, confined space entry, fall protection, cranes, hoisting and rigging, scaffolding, electrical safety, hand/power tools, ladder safety, housekeeping, steel erection, diving safety, soft/hard line handling, heat stress, cold stress, biological hazards, safe lifting, PCBs, drilling operations, working on ice, electro-fishing, working on a bridge, and ionizing radiation.

All work must be performed using the buddy system, a system of organizing employees into work groups so that each employee of the work group is designated to be observed by at least one other employee in the work group. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency. If an individual in a work group does not have a direct line of sight with another group member, then the individual must have a means of communicating with the group, e.g., two-way radios.

4.1.1 Processing Facility Upgrades and Repair Hazards

The hazards associated with Processing Facility Upgrade and Repair activities can be chemical, physical, biological, and environmental.

Chemical hazards include, but are not limited to:

- Coming into contact with contaminated sediment or hazardous materials; and
- Coming into contact with products, paints, solvents, glues, and other materials of construction.

Physical hazards include, but are not limited to:

- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;

- Coming in contact with electricity;
- Drowning;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces; and
- Vehicle/train incidents.

Biological hazards include exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, noise, high wind, tornadoes, hurricanes, and lightning storms.

Manual materials handling and manual project site preparation may cause blisters, sore muscles, and joint and skeletal injuries; these activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

For this project, the primary risk management tool utilized is the Job Safety Analysis (JSA). The JSA is a documented process of analyzing discrete work tasks consisting of identifying the task, breaking it down into steps, identifying the hazards associated with each step and identifying the control measures used for each step to protect the worker, environment or public. In accordance with this document and the contract documents, a hazard/risk/exposure assessment utilizing the project JSA template will be performed for each major activity that will take place. Appendix A of this document provides the JSA template. When more detailed procedures are necessary to mitigate known hazards, those procedures will be included as Appendices to the Contractor HASP.

4.1.2 Processing Facility Operations Hazards

The hazards associated with the Processing Facility Operations activities are mainly chemical, physical and environmental.

Chemical hazards include, but are not limited to:

- Coming into contact with contaminated sediment or hazardous materials; and
- Coming into contact with products necessary for operations including fuels, oils, paints, solvents, glues, and treatment chemicals.

Physical hazards include, but are not limited to:

- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Coming in contact with electricity;
- Drowning;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces;
- Vehicle/train incidents;
- Working in trenches/excavations; and
- Work near radiological sources.

Environmental hazards include, but are not limited to, exposure to insects, animals, rodents, heat, cold, ultra-violet radiation, noise, high wind, tornadoes, hurricanes, and lightning storms.

Control Measures

For this project, the primary risk management tool utilized is the Job Safety Analysis (JSA). The JSA is a documented process of analyzing discrete work tasks consisting of identifying the task, breaking it down into steps, identifying the hazards associated with each step and identifying the control measures used for each step to protect the worker, environment or public. In accordance with this document and the contract documents, a hazard/risk/exposure assessment utilizing the project JSA template will be performed for each major activity that will take place. Appendix A of this document provides the JSA template. When more detailed procedures are necessary to mitigate known hazards, those procedures will be included as Appendices to the Contractor HASP.

4.1.3 Dredging Operations Hazards

The hazards associated with the Dredge Operations activities are mainly are mainly chemical, physical and environmental.

Chemical hazards include, but are not limited to:

- Coming into contact with contaminated sediment or hazardous materials; and
- Coming into contact with products necessary for operations including fuels, oils, paints, and solvents.

Physical hazards include, but are not limited to:

- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Confined space hazards;
- Drowning;
- Hypothermia;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Marine vessel incidents;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces;
- Soft/hard line hazards; and
- Proximity to low head dams and similar structures.

Environmental hazards include, but are not limited to, exposure to insects, animals, rodents, heat, cold, ultra-violet radiation, high wind, river current, noise, and lightning.

Control Measures

For this project, the primary risk management tool utilized is the Job Safety Analysis (JSA). The JSA is a documented process of analyzing discrete work tasks consisting of identifying the task, breaking it down into steps, identifying the hazards associated with each step and identifying the control measures used for each step to protect the worker, environment or public. In accordance with this document and the contract documents, a hazard/risk/exposure assessment utilizing the project JSA template will be performed for each major activity that will take place. Appendix A of this document provides the JSA template. When more detailed procedures are necessary to mitigate known hazards, those procedures will be included as Appendices to the Contractor HASP.

Exclusion zones must be established around areas on board the dredge, barges, and other support vessels where workers could incur contact with contaminated sediments. Such contact could result when the contaminated dredge bucket is placed on the deck of the dredge for storage, cleaning, or maintenance. Also dredge material spillage on the deck and gunwales of the material barges could be a source of exposure for the crew members. The dredging contractor will describe the exact locations of these exclusion zones and associated decontamination areas and support zones in their Contractor Health and Safety Plan.

Contractor activities occurring when the Vessel Traffic Service (VTS) is not operational shall comply with the Water Operations Permit, Float Plan and Field Activities Tracking Standard Operating Procedure (SOP) for any field activities within six feet of or on water bodies,

including rivers, streams, creeks, canals, storm water basins, and swamps. This SOP and associated forms are included in Attachment C. When the VTS is operational all Contractor vessels are required to report all vessel movements to VTS.

4.1.4 Habitat Construction Hazards

The hazards associated with the Habitat Construction activities are mainly chemical, physical and environmental.

Chemical hazards include, but are not limited to:

• Coming into contact with products necessary for operations including fuels, oils, paints, and solvents.

Physical hazards include, but are not limited to:

- Proximity to low head dams and similar structures;
- Being struck by tools/equipment/materials;
- Drowning;
- Hypothermia;
- Air embolism or other barotraumas;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Marine vessel incidents; and
- Slips/trips/falls on same elevation surfaces.

Environmental hazards include, but are not limited to, exposure to insects, animals, rodents, heat, cold, ultra-violet radiation, high winds, river current, water temperatures, tornadoes, hurricanes, and lightning storms.

Control Measures

For this project, the primary risk management tool utilized is the Job Safety Analysis (JSA). The JSA is a documented process of analyzing discrete work tasks consisting of identifying the task, breaking it down into steps, identifying the hazards associated with each step and identifying the control measures used for each step to protect the worker, environment or public. In accordance with this document and the contract documents, a hazard/risk/exposure assessment utilizing the project JSA template will be performed for each major activity that will take place. Appendix A of this document provides the JSA template. When more detailed procedures are necessary to mitigate known hazards, those procedures will be included as Appendices to the Contractor HASP.

Contractors engaged in commercial diving must develop a *Safe Practices Manual* for Commercial Diving. All diving operations must be conducted in accordance with 29 CFR 1910 Subpart T.

The diving contractor will also provide a task specific "Dive Plan" for each individual diving assignment that outlines the personnel roles and responsibilities, equipment, standard operating procedures, hazard controls, emergency procedures, etc., in accordance with 29 CFR 1910 Subpart T. Each Site Specific Dive Plan must be accepted by the CM before the diving operation can begin.

Contractor activities occurring when the Vessel Traffic Service (VTS) is not operational shall comply with the Water Operations Permit, Float Plan and Field Activities Tracking Standard Operating Procedure (SOP) for any field activities within six feet of or on water bodies, including rivers, streams, creeks, canals, storm water basins, and swamps. This SOP and associated forms are included in Attachment C. When the VTS is operational all Contractor vessels are required to report all vessel movements to VTS.

4.1.5 Rail Yard Operations Hazards

The hazards associated with the Rail Yard Operations activities are mainly chemical, physical and environmental.

Chemical hazards include, but are not limited to:

- Coming into contact with contaminated sediment or hazardous materials.
- Coming into contact with products necessary for operations including fuels, oils, paints, and solvents.

Physical hazards include, but are not limited to:

- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Fall from elevation;
- Fatigue;
- Fires;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces; and
- Vehicle/train incidents.

Environmental hazards include exposure to insects, animals, rodents, heat, cold, ultra-violet radiation, noise, noise, high wind, tornadoes, hurricanes, and lightning storms.

<u>Control Measures</u>

For this project, the primary risk management tool utilized is the Job Safety Analysis (JSA). The JSA is a documented process of analyzing discrete work tasks consisting of identifying the

task, breaking it down into steps, identifying the hazards associated with each step and identifying the control measures used for each step to protect the worker, environment or public. In accordance with this document and the contract documents, a hazard/risk/exposure assessment utilizing the project JSA template will be performed for each major activity that will take place. Appendix A of this document provides the JSA template. When more detailed procedures are necessary to mitigate known hazards, those procedures will be included as Appendices to the Contractor HASP.

4.1.6 Water Based Monitoring, Sampling, Design Support, and Engineering Data Collection Hazards

The hazards associated with the monitoring and design activities can be mainly chemical, physical and environmental.

Chemical hazards include, but are not limited to:

- Coming into contact with contaminated sediment or hazardous materials.
- Coming into contact with products necessary for operations including fuels, oils, paints, and solvents.

Physical hazards include, but are not limited to:

- Proximity to low head dams and similar structures;
- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Drowning;
- Diving related hazards;
- Hypothermia;
- Electrical shock;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces;
- Vehicle incidents; and
- Marine vessel incidents.

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, water temperature, noise, high wind, tornadoes, hurricanes, and lightning storms.

Manual materials handling and manual project site preparation may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Work in close proximity to the river presents the possibility of drowning. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

For this project, the primary risk management tool utilized is the Job Safety Analysis (JSA). The JSA is a documented process of analyzing discrete work tasks consisting of identifying the task, breaking it down into steps, identifying the hazards associated with each step and identifying the control measures used for each step to protect the worker, environment or public. In accordance with this document and the contract documents, a hazard/risk/exposure assessment utilizing the project JSA template will be performed for each major activity that will take place. Appendix A of this document provides the JSA template. When more detailed procedures are necessary to mitigate known hazards, those procedures will be included as Appendices to the Contractor HASP.

Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6, and those for diving safety are presented in Section 4.15.

Contractor activities occurring when the Vessel Traffic Service (VTS) is not operational shall comply with the Water Operations Permit, Float Plan and Field Activities Tracking Standard Operating Procedure (SOP) for any field activities within six feet of or on water bodies, including rivers, streams, creeks, canals, storm water basins, and swamps. This SOP and associated forms are included in Attachment C. When the VTS is operational all Contractor vessels are required to report all vessel movements to VTS.

4.1.7 Land Based Monitoring, Sampling, Design Support, and Engineering Data Collection Hazards

The hazards associated with the monitoring and design activities can be mainly chemical, physical and environmental.

Chemical hazards include, but are not limited to:

- Coming into contact with contaminated sediment or hazardous materials.
- Coming into contact with products necessary for operations including fuels, oils, paints, and solvents.

Physical hazards include, but are not limited to:

- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Coming into contact with contaminated sediment or hazardous materials;
- Hypothermia;
- Electrical shock;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces; and
- Vehicle / train incidents.

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, water temperature, noise, high wind, tornadoes, hurricanes, and lightning storms.

Manual materials handling and manual project site preparation may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Work in close proximity to the river presents the possibility of drowning. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

For this project, the primary risk management tool utilized is the Job Safety Analysis (JSA). The JSA is a documented process of analyzing discrete work tasks consisting of identifying the task, breaking it down into steps, identifying the hazards associated with each step and identifying the control measures used for each step to protect the worker, environment or public. In accordance with this document and the contract documents, a hazard/risk/exposure assessment utilizing the project JSA template will be performed for each major activity that will take place. Appendix A of this document provides the JSA template. When more detailed procedures are necessary to mitigate known hazards, those procedures will be included as Appendices to the Contractor HASP.

4.2 CONTRACTOR HASP, GENERAL HAZARDS AND CONTROL MEASURES

Every Contractor must establish, implement and maintain a written Contractor HASP and a copy must be available for review at the Contractor's primary field office. If a lower tier sub-

contractor is being used by the Contractor, the subcontractor must comply with all the conditions of the Contractor's HASP or submit and have approved a separate HASP for the sub-contractor's work scope. The Contractor HASP shall meet the minimum requirement described in this document and in Section 01350 – Health and Safety of the contract.

General safety and health hazards are associated with the field activities of the RA work plan and support activities. In addition to the site-specific requirement identified in this RA HASP, the contractor shall also comply with GE's Environmental, Health and Safety (EHS) Requirements described in Appendix B and the Site Safety Rules included in Appendix C. In addition to the general hazards and control measures presented here, it is recognized that changes implemented during the course of work can introduce previously unconsidered safety hazards to the worker. The Contractor, in conjunction with the CM, is required to evaluate changes in the means or methods used to accomplish the work including safety hazards.

4.3 WATER SAFETY

Contractor personnel working over, near or adjacent to water, or where the danger of drowning exists, must wear a United States Coast Guard (USCG)-approved Commercial Type I, II, or III personal flotation device (PFD), appropriate to the circumstance. Other Types of USCG-approved PFDs must be approved by the CM prior to their use. The PFD shall be equipped with an attached emergency whistle and a light that is activated when submerged in water. All PFDs shall be colored "International Orange" and will have SOLAS-grade reflective panels. Self-inflating PFDs will not be allowed on the project. Prior to and after each use, the PFD must be inspected for defects that would alter their strength and buoyancy. Defective units must be removed from service. This section pertains to personnel intending to work above the water surface, not divers who are actively engaged in diving operations (including dressing in and out of their gear). Divers who are engaged in non-diving operations (such as habitat planting, wading, etc.) are required to wear PFD's when wearing them does not prohibit them from performing the task.

Ring buoys with at least 90 feet of line must be provided and readily available for emergency rescue operations. Distance of working personnel from ring buoys may not exceed 200 feet. Some means of rescue, e.g., a ring buoy or boat, must be immediately available at locations where personnel are working over or adjacent to water.

Employees walking or working on barges, support vessels, floating platforms, and piers or docks shall wear USCG-approved personal flotation devices. Fall protection shall also be provided if there is a possibility that persons could fall six or more feet to a lower level, deck, tethered vessel, water or dock/pier.

Vessel Operators will have adequate training and experience to qualify them for their assignment. Operators of small craft shall complete a USCG boating safety training course prior to conducting work on the river or canal. Each operator/skipper must demonstrate proficiency in the following subject areas: proper operation of a boat; boat and safety equipment inspections;

content and frequency of equipment safety inspections; proper use of on-board safety equipment, including fire extinguisher, radio or cellular phone, flares, horn, etc.; proper procedures on the completion and filing of a float plan; appropriate boating "rules-of-the-road"; emergency procedures in the event of capsizing or being thrown overboard; and different types of PFDs and their proper inspection and use.

Prior to each day or shift of boat operations, a boat inspection must be conducted by the boat operator/skipper. This inspection must be conducted in accordance with accepted USCG and any applicable state boating safety inspection procedures. The inspection must verify that necessary safety equipment is aboard and functioning properly, all lines are untangled and ready for immediate deployment, and that all members of the crew are aware of proper procedures that are to be followed upon the water. In addition, this information must be reviewed during the daily toolbox safety meeting to confirm that the procedures have been followed and all crew members are satisfied as to its completion.

It will be the responsibility of the site supervisor and/or vessel captain to verify that daily boat/PFD/equipment inspections are completed and documented using a checklist, and daily toolbox safety meetings are conducted and documented.

Contractors shall comply with the Water Operations Permit, Float Plan and Field Activities Tracking Standard Operating Procedure (SOP) for any field activities within six feet of or on water bodies including rivers, streams, creeks, canals, storm water basins, and swamps. This SOP and associated forms are included in Attachment C.

Each vessel shall have established areas to use for embarkation and debarkation to reduce the potential for slips and falls when transferring from one vessel to another or to a dock.

4.3.1 Low Head Dams

Dredging, habitat construction and support activities will be conducted upstream of low-head dams. A total of seven low-head dams are located within the project area. Consult the NYSCC charts for dam locations prior to any work activities on the river.

Hazards

The low-head dam is one of the most dangerous river concerns and can be a threat to an unwary boater, swimmer or wader. Hazards exist not only from going over the dam, but also from being caught in the backwash below the dam, the hydraulic, where the power of the water is sometimes overlooked. Anything caught in this backwash below the dam is trapped and recirculated round and round, making escape or rescue difficult. A person caught in the backwash of a low-head dam in certain flows will be carried to the face of the dam, where water pouring over it will wash the victim down under and back beneath the boil. When the victim struggles to the surface, the backwash again carries the victim to the face of the dam, thus continuing the cycle.

These dams are sometimes loaded with debris, such as tires and logs on the surface and rocks and steel bars on the bottom, posing another serious problem for the recirculating victim. Dams do not have to have a deep drop to create a dangerous backwash. During periods of high water and heavy rains, the backwash current problems get worse, and the reach of the backwash current is extended downstream.

Faces of a low-head dam are nearly vertical and their concrete surfaces are smooth. A person trapped against the dam face is unlikely to climb it. Water pouring over the dam will be highly aerated. The presence of these bubbles reduces buoyancy by a third and reduces the effectiveness of Personal Flotation Devices.

Control Measures

In addition to completing a JSA for any work near dams, the Contractor must complete a Near Dam River Operations Plan. Near Dam work is considered any operations conducted downstream of any dam safety warning cable or signage or within 1,000 feet upstream of any dam, whichever is greater. Refer to Section 01350 – Health and Safety of the contract for details required in the Near Dam River Operations Plan.

4.3.2 Cold Water Hazards

Working over or adjacent to water presents the likelihood of hypothermia should emersion occur.

Hazards

Cold stress normally occurs in temperatures at or below freezing, or under certain circumstances, in temperatures of 40°F. However, if an individual becomes wet or immersed in water, the likelihood of hypothermia is significantly increased. See Section 4.17.1 for additional information on hypothermia.

Control Measures

When the water temperature is between 40 and 50 degrees Fahrenheit, field personnel working on the river or canal shall wear a float coat (top half of a Mustang Suit) or a one-piece survival suit. When the water temperature is less than 40 degrees Fahrenheit, field personnel shall wear either a float coat or bib-overalls (a full two-piece Mustang Suit), or a one-piece survival suit. Suits or Float Coats shall be USCG- approved. See Section 4.17.1 for additional information.

4.4 LOCKOUT/TAGOUT PROCEDURES

The Lockout/Tagout (LOTO) standard applies, but is not limited to, activities that are performed on a machine, a piece of equipment, a process, or circuit. Primary, secondary, stored, and single-source energy sources require a lockout when performing servicing and/or maintenance activities. Primary energy sources are the main energy sources such as electricity, gas, fluids, etc., provided to machines, equipment, processes, and circuits. Shut down machinery with moving parts or process equipment in service before adjustments or repairs. Project LOTO procedures must comply with the GE Master LOTO Program (Appendix D).

If shutdown is not feasible, a risk assessment must be used. The risk assessment explores the safest conditions possible for individual work assignments. Risk assessment establishes safe practices and alternative methods to reduce the possibility of injury when normal LOTO procedures cannot be applied. A task hazard analysis (mitigation plan) and written procedures specific for the job must be completed and reviewed with the CM prior to start.

Never remove warning or danger tags or locks on any apparatus, valves, or switches unless you have been instructed to do so, and then only by the persons who attached them.

Contractors who are involved with equipment/systems and are potentially exposed must implement procedures that provide protection equal to or better than the GE LOTO program. LOTO programs for outside services or contractors must be reviewed by authorized CM personnel.

The contractor supervisor must be made aware of the overall LOTO procedure and informed of the equipment specific procedure by the CM.

Contractors must place their own locks and tags (one lock, one key, one person) and verify LOTO by try-out. As a best practice, the CM may perform the LOTO step-by-step process. The contractor will then be required to attach and secure their individual LOTO locks and red tags to the same energy-isolating devices that the CM has locked out and validate zero energy by try-out.

All contractor workers involved in a LOTO operation must develop a written LOTO program and have documentation of LOTO training. This documentation must be available for audit at the work site.

4.5 FIRE PREVENTION/HOT WORK PROCEDURES

Smoking will only be allowed in designated areas. The CM will review contractor requests for specified smoking areas. The Contractor will be responsible for providing fire extinguisher, sand pail, and overall housekeeping and maintenance of their smoking area.

Use only approved cleaning agents — never gasoline or flammable liquids. Gasoline and similar flammable liquids must be stored only in approved safety containers and in areas free of burning hazards. Keep all heat sources from flammable liquids, gases, or other combustible materials. Open fires are strictly prohibited.

A hot work permit is required for all hot work on site (see Attachment D). Every hot work operation must have a properly trained and equipped fire watch with appropriate fire extinguishers for the specific hazard in the work area. The fire watch must remain in the work area for at least one hour after the hot work activity is completed and up to three hours where indicated on the Hot Work Permit. When the four-hour monitoring is completed, the fire safety supervisor inspects the area once more.

To avoid accidental displacement, keep compressed gas cylinders standing and securely tied off, whether empty or full. Make sure valve protection caps are on when cylinders are not in use. The valve shall be closed on all empty cylinders.

When moving cylinders by crane or derrick, a cradle, boat, or suitable platform shall be used. Slings or hooks shall not be used.

When cylinders are not in use, they must be secured and capped. If cylinders are not used within a 24-hour period, they are considered to be in storage, and must be secured, capped, and separated. Separate oxygen and fuel gas cylinders by a minimum of 20 feet or a 5-foot high, ½-hour fire-rated barrier. In lieu of removing the cylinders for storage as noted above, a gas cylinder cart with an engineered steel fire barrier (where the steel barrier has been engineered specifically to meet a ½-hour fire resistance rating and to prevent a fire in one cylinder from spreading to the other cylinder on the cart, and the barrier is also depicted as meeting the standard's height requirement of at least 5 feet high) would be acceptable in order to comply with §1926.350(a)(10).

It will be necessary to perform hot work such as welding, cutting, and grinding at various times during the project. Before any hot work can be performed, certain precautions must be taken and conditions met to determine that hot work efforts can be performed safely. The following are required:

- An initial site survey must be made by the contractor to determine that the area is free of flammable and combustible materials.
- Good housekeeping practices must be maintained at all sites that require hot work.
- Adequate fire extinguishing equipment must be in place and readily accessible at all hot work locations, and employees must be properly trained in the use of such equipment.
- Contractor will request a hot work permit (Attachment D), to be issued by CM and completed by the individuals specified on the permit.
- A firewatch must be provided as necessary and remain in place for 60 minutes after completion of work when conditions warrant and are so specified on the hot work permit. The fire watch or designee must continue monitoring for an additional three hours when indicated on the Hot Work Permit. When the four-hour monitoring is completed, the fire safety supervisor inspects the area once more. The firewatch must be trained to use the required fire extinguisher and hose, and be familiar with the position's responsibilities.

4.6 CONFINED SPACE PROCEDURES

A confined space is an enclosed area that has each of the following four characteristics:

1. Large enough and so configured that a worker can bodily enter and perform assigned work;

2. Has limited means for worker entry and exit due to the number, size, or location of openings;
3. Is not designed for continuous worker occupancy; and
4. Contains or may contain a serious safety or health hazard.

Such hazards include currently or potentially hazardous atmospheres, potential worker entrapment (from inwardly converging walls or downward sloping floor), or potential worker engulfed by stored materials. Examples of confined spaces include tanks, vessels, pits, sewers, pipelines, boilers, and utility vaults.

It will be assumed that all confined spaces are Permit Required Confined Spaces (PRCSs) and will be entered as such, in accordance with the requirements of 29 CFR 1910.146, unless they can be shown and documented by a competent person to be a non-permit required confined space. Entry into a confined space shall be conducted only if necessary to do assigned work. Whenever possible, assigned work shall be completed from outside the space. The contractor shall implement procedures that provide protection equal to or better than the minimum requirements described in GE's Confined Space Manual (Appendix E).

Entry into a confined space is prohibited until atmospheric testing of the space and applicable entry procedures have been documented and permits completed.

All contractor entrants and attendants must have documentation of confined space entry/ attendant training. Additional respiratory protection training and documentation will be required if respiratory protection is needed. This documentation must be available for audit at the work site.

All entrants and attendants must be informed of the entry procedures, permit requirements, air monitoring results, hazard mitigation plan and rescue plan prior to the entry. The use of appropriate retrieval equipment or other approved means of rescue is required for all confined space entries. The number of retrieval or rescue devices must be equal to number of entrants. An attendant shall be posted for the duration of entry and may not enter the confined space, leave their post nor be assigned any other duties that would distract them from their role as attendant.

4.7 FALL PROTECTION PROCEDURES

Project fall protection procedures must comply with the GE Fall Protection Manual (Appendix F). All workers in an area exposed to a fall greater than six feet must use appropriate fall protection. Such protection may include:

- Guardrail systems;
- Safety net systems; and
- Personal fall arrest systems.

Other protection methods include:

- Hole covers;

- Positioning device systems;
- Equipment guards;
- Fences and barricades; and
- Warning line systems set back a safe distance from the hazard, in combination with guardrail systems, safety net systems, personal fall arrest systems, or safety monitoring systems.

One hundred percent fall protection is required, but not limited to, the following when a worker is exposed to a fall of six feet or more:

- Working on barges with exposed hoppers or perimeters;
- Performing steel erection work;
- Working on scaffolds;
- Unprotected sides and edges;
- Overhand bricklaying and related work;
- Leading edges;
- Roofing work on low-slope roofs;
- Hoist areas;
- Steep roofs;
- Holes;
- Precast concrete erection;
- Formwork and reinforcing steel;
- Wall openings;
- Ramps, runways, and other walkways;
- Walking/working surfaces;
- Excavations;
- Aerial lifts;
- Dangerous equipment;
- Metal decking operations; and
- Erecting, dismantling, and working on scaffolds.

Trades people shall not stand on motors, pumps, conduits, mid or upper-rails of aerial or articulating lifts, or the like to gain access to elevated work. Working on a roof within six feet of the edge or a floor opening requires appropriate fall protection (guardrail systems, safety net systems, or personal fall arrest systems). Use of a safety monitor system or controlled access zone will not be accepted without prior approval from the CM Project Safety Manager.

A full-body safety harness must be worn at all times in articulating scissors and personnel lifts. Chains must be closed. Harnesses must be secured to an approved tie-off point when

breaking the plain of the lift. Safety harnesses must be secured to an approved tie-off point in all aerial lifts. Establish a barricaded or roped off danger zone around lifts for falling objects.

Hoisting of personnel on a personnel platform by a crane or derrick is prohibited, except when the erection, use, and dismantling of conventional means of reaching the worksite, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform, or scaffold, would be more hazardous or is not possible because of structural design or worksite conditions. This type of operation must meet the requirements of OSHA 1926.550(g).

Workers must wear a full-body safety harness with a safety lanyard secured to a separate lifeline while working from swing scaffolds, boatswain's chairs, or other suspended work platforms where a fall hazard is present.

Contractor must develop a written fall protection and prevention procedure and communicate it to all affected employees. The program will contain the following elements:

- Hazard identification;
- Selection of fall hazard control;
- Equipment inspection and maintenance;
- Rescue and retrieval methods for employees involved in a fall; and
- Employee training.

Contractor must conduct a fall hazard assessment to address both routine ongoing activities and tasks as well temporary activities, which may take place during maintenance and construction. Control measures will be identified, implemented, and communicated by the contractor. Documentation of fall hazard control measures should be included in JSAs, safe work plans, or other operating procedures.

Contractor workers must be trained in the requirements of the fall protection and prevention procedure, including use of fall protection equipment as appropriate. Contractors must inspect and maintain fall protection equipment in accordance with manufacturer's recommendations.

Barges or other marine equipment that are not fitted with guard rail systems shall meet applicable fall protection requirements.

4.8 CRANES, HOISTING, AND RIGGING

The contractor shall implement procedures that provide protection equal to or better than the minimum requirements described in GE's Crane Safety Manual (Appendix G). Never raise a load over people or occupied buildings. Tag lines must be used to control every load. Rigging operations utilizing chains are not permitted without prior approval from GE EHS program manager. Multiple-lift rigging is strictly prohibited. All materials shall be rigged to prevent unintentional displacement. Hooks with self-closing safety latches shall be used to prevent components from slipping out of the hook. Rigging must be in good condition, appropriate for

the lift and tagged with a manufacturer's rating tag. Defective rigging equipment, or rigging without a manufacturer's rating tag shall be labeled "Do Not Use," and removed from service.

Only qualified operators may operate power equipment. Seat belts must be worn where applicable.

Safe lifting procedures for cranes and hoists must be developed and documented. Crane and hoist operators and qualified riggers must conduct documented rigging equipment inspections prior to each use on each shift and as necessary during its use to ensure that it is safe.

All operators of cranes and hoists should have received training that addresses safe operating practices for all crane types that they will be operating on site.

Preventative maintenance must be conducted on cranes and hoists in accordance with manufacturer's guidance or local regulatory requirements.

Contractors must submit copies of detailed and documented annual inspections conducted by qualified individuals.

Operators of tower cranes, derricks, and mobile cranes must possess a current Certificate of Competence. Operator certification and crane operations must comply with all applicable requirements of New York State Code Rule 23, Subpart 23-8.

Riding on hooks, headache balls, or slings of hoisting equipment is strictly prohibited.

4.9 SCAFFOLDING

All scaffolds must be inspected before use and must be designed for the safe working load. Only scaffold planking tested and approved to carry the load may be used. Scaffold planking must be secured by tying or cleats to prevent slipping. Mark scaffold planks (in most cases the manufacturer does this) and use only on scaffolds.

Handrails and toe boards shall be used on all scaffolds and the scaffold secured as required. Rolling tower scaffolds must be locked while the scaffold is in use. Tower must be free of personnel, material, and equipment before being moved. Rolling scaffolds are not to be moved from the top. Ladders must be used for accessing scaffolds. Climbing of bracing is prohibited.

Scaffold platforms 6 feet or more above any working surface must be equipped with a guardrail system. Top rails (42 inches plus or minus 3 inches), mid rails (midway between the top rail and the scaffold platform), and toe boards or personal fall arrest systems must be implemented.

No scaffold shall be erected, moved, dismantled, or altered except by trained and qualified personnel under the authority of the competent person. Personnel erecting or dismantling scaffolding must adhere to fall protection standards above 6 feet.

Abide by the scaffold tag system:

- *GREEN*–complete scaffold per required safety standards.

- *YELLOW*–conditional use — 100% fall protection required.
- *RED*–Scaffold not complete. Do Not Use.

Makeshift platforms, such as stacked materials, chairs, boxes, or drums shall not be used. Scaffolds shall be built to OSHA standards (1926.451).

Tubular welded frame scaffolds have additional special safety requirements: scaffold legs shall be set on adjustable bases, plain bases, or other foundations adequate to support the maximum rated load. To prevent movement, the scaffold shall be secured to the building or structure at intervals not to exceed 30 feet horizontally and 26 feet vertically. All pins to secure diagonal braces and to prevent uplift shall be used. Outriggers and platforms below the working/walking level shall be fully planked. Outriggers shall be tied to the frame. Scaffolds may not be used as material hoist towers or for mounting derricks without first determining the loads and stress involved. All scaffolds shall be free of tools, trash, etc. before calling in for removal.

4.10 ELECTRICAL SAFETY

Electrical equipment shall not be installed, repaired, or removed except by trained qualified electricians. Electrically operated equipment (stationary and portable) must be grounded.

When extension cords, power tools or equipment cords are frayed or worn, or when bare wire is showing, the equipment must be tagged and taken out of service. Do not use electrical tape on extension cords. Temporary cords should be supported a minimum of eight feet above the floor in egress walkways, corridors and areas requiring employee access. Temporary lighting must be guarded.

All 120-volt, single phase 15- and 20-ampere receptacle outlets at the Processing Facility, Work Support Marina, and all support sites, which are not a part of the permanent wiring of the building or structure and are in use by employees, shall have approved ground fault circuit interruption (GFCI) for personnel protection. When using the permanent receptacles, GFCI devices must be installed on each extension cord prior to the source receptacle.

Lock Out Tag Out (LOTO) programs represent a lifesaving control. Compliance with GE's procedures is mandatory. Equipment-specific energy control procedures are required for all LOTO operations. See GE’s LOTO Program in Appendix D.

Extension cords must be at least 16-gauge heavy duty three-wire with a UL approved three prong grounded plug. Extension cords connected in series shall not exceed 200 linear feet. 110-volt outlets on portable generators and welders shall be three-way (NEMA 5-15R) grounded to the frame. The power lead shall be connected through a GFCI. Prior to in-service each generator shall best tested to assure grounded connections.

Arc flash is a rapid, explosive discharge of electrical energy that usually results from a short circuit fault. Project equipment has been designed and incorporates arc flash calculations, arc flash hazard categories and arc rating labeling on the equipment. All work on the electrical

equipment where arc flash is possible will be performed by a qualified electrician and will require the appropriate Arc Flash PPE as specified and detailed in NFPA70E.

4.11 HAND AND POWER TOOLS

All hand and power tools must be the appropriate tool for the job. They must be inspected prior to use.

Defective tools and equipment must be taken out of service and shall be properly repaired before reuse. Machinery, tools (including portable grinders and buffers) and equipment with exposed gears, belts, power transmission, couplings, etc., shall not be operated without effective guards in place.

The use of gasoline and propane-powered equipment in any building is strictly prohibited unless specific permission is granted by the CM.

Operators of powder actuated tools, i.e., tools that use a chemical propellant charge to propel nails or other such fasteners, must have documented safety training in the use of such tool.

4.12 LADDER SAFETY

All ladders shall be heavy duty, industrial strength fiberglass/composite construction. The use of metal/aluminum and wooden ladders is prohibited unless approved for a specific purpose in advance by the CM.

Stepladders must be fully opened and used as intended. They cannot be used as straight ladders. Tie-off all straight and extension ladders to keep them secure. Straight and extension ladders must extend at least three feet beyond the top landing. The base of the ladder shall be set out at least one-fourth of the ladder height measured from bottom to point of bearing.

Each ladder owner must have a process to document regular ladder inspections. Any ladder found defective shall be tagged, removed from service and either destroyed (vertically) or repaired to original specifications.

Do not place ladders in blind spots (doorways, driveways) or in egress ways unless properly barricaded or guarded.

4.13 HOUSEKEEPING

Cleanliness and orderliness are the first fundamentals of good housekeeping. Contractors are responsible for cleaning up and removing hazardous and non-hazardous waste generated on site. Each contractor shall be responsible for maintaining work areas free from waste materials, debris, and rubbish. Work will not be considered complete until all waste materials are removed and the work area returned to a clean and orderly condition. Waste material must be disposed of off-site.

All protruding nails in form lumber, boards, etc., must be withdrawn or bent into the wood before the wood is stacked or piled.

Rags, packing materials, paper cups, and sawdust in saw areas must be collected daily and placed in proper containers.

All objects with sharp edges (scrap sheet metal, scrap glass, bottles, metal cans) shall be collected daily and placed in containers.

Avoid placing debris and other obstacles in roadways, walkways, aisles, and other travel routes.

Allow sufficient time at the end of each day for proper cleanup of the work area. Place all debris in proper refuse containers and keep lids closed tightly to prohibit bees, wasps, and other pests.

All stored material must be kept in an orderly manner at all times.

Provide a proper collection container and floor protection when using cutting oil, solder flux, hydraulic oil, and other fluids. Rags containing oil, hydraulic fluid or other combustible fluids shall not be placed in trash containers with the other wastes, shall not be placed in containers left inside buildings and shall be disposed of in accordance with applicable hazardous waste regulations. In the event of a large spill, immediately install acceptable containment barriers.

4.14 STEEL ERECTION

The safety standards for structural steel erection will follow the OSHA regulations for Steel Erection Subpart R (1926.750-1926.761 inclusive of Appendices A-H) dated January 18, 2001, and revised on July 18, 2001, with the following exceptions and additions:

- All workers, including connectors and deckers, must be protected from falls at or greater than 6 feet (1.8m).
- Multiple lift rigging procedures (Christmas treeing) is strictly prohibited.
- The use of a Controlled Decking Zone (CDZ) is prohibited.

Cranes used in steel erection activities shall be visually inspected prior to each shift by a competent person. The inspection must include observation for deficiencies during operation. Deficiencies constituting a hazard require that the hoisting equipment be removed from service until the deficiency is corrected.

At the end of the shift or when environmental or jobsite conditions require, metal decking must be secured against displacement. Metal decking must be laid tightly and immediately secured upon placement to prevent accidental movement or displacement.

Wire mesh, exterior plywood, or equivalent must be installed around columns where planks or metal decking do not fit tightly. The materials used must provide fall protection for personnel and prevent objects from falling through.

All columns must be anchored by a minimum of four anchor bolts. Anchor bolts should not be repaired, replaced, or field modified without the approval of the project structural engineer of record.

4.15 DIVING SAFETY

All diving operations conducted during the project are considered to be commercial diving operations; exceptions to this rule can only be granted after a written request to use scientific diving procedures has been reviewed and approved by the CM. However, without exception, any diving operations conducted by the Facility Site Work Construction Contractor, Processing Facility Operations Contractor, Dredging Contractor, and Habitat Construction Contractor or subcontractors are considered to be commercial diving operations, and not scientific diving.

Each contractor involved in commercial diving operations must comply with all applicable requirements of OSHA's Commercial Diving Standard (29 CFR 1910 Subpart T). They must develop a *Safe Practices Manual* as per 29 CFR 1910.420(b) for their diving operations before beginning work. The Manual shall be made available at the dive location and each dive team member must read and be familiar with the Safe Practices Manual. This manual must include:

- A copy of the OSHA Commercial Diving Standard and the employer's policies for implementing the requirements of this standard;
- Safety procedures and checklists for diving operations;
- Assignments and responsibilities of the dive team members;
- Equipment procedures and checklists; and
- Emergency procedures.

4.15.1 General

General diving safety requirements are summarized below:

- Contractors engaged in commercial diving must develop and follow a Safe Practices Manual.
- All diving operations will be performed with a minimum of two divers dressed on site (one may be a standby diver on the surface). In the event that audio communication fails, line pull signals will be established and the dive terminated until radio communications can be restored.
- All diving will be from boats, an approved shoreline work location, or a dive platform.
- Diver tenders are to remain on duty at their stations until divers are out of the water.
- No night diving will occur.
- All diving will be conducted with SCUBA equipment or approved surface supplied air systems.
- No diving will be conducted at depths greater than 35 feet.
- No diving will be conducted in enclosed or physically confining spaces.

- No diving will be conducted against currents exceeding 1 knot per hour unless line-tended.
- No diving will take place if surface visibility is less than 200 feet at that given location.
- The diver must terminate a SCUBA dive while there is still sufficient cylinder pressure remaining (generally, 500 pounds per square inch (psi)) to permit the diver to safely reach the surface, including required in-water decompression time, if applicable. For purposes of this project, in-water decompression is not likely due to the shallow depths at which work will be performed.
- All definable features of work (a definable feature of work is a task that is separate and distinct from other project activities and has separate control requirements.) that involve diving require a task specific "Dive Plan" that addresses the task for the dive, location, safety procedures, unusual hazards or environmental conditions, equipment to be used, maximum depths and estimated bottom times. The plan shall address appropriate ranges of water velocity, visibility, temperature, etc. that diving operations for that definable feature of work may be conducted.
- Liveboating (the practice of supporting a surface-supplied air or mixed-gas diver from a vessel which is underway) shall not be performed.
- The contractor shall maintain and use a two-way voice communication system for all communications with divers.
- The contractor shall maintain a dive profile to include a written record for each diver with the depth-time profile to aid the designated person-in-charge in implementing the planned dive schedule and making necessary adjustments.
- The contractor shall terminate a dive when a diver makes a request, a diver fails to respond to communications or signals, or communications are lost and cannot be quickly re-established with the diver.
- Post-dive, the contractor shall check the physical condition of the diver; instruct the diver to report any physical problems or adverse physiological reactions; advise the diver of the nearest decompression chamber, and alert the diver to the hazards of flying too soon after the dive.
- The contractor shall comply with OSHA record keeping requirements to maintain a safe practices manual; depth-time profiles of each dive; the dive record; decompression-procedure assessment evaluations; equipment-inspection records, equipment-testing records, and hospitalizations records.
- The buddy system and diver attendants are to be used to monitor dive team members.
- Proper ascent techniques are to be established to reduce the potential for air embolisms.

4.15.2 Training

Each dive team member shall meet the minimum qualifications outlined in 29 CFR 1910.410 and the Consensus Standards for Commercial Diving and Underwater Operations

(ADCI 2004). Each diver will be assigned tasks in accordance with their experience and training. Each diver must be trained, qualified, and authorized for the diving mode and specialized equipment being used, the diving activity to be performed, and the depths at which the dive is to be conducted. Contractors shall maintain a file on each diver that identifies training, qualifications and what activities the diver can perform.

Tasks may be assigned to an individual who has not previously performed the specific task, provided that these tasks are performed under the direct supervision of an experienced dive team member.

All dive team members must be trained in CPR and first aid (American Red Cross standard course or equivalent). An AED will be available on the dive platform.

4.15.3 Dive Planning

Planning of each diving operation will include an assessment of the safety and health aspects of each task. Planning elements include:

- Diving mode;
- Safe entry procedures, considering underwater obstructions or shallow depths;
- Procedures and engineering controls to preclude contact with propellers;
- Means of visual warnings of dive activities such as buoys and signage;
- Surface and underwater conditions and hazards;
- Breathing gas supply (including reserves);
- Thermal protection;
- Diving equipment and systems;
- Dive team assignments and physical fitness of dive team members; and
- Emergency and rescue procedures.

The diving contractor will provide a task specific “Dive Plan” for each individual diving assignment.

To minimize hazards to the dive team, diving operations shall be coordinated with other activities in the vicinity that could potentially interfere with the diving operation, including recreational activities as well as commercial activities.

4.15.4 Dive Site Preparation

Appropriate protocols such as dive flagging will be used to alert boaters where diving operations are underway. A warning horn and hailing device shall be available to communicate with other vessels, including small craft which might not be equipped with VHF radio communication. Diver communication systems shall be used to call “Diver up” when hailing other vessels does not work.

During the pre-dive briefing, all dive team members will receive a briefing by the Dive Supervisor on the following topics:

- Tasks to be undertaken;
- Safety procedures for the diving mode;
- Required buoys and signage;
- Any unusual hazards or environmental conditions likely to affect the safety of the diving operation; and
- Any modifications to operating procedures necessitated by the specific diving operation.

Prior to making individual dive team member assignments, the Dive Supervisor must inquire into each dive team member's current state of physical fitness, and indicate to the dive team member the procedure for reporting physical problems or adverse physiological effects during and after the dive.

4.15.5 Equipment Inspection

The procedures listed below must be followed when conducting equipment inspection:

- Each diver must conduct a functional check of his/her diving equipment in the presence of the Dive Supervisor. Each diver must verify that his/her equipment is in proper working order, and that the equipment is suitable and sufficient for the type of diving operation planned. The Dive Supervisor must verify that the equipment check has been performed.
- Each diver must have a submersible pressure gauge for monitoring SCBA cylinder pressure, capable of being monitored by the diver during the dive.
- Each diver must have the capability of achieving and maintaining positive buoyancy on the surface.
- Each diver must have the capability to execute a controlled neutrally buoyant ascent through the use of an approved buoyancy control device.
- The entire SCUBA apparatus for each diver must be inspected by the diver and Dive Supervisor prior to the dive. Critical inspection points include the breathing gas supply system, masks, thermal protection, and weights.
- The proper function of the cylinder pressure gauge must be inspected by each scuba diver and verified by the Dive Supervisor.
- The pre-dive briefing and equipment inspection shall be documented.

4.15.6 Water Entry and Exit

The procedures listed below must be followed when entering and exiting the water:

- A means capable of supporting the diver will be provided for entering and exiting the water, unless the entry is in water of wading depth. The means provided for exiting the water must extend below the water surface.
- A means will be provided to assist an injured diver from the water.
- Safe entry procedures must consider underwater obstructions or shallow depths.

4.15.7 Emergency Procedures

The procedures listed below must be followed in the event of an emergency during underwater operations:

- A standby diver must be available any time a diver is in the water.
- Divers must be line-tended from the surface, or accompanied by another diver in the water in continuous visual contact during the diving operations.
- A diver-carried reserve breathing gas supply must be provided for each diver. The reserve must be either a manual reserve (J valve), or an independent reserve cylinder with a separate regulator or connected to the underwater breathing apparatus.
- The valve of the reserve breathing gas supply must be in the closed position prior to the dive.

4.16 SOFT/HARD LINES

Both hard and soft lines can present a significant safety hazard when overloaded or under load if lines are in poor condition. Soft lines, e.g., synthetic rope, and hard lines, e.g. wire rope, shall be inspected as specified by the manufacturer, by a competent person, before use on each shift and as necessary during its use to ensure it is safe.

For hard lines, when two or more wires are broken or rust or corrosion is found adjacent to a socket or end fitting, or any other defect is found that would make the line unfit for service, the wire rope shall be removed from service or re-socketed.

High strength, lightweight soft lines (typically synthetic) shall be used in lieu of traditional heavy, low strength (typically natural materials) soft lines. Soft lines shall not be used if they are frozen or if they have been subjected to acids, corrosives, strong chemicals or excessive heat. Soft lines shall be protected from abrasion by padding where they are fastened or drawn over square corners, sharp edges, rough surfaces or other points of wear.

The use and maintenance of soft and hard lines shall be in accordance with recommendations of the manufacturer, and within the safe working load of the line. Lines, when not in use, shall be properly stored and maintained in a safe condition.

Safe handling procedures for soft and hard lines shall be developed by any contractor using lines to secure a marine vessel, e.g., barges, dredges, tug boat, etc. Contractor personnel shall receive documented training that will include, but is not limited to; hand protection, pinch points, properly securing lines to bollards and cleats, body and hand positioning when handling or

releasing lines, lines under load or tension, line selection, inspection techniques, line life factors, line working loads, broken lines, and wire rope clip spacing and orientation. The hazards associated with repetitive motion and cumulative trauma injury should also be discussed.

4.17 ENVIRONMENTAL HAZARDS

4.17.1 Heat Stress

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, etc., as well as the physical and conditioning characteristics of the individual. Since heat stress is one of the most common illnesses associated with heavy outdoor work conducted with direct solar load and, in particular, because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses. Personnel must be aware of the types and causes of heat-related illnesses and be able to recognize the signs and symptoms of these illnesses in both themselves and their co-workers.

Hazards

Heat rashes are one of the most common problems in hot work environments. Commonly known as prickly heat, a heat rash is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment and cleans the skin surface.

Heat cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused both by too much or too little salt.

Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution (plus or minus 0.3% NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for six to eight hours in heavy protective gear, a loss of sodium may occur. Drinking commercially available carbohydrate electrolyte replacement liquids can be effective in minimizing physiological disturbances during recovery. Their use should be evaluated by Contractor's SSO/SSHO.

Heat exhaustion occurs from increased stress on various body organs due to inadequate blood circulation, cardiovascular insufficiency, or dehydration. Signs and symptoms include pale, cool, and moist skin; heavy sweating; dizziness; nausea; headache; vertigo; weakness; thirst; and giddiness. Fortunately, this condition responds readily to prompt treatment.

Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be

operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, which is a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment, be given fluid replacement, and be encouraged to get adequate rest.

Heat stroke is the most serious form of heat stress. Heat stroke occurs when the body's system of temperature regulation fails and the body's temperature rises to critical levels. This condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict.

Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature, e.g., a rectal temperature of 105.8 degrees Fahrenheit (°F). If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of workload and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a cool or shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first-aid treatment.

Regardless of the worker's protestations, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or exhaustion, that person may be predisposed to additional heat injuries.

Control Measures

Each Contractor is required to develop a Heat Stress Management Procedure in accordance with the 01350, Health and Safety contract document. The procedure shall include work/rest schedules and physiological monitoring requirements. Heat stress monitoring and work rest cycle implementation should commence when the ambient adjusted temperature exceeds 72°F. A minimum work rest regimen and procedures for calculating ambient adjusted temperature are described in Table 1, below.

Table 1 – Work/Rest Schedule[a, b]

Adjusted Temperature[c]	Work-Rest Regimen Normal Work Ensembled[d]	Work-Rest Regimen Impermeable Ensemble
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5° to 90°F (30.8° to 32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5° to 87.5°F (28. 1° to 30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5° to 82.5°F (25.3° to 28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5° to 77.5°F (30.8° to 32.2°C)	After each 150 minutes of work	After each 120 minutes of work

Notes:

a. For work levels of 250 kilocalories/hour (light-moderate type of work)

b. The information presented above was generated using the information provided Table 8-10 of the *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, National Institute for Occupational Safety and Health (NIOSH), OSHA, USCG, and USEPA (86-116, October 1985).

c. Calculate the adjusted air temperature (ta adj) by using this equation: ta adj ºF = ta ºF + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100% sunshine = no cloud cover and a sharp, distinct shadow; 0% sunshine = no shadows.)

d. A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

To determine if the work rest cycles are adequate for the personnel and specific site conditions, additional monitoring of individual heart rates will be conducted during the rest cycle. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one third and maintain the same rest period.

Additionally, one or more of the following control measures can be used to help control heat stress and are mandatory if any site worker has a heart rate (measure immediately prior to rest period) exceeding 115 beats per minute:

- Site workers will be encouraged to drink plenty of water and/or electrolyte replacement fluids throughout the day. Their use should be evaluated by Contractor's SSO/SSHO.
- On-site drinking water will be kept cool (50°F to 60°F).
- A work regimen that will provide adequate rest periods for cooling down will be established, as required.
- All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps.
- Cooling devices, such as vortex tubes or cooling vests, should be used when personnel must wear impermeable clothing in conditions of extreme heat.
- Site personnel should be instructed to monitor themselves and co-workers for signs of heat stress and to take additional breaks as necessary.
- A shaded rest area must be provided. All breaks should take place in the shaded rest area.

- Site personnel must not be assigned to other tasks during breaks.
- Site personnel must remove impermeable garments during rest periods. This includes white Tyvek®-type garments. Frequent changes of the garments are recommended.

All project personnel must be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress disorders.

4.17.2 Cold Stress

Cold stress normally occurs in temperatures at or below freezing, or under certain circumstances, in temperatures of 40°F.

Hazards

Extreme cold for a short time may cause severe injury to exposed body surfaces or result in profound generalized cooling, causing death. Areas of the body that have high surface area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible. Two factors influence the development of a cold weather injury: ambient temperature and the velocity of the wind. For instance, 10°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18°F. An equivalent chill temperature chart relating the actual dry bulb temperature and wind velocity is presented in Table 2, below.

Table 2 – Wind Chill Temperature Chart

Estimated Wind Speed (in mph)	Actual Temperature Reading (ºF)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (ºF)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds.				
	Trench foot and immersion foot may occur at any point on this chart.											

Note: This chart was developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA (Source: ACGIH Threshold Limit Values for Chemical Substances and Physical Agents).

Frostbite is the generic term for a local injury resulting from cold. Several degrees of tissue damage are associated with frostbite. Frostbite of the extremities can be categorized into:

- Frost Nip or Incipient Frostbite — characterized by sudden blanching or whitening of skin;
- Superficial Frostbite — skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient; or
- Deep Frostbite — tissues are cold, pale, and solid; extremely serious injury.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. It can be fatal. Its symptoms are usually exhibited in five stages:

1. Shivering;
2. Apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95°F;
3. Unconsciousness, glassy stare, slow pulse, and slow respiratory rate;
4. Freezing of the extremities; and
5. Death.

Trauma sustained in freezing or sub-zero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues in addition to providing for first-aid treatment. To avoid cold stress, site personnel must wear protective clothing appropriate for the level of cold and physical activity. In addition to protective clothing, preventive safe work practices, additional training, and warming regimens may be utilized to prevent cold stress.

Control Measures

Each Contractor shall develop a A Cold Weather Operations Procedure in accordance with the 01350, Health and Safety contract document. To prevent cold stress illnesses, follow the safety precautions listed below.

- Protective gloves are typically worn during field activities. These gloves offer some thermal protection. For air temperature of 0°F or less, mittens should be used to protect the hands. For exposed skin, continuous exposure should not be permitted when air speed and temperature results in a wind chill temperature of -25°F.
- At air temperatures of 36°F or less, field personnel who become immersed in water or whose clothing becomes wet must be immediately provided with a change of clothing and be treated for hypothermia.
- If work is done at normal temperature or in a hot environment before entering the cold, the field personnel must verify that their clothing is not wet due to perspiration. If wet, field personnel must change into dry clothes prior to entering the cold area.

- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work must be modified or suspended until adequate clothing is made available or until weather conditions improve.
- Field personnel handling evaporative liquid, e.g., gasoline, alcohol, or cleaning fluids, at air temperatures below 40°F must take special precaution to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling.

In addition, the following safe work practices should be employed to prevent cold stress:

- All field personnel will be provided with adequate cold weather gear, including insulated coveralls, gloves or mittens, and cold weather boots. Warming facilities or equipment will be provided, e.g., heated car, and utilized by field personnel as needed. When the water temperature is between 40 and 50 degrees Fahrenheit, field personnel working on the river or canal shall wear a float coat (top half of a Mustang Suit) or a one-piece survival suit. When the water temperature is less than 40 degrees Fahrenheit, field personnel shall wear either a float coat or bib-overalls (a full two-piece Mustang Suit), or a one-piece survival suit. Suits or Float Coats shall be USCG-approved. If extremely cold or severe weather conditions are forecast, work activities should be postponed.
- Direct contact between bare skin and cold surfaces (less than 20°F) should be avoided. Metal tool handles and/or equipment controls should be covered by thermal insulating material.
- For work performed in a wind chill temperature at or below 10°F, workers should be under constant protective observation (buddy system). The work rate should be established to prevent heavy sweating that will result in wet clothing. For heavy work, rest periods must be taken in heated shelters and workers should be provided with an opportunity to change into dry clothing if needed.
- Field personnel should be provided the opportunity to become accustomed to cold-weather working conditions and required protective clothing.
- Work should be arranged in such a way that sitting or standing still for long periods is minimized.
- During the warming regimen (rest period), field personnel should be encouraged to remove outer clothing to permit sweat evaporation or to change into dry work clothing. Dehydration, or loss of body fluids, occurs insidiously in the cold environment and may increase susceptibility to cold injury due to a significant change in blood flow to the extremities. Fluid replacement with warm, sweet drinks and soups is recommended. The intake of coffee should be limited because of diuretic and circulatory effects.

4.17.3 Other Weather Hazards

Hazards

High winds, foggy conditions, tornadoes, hurricanes, and thunderstorms, and other types of inclement weather may be experienced at the site and pose a significant hazard when working on water.

Control Measures

Be alert to the anticipated weather conditions on a daily basis. If high winds are expected, secure all materials and loads that could be impacted. Be aware of the wind limitations on operating equipment such as cranes, man lifts, and other equipment that could be adversely impacted. During foggy conditions, limit all movement of vehicles, equipment, and vessels so that safe operations are ensured. Be alert to weather bulletins and track the potential for tornadoes, hurricanes, etc., and take preparatory and evasive action as necessary. Verify that safe refuges are available during thunderstorms in accordance with the provisions of the Project Lightning Safety Policy. See Attachment E.

4.17.4 Biological Hazards

Portions of the field work will be conducted in grassy and wooded areas along the river. Numerous biological hazards may be present, including poison ivy, snakes, thorny bushes and trees, ticks, mosquitoes, and other pests.

4.17.4.1 Tick-Borne Disease

The following tick-borne diseases may present hazards when conducting field work. These diseases are transmitted primarily by the deer tick, which is smaller and redder than the common wood tick. The disease may be transmitted by immature ticks, which are small and hard to see. The tick may be as small as a period on this page.

- *Lyme Disease* — The disease commonly occurs in New York State in the spring and summer and is transmitted by the bite of infected ticks. Symptoms of Lyme disease include a rash or a peculiar red spot, like a bull's eye, which expands outward in a circular manner. The victim may have headache, weakness, fever, a stiff neck, swelling and pain in the joints, and eventually, arthritis.
- *Erlichiosis* — The disease also commonly occurs in New York State in the summer and is transmitted by the bite of infected ticks. Symptoms of erlichiosis include muscle aches, joint aches, and flu-like symptoms, but there is typically no skin rash.
- *Rocky Mountain Spotted Fever (RMSF)* — This disease is transmitted via the bite of an infected tick. The tick must be attached four to six hours before the disease-causing organism (*Rickettsia rickettsii*) becomes reactivated and can infect humans. The primary symptom of RMSF is the sudden appearance of a moderate-to-high fever. The fever may persist for two to three weeks. The victim may also have a headache, deep muscle pain, and chills. A rash appears on the hands and feet on about the third day

and eventually spreads to all parts of the body. For this reason, RMSF may be confused with measles or meningitis. The disease may cause death, if untreated, but if identified and treated promptly, death is uncommon.

Control Measures

Tick repellant containing diethyltoluamide (DEET) should be used when working in tick-infested areas, and pant legs should be tucked into boots. In addition, workers should search the entire body every three or four hours for attached ticks. Ticks should be removed promptly and carefully without crushing, since crushing can squeeze the disease-causing organism into the skin. A gentle and steady pulling action should be used to avoid leaving the head or mouth parts in the skin. Hands should be protected with surgical gloves when removing ticks.

4.17.4.2 Poisonous Plants

Hazards

Poisonous plants may be present all along the river. Personnel should be alerted to their presence, and instructed on methods to prevent exposure.

Control Measures

The main control is to avoid contact with the plant, cover arms and hands, and frequently wash potentially exposed skin. Particular attention must be given to avoiding skin contact with objects or protective clothing that have touched the plants. Treat every surface that may have touched the plant as contaminated, and practice contamination avoidance. If skin contact is made, the area should be washed immediately with soap and water, and observed for signs of reddening.

4.17.4.3 Snakes

The possibility of encountering snakes exists, specifically for personnel working in grassy, wooded, and vegetated areas.

Hazards

Snake venoms are complex and include proteins, some of which have enzymatic activity. The effects produced by venoms include neurotoxic effects with sensory, motor, cardiac, and respiratory difficulties; cytotoxic effects on red blood cells, blood vessels, heart muscle, kidneys, and lungs; defects in coagulation; and effects from local release of substances by enzymatic actions. Other noticeable effects of venomous snake bites include swelling, edema, and pain around the bite, and the development of ecchymosis (the escape of blood into tissues from ruptured blood vessels).

Control Measures

To minimize the threat of snake bites, all personnel walking through vegetated areas must be aware of the potential for encountering snakes and the need to avoid actions potentiating encounters, such as turning over logs, etc. If a snake bite occurs, an attempt should be made to

safely kill the snake for identification. The victim must be transported to the nearest hospital within 30 minutes; first aid consists of applying a constriction band and washing the area around the wound to remove any unabsorbed venom.

4.17.4.4 Spiders

Personnel may encounter spiders during work activities along the river and when working in and around or moving stored materials such as boxes, lumber, etc.

Hazards

Two spiders are of concern, the black widow and the brown recluse. Both prefer dark sheltered areas such as basements, equipment sheds and enclosures, and around woodpiles or other scattered debris. The black widow is shiny black, approximately one inch long, and found throughout the United States. There is a distinctive red hourglass marking on the underside of the black widow's body. The bite of a black widow is seldom fatal to healthy adults, but effects include respiratory distress, nausea, vomiting, and muscle spasms. The brown recluse is smaller than the black widow and gets its name from its brown coloring and behavior. The brown recluse is more prevalent in the southern United States but may be found in New York State. The brown recluse has a distinctive violin shape on the top of its body. The bite of the brown recluse is painful and the bite site ulcerates and takes many weeks to heal completely.

Control Measures

To minimize the threat of spider bites, all personnel walking through vegetated areas must be aware of the potential for encountering these arachnids. Personnel need to avoid actions that may result in encounters, such as turning over logs and placing hands in dark places such as behind equipment or in corners of equipment sheds or enclosures. If a spider bite occurs, the victim must be transported to the nearest hospital as soon as possible; first aid consists of applying ice packs and washing the area around the wound to remove any unabsorbed venom.

4.17.4.5 Mosquitoes

Personnel may be exposed to mosquitoes during work activities along the river.

Hazards

Typical exposure to mosquitoes does not present a significant hazard. However, if West Nile virus is prevalent in the area, mosquitoes can present a hazard and exposure to this virus is increased. West Nile virus results in flu-like symptoms and can be serious if not treated or in immune-compromised individuals. West Nile cases have been confirmed in New York State.

Control Measures

To minimize the threat of mosquito bites, all personnel working outside must be aware of the potential for encountering mosquitoes and implement the basic precautions listed below:

- Avoid working at dawn or dusk when mosquitoes are most active.
- Prevent accumulation of standing water at the work site.

- Apply an insect repellent that contains DEET to exposed skin and clothing.
- Wear light colored clothes, preferably with long-sleeves and full-length pants.
- Do not touch any dead birds or animals.

If dead birds are detected near a particular work area, report to the local county health department. If flu-like symptoms are present, contact the site SSR for more information.

4.17.4.6 Wasps and Bees

The possibility of encountering wasps or bees may occur along the river, conducting field operations, or at the processing facility. Notice that the use of pesticides for bees or wasps is prohibited on the project unless the insect(s) has been deemed an immediate threat to personnel and the pesticide to be used has been approved for use. If any nests are noted in the work area, report this finding to the CM.

Hazards

Typical exposure to wasp or bees does not present a significant hazard. However, wasp or bee stings are very painful and can be very serious when individuals with an allergy are stung. Employees that have an allergy and have a prescribed Epinephrine Auto Injector (EpiPen) should let coworkers know where it is in the event they are stung. Personnel will only assist in administering the EpiPen if you are trained to do so or given permission by the injured person.

Control Measures

To prevent wasp and bee stings there are several steps to take:

- Keep waste containers tightly closed.
- Look around the work area to see if there are any large groups of wasps or bees.
- Avoid wearing perfumes or colognes as they attract wasp or bees. Use an unscented sun block and insect repellant.
- If you see a wasp or bee, do not run away or make sudden moves.
- Do not kill a bee unless it is absolutely necessary. Bees emit an odor when they are killed that tells other bees there is danger. When other bees smell it, they attack and sting in large groups.
- If you see a large group of wasp or bees, leave them alone and leave the area. Report the location so proper removal of the wasps or bees can be accomplished.
- Apply an insect repellent that contains DEET to exposed skin and clothing.
- Wear light colored clothes, long sleeves and long-legged pants. Bees are attracted to sweaty skin.
- Avoid disturbing likely wasp nests and beehive sites, such as large trees, tree stumps, logs, and large rocks.

If you are stung by a wasp, bee, hornet or yellow jacket, follow these instructions:

- Bees leave behind a stinger attached to a venom sac. Do not try to pull it out as this may release more venom; instead gently scrape it out with a blunt-edged object, such as a credit card or dull knife.
- Wash the area carefully with soap and water. This should be continued several times a day until the skin is healed.
- Apply a cold or ice pack, wrapped in cloth for a few minutes.
- Apply a paste of baking soda and water and leave it on for 15 to 20 minutes.
- Telephone 911 to summon paramedics if the victim is having an allergic reaction, and use a bee sting emergency survival kit if previously prescribed.
- Treat swelling by elevating the swollen body part above the heat.
- Do not squeeze the sting, or rub mud into it. This increases the risk of infection.
- Do not administer drugs not prescribed for the victim. Seek immediate medical attention if you are stung in the mouth or nose, swelling may block airways. Also seek emergency care if any of the following symptoms are present, as these could indicate an allergic reaction: 1) large areas of swelling; 2) abnormal breathing; 3) tightness in throat or chest; 4) dizziness; 5) hives; 6) fainting; 7) nausea or vomiting; and 8) persistent pain or swelling.

4.18 LIFTING SAFETY

Using proper lifting techniques may prevent back strain or injury. The fundamentals of proper lifting include:

- Consider the size, shape, and weight of the object to be lifted. A mechanical lifting device or additional persons must be used to lift an object if it cannot be lifted safely alone.
- The hands and the object should be free of dirt or grease that could prevent a firm grip.
- Gloves must be used, and the object inspected for metal slivers, jagged edges, burrs, or rough or slippery surfaces.
- Fingers must be kept away from points that could crush or pinch them, especially when putting an object down.
- Feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear.
- The load should be kept as low as possible, close to the body with the knees bent.
- To lift the load, grip firmly and lift with the legs, keeping the back as straight as possible.
- A worker should not carry a load that he or she cannot see around or over.

- When putting an object down, the stance and position are identical to that for lifting; the legs are bent at the knees, and the back is straight as the object is lowered.
- When two persons are going to conduct a team lift, communication is key in coordinating the previously-listed lifting steps. One person should coordinate the lift.

4.19 POLYCHLORINATED BIPHENYLS (PCBs)

The chemical hazards associated with project operations are primarily related to ingestion of, and dermal contact with, PCBs (as well as any other potential constituents of concern (COC) that may be identified) in soils, sediments, and water. To minimize the potential for ingestion and dermal contact, appropriate personal hygiene must be followed during field activities. Inhalation exposure to PCBs is possible if project personnel inhale soil particles that contain PCBs or other constituents.

The OSHA permissible exposure limit (PEL) is a time-weighted average (TWA) airborne concentration of 1,000 micrograms per cubic meter (µg/m3) for PCBs containing 42% chlorine (average molecular formula of $C_{12}H_7C_{l3}$). The standard encompasses all physical forms of these compounds: aerosols, vapor, mist, sprays, and PCB-laden dust particles. The standard is based on an eight-hour work day, five days per week, with no weekend exposure. Contractors working more than a 40-hour work week are required to adjust the exposure level to match actual exposure hours.

Additionally, community exposure limits have been established in the QoLPS. Work activities such as sediment handling and processing may result in PCB-related impacts to air quality of the general public. The QoLPS for air quality include standards and "concern levels" (at 80% of the standard levels) for total PCB concentrations in air during the remedial action. There are separate concern levels and standards for residential and commercial/industrial areas. They are:

- For residential areas, a concern level of 0.08 µg/m3 and a standard of 0.11 µg/m3, both as 24-hour average PCB concentrations; and
- For commercial/industrial areas, a concern level of 0.21 µg/m3 and a standard of 0.26 µg/m3, both as 24-hour average PCB concentrations.

4.20 DRILLING OPERATIONS

Drilling operations may be conducted on land using truck mounted equipment or on water using barge-mounted equipment. Drilling operations may consist of rotary, percussion, direct push, or vibratory methods. Attachment F contains the Pre-drilling/Subsurface Checklist for Intrusive Fieldwork.

Hazards

Tools and equipment, such as elevators, cat lines, and wire rope, have the potential for striking, pinning, or cutting personnel. The presence of overhead utilities and underground

obstacles poses a hazard if boring equipment contacts them. For water based work, additional hazards are present related to unsecured equipment on the barge platform and the increased potential for man-overboard or drowning incidents.

- *Wire Rope* - Worn or frayed wire rope presents a laceration hazard if loose wires protrude from the main bundle.
- *Cat Lines* - Cat lines are used on drilling rigs to hoist material. Accidents that occur during cat line operations may injure the employee doing the rigging, as well as injure the operator. Insufficient hoisting control causes sudden and erratic load movements, which may result in hand and foot injuries.
- *Working Surfaces* - Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, slips, and falls.
- *Materials Handling* - The most common type of accident that occurs in material handling operations is the "caught between" situation when a load is being handled and a finger or toe gets caught between two objects. Rolling stock can shift and/or fall from a pipe rack or truck bed.

Control Measures

All drillers must possess required state or local licenses to perform such work and receive site-specific training prior to beginning work. The operator is responsible for the safe operation of drilling equipment and adherence to the requirements of the RA HASP. The driller must verify that all safety equipment is in proper condition and is properly used. The members of the drill crew must follow all instructions of the driller, wear appropriate PPE, and be aware of all hazards and control procedures. The drill crew must participate in the daily safety meetings and be aware of all emergency procedures.

Under no circumstances will personnel be permitted to ride the traveling block or elevators, nor will the cat line be used as a personnel carrier.

- *Pre-Drilling Protocol* - Before drilling activities commence, the existence and location of underground pipe, electrical equipment, and gas lines must be determined. An underground facilities protection organization (UFPO) must be contacted at least one week, but no more than two weeks, prior to subsurface activities. Arrange for telephone, electrical, cable television, and natural gas locators to mark out lines on site prior to conducting work. Provide the electric and natural gas locators with a site figure that shows the locations where drilling activities will be completed. Conduct a site walk with the locators to visually identify each location where drilling activities are to be completed. The Pre-Drilling/Subsurface Checklist for Intrusive Fieldwork (see Attachment F) must be used to document that nearby utilities have been marked on the ground, and that the drilling locations have been cleared. The completed Pre-Drilling/Subsurface Checklist for Intrusive Fieldwork must be present prior to commencement of any intrusive investigation.

- *Equipment Inspection* - Each day, prior to the start of work, the drill rig and associated equipment must be inspected by the driller and/or drill crew. The following items must be inspected:
  - Vehicle or derrick condition;
  - Proper storage of equipment;
  - Condition of all wire rope and hydraulic lines;
  - Fire extinguisher; and
  - First-aid kit.
- *Drill Rig Set Up* – For land-based operations, all boring sites will be inspected by the driller prior to mobilizing the rig to verify a stable surface exists. This is especially important in areas where soft, unstable terrain is common. The drill rig must be properly blocked and leveled prior to raising the derrick. The leveling jacks must not be raised until the derrick is lowered. The rig must be moved only after the derrick has been lowered. When the ground surface is soft or otherwise unstable, wooden blocks, at least 24 inches by 24 inches and 4 inches to 8 inches thick, must be placed between the jack swivels and the ground. The emergency brake must be engaged, and the wheels that are on the ground must be chocked. For river-based operations, the drill rig must be properly secured to the barge.
- *Overhead Electrical Clearances* - If drilling activities are conducted in the vicinity of overhead power lines, the power to the lines must be de-energized, tested de-energized, or marked up/guaranteed, or the equipment must be positioned such that no part, including derrick can come within the minimum clearances as outlined in the table below:

Minimum Clearances

Nominal System Voltage	Minimum Required Clearance
0 to 50 kV	10 feet
Over 50 to 200 kV	15 feet
Over 200 to 350 kV	20 feet
Over 350 to 500 kV	25 feet
Over 500 to 750 kV	35 feet
Over 750 to 1,000 kV	45 feet
Over 1,000 kV	As established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution

When the drill rig is in transit, with the derrick lowered and no load, the equipment clearance must be at least 4 feet for voltages less than 50kV, 10 feet for voltages of 50kV to 345kV, and 16 feet for voltages above 345kV.

- *Hoisting Operations* - Drillers should never engage the rotary clutch without watching the rotary table, and confirming that it is clear of personnel and equipment. Other safety procedures concerning hoisting operations include:
  - Unless the draw works is equipped with an automatic feed control, the brake should not be left unattended without first being tied down.
  - Auger strings or casing should be picked up slowly.
  - During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller should be on the rig floor; no one else should be on the rig or derrick.
  - The brakes on the draw works of the drill rig should be tested by the driller each day. The brakes should be thoroughly inspected by a competent individual each week.
  - A hoisting line with a load imposed should not be permitted to be in direct contact with any derrick member or stationary equipment, unless it has been specifically designed for line contact.
  - Workers should never stand near the borehole whenever any wire line device is being run.
  - Hoisting control stations should be kept clean and controls labeled as to their functions.
- *Cat Line Operations* - Only experienced workers will be allowed to operate the cathead controls. The kill switch must be clearly labeled and operational prior to operation of the cat line. The cathead area must be kept free of obstructions and entanglements.

The operator should not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted.

Personnel should not stand near, step over, or go under a cable or cat line that is under tension.

- Employees or subcontractors rigging loads on cat lines must:
  - Keep out from under the load;
  - Keep fingers and feet where they will not be crushed;
  - Be sure to signal clearly when the load is being picked up;
  - Use standard visual signals only and not depend on shouting to co-workers for communication; and
  - Make sure the load is properly rigged, since a sudden jerk in the cat line will shift or drop the load.

- *Wire Rope* - When two wires are broken or rust or corrosion is found adjacent to a socket or end fitting, the wire rope must be removed from service or resocketed. Special attention must be given to the inspection of end fittings on boom support, pendants, and guy ropes. Other safety procedures when using wire rope include:
  - Wire rope removed from service due to defects must be cut up or plainly marked as being unfit for further use as rigging.
  - Wire rope clips attached with U-bolts must have the U-bolts on the dead or short end of the rope, i.e. "never saddle a dead horse"; the clip nuts must be re-tightened immediately after initial load carrying use and at frequent intervals thereafter.
  - When a wedge socket fastening is used, the dead or short end of the wire rope must have a clip attached to it or looped back and secured to it by a clip; the clip must not be attached directly to the live end.
  - Protruding ends of strands in splices on slings and bridles must be covered or blunted.
  - Except for eye splices in the ends of wires and for endless wire rope slings, wire rope used in hoisting, lowering, or pulling loads, must consist of one continuous piece without knot or splice.
  - An eye splice made in any wire rope must have not less than five full tucks.
  - Wire rope must not be secured by knots. Wire rope clips must not be used to splice rope.
  - Eyes in wire rope bridles, slings, or bull wires must not be formed by wire clips or knots.
- *Auger Handling* - Auger sections must be transported by cart or carried by two persons. Individuals should not carry auger sections without assistance. Other safety precautions when handling augers include:
  - Workers should not be permitted on top of the load during loading, unloading, or transferring of rolling stock.
  - When equipment is being hoisted, personnel should not stand where the bottom end of the equipment could whip and strike them.
  - Augers stored in racks, on catwalks, or on flatbed trucks or barges should be secured to prevent rolling.

4.21 ELECTROFISHING

The use of electrofishing equipment involves potential hazards related to the high voltage output. Because water is an excellent conductor of electricity, the operator of the electrofishing equipment must observe certain precautions to avoid injury.

The electrofisher operates by sending current through the cathode, through the water, and to the anode. The equipment operator must become part of the circuit to be shocked. Touching the

cathode and anode simultaneously would complete the circuit and result in a severe electric shock. Operators are not permitted to touch the electrodes.

Symptoms of electric shock range from muscle contraction (unable to let go), potential lung paralysis, ventricular fibrillation, heart paralysis, severe burns, and death.

Control Measures

The following general safety procedures apply to all types of electrofishers, and should be observed at all times.

- Use electrical lineman gloves of at least 1,000-volt rating. If the gloves become very wet inside, stop electrofishing and dry them thoroughly or use a dry pair of gloves.
- Remove wristwatch, rings, and any other metal jewelry.
- Use only dip nets with insulated or non-conductive handles.
- Make all electrical connections before turning on the power.
- Be sure that all personnel are aware that electrofishing is going to begin and that they are clear of electrodes before turning on the power.
- Be sure that no animals, e.g., livestock, dogs, etc., are in the water near the sampling locations.
- The equipment must include a switch that keeps the circuit open unless actively and continuously closed. The operator also will have access to an emergency shut-off switch.
- Operate the equipment within acceptable power ranges to prevent overloading the equipment and minimize the potential of fire hazard.
- During electrofishing, the high voltage flashing light and/or audible tone generator shall be working.
- Do not touch people, equipment, or metal objects with the anode or cathode probes/surfaces.
- Wear polarized sunglasses to detect sub-surface hazards and obstacles. No glasses with metallic frames are to be worn when electrofishing.
- Turn the power off immediately if a problem occurs and also when the unit is not in use.

Additional Control Measures for Backpack Electrofishers

The following safety procedures, including the previously listed general procedures, should be followed at all times when using backpack electrofishers.

- Use water-tight wading hip boots or chest waders. If the waders or boots become wet inside, stop electrofishing and dry them thoroughly or use a dry pair of boots or waders.
- Walk slowly and carefully to prevent tripping on objects in the stream.

- Sampling must cease if persons, pets, or livestock are observed in the water or on shore within 12 meters of the electrofishing unit.
- To prevent overloading the unit, do not touch the cathode with the anode.
- Check that the mercury tilt switch shuts off the power when the unit is tipped more than 45° from vertical.
- Backpack electrofishers add a burden to the user, requiring careful body positioning to avoid back strain.

4.22 WORKING ON A BRIDGE

Whenever possible, sampling will be performed from a boat. If sampling from a bridge is required, roadway traffic avoidance will be accomplished by following these procedures:

- A functioning cellular phone must be present at the site at all times for emergency communication.
- Check with the local traffic control department (police/public works) to determine if a stationed uniformed police officer is necessary;
- If possible, schedule work for off-peak traffic hours;
- Personnel must utilize PPE, including an orange traffic safety vest, safety cones, and "men working" signs; personnel are to be trained to comply with DOT regulations.
- If a sidewalk is not present, then personnel must park the vehicle on the shoulder of the road with the emergency flashers on; the shoulder must be at least 6 feet wide and the wheels of the vehicle must not extend over the white lines on the roadway. Additionally, all personnel must conduct work on the opposite side of the vehicle from oncoming traffic, i.e., personnel are protected by the vehicle; and
- Work will only be conducted during daylight at bridge locations, and will not be conducted if slippery road conditions exist or if snow plows could potentially be in operation.

River traffic avoidance will be accomplished by following these procedures:

- During the navigation season, an easily visible floating buoy, i.e., orange, will be attached to the cable used to suspend all equipment from the bridge. This buoy will be attached using a sliding harness, allowing the buoy to float at the surface while the sampler is submerged.
- Prior to lowering any equipment, a visual observation will be performed to confirm the lack of boat traffic in the vicinity of the bridge.

Water safety and fall protection will be accomplished by following these procedures:

- All personnel must wear a USCG-approved PFD whenever working on or near the water, except when adequate fall protection exists on bridges (42" high top rail and mid-rail).

- Work must be conducted so that both feet of the personnel are on the base of the bridge, shoulder of the road, or sidewalk, e.g., not standing on the railing, with the center of gravity lower than the bridge railing. Additionally, a personal fall arrest system must be used if there is no guardrail at least 42 inches high.

4.23 IONIZING RADIATION

The Sediment Processing Facility utilizes four in-line density meters on process piping that contain an enclosed source of ionizing radiation. Personnel may work in the vicinity of the devices.

Hazards

The Ohmart-Vega density meters contain a Cesium-137 source. These meters detect the flow of liquid through pipes. The model is Gen 2000 density meter. The Cesium and a detector are placed on opposite sides of the material to be measured. Gamma or beta radiation transmitted through the sample is then detected by the meter. The Cs-137 can be dangerous, but the meters are designed to remain sealed and keep people from being exposed. This unit is set to have a 2 millirem (mrem) exposure maximum.

Control Measures

To eliminate the threat exposure from ionizing radiation, all personnel must be aware of the control methods listed below:

- Workers performing tasks near the meters will be advised of their location.
- Observe the warning sign on the meters.
- Do not tamper with the meter housing or the locked enclosure.
- Report any concerns of meter or enclosure damage.

4.24 FATIGUE

The Sediment Processing Facility and Dredging Operations will have extended work shifts and unusual work hours. This schedule and a lack of sleep will contribute to fatigue. Fatigue increases the likelihood of inattentiveness and stress, which can lead to accidents.

Fatigue is defined as the reduced mental and physical functioning caused by sleep deprivation and/or being awake during normal sleep hours.

Control Measures

To eliminate fatigue, a each contractor must develop a Fatigue Risk Management Plan (FRMP) to mitigate worker fatigue using the control methods listed below;

- A FRMP shall address how during full scale operations of 24 hours a day, six and potentially seven days a week, a work schedule can be structured to provide the required rest.
- Documentation shall be maintained to show compliance with the FRMP.

- The FRMP shall at a minimum contain the following:
  - A mandatory requirement for consecutive days off for every twelve consecutive days worked.
  - A maximum number of hours scheduled for work during any single shift.
  - A maximum number of hours worked total per day or extended shift.
  - A minimum of number of hours off between shifts.
  - A defined call-out system to cover for employee unscheduled time off.

  For work aboard the live aboard tugs, the FRMP shall at a minimum provide for the following:

  - A minimum of 7 consecutive days off for every 21 days worked.
  - Maximum of 8 hours per shift if two shifts will be worked in a 24 hour period.
  - No more than sixteen hours worked total per 24-hour day or extended shift.
  - A defined call-out system to cover for employee unscheduled time off.

SECTION 5

PERSONAL PROTECTIVE EQUIPMENT

5.1 LEVELS OF PROTECTION

PPE is required to safeguard project personnel from various hazards. Varying levels of protection may be required depending on the degree of physical hazard and the potential for exposure to PCB contaminated sediment.

PPE shall be worn at all times on the site, including travel within the site when starting or ending shifts.

- Hard hats are required at all times in the work area areas, i.e., construction, processing/operations, dredging, wharf, marine vessel. The following color code system for hard hats shall be implemented: White hard hats shall be worn by all GE, CM, Engineer of Record, and contractor personnel. Yellow hard hats shall be worn by all visitors. Green hard hats shall be worn by all safety personnel. Blue hard hats shall be worn by any new employee for the first 30 days. Cowboy hard hats are not permitted. Hard hats must be worn in the forward direction, unless the hard hat has a swivel suspension and is American National Standards Institute (ANSI) approved to be worn in the reverse direction.
- Appropriate eye and face protection that complies with ANSI Z87 shall be worn at all times. Safety glasses with side shields are required as a minimum.
- Sensible and safe work clothing/shoes must be worn. This means the wearing of shirts with a minimum four-inch sleeve. Shorts, cutoffs, sleeveless shirts, tank tops, sneakers, and running shoes are strictly prohibited.
- No canvas or leather sneakers (even if equipped with steel toe) or sandals will be worn. All construction boots or shoes designed to accommodate laces must be fully laced.
- Appropriate hearing protection shall be worn in work areas where levels exceed established standards.
- Suitable gloves must be worn to protect the hands from injury as appropriate for the work to be performed.
- Approved respirators must be used when excessive dust, mist, fumes, gases, or other atmospheric impurities are present.
- Self-inflating PFDs will not be allowed on the project.
- Float coats are required when the water temperature is between 40F to 50F. A survival suit or a float coat and bibs are required when the water temperature is below 40F.
- Full-body safety harnesses and secured safety lanyards or retractable lifelines must be used when working from unguarded work surfaces where falls greater than six feet

present a hazard. Lanyards or retractable lifelines must be secured to separate lifelines and independent connection points capable of withstanding the load of a potential fall.

- Proper personal protective equipment must be worn for welding and burning. Welding screens must be used when welding operations are in the vicinity of other employees.
- Electric insulating protective equipment, such as rubber gloves, blankets, hoses, boots, etc. shall be inspected before use.
- Proper diving PPE is to be established based on the planned operations to be performed, e.g., planting, welding, etc.

In accordance with this document and the contract documents, a hazard/risk/exposure assessment utilizing the project JSA template will be performed for each major activity that will take place. Appendix A provides the JSA template.

5.1.1 Level D Protection

The minimum level of protection that will be required of project personnel will be Level D, which will be worn when site activities present no potential for dermal contact with contaminated media, and no potential for inhalation exposure exists. The following equipment will be used for Level D:

- Work clothing as prescribed by weather conditions;
- Leather safety-toe shoes or boots, meeting ANSI Z41;
- Safety glasses with permanent side shields or goggles, meeting ANSI Z87;
- USCG-approved Commercial Type I, II, or III PFD when working over or near water e.g., on a boat, barge, shoreline, dock, or bridge, and the potential for drowning exists. Each PFD shall be worn with an attachable emergency whistle and a water activated light attached to the PFD;
- Hard hat, meeting ANSI Z89, when falling object hazards are present;
- Hearing protection (if noise levels exceed 85 decibels on the a-scale (dBA), then hearing protection with a USEPA noise reduction ratio (NRR) of at least 20 dBA must be used);
- Gloves as appropriate for task (detail glove type for task in JSA); and
- Lighted reflective light-emitting diode (LED) illuminated safety vests shall be required for all personnel working near roadways, railways or moving vehicles, including heavy operating equipment, if working before dawn, after dusk or during reduced visibility, e.g., fog, overcast skies, etc. High visibility reflective safety vests or other suitable garments approved by the CM shall be worn by all other personnel that are not working near roadways, railways, or moving vehicles.

5.1.2 Modified Level D Protection

Modified Level D PPE will be used when airborne concentrations of a chemical hazard are not present at levels of concern, but site activities present an increased potential for contact with

contaminated sediment. Modified Level D protection consists of Level D PPE in addition to the following:

- Nitrile gloves worn over nitrile surgical gloves;
- Latex / polyvinyl chloride (PVC) over boots when contact with contaminated sediment is anticipated;
- Tyvek® suit when body contact with contaminated sediment is anticipated; and
- Polyethylene-coated Tyvek® suit or raingear when body contact with wet sediment or liquid contaminants is anticipated.

5.1.3 Level C Protection

Level C protection will be required when the airborne concentration of a chemical hazard reaches one-half of the OSHA PEL or American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV). Level C protection consists of Level D PPE in addition to the following:

- Full-face, air-purifying respirator with combination organic vapor and high-efficiency particulate air (HEPA) cartridges.

5.1.4 Level B Protection

Level B protection is not worn on site for routine activities by may be required for routine activities such as working inside process vessels, performing painting or epoxy operations, etc. Level B protection consists of Level C PPE except that a supplied air respirator rather than an air purifying respirator is worn.

5.2 SELECTION OF PPE

PPE will be selected based on the potential for contact with contaminated sediment materials, site conditions, air quality, and the judgment of the PSM, SSR, or site supervisor.

5.3 SITE RESPIRATORY PROTECTION PROGRAM

Each contractor HASP will provide its own written respiratory protection program in compliance with 29 CFR 1910.134, which will consist of the following (as a minimum):

- All on-site personnel who may use respiratory protection will have an assigned respirator.
- All on-site personnel who may use respiratory protection will have been fit tested and trained in the use of a full-face air-purifying respirator within the past 12 months.
- All on-site personnel who may use respiratory protection must, within the past year, have been medically certified as being capable of wearing a respirator. Documentation of the medical certification must be provided to the PSM prior to commencement of site work.

- Respirators must be properly cleaned, maintained, stored, and National Institute for Occupational Safety and Health (NIOSH) approved.
- If air-purifying cartridge respirators are used, a calculation must be completed to determine the end of service life for the cartridge and establish a cartridge change-out schedule. Using breakthrough or changing cartridges at the end of each shift is not acceptable.
- All on-site personnel who may use respiratory protection must be clean-shaven. Mustaches and sideburns are permitted, but they must not touch the sealing surface of the respirator.
- Respirators will be inspected, and a negative pressure test performed prior to each use.
- After each use, the respirator will be wiped with a disinfectant, cleansing wipe. When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location, in a manner that will not distort the face piece.

5.4 USING PPE

Depending on the level of protection selected, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory if Modified Level D or Level C PPE is used.

5.4.1 Donning Procedures

Use the following procedures when donning PPE:

- Remove bulky outerwear, remove street clothes (if applicable), and store in clean location.
- Put on work clothes or coveralls (if applicable).
- Put on the required chemical protective coveralls.
- Put on the required chemical protective boots or boot covers.
- Tape the legs of the coveralls to the boots with duct tape.
- Put on the required chemical protective gloves.
- Tape the wrists of the protective coveralls to the gloves.
- Don the required respirator and perform appropriate fit check (Level C).
- Put hood or head covering over head and respirator straps and tape hood to face piece (Level C).
- Don remaining PPE, such as safety glasses or goggles and hard hat.

5.4.2 Doffing Procedures

Whenever a person leaves the exclusion zone (EZ) of a particular work area, the following decontamination sequence must be followed:

- Rinse contaminated materials from the boots or remove contaminated boot covers.
- Clean reusable protective equipment.
- Remove protective garments, equipment, and respirator (Level C). All disposable clothing should be placed in plastic bags, which are labeled with contaminated waste labels.
- Wash hands, face, and neck (or shower if necessary).
- Proceed to clean area and dress in clean clothing (if applicable).
- Clean and disinfect respirator for next use.

All disposable equipment, garments, and PPE must be bagged in plastic bags and labeled for disposal. See Section 9, Decontamination, for detailed information on decontamination stations.

5.4.3 Selection Matrix

The level of PPE selected will be based on air monitoring of the work environment and an assessment of the potential for skin contact with contaminated media. The PPE selection matrix is presented in Table 3 below.

Table 3 – PPE Selection Matrix

Task	Anticipated Level of PPE for Task Initiation
Rail Yard Operations	Modified Level D or Level D
Processing Facility Upgrades/Construction	Modified Level D or Level D
Processing Facility Operations	Modified Level D
Dredging Operations	Modified Level D
Habitat Construction	Level D
Support Activities	Modified Level D or Level D
Decontamination/Equipment Cleaning Activities	Modified Level D

SECTION 6

AIR MONITORING AND ACTION LEVELS

6.1 AIR MONITORING

Assessment and evaluation of field personnel exposure to airborne contaminants through real-time and integrated monitoring shall be performed by each contractor as per the Contractor HASP, concurrent with activities which may possibly generate airborne contaminants approaching established exposure limits (PEL, ACGIH TLV). PCBs are the primary contaminant of concern on the project; however, other contaminants, e.g., metals, may be encountered in the course of river dredging. The sediment coring program has also identified metals (Cr, Cd, As, Hg) from an upstream pigment plant. Therefore, the contractor must review all sediment data and address any appropriate controls in the development of the Contractor HASP. The Contractor HASP and air monitoring plan may have to be reevaluated should other discoveries be made. A discussion of potential air contaminants is presented in the following sections.

6.2 POLYCHLORINATED BIPHENYLS (PCBs)

PCBs have very high boiling points and exhibit low volatility. Site work will take place outdoors or indoors with adequate ventilation. There is very little potential for PCB vapor generation above the PEL, and very little potential for airborne particulate generation during project activities, as PCBs have a strong affinity for sediment and the sediment will be wet. If airborne particulates, e.g., dust, are generated during the dewatering process or transferring of coarse material to the staging area, dust suppression measures will be implemented by the contractor. Contractors will be required to closely monitor emission levels as community level exposure limits are much lower than employee limits. The contractor is responsible for maintaining community level exposure at or below the QoLPS limits.

6.3 AIRBORNE PARTICULATES (DUST)

Real-time aerosol monitors will be used by contractors to monitor the level of airborne particulates. Perimeter, point source, and personnel air monitoring will also be required.

6.4 GASOLINE AND SOLVENTS

Standard safety procedures will be followed when handling gasoline and solvents to minimize vapor generation and inhalation exposure. Safety containers will be capped and stored outside in a manner that provides adequate ventilation and minimizes the risks of release, fire, or explosion. Potential exposures are of very short duration.

6.5 HYDROGEN SULFIDE

Dredging in areas of heavy organic sediments may release hydrogen sulfide. The dredging contractor will be required to monitor hydrogen sulfide and combustible gasses with a combustible gas indicator with a hydrogen sulfide detector. Action levels for hydrogen sulfide will be established as per Section 6.7. Contractors will be required to closely monitor emission levels as community level exposure limits are much lower than employee limits. The contractor is responsible for maintaining community level exposure at or below the QoLPS limits.

6.6 RESPIRATORY HAZARD ASSESSMENT

The Contractor SSO/SSHO will perform a respiratory hazard assessment, which will include a review of the Contractor HASP, corresponding JSAs, and other applicable programs to determine that the requirements specified by the Respiratory Standard have been met.

6.7 ACTION LEVELS

When real-time air monitoring cannot be performed for all potential chemicals of concern, theoretical exposure limits based on a worst-case scenario shall be calculated using dust as an action level, which cannot exceed 1.0 milligram per square meter (mg/m^3). Action levels may be adjusted based on the data obtained over the duration of the project.

When determining whether employees are approaching established exposure limits, exposures and corresponding PEL must be calculated based on the number of hours worked, e.g., 12 hours versus the traditional eight-hour PEL or TLV.

SECTION 7

MEDICAL MONITORING

7.1 MEDICAL SURVEILLANCE PROGRAM

All project personnel who work in areas that may result in the exposure to chemicals at or above the PEL, are members of a hazmat team, or who wear a respirator for more than 30 days per year shall participate in a medical surveillance program in compliance with 29 CFR 1910.120(f). Copies of the documentation required as part of 29 CFR 1910.120(f) shall be maintained by each contractor and subject to audit by the CM.

7.1.1 Pre-Placement Medical Examination

All project personnel operating motor vehicles or heavy equipment associated with the project, including dredge cranes and operating vehicles off-site for project purposes, shall pass a functional capacity examination (FCE) prior to starting work that shall include:

- 20/20 vision to perceive or recognize distances, depths, and peripheries;
- Audiogram results indicating the ability to hear audible instructions via two-way radio;
- Ability to move the head and neck sideways for increased peripheral vision; and
- Ability to ascend/descend fixed ladders and stairs.

All on-site personnel involved with lifting, carrying, pushing, or pulling equipment and materials that weigh up to 40 pounds shall have an FCE to confirm they are physically fit to perform their job.

All on-site personnel involved with dredging, processing, and handling PCB-impacted sediments shall have a baseline, annual and exit examinations in compliance with 29 CFR 1910.120(f) to identify any pre- or post-exposure medical conditions.

The examining physician shall provide the employee with a letter summarizing his findings and recommendations, confirming the worker's fitness for work and ability to wear a respirator.

7.2 OTHER MEDICAL EXAMINATIONS

Each diver must be certified by a licensed physician to be medically qualified for their assignment before diving. The medical examination must be documented and a written report prepared by the examining physician. The medical examination must contain the examining physician's opinion of the individual's fitness to dive, including any recommended restrictions or limitations. The report must be reviewed by the Diving Supervisor.

In addition to pre-employment, annual, and exit physicals, personnel may be examined:

- At employee request after known or suspected exposure to toxic or hazardous materials; or

- At the discretion of the Contractor, PSM, SSR, or occupational physician in anticipation of or after known or suspected exposure to toxic or hazardous materials.

7.3 MEDICAL RESTRICTION

When the examining physician identifies a need to restrict work activity, the employee's supervisor must communicate the restriction to the employee and the site supervisor, who will communicate the information to the PSM. The terms of the restriction will be discussed with the employee and the supervisor.

Alternate, light-duty work will be made available to personnel whenever possible.

SECTION 8

PERSONNEL TRAINING

8.1 GENERAL

Below is a table that details the training requirements for onsite personnel.

Personnel / Type of Training	Project Safety Orientation	OSHA 8-hr Super. Training	CM Mgt/Sup Safety Training	HAZWOPER 40-hr	Zero Incident	CPR/ First Aid	OSHA 30-hr	Defensive Driving	Controlled Substance / Alcohol Abuse Awareness
Visitors (including regulatory personnel)	Yes	No	No	No (must be escorted by HAZWOPER trained personnel)	No	No	No	No	No
GE Site Project Personnel	Yes	No	No	Yes (for Processing, Dredging and Habitat Const.)	Yes	No	No	No	No
CM Site Project Personnel	Yes	Yes (for Safety personnel)	Yes	Yes (for Processing, Dredging and Habitat Const.)	Yes	Yes (for Safety personnel)	Yes (for Safety personnel)	Yes (if driving for business)	Yes
Contractor Managers, Supervisors and Safety Personnel	Yes	Yes	Yes	Yes (for Processing, Dredging and Habitat Const.)	Yes	Yes	Yes	Yes (if driving for business)	Yes (biannually)
Contractor Field/Craft	Yes	No	No	Yes (for Processing, Dredging and Habitat Const.) see note 1 below	No	Yes (for SSR)	No	Yes (if driving for business)	No

Note 1: Contractor and subcontractor field personnel who work in areas that may result in exposure to hazardous substances or health hazards must be trained in compliance with 29 CFR 1910.120 (HAZWOPER).

All project personnel shall attend a site-specific project safety orientation upon hire that will review the Zero Incident management approach; the project team's proactive approach to manage the interrelated areas of safety, health, environment, and risk management; and the project goal of zero accidents and zero injuries with work tasks designed to minimize or eliminate hazards to personnel, process, equipment, environment, and the general public. In addition, it will be reinforced that no individuals shall perform tasks that may endanger their own safety and health or that of others. In other words, all individuals are empowered to have "stop

work authority". Visitors will also be required to receive an abbreviated project safety orientation.

The site-specific project safety orientation for all project personnel will also discuss behavior-based safety, the benefits of behavior-based safety, and how to conduct a worker safety observation and participate in a feedback session to identify positive and questionable behaviors.

All on-site personnel will receive training on the effects and consequences of controlled substance use on personal health, safety, and work environment.

All project personnel that drive any type of vehicle on or off the site for any purpose related to the project (other than driving to and from a place of residence for work) shall complete a defensive driving course and provide documentation.

All on-site personnel who work in areas that may result in the exposure to hazardous substances or health hazards must be trained in compliance with 29 CFR 1910.120 (HAZWOPER standard). Certification must be renewed on an annual basis by completing an 8-hour refresher.

8.2 40-HOUR OSHA HAZWOPER COURSE

The following is a list of the topics typically covered in the 40-hour HAZWOPER training:

- General safety procedures;
- Physical hazards (fall protection, noise, heat stress, cold stress);
- Names and job descriptions of key personnel responsible for site health and safety;
- Safety, health, and other hazards typically present at hazardous waste sites;
- Use, application, and limitations of PPE;
- Work practices by which project personnel can minimize risks from hazards;
- Safe use of engineering controls and equipment on site;
- Medical surveillance requirements;
- Recognition of symptoms and signs that might indicate overexposure to chemicals;
- Worker right-to-know (Hazard Communication, 29 CFR 1910.1200);
- Routes of exposure for chemicals of concern;
- Engineering controls and safe work practices;
- Components of a health and safety program and a site-specific HASP;
- Decontamination practices for personnel and equipment;
- Confined-space entry procedures; and
- General emergency response procedures.

8.3 SUPERVISOR TRAINING

Management and supervisors must complete the following courses:

- Eight-hour HAZWOPER supervisor;
- Thirty-hour OSHA construction safety course;
- START – behavior-based safety training;
- Controlled substance and alcohol awareness training on the manifestations and behavioral causes that may indicate controlled substance and alcohol use or abuse (required on at least a biannual basis); and
- CPR/first aid.

8.4 SITE-SPECIFIC TRAINING

A project orientation session covering site hazards, procedures, and contents of the RA HASP must be received by all on-site personnel prior to commencement of work or entering the site. The orientation shall include a discussion of the chemical, physical, and biological hazards; names of personnel responsible for site safety and health; proper use of PPE; work practices to minimize risk from hazards; safe use of engineering controls and equipment; decontamination procedures; and emergency procedures.

8.4.1 Visitors

A visitor is an individual that is not permanently assigned to the project, has not received a project safety orientation or does not have the required training certifications to work on the site.

Visitors arriving on the site must be escorted at all times by the PSM, CM safety representative, or site supervisor, or must receive the site-specific project safety orientation and have the appropriate training certifications, e.g., HAZWOPER certification.

8.4.2 Safety "Toolbox" Meetings

Safety "toolbox" meetings conducted prior to each shift will cover the current weather and site conditions, incidents from the previous shift, safe or at-risk/questionable behaviors from the previous shift, work to be accomplished, anticipated hazards, engineering controls/work practices/PPE to protect against hazards and any additional safety topics. No work will be performed before the safety "toolbox" meeting has been held. The safety "toolbox" meeting must also be held prior to new tasks, and repeated if new hazards are encountered. Safety "toolbox" meetings shall be documented on the safety meeting sign-in sheet provided as Attachment G, or equivalent. All project personnel arriving on site after the safety "toolbox" meeting must review the contents of the meeting and sign the sheet.

8.5 FIRST AID AND CPR

At least two employees current in first aid/CPR will be assigned to each work crew carrying out a specific field task and will be on the site during operations. These employees may include the SSR or management personnel providing they are on site when work operations are performed. These individuals must also receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens.

8.6 BOAT OPERATORS

The operator/skipper of any boat, e.g., barge, tug, dredge, support vessel, etc., must complete a USCG boating safety training course prior to conducting work on the river. Each operator/skipper must demonstrate proficiency in the following subject areas: proper operation of a boat; boat and safety equipment inspections; content and frequency of equipment safety inspections; proper use of on-board safety equipment, including fire extinguisher, radio or cellular phone, flares, and horn; proper procedures on the completion and filing of a float plan; appropriate boating "rules-of-the-road"; emergency procedures in the event of capsizing or being thrown overboard; and different types of PFDs and their proper inspection and use.

8.7 COMPETENT PERSON

Contractors are individually responsible for training their respective workers and for complying with all project requirements. Table 4 below provides some guidance on competent/qualified person, training, and JSA requirements for specific safety and health regulations.

Table 4 Competent Person and Job Safety Analysis Requirements

Safety and Health Requirement	OSHA Regulation	Competent/ Qualified Person	Training Required	Written Plan and JSA Required
General Safety and Health	1926.20	*Yes*	*Yes*	*Yes*
Safety Training	1926.21	*Yes*	*Yes*	*Yes*
Confined Spaces	1926.21, 1910.147	*Yes*	*Yes*	*Yes*
Confined Space Permit System	See above	*Yes*	*Yes*	*Yes*
First Aid and Medical	1926.23, 50	*Yes*	*Yes*	*Yes*
Fire Protection and prevention	1926.24, 150-155, 352	*Yes*	*Yes*	*Yes*
Housekeeping	1926.25	*N/A*	*N/A*	*N/A*
Illumination	1926.26, 56	*Recommended*	*N/A*	*N/A*
Sanitation	1926.27, 51	*N/A*	*N/A*	*N/A*
Personal Protective Equipment	1926.28, 95-98, 100-107	*Yes*	*Yes*	*Yes*
Acceptable Certifications	1926.29	*Yes*	*Yes*	*Yes*
Incorporation by Reference	1926.31	*N/A*	*N/A*	*N/A*
Emergency Employee Action Plans	1926.35	*Recommended*	*Yes*	*Yes*
Noise Exposure	1926.52	*Yes*	*Yes*	*Yes*

Table 4 (Continued)
Competent Person and Job Safety Analysis Requirements

Safety and Health Requirement	OSHA Regulation	Competent/ Qualified Person	Training Required	Written Plan and JSA Required
Radiation Protection	1926.53, 54	*Yes*	*Yes*	*Yes*
Gases, Vapors, Dusts, and Mists	1926.1926.55	*Yes*	*Yes*	*Yes*
Ventilation	1926.57, 353	*Recommended*	*Yes*	*Yes*
Hazard Communication	1926.59	*Yes*	*Yes*	*Yes*
Hazardous Waste Operations and Emergency Response	1926.65 1910.120	*Yes*	*Yes*	*Yes*
Accident Prevention Signs and Tags	1926.200	*N/A*	*N/A*	*N/A*
Signaling	1926.201	*Recommended*	*N/A*	*Yes*
Barricades	1926.202	*N/A*	*N/A*	*N/A*
Material Storage	1926.250	*N/A*	*Yes*	*Yes*
Rigging	1926.251	*Yes*	*Yes*	*Yes*
Waste Disposal	1926.252	*Yes*	*Yes*	*Yes*
Tools	1926.300-307	*N/A*	*N/A*	*Yes*
Gas Welding and Cutting	1926.350	*Recommended*	*Yes*	*Yes*
Arc Welding	1926.351	*Recommended*	*Yes*	*Yes*
Electrical	1926.400-415	*Yes*	*Yes*	*Yes*
General Electrical	1926.416	*Yes*	*Yes*	*Yes*
Lockout/Tagout	1926.417, 1910.147	*Yes*	*Yes*	*Yes*
Lockout/Tagout Permit System	See above	*Yes*	*Yes*	*Yes*
Maintenance of Electrical Equipment	1926.431	*Yes*	*Yes*	*Yes*
Environmental Deterioration of Electrical Equipment	1926.432	*Yes*	*Yes*	*Yes*
Batteries/Battery Charging Equipment	1926.441	*N/A*	*Yes*	*Yes*
Scaffolding	1926.450-454	*Yes*	*Yes*	*Yes*
Aerial Lifts	1926.453	*Yes*	*Yes*	*Yes*
Fall Protection	1926.500-503	*Yes*	*Yes*	*Yes*
Cranes, Derricks, Hoists, Elevators, and Conveyors	1926.550	*Yes*	*Yes*	*Yes*
Motor Vehicles, Mechanized Equipment	1926.600-603	*Yes*	*Yes*	*Yes*
Powered Industrial Trucks (forklifts)	1910.178	*Yes*	*Yes*	*Yes*

Table 4 (Continued)
Competent Person and Job Safety Analysis Requirements

Safety and Health Requirement	OSHA Regulation	Competent/ Qualified Person	Training Required	Written Plan and JSA Required
Site Clearing	1926.604	*N/A*	*Yes*	*Yes*
Marine Operations and Equipment	1926.606	*Yes*	*Yes*	*Yes*
Excavations	1926.650-652	*Yes*	*Yes*	*Yes*
Excavation Permit	N/A	*Yes*	*Yes*	*Yes*
Concrete and Masonry Construction	1926.700-706	*Yes*	*Yes*	*Yes*
Steel Erection	1926.750-761 and SENRAC	*Yes*	*Yes*	*Yes*
Underground Construction	1926.800	*Yes*	*Yes*	*Yes*
Caissons	1926.801	*Yes*	*Yes*	*Yes*
Cofferdams	1926.802	*Yes*	*Yes*	*Yes*
Compressed Air	1926.803	*Yes*	*Yes*	*Yes*
Demolition	1926.850-860 inclusive	*Yes*	*Yes*	*Yes*
Power Transmission and Distribution	1926.950-960 inclusive	*Yes*	*Yes*	*Yes*
Rollover Protective Structures; Overhead Protection	1926.1000-1003 inclusive	*N/A*	*N/A*	*Yes*
Stairways and Ladders Scope	1926.1050	*N/A*	*Yes*	*Yes*
S/L General Requirements	1926.1051	*Yes*	*Yes*	*Yes*
Stairways	1926.1052	*Recommended*	*Yes*	*N/A*
Ladders	1926.1053	*Yes*	*Yes*	*Yes*
Ladder/Stair Training	1926.1060	*Yes*	*Yes*	*Yes*
Diving Scope	1926.1071-1072	*Yes*	*Yes*	*Yes*
Dive Team Quals	1926.1076	*Yes*	*Yes*	*Yes*
Dive Safe Practices Manual	1926.1080	*Yes*	*Yes*	*Yes*
Predive Procedures	1926.1081	*Yes*	*Yes*	*Yes*
Procedures During Dive	1926.1082	*Yes*	*Yes*	*Yes*
Post Dive Procedures	1926.1083	*Yes*	*Yes*	*Yes*
SCUBA Diving	1926.1084	*Yes*	*Yes*	*Yes*
Surface-Supplied Air Diving	1926.1085	*Yes*	*Yes*	*Yes*

Table 4 (Continued)
Competent Person and Job Safety Analysis Requirements

Safety and Health Requirement	OSHA Regulation	Competent/ Qualified Person	Training Required	Written Plan and JSA Required
Mixed-gas Diving	1926.1086	*Yes*	*Yes*	*Yes*
Liveboating	1926.1087	*Yes*	*Yes*	*Yes*
Diving Equipment	1926.1090	*Yes*	*Yes*	*Yes*
Diving Recordkeeping Requirements	1926.1092	*Yes*	*Yes*	*Yes*
Internal Traffic Control	N/A	*N/A*	*Yes*	*Yes*
Traffic Movement Restriction Times	N/A	*N/A*	*Yes*	*Yes*
Line Breaking	1910.119 and 1926.54	*Yes*	*Yes*	*Yes*
Major Material Movements	N/A	*N/A*	*Yes*	*Yes*
Right-of-way Restrictions	N/A	*N/A*	*Yes*	*Yes*

SECTION 9

DECONTAMINATION

9.1 CONTAMINATION CONTROL ZONES (CCZ)

CCZ must be defined and maintained in each potentially contaminated work area to prevent the spread of contamination and to prevent unauthorized people from entering potentially hazardous areas.

9.1.1 Exclusion Zone (EZ)

An EZ may consist of a specific work area, or may be an entire area of potential contamination. All personnel entering an EZ must use the required PPE, and must have the appropriate training and medical clearance. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. Cones, caution tape, or a site diagram may be used to identify the location of each EZ.

9.1.2 Contamination Reduction Zone (CRZ)

A CRZ or transition area will be established as needed to perform decontamination of personnel and equipment. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment, and machinery will be decontaminated in a specific location. The decontamination of all personnel will be performed on site adjacent to the EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for cleaning or disposal. This zone is the only appropriate corridor between the EZ and the Support Zone.

9.1.3 Support Zone (SZ)

The SZ is a clean area outside the CRZ to prevent employee exposure to hazardous substances. Eating and drinking will be permitted in the SZ only after proper decontamination. Smoking may be permitted in designated areas of the SZ, subject to site requirements.

9.2 PERSONNEL DECONTAMINATION

All personnel wearing Modified Level D or Level C PPE in an EZ must undergo decontamination prior to entering an SZ, in compliance with 29 CFR 1910.120(k). The personnel decontamination area will consist of the following stations at a minimum:

- *Station 1*: Personnel leaving the CZ will remove the gross contamination from their outer clothing and boots.
- *Station 2:* Personnel will remove their outer garment and gloves and dispose of them in properly labeled containers. Personnel will then decontaminate their hard hats and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items will then be hand carried to the next station.

- *Station 3:* Personnel will thoroughly wash their hands and face before leaving the CRZ. Respirators will be sanitized and then placed in a clean plastic bag.

Personnel working on marine equipment shall decontaminate prior to accessing a support vessel for transportation to the support marina. Personnel shall wash hands, face, and other exposed skin areas prior to work breaks and eating.

No work clothing, shoes, or boots that have come into contact with contaminated sediment shall be worn or carried out of the project area unless they have been decontaminated.

9.3 EQUIPMENT DECONTAMINATION

All vehicles and equipment that have entered a potentially contaminated area will be visually inspected and, if necessary, decontaminated prior to leaving the area. If the visible level of vehicle contamination is low, decontamination may be limited to rinsing tires and wheel wells with water. If the vehicle has visible gross contamination, steam cleaning or pressure washing may be required. Rinsate from all decontamination activities will be collected or contained for proper treatment and/or disposal.

All barges and associated marine equipment shall be decontaminated of any visible sediment before being sent to the working wharf for repairs and/or maintenance.

9.3.1 PPE Decontamination

Where and whenever possible, single-use, external protective clothing must be used for work within the EZ or CRZ. This protective clothing must be disposed of in properly labeled containers. Reusable protective clothing will be rinsed at the site with detergent and water. The rinsate will be collected or contained for proper treatment and/or disposal.

When removed from the CRZ, the respirator will be thoroughly cleaned with soap and water. The respirator face piece, straps, valves, and covers must be thoroughly cleaned at the end of each work shift and ready for use prior to the next shift. Respirator parts may be disinfected with a solution of bleach and water or by using a spray disinfectant.

SECTION 10

EMERGENCY RESPONSE

10.1 GENERAL

This section presents emergency response procedures, including specific fire and spill response protocols, along with information pertaining to medical and first aid emergencies and injury, illness, and near-miss reporting requirements.

Each work area will be evaluated for the potential for fire, explosion, chemical release, or other emergency. An evacuation route from each specific work area must be identified prior to beginning work in the area.

Unusual events, activities, chemicals, and conditions must be reported to the site supervisor immediately.

10.2 EMERGENCY RESPONSE

If an incident that requires emergency response occurs, the site supervisor must take the following steps:

- Evaluate the incident and assess the need for assistance and/or evacuation;
- Call for outside assistance as needed;
- Notify the PSM and appropriate SSR of the incident;
- Notify GE and its representatives of the incident; and
- Take appropriate measures to stabilize the incident scene and ensure that the situation will not affect other areas.

Periodic drills will be conducted involving project personnel and external emergency responders. Specific drill requirements and scheduling will be identified in the pre-planning process, and drills will be held at least annually. Drills will consist of a simulated fire, medical and water-based response, as well as a table-top drill. A formal critique and discussion will be conducted for each of the drills.

10.2.1 Notifications

In the event of an incident that requires emergency response, project personnel will immediately notify 911 so that the proper emergency personnel can respond. Following the 911 call, a project-specific "Priority" will be issued to project personnel over the two-way radio. These priorities were developed with local emergency responders based on the expected capabilities of project personnel and external responders. The priorities are as follows:

- **Priority 1** — Call "911"; external response required. These include the following types of incidents:

  - traumas (either with or without exposure), e.g., fractures, open wounds, or falls from elevation;
  - life-threatening incidents (either with or without exposure), e.g., injured individual is unconscious, severely bleeding, not breathing or has chest pains;
  - chemical releases, e.g., a visible plume or exposure causing eye or throat irritation;
  - fires - that cannot be immediately extinguished by site personnel; and
  - and
  - sinking or capsized boats.
- **Priority 2** - Internal response with first aid supplies to provide basic life support, including minor medical injuries, e.g., abrasions, lacerations, eye irritations, etc.
- **Priority 3** - Internal response with spill supplies, including liquid spills within a containment system or to the ground or water.
- **Priority 4** - Internal response with support boat/marine vessel.
- **Priority 5** - Call Canadian Pacific Railway. Off-site incidents involving rail cars will be the responsibility of the rail carrier, working with local emergency responders.

The same personnel that called the "Priority" will notify the PSM, the appropriate area Safety Representative, i.e., dredging or facility operations, and other project safety personnel. All will respond to the scene accordingly.

If needed at the Processing facility, site radios will be used to notify contractor management for assistance. On each vessel, the captain is to notify Vessel Traffic Service (VTS) of the emergency. VTS will then direct assistance by other project vessels.

The PSM or designee will act as the incident commander for project emergencies that are handled internally. Trained on-site personnel will use fire extinguishers for small fires, and first aid/CPR-trained personnel will provide treatment for non-life threatening injuries.

In the event of an emergency requiring external emergency response, the first responding agency's lead officer will become the incident commander after he or she arrives on site. The PSM will serve as liaison to the external incident commander, as appropriate.

Appropriate emergency response measures will immediately be taken by project personnel to assist those who have been injured and to protect others from unsafe conditions. These measures may include contacting the relevant authorities (depending on the nature of the emergency) and/or health care facilities (see emergency contact numbers listed in Attachment A). It may also involve moving individuals to a secure location, as appropriate. On-site first-aid to an injury or illness will be provided by trained personnel. External emergency responders will be responsible for providing advanced life support services.

If an incident involves a fire that cannot be controlled with an extinguisher, the work area and/or vessel will be evacuated immediately and 911 called. The PSM (or on-site designee) will

promptly contact external fire department personnel whenever there is a fire that cannot be quickly controlled by on-site resources.

Upon the occurrence of any event during the performance of the work which requires reporting to the National Response Center (NRC) under Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), such reporting will be made by GE or their designee. GE will notify USEPA and New York State Department of Environmental Conservation (NYSDEC) of any incident that may present an immediate threat to public health or welfare or the environment, by immediately (upon obtaining knowledge of the incident) notifying USEPA's team leader, or, in the event of the unavailability of the team leader, the USEPA project coordinator or alternate USEPA project coordinator; and also notifying the NYSDEC project manager, or, in the event of the unavailability of the NYSDEC project manager, the Chief of NYSDEC's Hudson River Unit or the New York State Department of Health (NYSDOH) Bureau of Environmental Exposure Investigation.

If any action or occurrence during the performance of the work causes or threatens to cause a release of a hazardous substance that may present an immediate threat to public health or welfare or the environment, the USEPA and the NYSDEC will be notified by GE or its designee immediately on obtaining knowledge of such action or occurrence. Such notifications will be made to one of the USEPA project coordinators and to the NYSDEC Hudson River project manager (or, in the event of their unavailability, to their alternate contacts).

The following subsections present procedures for fire response and spill prevention/ response.

10.2.2 Fire Response

All personnel receive information regarding fire prevention and dire protection during the Project Safety Orientation and are instructed to use a fire extinguisher for incipient stage fires only.

In the event of a fire at the sediment processing facility or other land-based support property, a telephone call will be made to 911 if the fire cannot be readily extinguished. The arriving unit will report to the designated entry location and will be met by the PSM (or on-site designee) and briefed. The CM staff will provide the lead officer with facility-specific information and logistical support, as needed.

In the event of an incipient stage fire affecting river-based operations, the dredging contractor's personnel will attempt to extinguish the fire with onboard equipment (typically fire extinguishers). If a fire cannot be extinguished by dredging personnel, then they will call 911 and follow emergency response procedures, including abandoning the vessel if necessary. The lead officer will respond to a designated location, will be met by the PSM (or on-site designee) and briefed. Based on the incident, the lead officer will deploy appropriate water rescue resources with the assistance of project personnel. The CM staff will assist external responders

with operational support, e.g., stopping dock work and barge movement, and by providing assistance, e.g., boats, vehicles, and/or PPE.

10.2.3 Spill Prevention/Response

In the event of a spill, response actions will be primarily guided by the spill prevention, control, and countermeasure (SPCC) plans prepared by the dredging contractor (for in-river activities) and the processing facility contractor (for incidents on the main site). These contractor SPCC Plans will be prepared after 2014 contractor award and prior to commencing 2014 dredging and facility operations. For the purposes of this RA HASP, a general response approach has been summarized below.

In the event of an accidental release of a toxic or hazardous material, the employee observing the incident must immediately notify the site supervisor, and if possible, proceed to control the emergency situation.

When determining the possible hazards to human health and/or the environment that may result from the incident, the PSM must consider both the direct and indirect effects of the release, assess the possible effects of any toxic, irritating, or asphyxiating gases that are generated, and determine the effects of any hazardous run-off from water or chemical agents used to control fire and heat-induced explosions.

10.2.3.1 Spill Response Procedures – Sediment Processing Facility

Spills at the processing facility within the exclusion zone are captured within the built-in collection, containment, and treatment system designed to effectively address dredged and processed materials. A significant accident or spill of material could warrant immediate actions by the facility contractor to protect human health and safety, assess the severity of the event, and take appropriate mitigation measures, if needed. The event would be evaluated by the CM and contractor to determine its causes and future prevention, and proper project authorities would be notified of the event.

Generally, on-site sediment spills from a project truck will be picked up and placed back in the truck, while sediment spills during the process of loading rail cars will be picked up and placed into the rail car.

10.2.3.2 Spill Response Procedures – In River Activities

All project vessels will be required to have USCG safety equipment, including ship-to-shore very-high-frequency (VHF) radios and cellular phones to alert the CM and local responders of a spill.

The responders' first priority will be to assess the safety, rescue, or medical needs of members of the public and workers immediately affected by the spill.

At the same time, the apparent scale and severity of the spill will be evaluated so that appropriate response actions can be taken. Notification to the CM will be promptly made. The

CM will aid in summoning the contractor's spill response team or other support personnel. In all cases, the location and time of the spill, the vessels and people involved, and other important details will be conveyed to assist response actions and reporting.

Third, the spill will be contained and controlled. If the spill appears incidental, e.g., brief duration and of limited spatial extent, containment may not be necessary or feasible. If the spill is of a larger magnitude (larger quantity, longer duration or spatial extent), contingency measures will be implemented per the SPCC plan. These measures will include actions to contain and control the spill to the extent possible, e.g., safe, feasible, consistent with other project requirements, thereby stopping the spill, securing and stabilizing the immediate area, and taking steps to minimize the spread of the spill.

Fourth, the spill will be cleaned up or mitigated. A pre-planned course of action for the recovery of any spilled material containing PCBs will be implemented.

10.2.3.3 Spill Reporting Requirements

This section applies only to spills and releases within the Sediment Processing Facility or on the river. Reporting and responding to off-site accidents involving a release from loaded rail cars is the responsibility of the rail carriers.

Federal and state laws and regulations define when a spill or release must be reported. Pursuant to its authority under the CERCLA, USEPA has developed a list of hazardous substances that, if released to the environment in an amount greater than a defined reportable quantity (RQ), must be reported. For example, in the case of PCBs, the person in charge of a facility must immediately report upon learning that one pound or more of PCBs has been released to the environment within a 24-hour period.

Under its authority granted by the Federal Water Pollution Control Act (FWPCA), USEPA has developed a similar list of reportable quantities of hazardous substances in the event of a release of hazardous substances to the navigable waters. As with the CERCLA list, these require reporting if an amount exceeding an RQ is spilled into the water. In addition, the Oil Pollution Act (OPA) requires notification if a sheen of oil is visible on the water. Oil sheens generated as a result of sediment and debris removal are not subject to this reporting requirement.

Under state law, NYSDEC has developed its own list of hazardous substances that, if released to the environment, must be reported. That law (6 NYCRR Part 595, 597) requires the reporting of releases above a defined RQ (in the case of PCBs, one pound or more) to NYSDEC immediately, but within two hours after the discharge. State law also requires reporting of releases involving less than the RQ if the release may result in fire, explosion, exceedance of air and water quality standards, or injury to the public.

In addition, Section 17-1743 of the NYSDEC Law requires that a person who stores more than 1,000 gallons of any liquid (including petroleum) must immediately report any release of the liquid to land or waters.

Finally, New York's Navigation Law requires any person responsible for causing a discharge of oil or other petroleum to land or water notify NYSDEC immediately, but within two hours after the discharge, unless: (1) the spill is less than 5 gallons; (2) the spill is contained; (3) the spill has not and will not reach the water or any land; and (4) the spill is cleaned up within two hours of discovery.

If the release or spill requires reporting under CERCLA, the FWPCA, or the OPA, a telephone call will be placed to the National Response Center. Additional reports are required by Paragraph 41 of the consent decree. Under that paragraph, if a release must be reported under CERCLA, then GE is also required, within 24 hours of obtaining knowledge of the onset of the event, to orally notify USEPA's team leader, Hudson River Team, Emergency and Remedial Response Division, USEPA Region 2; or, in the event that the team leader is not available, either the USEPA project coordinator or the alternate USEPA project coordinator). GE is also required to provide oral notification to the NYSDEC project manager, Hudson River PCBs Superfund Site; or, in the event of the unavailability of the NYSDEC project manager, to the chief of NYSDEC's Hudson River Unit and to the NYSDOH Bureau of Environmental Exposure Investigation. If a spill has potential to impact navigation, GE will notify the NYSCC Canal Corporation/Thruway Dispatcher.

At a minimum, personnel reporting a spill or release must provide the following information to the site supervisor (using the Incident/Near-Miss Investigation Report provided as Attachment H, or equivalent):

- Location of the release or threatened release;
- The material released or threatened to be released;
- The approximate quantity and concentration of the release or threatened; and
- Any other information as required for compliance with NRC or NYSDEC reporting requirements (NYSDEC, 1996).

The contractor's supervisor will then contact the CM and notify them of the incident. The CM's project manager will notify GE and its representatives of the incident and determine if reports to the NRC or NYSDEC are required.

10.3 EMERGENCY INFORMATION

The means to summon local public response agencies such as police, fire, and ambulance will be reviewed in the project orientation. Emergency contacts are listed in Attachment A. The following sub-sections provide information on medical emergencies and first aid while working at the site.

10.3.1 First Aid

First aid will be provided by trained personnel. Injuries and illnesses requiring medical treatment must be documented. The site supervisor must conduct an incident investigation as soon as emergency conditions no longer exist and first-aid and/or medical treatment has been

administered. The report must be completed and submitted to the PSM and appropriate SSR within 72 hours after the incident.

If first-aid treatment is required, first-aid kits are kept at the CM office trailer and in each construction vehicle assigned to a supervisor. If treatment beyond first aid is required, the injured should be transported to the medical facility. If the injured is not ambulatory, or shows any sign of not being in a comfortable and stable condition for transport, then an ambulance/ paramedic should be summoned. If there is any doubt as to the injured worker's condition, it is best to let the local paramedic or ambulance service examine and transport the worker.

10.3.1.1 Emergency Care Steps

The steps listed below must be followed in the event of an injury at the site:

- *Survey the scene.* Determine if it is safe to proceed. Try to determine if the conditions that caused the incident are still a threat. Protect yourself from exposure before attempting to rescue the victim.
- *Do a primary survey of the victim.* Check for airway obstruction, breathing, and pulse. Assess likely routes of chemical exposure by examining the eyes, mouth, nose, and skin of the victim for symptoms.
- *Phone Emergency Medical Services (EMS).* Give the location, telephone number used, caller's name, what happened, number of victims, victims' condition, and help being given.
- *Maintain airway and perform rescue breathing* as necessary.
- *Perform CPR* as necessary.
- *Do a secondary survey of the victim.* Check vital signs and do a head-to-toe exam.
- *Treat other conditions as necessary.* If the victim can be moved, take the victim to a location away from the work area where EMS can gain access.

10.3.1.2 Inhalation

Any employee complaining of symptoms of chemical overexposure will be removed from the work area and transported to the designated medical facility for examination and treatment.

10.3.1.3 Ingestion

Call EMS and consult a poison control center for advice. If available, refer to the MSDS for treatment information, if recommended. If unconscious, keep the victim on his or her side and clear the airway if vomiting occurs.

10.3.1.4 Skin Contact

Personnel who have had skin contact with contaminated sediment will proceed through the decontamination zone to the wash-up area. Personnel must remove any contaminated clothing and then wash the affected area with soap and water. The individual should be transported to the

medical facility if showing any sign of skin reddening or irritation, or if requesting a medical examination.

10.3.1.5 Eye Contact

Field personnel who have had contaminated sediment splashed in their eyes or who have experienced eye irritation while in the contaminated zone must immediately proceed to the eyewash station set up in the decontamination zone. Do not decontaminate prior to using the eyewash. Remove whatever protective clothing is necessary to use the eyewash. Flush the eye with clean running water for at least 15 minutes. Arrange prompt transport to the designated medical facility.

10.3.2 Medical Emergency

In the event of a medical emergency associated with project activities, a telephone call will be made to 911 and the Emergency Care Steps in Section 10.3.1.1 will be followed until medical personnel arrive. The arriving unit will report to a designated entry location. The lead officer will be met by the PSM (or on-site designee) and briefed or will immediately receive injured personnel for evaluation and/or transport. In the event injured personnel cannot be moved, emergency personnel will be escorted to the incident location.

Emergency personnel will be provided with any site-specific PPE beyond their own response gear. Response personnel will have access to any on-site emergency response equipment, as needed. If the injured personnel cannot be decontaminated due to the possibility of causing further injury, the necessary PPE and supplies will be provided to protect emergency response personnel or equipment from contamination.

For emergency incidents that occur on water, a notification will be made to VTS, who is responsible for contacting 911 and notifying the 911 operator of the designated control zone where the emergency has occurred. The lead officer will respond to the designated location. Injured personnel who are in a condition to be transported will be transferred by project vessel to a designated location. If injured personnel cannot be transported, the lead officer will go to the designated location to be greeted by the PSM and briefed. External emergency responders will be directed to the scene if using their own vessel. Response personnel will have access to project emergency equipment, including vessels, as needed. If the injured personnel cannot be decontaminated due to the possibility of causing further injury, the necessary PPE and supplies will be provided to protect emergency response personnel or equipment.

10.3.5 Water Emergency – Man Overboard

In the event of an emergency, a notification will be made to VTS, who is responsible for contacting 911 and notifying the 911 operator of the designated control zone where the emergency has occurred. Onboard personnel may attempt to rescue the overboard person, if it can be done safely. Arriving unit(s) will report to a designated entry location. The lead officer will be met by the PSM and briefed or will immediately receive injured personnel for evaluation

and/or transport. Project support vessels, personnel, and/or equipment will be made available to external emergency responders, as well as any land-based logistics and support equipment.

10.3.5.1 – Diving Emergency

In the event of an emergency, a notification will be made to VTS, who is responsible for contacting 911 and notifying the 911 operator of the designated control zone where the emergency has occurred. On board personnel will assist the diver tenders as directed by emergency services in removing an injured diver.

10.3.6 Emergency Contacts

The means to summon local public response agencies such as police, fire, and ambulance will be reviewed in the project orientation. These potential agencies are identified in Attachment A. In the event of an emergency requiring immediate medical care, 911 should be called. If it is prudent to transfer individuals with minor injuries to the nearest hospital, the hospital will vary depending on the location of work being performed. Three hospitals qualified to perform emergency care have been identified in Figure 6a – 6c.

10.4 INCIDENT REPORTING

All incidents, however minor, will be reported to the site supervisor immediately. Incidents can include near misses, spills, property damage, first aid cases or injury beyond first aid. Safety Stops are reported in the same manner as incidents. Incidents are to be reported, investigated, and a Root Cause Analysis performed in accordance with the Project Incident Management Matrix (Attachment H). If it is not possible to complete an electronic entry into the Gensuite reporting system, the SSO/SSHO or the site supervisor will complete an Incident/Near-Miss Investigation Report (Attachment I) and submit it to the PSM 4 hours.

The investigation process shall include the following elements:

1. Quickly assess incident scene
2. Assemble investigative team (Contractor and CM member)
3. Ensure that information is quickly collected, physical info, photos, sketches, interviews.
4. Review pertinent documents.
5. Interview:
    a. Principal Witnesses (people that are directly involved in the incident)
    b. Eye Witnesses (people that saw the incident occur)
    c. General Witnesses (people that were in the vicinity, before during or after the incident)
6. Through the use of an event and causal factor (E&CF) chart identify:
    a. the immediate event or condition that caused the incident (Direct Causes)
    b. the events or conditions that along with other causes increased the chance of the incident but by themselves did not cause the incident (Contributing Causes)

   c. the Contributing Causes that were chiefly responsible for the incident (Causal Factors)
7. Analyze each Causal Factor using a systematic process such as Why Tree, Tap-Root®, 5-Why, Ishikawa diagram or similar tool
8. Prepare a Corrective Action Plan that identifies:
   a. Corrective Actions needed
   b. Responsible Person for each action
   c. Expected Completion Date for each action
9. Complete a Close-out Report
10. Conduct a follow-up inspection

Contractor management will receive Incident Investigation training conducted by the CM PSM or a designated representative.

Incident investigations will be held with the appropriate parties necessary to determine root causes of the incident and establish corrective actions.

10.5 EMERGENCY EVACUATION PLAN

10.5.1 Emergency Evacuation Plan – Processing Facility

In the event of an emergency which requires site evacuation to protect the health and safety of site personnel, the PSM or his or her designee will implement the Emergency Evacuation Plan and will be designated as the on-site emergency coordinator. The Emergency Evacuation Plan procedure is to be communicated to all site workers, subcontractors, and visitors as part of the Site Safety Orientation.

The following signals will be used:

- When it is necessary to summon emergency assistance or notify site personnel of an incident, the supervisor or designated personnel will summon assistance using the site radio system.
- When an alert is initiated, personnel in trained first aid are to assist the PSM or his designee with the medical incident.
- An Evacuation Notice will be given over the radio system directing all site personnel to report to designated assembly points for personnel accounting. The Evacuation notice is to be used for possible evacuation of the processing facility.
- In the event the alarm signal cannot be transmitted via radio, a call tree to the site contractors will be initiated.
  1. Upon hearing the evacuation notice, all personnel on-site (contractors, CM, GE and visitors) calmly proceed to and gather at the Assembly Area. The General/Site Assembly Area is located in the parking lot outside the Administrative complex buildings. Refer to Figure 3 showing the assembly area. Personnel will gather in the Assembly Area and report to their respective

organizations. When proceeding to the Assembly Area, each contractor should adhere to the following requirements:

- Shut off all machinery, if safe to do so.
- Crew leaders, SSRs and SSOs will determine the safest exit routes for employees and will determine an alternate exit if the first choice is inaccessible.
- While proceeding to the assembly areas, crew leaders should to keep their group together. Immediately upon exit to a safe area, the crew leader will conduct another head count to verify their crew is all present.

2. Each organization will then complete a head count, verify that all employees are accounted for and report the results to the PSM.
3. If a complete site evacuation is determined to be required by the PSM, each organization will have their employees proceed to a secondary assembly point to be designated by the PSM. The primary evacuation route from the Processing Facility is the Lock 8 Way Road to the north. The secondary evacuation route is the Old Lock 8 Road to the south. The PSM will advise which evacuation route to take. Once personnel have gathered at the secondary assembly point, a second head count will be conducted and the results provided to the PSM.

When the site alarm system is activated, no additional entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the site will cease in order to allow safe exit of personnel and movement of emergency equipment. The PSM will notify all river contractors of the emergency situation and contractors will instruct vessel captains how to proceed. The site will not be re-entered until the PSM gives clearance to do so.

Drills will be held periodically to practice all of the above procedures and will be treated with the same seriousness as an actual emergency.

10.5.2 Emergency Evacuation Plan – In-River

In the event of an emergency in-river, the Emergency Response Plan – In River will require evacuation from either the Work Support Marina or an affected vessel to protect the health and safety of project personnel. The Captain of the vessel, the PSM or his designee will implement the Emergency Evacuation Plan and will be designated as the on-site emergency coordinator. The Emergency Evacuation Plan procedure is to be communicated to all river workers, subcontractors, and visitors as part of the Site Safety Orientation.

10.5.2.1 Emergency Evacuation Plan - Land Based Properties

The following procedures will be used at land-based support properties:

- When it is necessary to summon emergency assistance or notify site personnel of an incident, the supervisor or designated personnel will summon assistance using the site radio system. An alert is used for medical incidents.
- When an alert is initiated, personnel in trained first aid are to assist the PSM or his designee with the medical incident.

- If necessary to give an Evacuation Notice, word of mouth, site radios, and cell phones will be used to clear the area. Upon receiving notice, all workers will report to the assembly area.

Upon determination of an emergency condition requiring a site evacuation, the PSM or his designee sounds the evacuation notice, word of mouth and the call tree to the site contractors will be initiated.

1. Upon hearing the evacuation notice, all personnel on-site (contractors, CM, GE and visitors) calmly proceed to and gather at the designated Assembly Area(s) for that work site. Personnel will gather in the Assembly Area and report to their respective organizations. When proceeding to the Assembly Area, each contractor should adhere to the following requirements:
   - Shut off all machinery, if safe to do so.
   - Crew leaders, SSRs and SSOs will determine the safest exit routes for employees and will determine an alternate exit if the first choice is inaccessible.
   - While proceeding to the assembly areas, crew leaders should to keep their group together. Immediately upon exit to a safe area, the crew leader will conduct another head count to verify their crew is all present.
2. Each organization will then complete a head count, verify that all employees are accounted for and report the results to the PSM.
3. If a complete site evacuation is determined to be required by the PSM, each organization will have their employees proceed to a secondary assembly point to be designated by the PSM. Once personnel have gathered at the secondary assembly point, a second head count will be conducted and the results provided to the PSM.

When the WSM alarm system is activated, no additional entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the WSM will cease to allow safe exit of personnel and movement of emergency equipment. The PSM will notify all river contractors of the emergency situation and contractors will instruct vessel captains how to proceed. The site will not be re-entered until the PSM gives clearance to do so.

Re-start of work at the WSM will be made only after the PSM gives clearance.

10.5.2.2 River Vessel Evacuation

If an emergency occurs on a vessel, the following procedures will be implemented. The captain of the vessel will notify the contractor manager immediately of the situation either by radio or use of the VTS. The contractor manager is to notify the PSM or his or her designee. The captain of the vessel will evaluate the situation and determine if the Emergency Evacuation Plan for the vessel is to be implemented.

- The Captain will call for assistance to evacuate the crew from the vessel.

- Neighboring vessels will assist in the evacuation as directed by the VTS managers.
- Man Overboard may be called by the captain if the situation warrants it.
- Crew members evacuated will have a headcount conducted by the Captain of the vessel after all members have left the vessel in distress and have been assembled.
- The Captain will notify the contractor manager at the completion of the headcount.
- The contractor will provide this information to the on-river emergency coordinator.

Restart of work at or on the river will be made only after the PSM gives clearance.

Drills will be held periodically to practice all of the above procedures and will be treated with the same seriousness as an actual emergency.

SECTION 11

AUDITS AND CORRECTIVE ACTION

11.1 FORMAL SITE AUDIT

The CM field audit protocol is designed to identify and correct unsafe behaviors, acts, or conditions in each contractor's scope of work. The CM will conduct site audits based on safety concerns and selected safety focus topics. Items found to be out of compliance must be assigned corrective action and the corrective action tracked to completion. The PSM maintains the original audit documentation on file.

11.2 DAILY SITE WALK CHECKLIST

The CM's project personnel conduct a daily safety site walk to identify problem areas. Items found to be out of compliance must be assigned corrective action and the corrective action tracked to completion. Contractors are required to document their daily checklist inspection and keep copies of the inspections on site.

11.3 ENFORCEMENT

CM and contractors enforce all applicable requirements of OSHA 1910 and 1926, New York State Department of Labor codes, rules and regulations and contract requirements. Contractor will have written progressive disciplinary systems available for review in the respective contractor HASP. At a minimum, the disciplinary program must include a 3-tier disciplinary policy that includes:

1. Verbal warning
2. Written warning
3. Removal from site

In the event that a serious infraction occurs, the contractor and/or the CM can require an immediate removal of that individual from the site. Serious infractions include but are not limited to:

- Non-compliance with site fall protection requirements
- Violation of Confined Space Policy
- Disregard of Lock-out Tag-out procedures
- Physical aggression toward another worker
- Possession of weapons, alcohol, or illegal drugs
- Failure of substance abuse test or failure to submit to a substance abuse test upon request
- Gross disregard for the safety of self or other site personnel or property

11.4 SAFETY VIOLATIONS

There are three levels of safety notices used on the project:

1. Safety Concern Form: To be used by the CM when a condition or behavior is questionable or activity is in conflict with some requirement of the 01350, RA HASP, GE procedure, OSHA violation, etc.
2. Safety Warning Letter – Unresolved Concern or Repeat Violation: To be used by the CM when previous concerns have not been addressed.
3. Notice of Violation (NOV): Issued by the CM for repeat serious violations, violations of a serious nature requiring a local or more widespread work stoppage. May be accompanied by a stop work order.

The NOV documents poor performance and requires a response from contractor senior management. The notice contains five distinct levels of discipline, from submission of a recovery plan to contract termination.

1. Contractor is notified of the violation and should take corrective action to prevent a reoccurrence. The corrective action shall be documented to the CM representative immediately.
2. Contractor must submit a plan for compliance to CM within two days of receipt of a formal letter. The compliance plan must include the means of compliance and the date that the requirements for compliance will be completed. Once compliance has been achieved, a follow-up letter must be sent to the CM.
3. Contractor is required to review the stated procedures with the CM. Work may not commence on the site until the review is complete and the contractor responds formally that the procedure is understood and will comply.
4. Contractor is required to review the stated procedures with CM. Work may not commence on the site until the review is complete, and contractor must confirm formally the disciplinary action to be taken against the supervisor and employees.
5. All work on the site will stop until the CM reviews all the facts with the subcontractor and determines whether the contract between the parties will be terminated.

SECTION 12

REFERENCES

NIOSH, OSHA, USCG, and USEPA. 1985. *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*. 86116.

NYSDEC. 1996. *Technical Field Guidance: Spill Reporting and Initial Notification Requirements*. May 1, 1996.

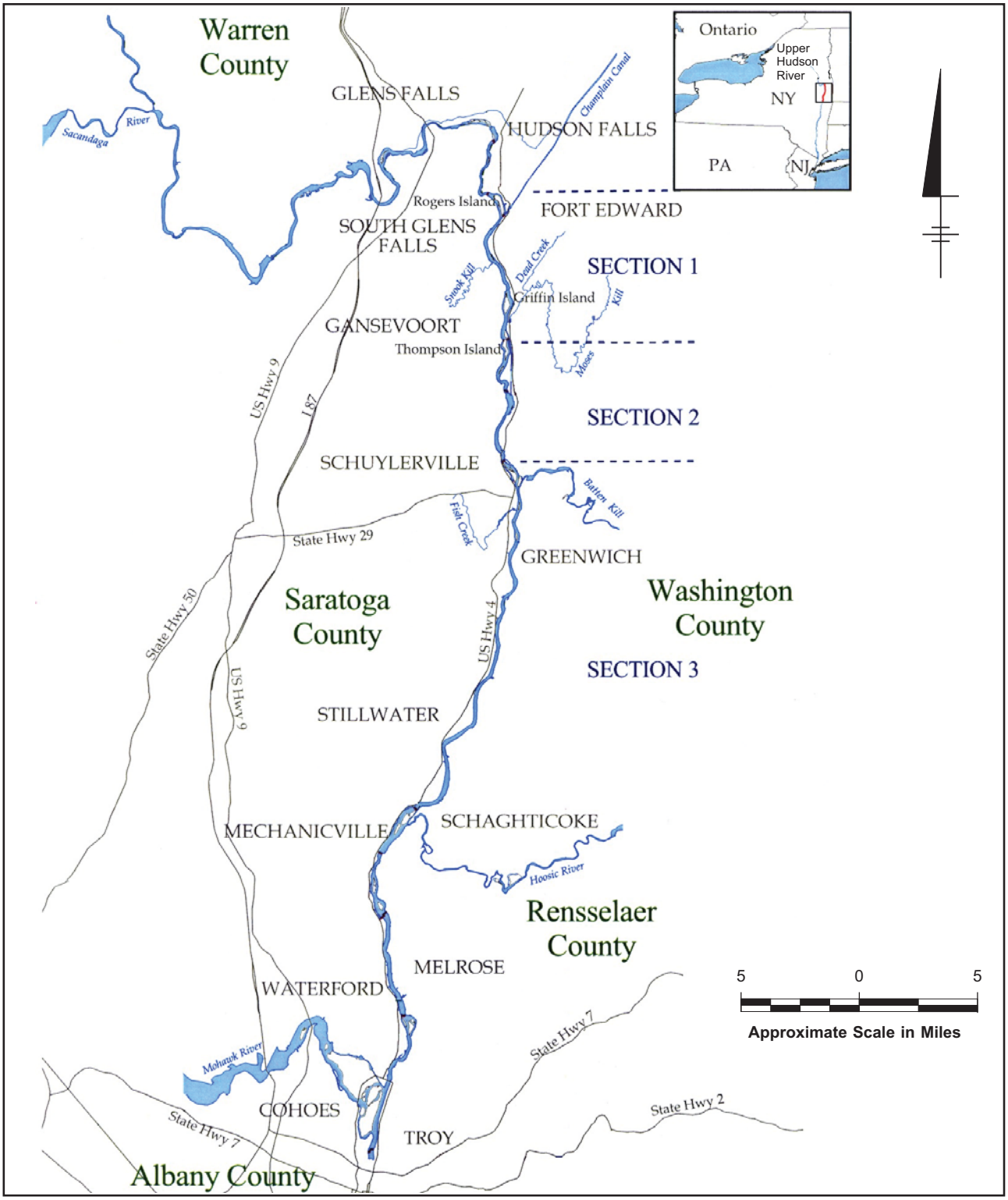
Parsons. 2014. *Phase 2 Remedial Action Community Health and Safety Plan for 2014 - Hudson River PCBs Superfund Site* (2014 CHASP). Prepared for General Electric Company, Albany, NY. February.

Parsons. 2014a. *Remedial Action Work Plan for Phase 2 Dredging and Facility Operations in 2014 - Hudson River PCBs Superfund Site*. Prepared for General Electric Company, Albany, N.Y. February.

US EPA/GE. 2002. Administrative Order on Consent for Hudson River Sediment Sampling (Index No. CERCLA-02-2002-2023) (Sediment Sampling AOC). Effective Date July 26, 2002.

US EPA/GE. 2005. Consent Decree in *United States v. General Electric Company*, Civil Action No. 1:05-cv-1270, lodged in United States District Court for the Northern District of New York, October 6, 2005. Final judgment entered November 2, 2006.

FIGURES



NOTES:

1. All locations are approximate.
2. Adapted from EPA Feasibility Study (December 2000).

GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBS SUPERFUND SITE
2013 Remedial Action Health and Safety Plan

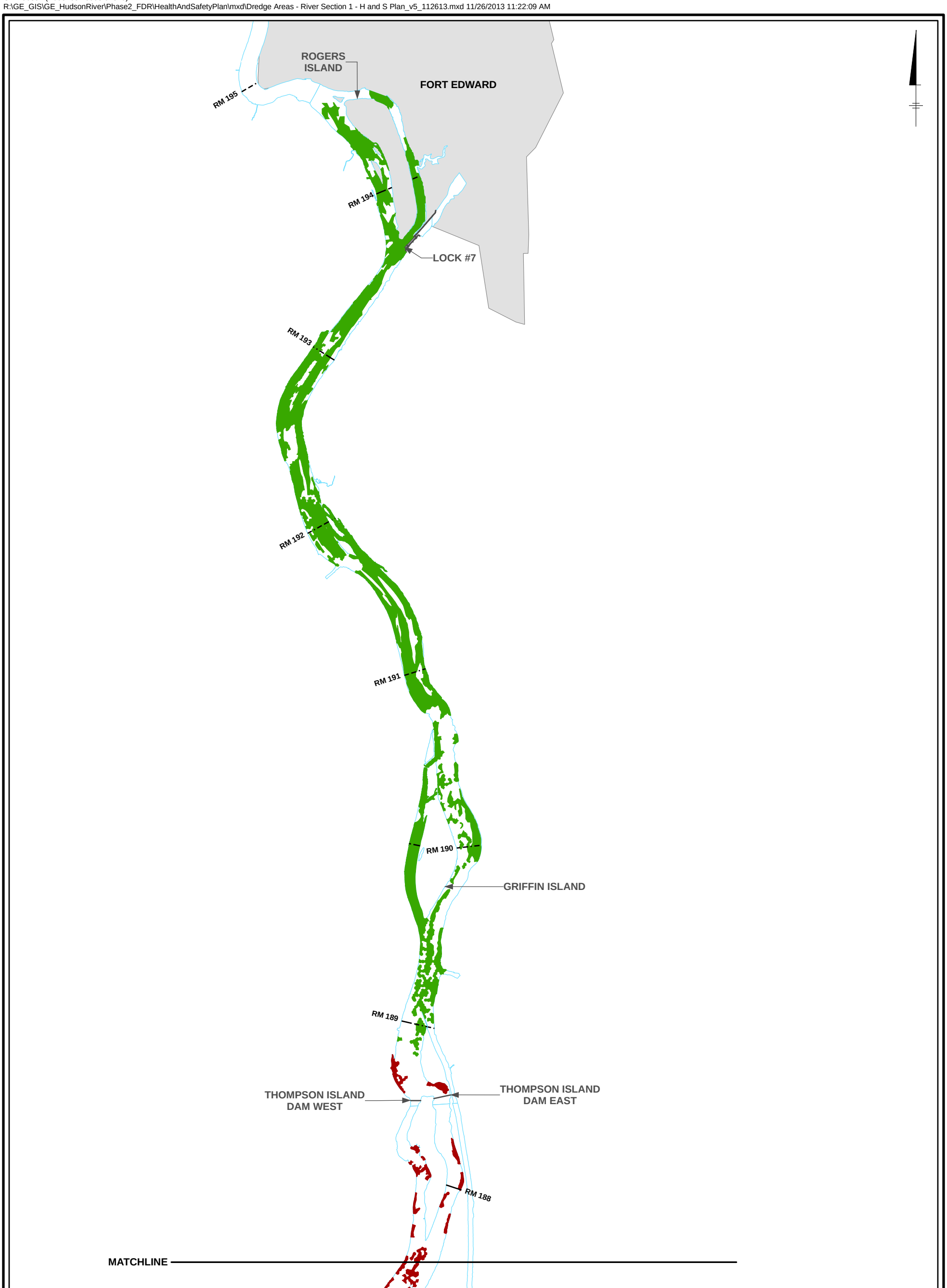
UPPER HUDSON RIVER

ARCADIS

FIGURE
1

02/29/2012 SYRACUSE, NY-ENV/CAD-141 DJHOWES
B0031087/2009/02800/CDR/31087N02.CDR

City: SYR Div/Group: 90 Created By: mkohberger Last Saved By: momeara
GE Hudson (B0031087.0003.04810)
R:\GE_GIS\GE_HudsonRiver\Phase2_FDR\HealthAndSafetyPlan\mxd\Dredge Areas - River Section 1 - H and S Plan_v5_112613.mxd 11/26/2013 11:22:09 AM



LEGEND:

- DAM/LOCK
- RIVER MILE MARKER
- COMPLETED DREDGE AREA
- REMAINING DREDGE AREA
- INCORPORATED AREA
- SHORELINE

NOTE:
1. BASE MAPPING PROVIDED BY QEA, LLC.

0 0.5 1 Miles
GRAPHIC SCALE

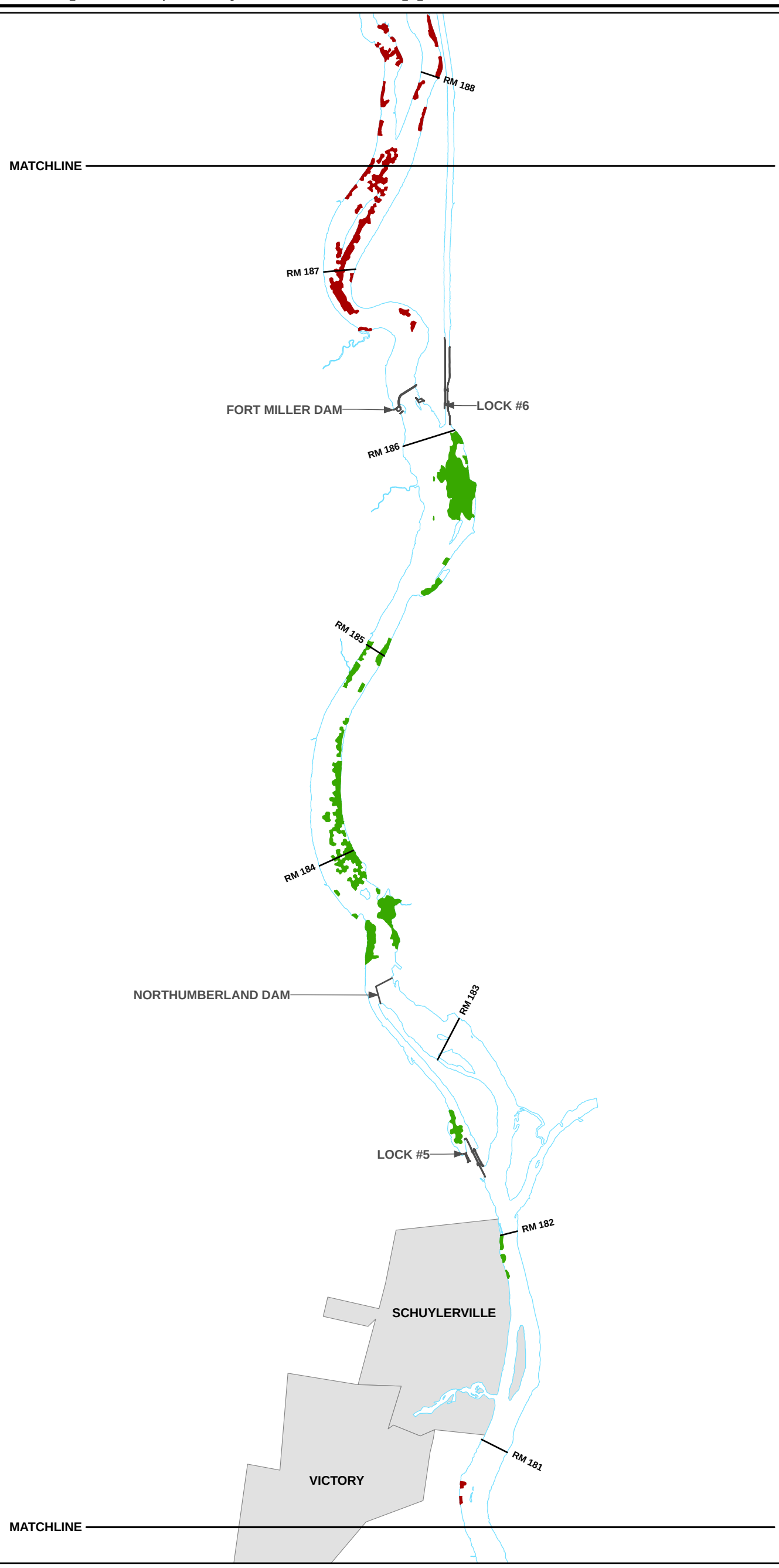
GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE
2014 REMEDIAL ACTION HEALTH AND SAFETY PLAN

DREDGE AREAS

ARCADIS

FIGURE
2a

City: SYR Div/Group: 90 Created By: mkohberger Last Saved By: momeara
GE Hudson (B0031205.0000)
R:\GE_GIS\GE_HudsonRiver\Phase2_FDR\HealthAndSafetyPlan\mxd\Dredge Areas - River Section 2 - H and S Plan_v5_112613.mxd 11/26/2013 11:47:44 AM



LEGEND:
- RIVER MILE MARKER
- DAM/LOCK
- COMPLETED DREDGE AREA
- REMAINING DREDGE AREA
- INCORPORATED AREA
- SHORELINE

NOTE:
1. BASE MAPPING PROVIDED BY QEA, LLC.

0 0.5 1 Miles
GRAPHIC SCALE

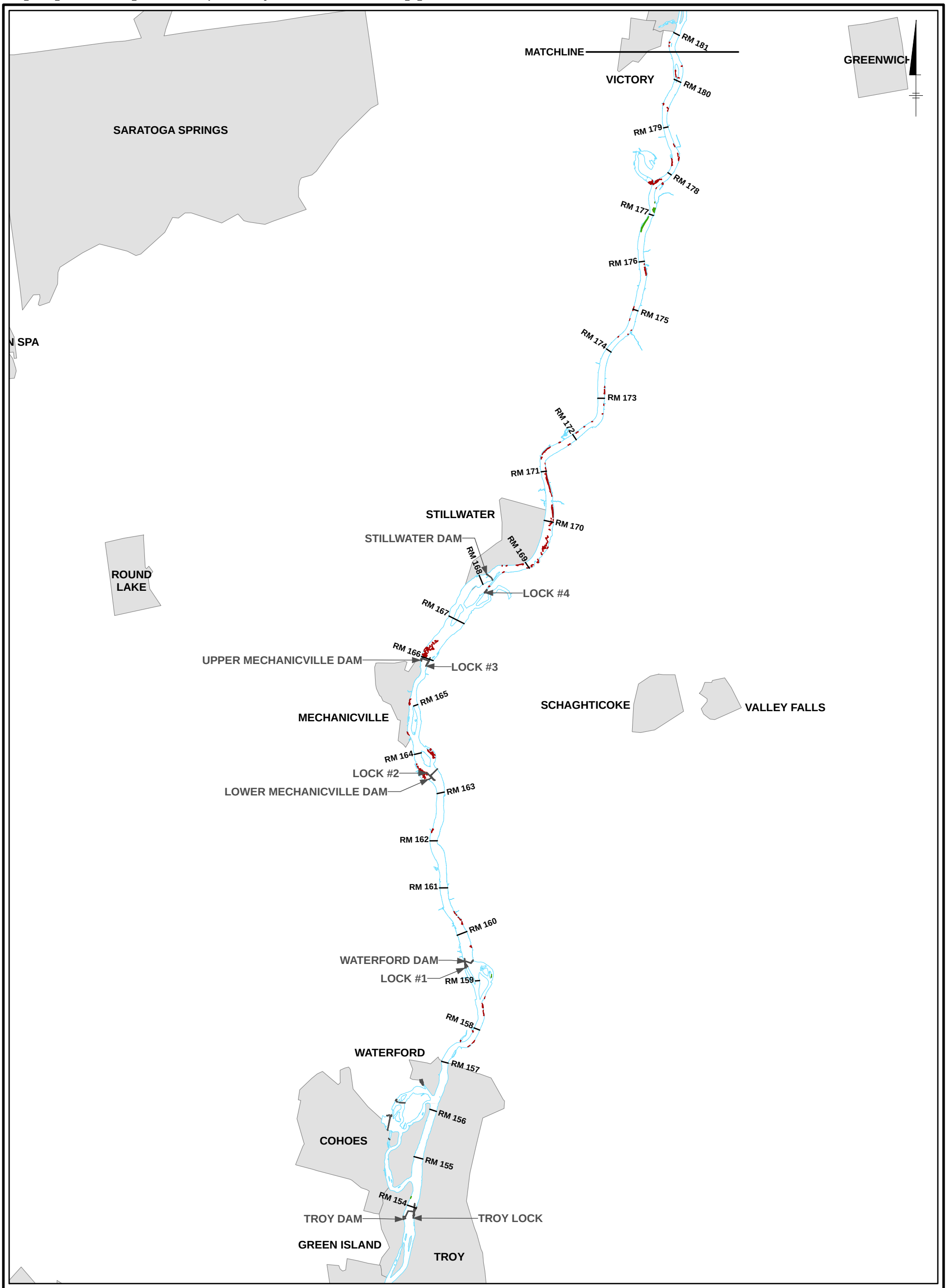
GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE
2014 REMEDIAL ACTION HEALTH AND SAFETY PLAN

DREDGE AREAS

ARCADIS

FIGURE
2b

City: SYR Div/Group: 90 Created By: mkohberger Last Saved By: momeara
GE Hudson (B0031205.0000)
R:\GE_GIS\GE_HudsonRiver\Phase2_FDR\HealthAndSafetyPlan\mxd\Dredge Areas - River Section 3 - H and S Plan_v5_112613.mxd 11/26/2013 11:53:52 AM



LEGEND:
- RIVER MILE MARKER
- DAM/LOCK
- COMPLETED DREDGE AREA
- REMAINING DREDGE AREA
- INCORPORATED AREA
- SHORELINE

NOTE:
1. BASE MAPPING PROVIDED BY QEA, LLC.
2. DREDGING COMMENCED IN CU83 AND CU99 DURING 2013 AND WILL BE COMPLETED IN THESE CUs IN 2014.

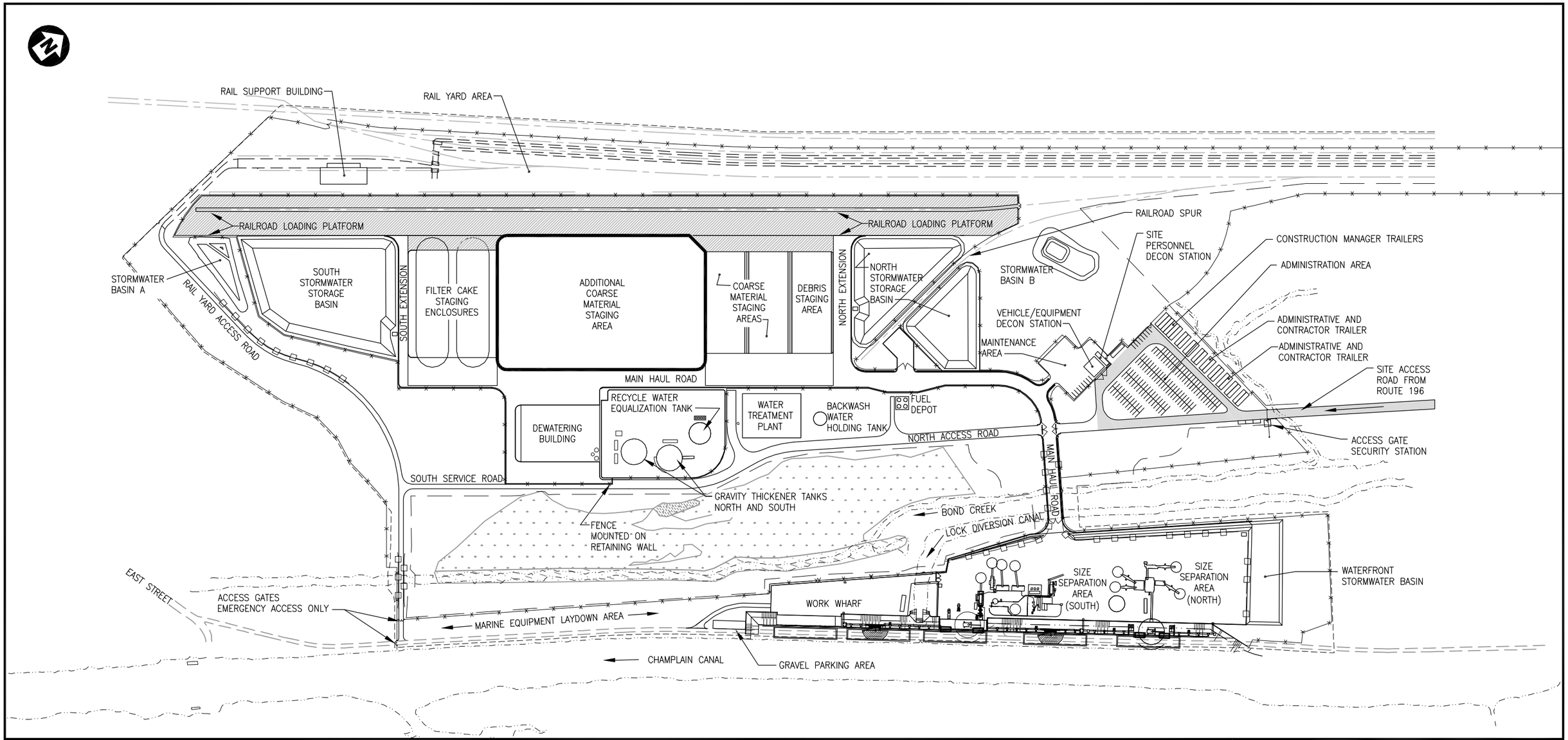
0 2 4 Miles
GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE
2014 REMEDIAL ACTION HEALTH AND SAFETY PLAN

DREDGE AREAS

ARCADIS

FIGURE
2c



SOURCE:

BASE MAP INFORMATION SUPPLIED BY ARCADIS AND SHAW.

300 150 0 300

SCALE: 1" = 300'

LEGEND:

- GUIDE RAIL
- SITE PERIMETER FENCE
- FORESTED AREA
- EMERGENT WETLANDS
- SITE ACCESS ROAD FROM ROUTE 196
- RAILROAD LOADING PLATFORM

FIGURE 3

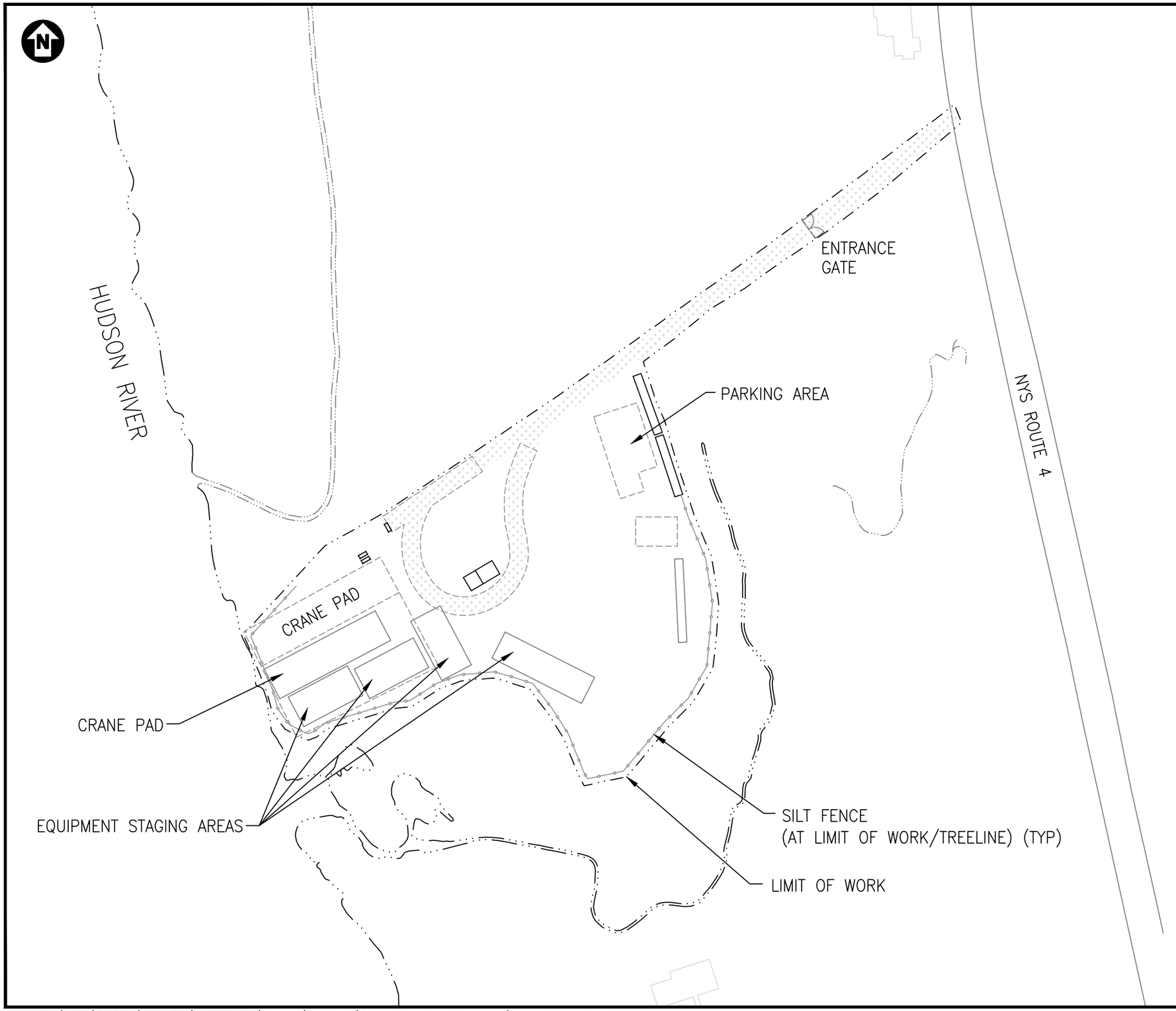
GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE
REMEDIAL ACTION HEALTH & SAFETY PLAN

PROCESSING FACILITY SITE PLAN
(PROCESSING & RAIL YARD FACILITY)

PARSONS

GE COMPANY - PARSONS PROJECT OFFICE, BUILDING 40-2, 381 BROADWAY FT. EDWARD, NY 12828

FILE NAME: P:\GE HUDSON RIVER\442209 PHASE 2\09.0 REFERENCE DOCUMENTS\9.6 RAWP-2 CAD DWGS\442209-PFSP-FIGURES-2013.DWG
PLOT DATE: 3/15/2013 11:54 AM PLOTTED BY: GOLDTHWAIT, JAMES



SOURCE:

BASE MAP INFORMATION SUPPLIED BY CASHMAN.

LEGEND:

- SILT FENCE
- SHORELINE
- LIMIT OF WORK
- BUILDINGS/STRUCTURES/ROADS
- TRUCK ROUTE
- DISTURBED AREA

120 60 0 120 240

SCALE: 1"=120'

FIGURE 4

GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE

GENERAL SUPPORT PROPERTY

PARSONS

GE COMPANY – PARSONS PROJECT OFFICE, BUILDING 40-2,
381 BROADWAY FT. EDWARD, NY 12828

FILE NAME: C:\USERS\P003604A\DOCUMENTS\PARSONS 2014\PROJECTS\2014 RAWP\ROUTE4-442209C003 – STANDARD\ROUTE4-442209C003.DWG
PLOT DATE: 1/15/2014 8:47 AM PLOTTED BY: BELLACK, MICHAEL

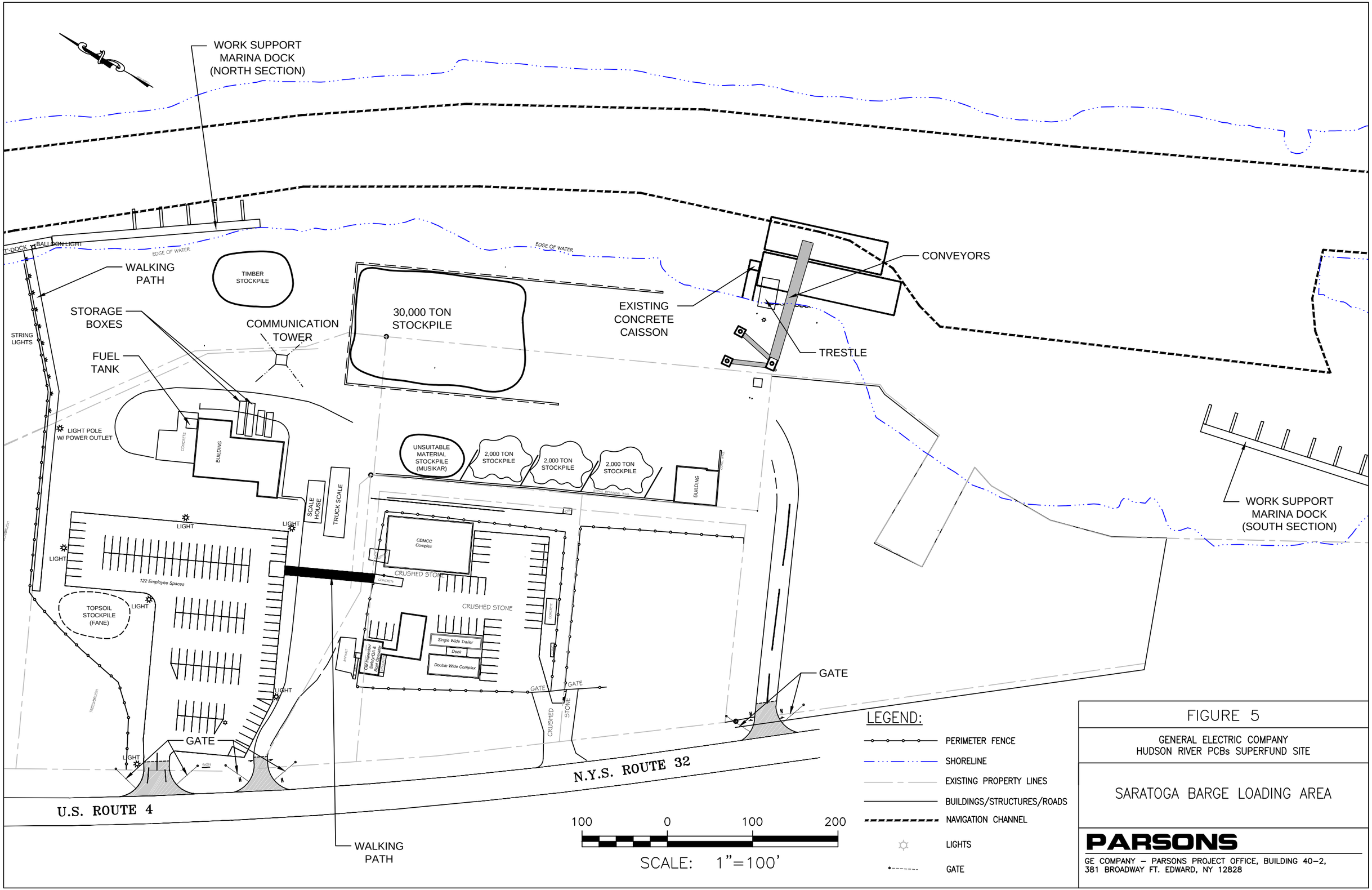


FIGURE 5

GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE

SARATOGA BARGE LOADING AREA

PARSONS

GE COMPANY – PARSONS PROJECT OFFICE, BUILDING 40–2,
381 BROADWAY FT. EDWARD, NY 12828

FIGURE 6A
GLENS FALLS HOSPITAL
100 PARK STREET
GLENS FALLS, NY
(518) 926-1000

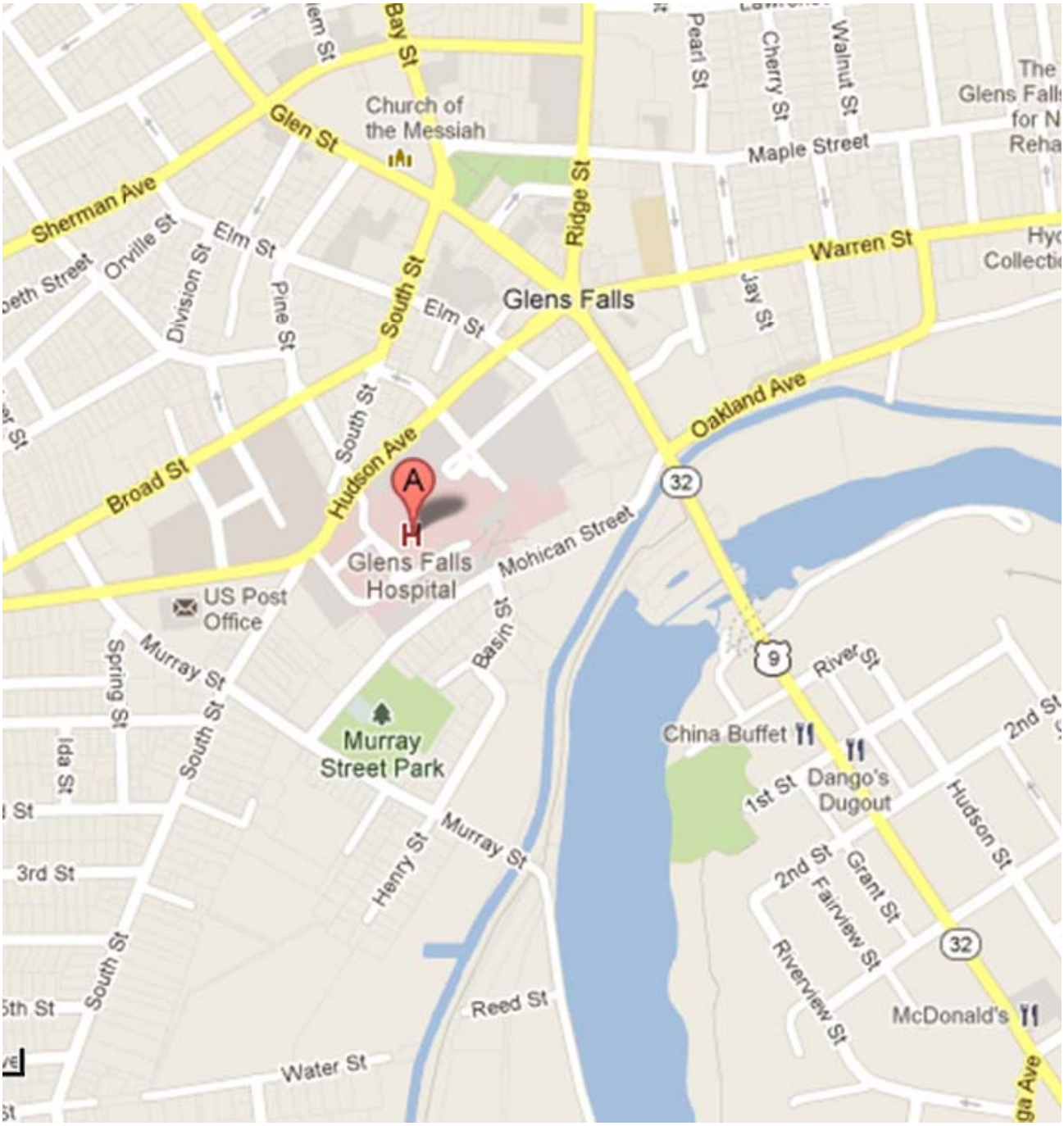


FIGURE 6B
SARATOGA HOSPITAL
211 CHURCH STREET
SARATOGA SPRINGS, NY
(518) 580-2450

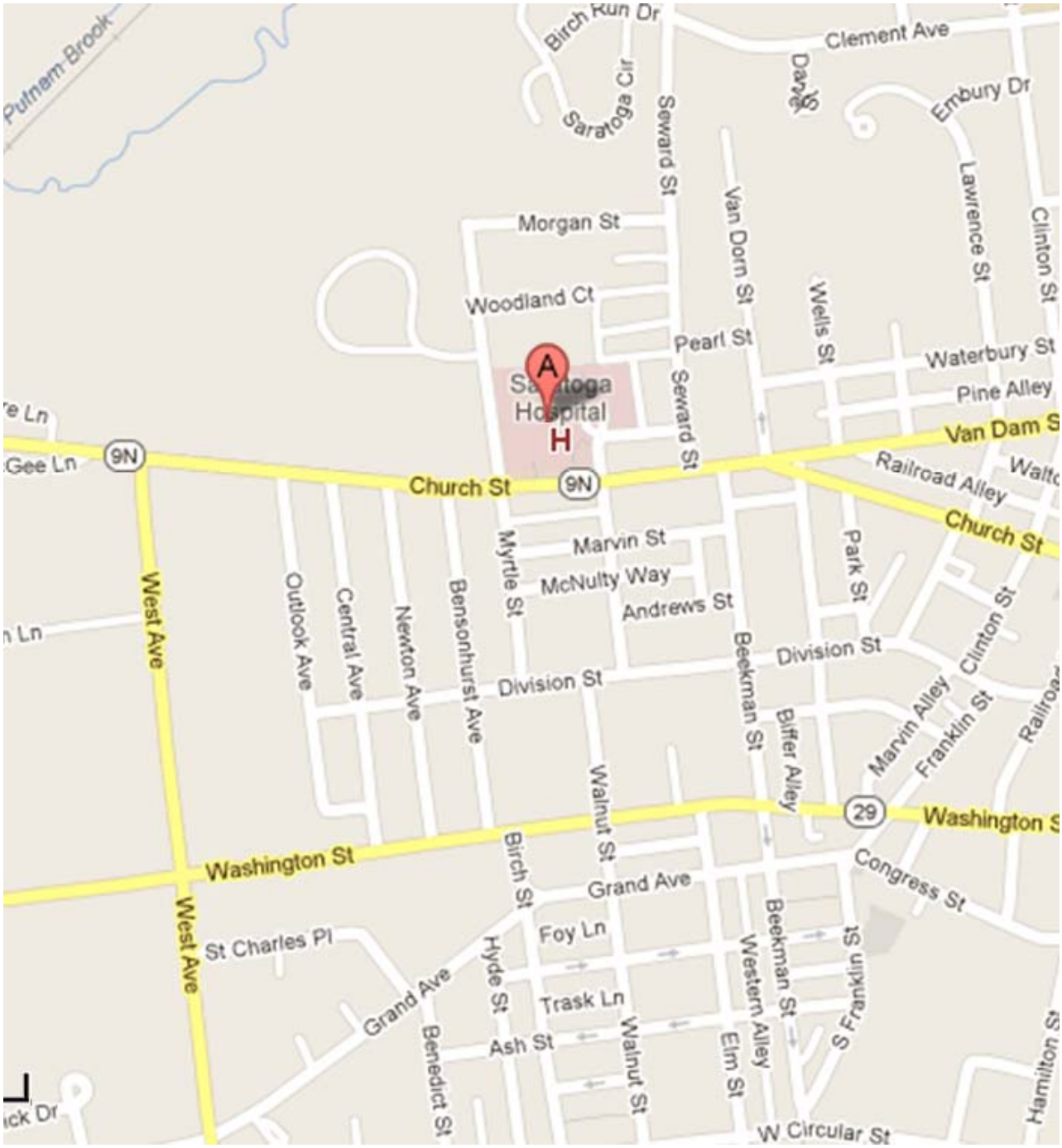
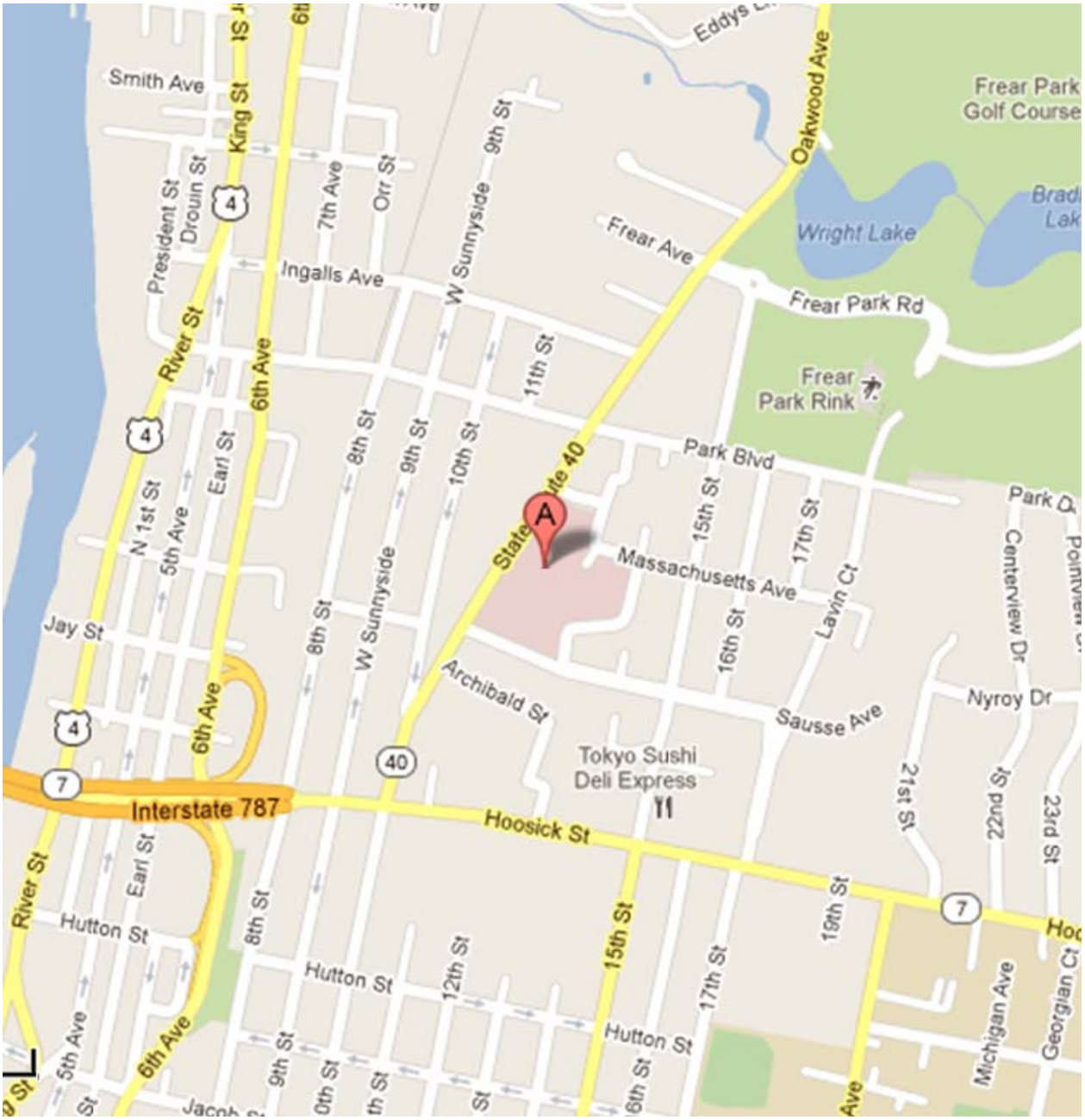


FIGURE 6C
ST. MARYS HOSPITAL
1300 MASSACHUSETTS AVE.
TROY, NY
(518) 268-5000



ATTACHMENT A

EMERGENCY CONTACT INFORMATION
(in Alphabetical Order)

SITE EMERGENCY AND SAFETY PERSONNEL CONTACT INFORMATION

EMERGENCY CONTACT INFORMATION

Emergency Contact	Contact Name	Emergency No.	Alternate No.
John H. Ahearn Jr. Rescue Squad	N/A	911	518-664-8354 Squad
Arvin Hart Fire Department	Chief Jamie Herrick	911	518-664-6711 Station
Canadian Pacific Railway Police Communication Ctr.	N/A	800-716-9132 Dial 1	518-383-7200 Press (1) for Railway Police
Cohoes Fire Department	Chief Joseph Fahd	911	518-687-0694 Station 518-237-1241 Office 237-1472 Direct
Cohoes Police Department	Chief William Heslin, Sr.	911	518-237-5333 Station
David Nevins Fire Company	Chief Larry Wolcott	911	518-695-6623 Station
Easton Volunteer Fire Department	N/A	911	518-692-7049 Station
Easton/Greenwich Rescue Squad	N/A	911	518-507-6507 Station
Ft. Edward Police Department	Chief of Police Justin Derway	911	518-747-6365 Station
Ft. Edward Rescue Squad	Captain John Smith	911	518-747-6198 Squad 518-361-5361Cell
Ft. Edward Fire Department	Chief Matt Hurlburt	911	518-747-5127 Station 518-695-5373 Cell 518-747-0873 Home
Gansevoort Fire Department	Chief Kurt Haas	911	518-792-4396 Squad 518-683-5111 Cell
General Schuyler EMS	Jamie Barton	911	518-871-1819 Station 518-372-8438 Cell

Emergency Contact	Contact Name	Emergency No.	Alternate No.
Greenwich Fire Department	Chief Dean Watkins	911	518-692-9002 Station 518-692-9809 Home
Halfmoon Fire Department	Chief Jeremy Connors	911	518-371-7571 ext. 21 Station
Hemstreet Park Fire Department	Chief Bryan Lawliss	911	518-664-1681 Station
Hillcrest Fire Department	Chief Jim Hopeck	911	518-664-3434 Station
Hoosic Valley Volunteer Fire Company 1	N/A	911	518-753-4664 Station
Kingsbury Volunteer Hose Company # 1	Chief James Brunnelle	911	518- 955-0377 -Cell 518-747-4990 Fire House
Mechanicville Fire Department	Chief Jeff Alonzo	911	518-664-6121 Station
Mechanicville Police Department	Chief Joseph Waldron	911	518-664-7383
Melrose Fire Department	Chief Dominic Pasinella	911	518-235-9860 Station
Middle Falls Fire Department	N/A	911	518-692-2830 Station
Moreau Emergency Squad	Chief, Andre Delvaux	911	518-793-3011 Station 518-791-2305 Cell
National Response Center and Terrorist Hotline	N/A	800-424-8802	N/A
New York State Canal Corporation	Canal Corporation / Thruway Dispatcher	N/A	518-436-2822, or 800-635-8556 This would be the only emergency phone.

Emergency Contact	Contact Name	Emergency No.	Alternate No.
New York State Department of Environmental Conservation	Hudson River Project Manager, Kevin Farrar	N/A	518-402-9778 Office 518-810-6838 Cell
New York State Department of Environmental Conservation	William Daigle, Hudson River Unit, Division of Environmental Remediation	N/A	518-402-9770
New York State Department of Health (Glens Falls)	Anita Gabalski, Director	N/A	518-793-3893 866-881-2809 Emergency
New York State Department of Health	Deanna Ripstein, Project Manager	N/A	518-402-7860 866-881-2809 After Hours
New York State Department of Health (Glens Falls)	Kristine Wheeler	518-542-5782	518-793-3893
New York State Police	Troop “G” Headquarters	N/A	518-783-3211 Office 518-477-9333 Emergency Dispatch
New York State Police	Troop “T” Headquarters	N/A	518-436-2825 Local 518-433-4924 Dispatch 800-842-2233 Emergency Dispatch
New York State Spill Response Program	Janet Crawford, Coordinator Spill Hotline 24 hour	N/A	800-457-7362
Northside Fire District/FB Peck Hose Company	Chief Dan Sheffer	911	518-235-4609 Station

Emergency Contact	Contact Name	Emergency No.	Alternate No.
Poison Control Center	N/A	800-222-1222	N/A
Quaker Springs Fire Department	Chief Don Ormsby Jr.	911	518-584-3349 Station
Rensselaer County Department of Public Safety	Director Kelly Paslow	N/A	518-266-7676 Office
Rensselaer County Sheriff	Jack Mahar	911	518-266-1900 Station
Saratoga County HAZMAT	Mike Aufiero	911	518-885-2232 Office 518-885-5415 Home
Saratoga County Office of Emergency Services	Ed Tremblay, Fire Coordinator	N/A	518-885-2232 Station
Saratoga County Sheriff	Sheriff Michael Zurlo	911	518-885-2450 24 hour 518-885-6761 Dept
Schuylerville Fire Department (Schuyler Hose Company)	Chief Brian Meyers	911	518-695-3298 Station 518-695-6821
South Glen Falls Fire Company	Chief Keith Dickinson	911	518-792-1674 Station 1 518-798-4020 Station 2 518-361-2656 Cell
South Glens Falls Police	Chief Kevin Judd	911	518-792-6336 Station 518-792-4173 Dispatch
Stillwater Fire Department	Chief Tony Conti	911	518-664-3617 Station
Stillwater Police Department	Chief Dennis Latham	911	518-664-4661 ext. 14 Station
Stillwater Rescue Squad	N/A	911	518-664-8012 Station
Tri-State Emergency Team	Chief Ed Kelly	911	518-237-6744 Station
Troy Fire Department	Chief Thomas O. Garrett	911	518-270-4471 Station

Emergency Contact	Contact Name	Emergency No.	Alternate No.
Troy Police Department	Chief John Tedesco Chief Van Bramer	911	518-270-4421 Station 518-270-4780
U.S. Coast Guard (Station Burlington, VT)	N/A	911	802-864-6791 Emergency 802-951-6792 Station
U.S. Environmental Protection Agency	Hudson Falls Field Office Director, David King	N/A	518-747-4389 Office 518-321-7239 Cell
U.S. Environmental Protection Agency	Hudson Falls Field Office Gary Klawinski	N/A	518-747-4389 Office 518-514-8571 Cell
Warren County Sheriff	Nathan "Bud" York, Sheriff	911	518-743-2500 Office
Washington County Department of Public Safety	Director, William Cook	911	518-747-7520 Office 518-796-1749 Cell
Washington County Department of Public Safety	Deputy Director of Emergency Management, Jonathan Pease	911	518-747-7520 Office 518-338-8567 Cell
Washington County Sheriff	Sheriff Jeff Murphy	911	518-746-2475 Office
Waterford Fire Department	Chief Jason Rocque	911	518-664-6414 Station
Waterford Police Department	Police Commissioner John Tanchak	911	518-237-3341 Station
Waterford Rescue Squad	N/A	911	518-237-2473 Squad

CONSTRUCTION MANAGER CONTACT INFORMATION

Project Personnel	Name/Contact	Telephone Numbers
Project Construction Manager	Aric Barto	210-241-4379
Project Safety Manager	Lisa Rygiel	518-470-7067
Processing Facility Site Manager	Everett Jones	518-858-1834
Dredging Operations Safety Representative	Joe Montinieri	518-361-7597
River Operations Manager	Carl Jakob	518-705-3145
Processing Safety Representative	Rob Giordano	518-361-7904
Contractor PM/Safety Representatives:	**K30 –Processing Facility Operations** Sid Archinal – Project Director John Waechter - PM Sean Olinsky – SSO	609-760-6919 518-378-3679 301-651-2352
	K42A– Dredging Operations Norm Bourque PM Chuck Towle SSO	617-584-0444 617-201-1833
	K60 - Rail Yard Operations Steve Fisk PM Ken Saville SSO **Arcadis** Charles Guest, PE – PM Doug Weeks – SSO **Anchor QEA, LLC** Mark LaRue – PM Kevin Ballou – SSO	518-469-4145 724-584-8671 518-250-7377 518-250-7378 315-453-9009 518-792-3709

Notes
CSP = Certified Safety Professional
PM = Project Manager
SSO = Site Safety Officer

ATTACHMENT B

HEALTH AND SAFETY PLAN ACKNOWLEDGMENT

ATTACHMENT B

Site-Specific Health and Safety Plan (HASP) Acknowledgement

I hereby confirm that site-specific health and safety training has been conducted by the site health and safety officer, which included:

- Names of personnel responsible for site safety and health
- Safety, health, and other hazards at the site
- Proper use of personal protective equipment
- Work practices by which the employee can minimize risk from hazards
- Safe use of engineering controls and equipment on the site
- Acute effects of compounds at the site
- Decontamination procedures
- Audits, enforcement, and disciplinary policy

For the following project:

_____	_____	_____
(Project Title)	(Project Number)	(City, State)

Name (print)	Signature	Company	Date

ATTACHMENT C

WATER OPERATIONS PERMIT, FLOAT PLAN AND FIELD ACTIVITIES TRACKING STANDARD OPERATING PROCEDURE

GE HUDSON RIVER SEDIMENT REMEDIATION PROJECT WATER OPERATIONS PERMIT

1. PERMIT AUTHORIZATION
(To Be Completed by Approver of Permit)

Permit valid from: _____ to _____
(Maximum of 1 Week Duration Unless Otherwise Approved)

Special Permit Restrictions Noted: _____

Operations **Restricted** when river flows are greater than _____ cfs and/or visibility is less than ____ miles.

Must be docked and personnel **OFF** the water at the end of each day no later than: _____

Is night work allowed: Yes ☐ No ☐

CM Health and Safety Representative: _____ Date: _____

River Operations Manager and/or Designated Representative: _____ Date: _____

2. GENERAL PERMIT INFORMATION
(To Be Completed by Applicant)

Applicant Name: _____

Principal Contractor: _____

Sub-Contractor *(if applicable)*: _____

Purpose of Work: _____

Geographic Work Limits: *(Include locations, CUs, chart references)*

[Provide land based launch/support location(s) as well]

_____

_____

Does work involve use of boats or vessels? Yes ☐ No ☐ shoreline work? Yes ☐ No ☐

Is the work within 3000' of any dams? Yes ☐ No ☐

Maximum river flow that work will be conducted to: _____

Expected water temperature range during work period: _____

Anticipated water depths in work area: _____

Work Duration: _____

Typical Work Hours: _____

Contractor Site Safety Officer: _____ Cell Phone: _____

3. VESSEL AND OPERATOR INFORMATION
(To Be Completed by Applicant. If more than one vessel, attach additional forms to this document with additional vessel information)

Vessel Type: _____ Vessel Registration _____ Vessel Capacity _____

Is vessel equipped with GPS?: Yes ☐ No ☐ Is vessel equipped with AIS?: Yes ☐ No ☐ Other ☐

Maximum Number of Vessel Occupants Boat is rated for: _____

Number and Horsepower of Vessel Engines _____

Description of auxiliary propulsion: _____

Description of ground tackle on board and effective maximum depth: _____

_____

Marine VHF Working Channel: _____

Vessel Operator's Name: _____ Cell Phone: _____

Alternate Operator's Name: _____ Cell Phone: _____

GE HUDSON RIVER SEDIMENT REMEDIATION PROJECT
WATER OPERATIONS PERMIT

Company: _____ NYS Boating Safety Cert #: _____

Project Site Specific Health and Safety Training Completion Date: _____

4. REQUIREMENTS TO BE COMPLIED WITH
(To Be Completed by Applicant)

	Check Upon Verification Requirement Met
Project RA HASP and/or contractor-specific HASP has been read and understood by all participants	☐
Work Crew Project Orientation and Onboarding Requirements Completed	☐
Valid Insurance	☐
Contractor Health & Safety Plan Submitted	☐
JSAs Completed for work task and attached to permit application	☐
VHF Marine Radios on each vessel	☐
Minimum Safety Equipment Onboard *(as outlined in task JSA)*	☐
All Workers Have Proper PFDs	☐
All Workers Have Survival Suits *(cold temperature requirement)*	☐
Proposed Vessels have adequate power for intended task	☐
Copy of the daily vessel inspection attached to Float Plan	☐

5. SPECIAL NOTES

1. All vessels are required to check-in with the CM prior to heading out on the water. Upon docking at destination at end of work task or end of day, a check out call to the CM is required. **CM Safety – 518-361-7597 or joseph.montinieri@parsons.com**
2. A review of this Operations Permit must be completed with the vessel operator
3. Maintain communication on **Marine Band 13**.
4. Other:

6. CERTIFICATION

By signature, I certify that all of the information completed above is accurate and that I will comply with all safety procedures and this permit. I will review the contents of this permit application with all members of the work crew to which it applies.

Permit Request Originator Name *(Please Print)*	Permit Request Originator Signature	Date

WATER OPERATIONS PERMIT, FLOAT PLAN AND FIELD ACTIVITIES TRACKING STANDARD OPERATING PROCEDURE

PURPOSE

This water operations permit, float plan and field activities standard operating procedure (sop) defines the required process for submitting water operations permits and float plans before any Hudson River PCB superfund project work is undertaken within six feet of or on water bodies including rivers, streams, creeks, canals, storm water basins, and swamps.

APPLICABILITY

This sop applies to all contractors, including subcontractors, conducting fieldwork on behalf of GE for the Hudson River sediment remediation program (project). It includes work on the dredging, floodplains, ecological investigations, dredge spoils, remnant deposit, Hudson Falls, and Ft. Edward 004 projects. If you are not certain if this applies to your scope of work, please contact your GE project manager.

REQUIREMENT

In addition, if the work involves the use of a boat or vessel, a fully completed Float Plan (the attached float plan example provides the minimum level of detail to be provided) must be provided to the CM every day BEFORE the boat or vessel departs from its mooring or launch location using the GenSuite Water Permit Tool. If a vessel traffic control center is being used and can be reliably contacted within the entire area where work is intended to be performed, boats will not be required to complete a Float Plan, but will be required to follow the procedures in use by the vessel traffic control center.

If the work is strictly land-based, a two-week look-ahead schedule detailing the field activities to be performed shall be submitted to the CM on a weekly basis each Monday morning. The two-week look-ahead schedule shall describe the work to be performed, contractor performing the work, staff assigned and days the work will be performed.

PROCEDURE

1. The contractor field manager or other designated responsible person shall complete and submit for approval an initial Water Operations Permit to the Project CM by noon pf the Friday prior to the anticipated work start date. All sections of the permit shall be fully completed. Contractors shall follow the applicable requirements of Sections 4 and 5 of the RA Health and Safety Plan (HASP) and the contractor HASP for the development of a Job Safety Analysis (JSA) and use of PPE in support of the Water Operations Permit (Part 4). The relevant JSAs shall be referenced within the Water Operations Permit.
2. The electronic copies form the GenSuite Water Permit Tool will be retained for CM Document Control.

3. Any additional information requested by the CM shall be provided in a timely manner and work will not be allowed to commence until the additional information has been received and approved.
4. Once the permit has been reviewed by the CM and approved, an electronic copy of the approved permit shall be provided to the contractor. The approved permit shall then be reviewed with all employees participating in the water work as part of a pre-work activity and a copy shall also be available for review at the work area.
5. During the period in which the work is conducted, Water Operations Permit updates shall be submitted to the CM if any information on the permit has changed.
6. In addition, for any Water Operations Permit activity involving use of a boat or vessel not covered by a vessel traffic control center, an electronic Float Plan shall be submitted to the CM every morning for each boat or vessel that will be working that day. The completed and signed Float Plan shall be retained for CM Document Controls. It is the responsibility of the designated boat captain of each boat / vessel to ensure that the CM is in possession of their daily float plan before leaving the dock, or launch point for any water project work. When there are multiple vessels involved, each individual vessel must file an individual float plan.
7. The contractor field manager or other designated responsible person shall check in using the GenSuite Float Plan to notify the CM field representative that work is completed for that day within 30 minutes of arrival at the dock or launch point. In addition, the contractor field manager or other designated responsible person shall notify the CM field representative if a boat /vessel is to be delayed more than 60 minutes from the planned arrival time using the GenSuite Float Plan.
8. The contractor field manager or other designated responsible person shall immediately notify the CM Safety Manager and River Operations Manager in the event that no delayed arrival time has been established and a boat or vessel has not returned to the dock by the time designated on that day's Float Plan. In this event, the contractor shall endeavor to make contact with the boat captain; if communication is not established, the emergency plan to locate the boat/vessel will be initiated.

USCG Float Plan

Instructions: Complete this form and leave it with a reliable person who can be depended upon to notify the Coast Guard, or other rescue organization, should you not return or check-in as planned.

Vessel

Identification:
Name & Home Port:
Registration # :
Year & Make:
Length: Type: Power Hull Mat:
Hull Color: Draft:
Prominent Features:

Propulsion:
Primary - Type: No. Eng:
Auxillary - Type: None Fuel Capacity:

Telecommunications:
Radio Call Sign:
DSC MMSI no.:
Radio 1 Type: Monitored Chan:
Cell Phone Number:
Pager Number:

Navigation (check all on board):
Maps Charts Compass GPS
Radar Loran C Sounder

Safety and Survival

Visual Distress Signal
Day Only:
Night Only:
Day and Night Type:

Audible Distress Signal
Horn/Whistle:
Bell:

Other Gear:
Lifeboat: Flashlight:
Dinghy/Skiff: Signal Mirror:
Food & Water: Sea Anchor/Droque:
EPIRB:
Foul Weather Gear:

PFDs
Quantity on Board:

Ground Tackle
Anchor? Line Length:

Persons on Board

Operator: Age M/F Special Conditions - can't swim etc.
Name:
Address: Has experience w: Boat? Area?
City: State: Zip: Home Phone:
Vehicle: (yr, make, model): Vehicle License #:
Trailer parked at: Trailer License #:

Passengers/Crew name and address: Age M/F Special Conditions- can't swim, medical
1)
2)
3)

Itinerary

	Date	Time	Location	Travel Mode	Reason for stop	Check in Time
Depart:						
Arrive:						
Depart:						
Arrive:						
Depart:						
Arrive:						
Depart:						
Arrive:						
Depart:						
Arrive:						
Depart:						
Arrive:						
Depart:						
Arrive:						

Contact 1: Phone Number:
Contact 2: Phone Number:

ATTACHMENT D

HOT WORK PERMIT

HOT WORK PERMIT

STOP!
Avoid hot work or seek an alternative/safer method, if possible.

This *Hot Work Permit* is required for any temporary operation involving open flames or producing heat and/or sparks. This includes, but is not limited to: brazing, cutting, grinding, soldering, torch-applied roofing and welding.

Instructions

1. **Firesafety supervisor:**
   - **A.** Verify precautions listed at right (**or do not proceed with the work**).
   - **B.** Complete and retain Part 1. (**Part 1A** is for quality assurance documentation, if necessary.)
   - **C.** Issue **Part 2** to person performing hot work.

HOT WORK BY
☐ Employee
☐ Contractor _____

DATE	JOB NUMBER

LOCATION/BUILDING AND FLOOR

NATURE OF JOB

NAME (PRINT) AND SIGNATURE OF PERSON PERFORMING HOT WORK

I verify the above location has been examined, the precautions checked on the Required Precautions Checklist have been taken to prevent fire, and permission is authorized for this work.

NAME (PRINT) AND SIGNATURE OF FIRESAFETY SUPERVISOR/OPERATIONS SUPERVISOR

TIME STARTED: a.m. p.m. TIME FINISHED: a.m. p.m.

Permit Expires	DATE	TIME a.m. p.m.

Note: Emergency notification on back of form.
Use as appropriate for your facility.

To order additional hot work permits or other FM Global resources, order online 24 hours a day, seven days a week, at www.fmglobalcatalog.com.

FM Global

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Part 1

Required Precautions Checklist

Y	NA	
☐	☐	Control valves to water supply for sprinkler system are open.
☐	☐	Hose streams and extinguishers are in service/operable.
☐	☐	Hot work equipment in good working condition.
		Requirements within 35 ft. (11 m) of hot work
☐	☐	Ignitable liquid, dust, lint and oily deposits removed.
☐	☐	Explosive atmosphere in area eliminated.
☐	☐	Floors swept clean.
☐	☐	Combustible floors wet down, covered with damp sand or fire-resistive sheets.
☐	☐	Remove other combustible material where possible.
☐	☐	Otherwise, protect with FM Approved welding pads, blankets and curtains, fire-resistive tarpaulins or metal shields.
☐	☐	All wall and floor openings covered.
☐	☐	FM Approved welding pads, blankets and curtains installed under and around work.
☐	☐	Protect or shut down ducts and conveyors that might carry sparks to distant combustible material.
		Hot work on walls, ceilings or roofs
☐	☐	Construction is noncombustible and without combustible covering or insulation.
☐	☐	Combustible material on other side of walls, ceilings or roofs is moved away.
		Hot work on enclosed equipment
☐	☐	Enclosed equipment cleaned of all combustible material.
☐	☐	Containers purged of ignitable liquid/vapor.
☐	☐	Pressurized vessels, piping and equipment removed from service, isolated and vented.
		Fire watch/hot work area monitoring
☐	☐	Fire watch will be provided during and for one (1) hour after work, including any break activity.
☐	☐	Fire watch is supplied with suitable extinguishers, and where practical, a charged small hose.
☐	☐	Fire watch is trained in use of equipment and in sounding alarm.
☐	☐	Fire watch may be required in adjoining areas, above and below.
☐	☐	Monitor hot work area for an additional three (3) hours after the one (1) hour fire watch.
☐	☐	**Other precautions taken:**

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ATTACHMENT E

LIGHTNING SAFETY POLICY

LIGHTNING SAFETY

Purpose:

This policy is intended to provide a project-wide guideline for the identification, warning, and safety procedures for lightning for the GE Hudson River Dredging Project. This policy identifies contractor responsibilities, technical equipment requirements, and procedures.

Contractor Responsibilities:

Contractors working on the GEHR Dredging Project who have workers with a potential for exposure to lightning are required to provide either a computer-based weather tracking service (such as the one available via Vessel Traffic Service [VTS]) or a hand-held lightning detection system to identify, track, and warn employees of lightning storms. Workers with a potential for exposure would include, but are not limited to, those performing dredging, surveying, quality-of-life monitoring, habitat restoration, ecological work, wetlands work, sampling, rail operations, and processing. In addition, all contractors are required to monitor weather conditions such as rain, extreme temperatures, heavy winds, etc., through conventional systems such as the National Weather Service and local news. When severe weather conditions develop that would impact project personnel, operations, and/or equipment, the CM and contractors will coordinate appropriate response actions. Each contractor is responsible for documenting the implementation of the lightning safety policy as demonstrated by the completion of the Shelter Risk Assessment Form (Attachment 1) and the Contractor Shut Down and Start-Up Evaluation (Attachment 2) at the beginning of each dredging season.

In order to provide effective shelter in the event of lightning storms or adverse weather, each contractor is responsible for identifying appropriate shelter areas prior to hazardous weather events. Attachment 1, Shelter Risk Assessment Form, or similar tool, will be used to identify and document that safe shelter areas have been identified.

The ranges presented in Table 1 – Distance – Response Action, below, provide some flexibility to be used by the Contractor depending on the actual time needed to safely secure personnel and equipment as predetermined by their Contractor Shut Down and Start-Up Evaluation. The Contractor is also responsible for identifying the appropriate shutdown and start up processes based on the equipment and working atmosphere where they are conducting work as well as the severity and direction of the storm. See Attachment 2.

Technical Equipment Requirements:

Contractors with exposure to lightning are required to acquire either a computer-based weather tracking service or a hand-held portable system with the capability of identifying lightning strikes at long range. This range must encompass the locations of the Contractor's active work crews while working on the Project Site in addition to the surrounding geographical area. The purpose of using a technology-based system (as opposed to visual observation) is to provide a consistent, reliable, and more accurate method of detection and storm clearance. The lightning detection system must be capable of identifying the distance to lightning within a 50-mile range from the various work locations and send out a visual and audible alert when lightning is located within the prescribed distance found in Table 1.

Procedures:

Lightning

Each contractor must assign responsibility to one or more workers for staying apprised of daily-anticipated weather conditions. On days when the potential for lightning is present, hand-held detection systems must be activated and be present in the immediate location of the workers. The detector will be pre-set to provide a visual and audible alert when lightning is located within a prescribed distance as specified below. If the contractor relies on a computer-based weather tracking service, the contractor will monitor the alerts provide by the service. During lightning storms, distance to lightning will be monitored and assessed by the contractor with updates and appropriate response actions provided to the workers.

Table 1 – Distance – Response Action

Lightning Storm Distance	Response Action
Approaching Lightning Storm	
50 – 25 miles	Implement a heightened alert status. Communicate with supervisory and safety personnel that a lightning storm is in the area and is being tracked.
25 – 15 miles	Prepare for shut down in accordance with the Contractor Shut Down and Start-Up Evaluation. Notify supervisory personnel to begin shut-down process of outdoor equipment and activities and identify the nearest appropriate shelter based on the time necessary for shutdown as indicated in Attachment 2. The shut down must be complete when lightning is within a 15-mile range.
15 – 10 miles	Take Shelter. Verify that all workers are accounted for.
< 10 miles	Shelter in place: Maintain workers in shelter, continue to track path and direction of storm.
Retreating Storm	
10 – 15 miles	Continue shelter in place.
15 to 25 miles	Work may resume and appropriate start up measures implemented once the the lightning storm has passed the 15-mile distance from the operation and is moving away from the work area. Employees can return from shelter and initiate start-up activities as indicated in Attachment 2.
25 to 50 miles	Continue to monitor the weather pattern for any changes in storm direction until the storm has passed the 50-mile mark.

Note: The ranges presented in Table 1 above are intended to provide guidance and are not to intended to supersede sound professional judgment.

Attachment 1: Shelter Risk Assessment Form

Attachment 2: Contractor Shut Down and Start-Up Evaluation

Attachment 1
GEHR Shelter Risk Assessment Form

Contractor Name: _____

Work Area/Location/Task _____

Date of Assessment: _____

☐ Yes ☐ No	Is the shelter a secured structure with walls, a ceiling, and flooring? Comments:
☐ Yes ☐ No	Will there be enough room in the shelter to accommodate area personnel? Comments:
☐ Yes ☐ No	Are additional shelters available to accommodate area personnel and others if necessary? Comments:
☐ Yes ☐ No	If there is an absence of a secured structure, are there enclosed vehicles close by? Comments:
☐ Yes ☐ No	Do marine vessels used as shelters have enclosed cabins? Comments:
☐ Yes ☐ No	Are shelters located in a close enough proximity to allow employees time to evacuate to the shelters? Comments:
☐ Yes ☐ No	Have shelter locations and designations been communicated to employees? Comments:

Note: "No" answers indicate the need to identify a different shelter or additional shelters.

Attachment 2
Contractor Shut Down and Start-Up Evaluation

Contractor Name: _____

Work Area/Location/Task: _____

Date of Evaluation: _____

Prior to the implementation of this policy, it the Contractor's responsibility to determine what steps need to be implemented to safely shut down and start up work prior to and after a lightning storm event. The following items must be considered in this evaluation:

- Equipment to be shut down.
- Proximity and time needed to secure safe shelter.
- Duration of time necessary to effectively execute a safe shut down.
- Risks to the employees involved in the shut down and start up process.
- Path, duration, and severity of the storm

Specify shut down considerations and procedure here, must include the time necessary to implement shut down (add additional pages if necessary):

Specify start-up considerations and procedures here (add additional pages if necessary):

ATTACHMENT F

PRE-DRILLING/SUBSURFACE CHECKLIST FOR INTRUSIVE FIELDWORK

PREDRILLING/SUBSURFACE CHECKLIST FOR INTRUSIVE FIELDWORK

Site Name: _____ Job Number: _____
Site Phone Number: _____
Site Address: _____ County: _____
Client Proj. Mgr.: _____ Phone: _____
Site Manager Contacted Date: _____ By: _____
Site Drawings (yes / no / NA) _____ (please attach) Historical Drawings (yes / no / NA) _____
Third Party Construction/Redevelopment Plans (Yes/No/NA)

***ATTACH SITE FIGURE WITH PROPOSED BORING LOCATIONS

Subcontractor's (drillers, concrete, etc...) Company _____
Subcontractor's Contact Person _____ Phone _____
Meeting / Start Date _____ Time _____

1) Health and Safety Signoff Form Completed? (Yes/No) Date _____

2) Utility Protection Services (Minimum 48 Hrs. Advance Notice, State Specific Notification Period Supercedes)
Called: Date _____ Time _____ Initials _____
Reference # _____
Proposed Drilling Locations Premarked for Locating Service. Y / N

3) Private or In-House Utility Locating Service Performed? Y / N _____
Called: Date _____ Time _____ Initials _____
Name of Locating Service: _____
Telephone #/ contact: _____
Name of Supplier Locating Technician: _____
Type of sensing equipment used: _____
Proposed Drilling Locations Premarked Y / N

4) Other Potential Underground Structures
Name of City Engineer/Utility Representative: _____
Telephone #: _____
Date Notified _____ Maps: Y / N
Cleared: Y / N

5) COMPLETED SITE WALKOVER W/ SITE MANAGER/DESIGNEE OR OWNER/TENANT REP. Y / N
Name of Site Manager: _____
Name of Property Owner/Tenant Representative: _____
Cleared: Yes / No
Building Utility Service Line Connections Identified: Y / N
(Hand sketch on site map w/proposed boring locations and most likely utility trench locations)

6) Utility Inventory: Y / N

Utility	Name	Depth (ft) (If Available)	Phone	Notified - Date	Marked
Above Ground Services					
Electric		NA		Y / N	Y / N
Telephone		NA		Y / N	Y / N
Cable		NA		Y / N	Y / N
Overhead Supports		NA		Y / N	Y / N
Traffic light cables		NA		Y / N	Y / N

PREDRILLING/SUBSURFACE CHECKLIST FOR INTRUSIVE FIELDWORK

6) Utility Inventory Continued:

Below Ground Services:

Electric				Y / N		Y / N
Telephone				Y / N		Y / N
Cable				Y / N		Y / N
Gas				Y / N		Y / N
Water				Y / N		Y / N
UST System				Y / N		Y / N
Storm				Y / N		Y / N
Sanitary				Y / N		Y / N
Steam				Y / N		Y / N
Pipeline Companies				Y / N		Y / N

Other:

				Y / N		Y / N
				Y / N		Y / N
				Y / N		Y / N

7) Site-Specific Emergency Contingency Plan Incorporated in Health & Safety Plan Y / N

8) Drilling Locations Approved by Client Project Manager Named Above? Y / N

9) Signature of Parsons' Project Mgr. (required to begin fieldwork):

Name of Project Manager	Signature of Project Manager
Name of Parsons Field Personnel	Signature of Field Personnel

(This document to be included with the site H&S Plan and should be available upon request.)

ADDITIONAL COMMENTS / NOTES:

ATTACHMENT G

SAFETY TOOLBOX MEETING LOG

Safety Toolbox Meeting Log

Safety Meeting Presenter: _____Date: _____

Current Weather Conditions:

Temperature (^{o}F) = _____ Wind Direction = _____ Wind Speed = _____

Clear - Sunny – Cloudy – Rain - Snow Forecast = _____

Current Site Conditions (circle as appropriate):

Dry - Wet - Muddy - Frozen - Snow Covered - Other (describe) _____

1. Near-Miss, Incidents or Injuries to report from Previous Day Activities: No Yes - explain below:

_____

2. Safe and/or At-Risk Observations from Previous Day Activities: _____

_____

_____

3. Activities Taking Place Today: _____

_____

_____

4. Anticipated Hazards: _____

_____

_____

5. Engineering Controls-Work Practices-PPE to Protect Against Hazards: _____

_____

_____

6. Additional Safety Topic or Comments: _____

_____

_____

PRINTED NAME	SIGNATURE	COMPANY

ATTACHMENT H

INCIDENT/NEAR-MISS INVESTIGATION REPORT

ATTACHMENT H
INCIDENT/NEAR MISS INVESTIGATION REPORT

Date of Incident:	Client: GE - CEP	Client Contact: Bob Gibson
Project Name: **GE-Hudson River**	Project Location: Ft Edward, NY	Project Manager: Parsons:
Time of Incident:	Job/WBS: 447266	Incident Reported by:
Type of incident (check one): Property Damage, Near Miss, Personal Injury, Environmental Spill.	Name of Company/Subcontractor:	
Name Of Individual(s) Involved:		Trade/Function:
Was the individual involved with the incident performing their regular job? If "no", explain why: Yes	Describe task being performed:	

Description of incident according to the individual(s) involved or injured (including what happened and how the incident occurred). Continue on last blank page or attach additional pages if necessary.

According to the individual(s) involved with the incident or injured, what could have been done differently to prevent this incident from occurring?

Witness Names: Witness statements: Attach to this document

Describe Injury and Part of the Body Injured:

Describe any First Aid or Medical Treatment Provided On Site and/or at a Medical Facility.
Provide the Treating Facilities Name
Address
Phone Number

Injury Recordability: ☐ Yes ☐ No

Recordability Justification:

Did the Individual Return to Work by the next day?	Any Work Restrictions or Lost Time? If "Yes", describe:

Complete the information below with an Investigation Team as identified in GE 1350

ATTACHMENT H
INCIDENT/NEAR MISS INVESTIGATION REPORT

Date of Incident:	Client: GE - CEP	Client Contact: Bob Gibson
Project Name: **GE-Hudson River**	Project Location: Ft Edward, NY	Project Manager: Parsons:

List the appropriate GE **Root Cause(s)** **<u>and provide and explanation</u>** of those root causes below. GE root causes include Personal Factors and Job Factors.

Personal Factors: Difficult for employee to execute, Human Error, Lack of knowledge or skill, Not under direct control of the employee, Physical capability, Physical or psychological stress, Violation

Job Factors: Inadequate communication, Inadequate control system setup or failure, Inadequate engineering, Inadequate inspection/auditing, Inadequate job planning/instruction/ supervision, Inadequate mechanical integrity/maintenance management, Inadequate procedures/work instructions/work standards, Inadequate sourcing/supplier control). Inadequately maintained tools/equipment, Knowing misuse or abuse, Work environment not controlled by GE

1.

2.

3.

4.

Please provide (one) RCA: Events and Causal Factor Chart, Why Tree, Tap Root, 5 –Why, Ishikawa Diagram. Document or Photo, please attach to this document.

For Each Root Cause Listed Above, Reply "Why" the Cause Occurred (use additional pages as necessary).

1.

2.

3.

4.

ATTACHMENT H
INCIDENT/NEAR MISS INVESTIGATION REPORT

Corrective Action(s) for Each Cause - List Person(s) Responsible and Scheduled Completion Date: 1. 2. 3. 4.		
Investigation Team Members:		
SSR Completing the Report	Signature:	Date:

Attachments (check below and attach if applicable)

- ☐ Contractor Incident Report
- ☐ Incident Diagram
- ☐ Photographs
- ☐ Medical Statements
- ☐ Work restrictions
- ☐ JSAs
- ☐ Permits
- ☐ Witness Statements
- ☐ RCA Tool (Events and Causal Factor Chart, Why Tree, Tap Root, 5 –Why, Ishikawa Diagram)
- ☐ Photographs
- ☐ Lessons Learned
- ☐ Documentation of Corrective Action
- ☐ Other: _____

ATTACHMENT I

INCIDENT MANAGEMENT MATRIX

Attachment I
GE Hudson River Dredging Project - Incident Management Matrix

Incident Type	Gensuite Entry < 4 hours	Conduct Investigation	Conduct Mini-RCA (11)	Complete RCA < 72 hours (12)	Provide Report to CM < 7 working days
(1) Stop Work	✓				
(2) Near Miss: low potential severity	✓	✓	✓		✓
(3) Near Miss: high potential severity	✓	✓		✓	✓
(4) Near Miss Spill	✓	✓	✓		✓
(5) DEC Reportable Spill	✓	✓		✓	✓
(6) Property Damage: Minor	✓	✓	✓		✓
(7) Property Damage: Major	✓	✓		✓	✓
(8) First Aid: Minor	✓	✓	✓		✓
(9) First Aid: Major	✓	✓		✓	✓
(10) Injury Beyond First Aid	✓	✓		✓	✓

Notes:
(1) Temporary suspension of a task or operation by any individual to correct an an unsafe behavior or condition
(2) Low potential to have resulted in injury or property damage
(3) High potential to have resulted in injury or property damage
(4) Spill to containment, no release to impermeable surface or water
(5) Uncontained release to water or to permeable surface
(6) Less than $500 damage and/or no impact to operations
(7) Greater than $500 damage or operational impact
(8) First aid requiring very minor, on-site treatment, non-allergic bee stings, minor abrasions and scrapes
(9) First aid treated on site or first aid treatment provided by a medical provider that could have become an OSHA recordable treatment case but was managed
(10) Any injury that becomes an OSHA recordable case
(11) Mini RCA involving a minimum of 3 individuals, including the individual involved in the incident
(12) Scheduled RCA to include the involved individual(s), Contractor Site Safety Officer, union steward if desired, and safety and operational personnel from the CM and GE

APPENDIX A

JOB SAFETY ANALYSIS (JSA) TEMPLATE

Job Safety Analysis (JSA) Template

Activity/Work Task:	Overall Risk Assessment Code (RAC) (Use highest code)	Add code and color
Project Location:	Risk Assessment Code (RAC) Matrix	
JSA Number:		
Date Prepared: (mm/dd/yy)		
Prepared by (Name/Title):		
Reviewed by (Name/Title):		
	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above). The RAC is developed after correctly identifying all the hazards and fully implementing all controls.	
Notes & References :	P "Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.	
	S "Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of JSA.	

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

RAC Chart
E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Job Steps	Hazards	Controls	P	S	RAC

PPE and Equipment to be Used	Training Requirements/Competent or Qualified Personnel	Inspection Requirements

Printed Name	Signature	Representing	Date

APPENDIX B

GE EHS REQUIREMENTS

GE ENVIRONMENTAL, HEALTH, AND SAFETY REQUIREMENTS

Construction Management Services Agreement

Between General Electric Company and CM

1.0 GENERAL SCOPE

CM recognizes that the life, health and safety of persons and property during performance of the work is a material requirement of this Agreement. Accordingly, CM pledges to implement all necessary precautions for the prevention of accidents, and shall cooperate fully with Owner in addressing and resolving with due diligence any safety concerns that may be raised by Owner or its consultants during execution of the work, including, without limitation, the immediate suspension of all work until such time as pending safety issues are satisfactorily resolved. Notwithstanding the foregoing, CM shall remain primarily responsible for all its acts and omissions, and those of its employees, agents, subcontractors and suppliers, and their respective employees, agents, sub-subcontractors, and suppliers, regardless of tier, including those affecting life, health, and safety of persons and property.

2.0 COMPLIANCE WITH LAWS, RULES, REGULATIONS & STANDARDS

A. CM shall comply, and shall require its employees, agents, subcontractors, and suppliers, and their respective employees, agents, sub-subcontractors and suppliers, regardless of tier, with:

1. the requirements of all applicable National, Provincial, and Local laws, rules and regulations, including but not limited to those governing building construction, use of tools and equipment, and the safety of persons and property;
2. all rules and regulations of OSHA or other applicable governmental entities, Owner, and any other stakeholder which may be in effect at the job site regarding employment, passes, badges, smoking, fire prevention, environmental, health, safety, and conduct on the property; and
3. the highest (most stringent) applicable industry standards concerning the preservation of life, health, and safety of persons and property in the performance of the work shall apply.

B. Failure by CM to comply with the requirements of this clause, including the failure to enforce its requirements on its employees, agents, subcontractors, and suppliers, and their respective employees, agents, sub-subcontractors and suppliers, regardless of tier, shall be considered a material breach of the Agreement. Failure to comply with safety and security requirements is cause for work stoppage and termination of personnel from the project. Repeated and/or willful violations are cause for termination of the contract.

3.0 SAFETY

A. The CM shall:

1. Receive and acknowledge Owner's contractor safety rules and regulations for the project's operating site (if applicable). Furthermore the CM will review these safety rules with its employees, agents, subcontractors and suppliers, and their respective employees, agents, sub-subcontractors, and suppliers, regardless of tier, including those affecting life, health, and safety of persons and property.

2. Provide a site-specific EHS plan that addresses the identification of site hazards inclusive of a mitigation plan to address those hazards. The CM shall also request and receive a similar site-specific EHS plan from their subcontractors.
3. Take all necessary precautions for the safety of all persons and property on the Project;
4. Erect and properly maintain at all times, as required by job conditions and progress of the work, all necessary safeguards for the protection of the workmen and the public;
5. Post danger signs warning against the hazards created by such features of construction as protruding nails, bad hoists, well holes, hatchways, scaffolding, window openings, stairways, dangers from falling materials, etc.;
6. Not load or permit any part of the Work to be loaded so as to endanger its safety; and
7. Shall designate a responsible member of his organization on the worksite whose duty shall include the prevention of accidents.

In any emergency affecting the safety of persons or property, CM shall act, at CM's discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the CM on account of such emergency work shall be determined by agreement of the parties.

By executing this Agreement, CM warrants and certifies to Owner that its employees, its subcontractors' employees, and all persons employed by or through CM pursuant to this Agreement, have been properly trained in safety procedures associated with their trade and construction in general.

1. CM shall request and keep on file at the project site all EHS training documentation of its employees, agents, subcontractors and suppliers, and their respective employees, agents, sub-subcontractors, and suppliers, regardless of tier.

CM further warrants and certifies that it shall exercise due diligence and care in the supervision of the personnel so employed, to ensure that such safety procedures and practices are properly observed at all times during execution of the Work.

4.0 SUPERVISION AND DISCIPLINE

A. The CM shall provide a competent Superintendent who is authorized to act for him and has been approved by the Owner. Such Superintendent shall be on the Project site at all times when Work is being performed. CM shall be solely responsible for all construction means, methods, techniques, sequences and procedures, and for supervising the work of the subcontractors and materialmen and coordinating all portions of the Work.

CM shall at all times enforce discipline and good order among all persons employed on the Project by himself and his subcontractors and materialmen and he shall not employ nor allow anyone to employ on the Project any unfit person, anyone not skilled in the work assigned to them, nor anyone who fails or refuses to adhere to safety requirements in effect at the jobsite.

5.0 USE OF THE SITE

A. The CM shall confine operations at the site to areas permitted by law, ordinances, permits, and the Contract, and shall not unreasonably encumber the site with any materials or equipment.

B. The CM shall keep the job site and adjoining premises clean at all times of rubbish caused by him or his subcontractors, and at the completion of Work shall remove all rubbish, tools, equipment, surplus material and temporary structures and installations, leaving the premises clean and ready for use.

6.0 SUBCONTRACTED WORK

A. The CM may perform such portions of the Work with his own forces as his qualifications and experience shall permit. Prior to the award of any subcontract, the CM agrees to obtain pre-qualification information from the proposed subcontractor, and to submit for Owner's review, such subcontractor's environmental, health and safety history and training records.

B. The CM shall remain primarily responsible and liable for performance of the entire Work, regardless of whether the Owner has given approval or consent to a particular subcontractor, subcontract or any other matter in connection with either.

7.0 MINIMUM OWNERS REQUIREMENTS

The CM agrees to document all findings (hazardous conditions and hazardous acts) through the performance of daily inspections. Findings must be corrected and tracked to closure within 24 hours. The system(s) used for tracking must be able to trend the data.

All accidents and near misses must be reported to the Owner's Project Manager and EHS Manager immediately. Accident investigation reports must also be submitted and an accident/incident log kept for each project.

The CM agrees to develop/review a Task Hazard Analysis (mitigation plan) for all Construction Manager High Risk Operations as described in the attached *Owner's Construction/ Renovation EHS Requirements.*

Owner's EHS team may audit the site and may require access to all CM EHS files to measure conformance with this agreement. The CM agrees to correct all audit deficiencies within the specified time noted in the audit.

The CM will provide a monthly safety highlight report to the Owner's Project Manager and EHS Program Manager indicating field man-hours worked each month sorted by contractor and subcontractors of all tiers, recordable and lost time accidents, incidence rates and EHS highlights. A sample report is included in the *Owner's Construction/Renovation EHS Requirements.*

Prior to erecting, installing, constructing, repairing, adjusting, inspecting, operating, or maintaining any equipment or process where unexpected energization, start up, or release of hazardous energy sources will be isolated, locked and tagged out, e.g. electrical, pneumatic, hydraulic, gravity, electrical storage devices, capacitors, springs, and other mechanical. The CM must implement procedures that provide equal to or better than the General Electric LOTO program. **These procedures must be reviewed by authorized Owner's personnel before work commences.**

8.0 WORKMANSHIP

The CM shall perform the Work in a good workmanlike manner and in strict accordance with the Contract and complete the Project in a professional and timely manner. The CM will be responsible to the Owner for the acts and omissions of all of his employees and all subcontractors, their agents and employees, and all other persons performing any of the Work under a contract with the CM.

9.0 CORRECTION BY OWNER; SUSPENSION OF WORK

In the event that the CM shall fail to prosecute the Work in accordance with the Contract, or shall otherwise default thereunder, the Owner may, without terminating the Contract and without prejudice to any other remedy he might have, order the immediate suspension of the work, terminate the Contract, or cure said default at the expense of the CM following written notice thereof.

10.0 INDEPENDENT CONTRACTOR

CM is and shall remain for all purposes an independent contractor, and he shall have no power, nor shall he represent that he has any power, to bind Owner or to assume or create any obligation, expressed or implied, on behalf of Owner.

OWNER'S CONSTRUCTION/RENOVATION EHS REQUIREMENTS

PERSONAL PROTECTIVE EQUIPMENT

- Hard Hats are required at all times in the construction work area.
- Appropriate eye and face protection that complies with ANSI Z87 shall be worn at all times. Safety glasses with side shields are required as a minimum.
- Sensible and safe work clothing/shoes must be worn. This means the wearing of shirts with a minimum 4" sleeve.
- Shorts, cutoffs, sleeveless shirts, tank tops, sneakers and running shoes are strictly prohibited.
- At a minimum, substantial shoes must be worn on all project sites. No canvas or leather sneakers (even if equipped with steel toe) or sandals will be worn. All construction boots or shoes designed to accommodate laces must be fully laced.
- Appropriate hearing protection shall be worn in work areas where levels exceed established standards.
- Suitable gloves must be worn to protect the hands from injury as appropriate for the work to be performed.
- Approved respirators must be used when excessive dust, mist, fumes, gases or other atmospheric impurities are present.
- Safety harnesses and secured safety lanyards or retractable lifelines must be used when working from unguarded work surfaces where falls greater than 6 feet/1.8m present a hazard. (NOTE: Site requirements may limit this potential fall length to 4 feet/1.2m) Lanyards or retractable lifelines must be secured to separate lifelines and independent connection points capable of withstanding the load of a potential fall.
- Proper personal protective equipment must be worn for welding and burning.
- Welding screens must be used when welding operations are in the vicinity of other employees.
- Electric insulating protective equipment, such as rubber gloves, blankets, hoses, boots, etc. Shall be inspected before use.
- High visibility warning vests or other suitable garments marked with or made of reflectorized or high-visibility material must be worn when working in roadways or around heavy excavating equipment.

GENERAL SAFETY & SECURITY GUIDELINES

- Alcoholic beverages, recreational drugs and people under the influence of these substances are not permitted on site.
- Weapons and firearms are strictly prohibited.
- No food or drink will be allowed in the construction work area except in the designated eating area.
- Music radios/headsets are prohibited.

- No cameras or video equipment are permitted on site except as necessary to document the progress of the Work and as may be allowed under the specific Site Security guidelines.
- Smoking is not permitted in any building (including the building footprint and roof). Smoking is allowed in designated areas only.
- Horseplay and fighting is prohibited.
- Barricaded or roped of areas are considered danger zones and should be respected as such. Admittance to such areas is prohibited without authorization.
- Protect floor openings by providing adequate barricades and secured covers. All covers must be painted with high-visibility paint or shall be marked with the word "HOLE" or "COVER" to provide warning of the hazard.
- No one will be allowed to enter the site without proper identification. All trade workers, vendors, and visitors must comply with the Owner's badge and access program.
- Do not prop exit doors.
- Throwing or dropping materials from one level to another is prohibited.
- No toxic chemicals or other types of pollutants may be disposed of in the on-site sewerage systems, either storm or sanitary.
- All gas cans and other liquid chemicals must remain in secondary containment devices.
- No riding in the back of pick-up trucks.
- Park in designated contractor-parking areas.
- The driver of any motor vehicle on company property is responsible for its safe condition and use. The vehicle owner must promptly correct any malfunction of brakes, lights, horn, or exhaust system. The driver is required to have a valid driver's license and the vehicle must have a valid license plate. All traffic rules must be obeyed and pedestrians have the right of way at the Owner's site.
- All deliveries and use of special equipment will be through areas designated by the Owner. The Owner's facility has minimal staging and storage areas designated for construction use. All contractors must schedule and coordinate deliveries in order to minimize the necessity of storing materials prior to installation.
- Area and personal air monitoring required by federal, state or local regulations shall be the responsibility of the CM.

HOUSEKEEPING

- Cleanliness and orderliness are the first fundamentals of good housekeeping.
- Contractors are responsible for cleaning up and removing hazardous and non-hazardous waste generated on site.
- Each Contractor shall be responsible to maintain areas where he is performing work free from waste materials, debris and rubbish. Work will not be considered complete until all waste materials are removed and the work area returned to a clean and orderly condition. Waste material must be disposed of off-site.
- All protruding nails in form lumber, boards, etc., must be withdrawn or bent into the wood before the wood is stacked or piled.

- Rags, packing materials, paper cups, and sawdust in saw areas must be collected daily and placed in proper containers.
- All objects with sharp edges (scrap sheet metal, scrap glass, bottles, metal cans) shall be collected daily and placed in containers.
- Avoid placing debris and other obstacles in roadways, walkways, aisles and other travel routes.
- Allow sufficient time at the end of each day for proper cleanup of the work area. Place all debris in proper refuse containers.
- All stored material must be kept in an orderly manner at all times.
- Provide a proper collection container and floor protection when using cutting oil, solder flux, hydraulic oil, and other fluids.
- In the event of a large spill, immediately install acceptable containment barriers.

LADDERS

- The use of metal and wood ladders is prohibited. All ladders shall be heavy duty, industrial strength. The use of fiberglass, or aluminum/fiberglass composite ladders is acceptable. Job-made wooden ladders shall only be allowed upon approval from the Owner's EHS Program Manager.
- Stepladders must be fully open. They cannot be used as straight ladders.
- Tie-off all straight and extension ladders to keep them secure. Straight and extension ladders must extend three feet (3') beyond the top landing. The base of the ladder shall be set out at least one-fourth of the ladder height measured from bottom to point of bearing.
- Any ladder found defective shall be removed from service and destroyed (vertically) or repaired to original specifications.
- Do not place ladders in blind spots (doorways, driveways) or in egress ways unless properly barricaded or guarded.

TOOLS & EQUIPMENT

- Defective tools and equipment must be taken out of service and shall be properly repaired before reuse.
- Machinery, tools (including portable grinders and buffers) and equipment with exposed gears, belts, power transmission, couplings, etc. shall not be operated without effective guards in place.
- The use of gasoline and propane powered equipment in the building is strictly prohibited.
- A motor vehicle engine shall not be left running if the vehicle/equipment is unattended unless it is necessary in the normal operational requirement of the unit. Unattended means that the operator has left the normal control position of the vehicle.
- All moving equipment must be equipped with back-up alarms.
- Store or stack equipment and material so that it will not create a falling or tripping hazard or block access to fire extinguishers or emergency exits.

COMPRESSED GAS CYLINDERS

- Defective tools and equipment must be taken out of service and shall be properly repaired before reuse.
- To avoid accidental displacement, keep compressed gas cylinders standing and securely tied off, whether empty or full. Make sure valve protection caps are on when cylinders are not in use. The valve shall be closed on all empty cylinders.
- When moving cylinders by crane or derrick, a cradle, boat or suitable platform shall be used. Slings or hooks shall not be used.
- When cylinders are not in use, they must be secured and capped.
- If cylinders are not used within a 24-hour period, they are considered to be in storage, and must be secured, capped and separated. Separate oxygen and fuel gas cylinders by a minimum of 20' or a 5' high, ½ hour fire-rated barrier.

FIRE PREVENTION

- Use only approved cleaning agents — never gasoline or flammable liquids.
- Gasoline and similar flammable liquids must be stored only in approved safety containers and in areas free of burning hazards.
- Keep all heat sources from flammable liquids, gases or other combustible materials.
- Open fires are strictly prohibited.
- Every hot work operation must have a properly trained and equipped fire watch with appropriate fire extinguishers for the specific hazard in the work area. The fire watch must remain in the work area for at least 30 minutes after the hot work activity is completed.

FALL PROTECTION

All workers in an area exposed to a fall greater than 6 feet (1.8m) must use appropriate fall protection. Such protection includes:

- Guardrail systems
- Safety net systems
- Personal fall arrest systems

Other protection methods include:

- Controlled access zones
- Controlled decking zones
- Hole covers
- Positioning device systems
- Equipment guards
- Fences and barricades
- Warning line systems in combination with guardrail systems, safety net systems, personal fall arrest systems or safety monitoring systems.

Exception: When the employer demonstrates that it is infeasible or creates a greater hazard to use these systems, a fall protection plan that meets the OSHA requirements must be developed for review and implemented.

Fall protection is required but not limited to the following when a worker is exposed to a fall of six feet (1.8m) or more:

- Performing steel erection work
- Working on scaffolds
- Unprotected sides and edges
- Overhand bricklaying and related work
- Leading edges
- Roofing work on low-slope roofs
- Hoist areas
- Steep roofs
- Holes
- Precast concrete erection
- Formwork and reinforcing steel
- Wall openings
- Ramps, runways and other walkways
- Walking/working surfaces
- Excavations
- Aerial lifts
- Dangerous equipment
- Metal decking operations
- Erecting, dismantling and working on scaffolds

The provisions in this section do not apply when:

- Employees are making an inspection, investigation or assessment of workplace conditions prior to the actual start of work or after all construction work has been completed
- Working on certain cranes and derricks
- Working on certain types of equipment used in tunneling operations
- Engaged in the construction of electric transmission and distribution lines and equipment
- Working on stairways and ladders
- Tradespeople shall not stand on motors, pumps, conduits or the like to gain access to elevated work.
- Use of Safety Monitor System (SMS), Controlled Access Zone (CAZ), or Controlled Decking Zone (CDZ) will not be accepted unless prior approval from Owner's EHS Program Manager has been received.

- Working on a roof within six (6) feet (1.8m) of the edge or a floor opening requires appropriate fall protection (guardrail systems, safety net systems, or personal fall arrest systems). Use of a safety monitor system or controlled access zone will not be accepted without prior approval from Owner's EHS Program Manager.
- Safety harnesses must be worn at all times in scissors and personnel lifts. Chains must be closed. Harnesses must be secured to an approved tie-off point when breaking the plain of the lift.
- Safety harnesses must be secured to an approved tie-off point in all aerial lifts.
- Establish a barricaded or roped off danger zone around lifts for falling objects.

Hoisting of personnel on a personnel platform by a crane or derrick is prohibited, except when the erection, use, and dismantling of conventional means of reaching the worksite, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous or is not possible because of structural design or worksite conditions. This type of operation must meet the requirements of OSHA 1926.550(g).

Workers must wear a safety harness with his/hers safety lanyard secured to a separate lifeline while working from swing scaffolds, boatswain's chairs, or other suspended work platforms where a fall hazard is present.

CM's written Fall Protection Program - CM must develop a written Fall Protection Program and it must be communicated to all affected employees. The program will contain the following elements:

- Hazard identification
- Selection of fall hazard control
- Equipment inspection and maintenance
- Employee training

CM must conduct a fall hazard assessment to address both routine ongoing activities and tasks as well temporary activities, which may take place during maintenance and construction.

Control measures will be identified, implemented and communicated by the CM. Documentation of fall hazard control measures should be included in THAs, safe work plans or other operating procedures.

CM workers must be trained in the requirements of the fall protection program including use of fall protection equipment as appropriate.

Contractors must inspect and maintain fall protection equipment in accordance with manufacturer's recommendations.

SCAFFOLDING

- All scaffolds must be inspected before use and must be designed for the safe working load.
- Only scaffold planking tested and approved to carry the load may be used. Scaffold planking must be secured by tying or cleats to prevent slipping. Mark scaffold planks (in most cases the manufacturer does this) and use only on scaffolds.
- Handrails and toeboards shall be used on all scaffolds and the scaffold secured as required.

- Rolling tower scaffolds must be locked while the scaffold is in use. Tower must be free of personnel, material and equipment before being moved. Rolling scaffolds are not to be moved from the top.
- Ladders must be used for accessing scaffolds. Climbing of bracing is prohibited.
- Scaffold platforms more than 6 feet (1.8m) above any working surface must be equipped with a guardrail system–
- Top rails (42" (1.1m) plus or minus 3" (8cm), mid rails (midway between the top rail and the scaffold platform) and toe boards or personal fall arrest systems must be implemented.
- No scaffold shall be erected, moved, dismantled or altered except by trained and qualified personnel under the authority of the competent person.
- Abide by the Scaffold Tag System
  - *GREEN*–complete scaffold per required safety standards.
  - *YELLOW*–conditional use—100% fall protection required.
  - *RED*–Scaffold not complete. Do Not Use.
- Makeshift platforms, such as stacked materials, chairs, boxes, or drums shall not be used.
- Scaffolds shall be built to OSHA standards (1926.451).
- **Tubular Welded Frame Scaffolds have additional special safety requirements:**
- Scaffold legs shall be set on adjustable bases, plain bases or other foundations adequate to support the maximum rated load.
- To prevent movement, the scaffold shall be secured to the building or structure at intervals not to exceed 30 feet (9.1m) horizontally and 26 feet (7.9m) vertically.
- All pins to secure diagonal braces and to prevent uplift shall be used.
- **Outriggers and platforms below the working/walking level shall be fully planked. O**utriggers shall be tied to the frame.
- Scaffolds may not be used as material hoist towers or for mounting derricks without first determining the loads and stress involved.
- All scaffolds shall be free of tools, trash, etc. before calling in for removal.

CRANES, HOISTS & RIGGING

- Never raise a load over people or occupied buildings.
- **Tag lines must be used to control every load.**
- Rigging operations utilizing chains is not permitted without prior approval from Owner EHS Program Manager.
- Multiple-lift rigging is strictly prohibited.
- All materials shall be rigged to prevent unintentional displacement. H**ooks with self-closing safety latches shall be used** to prevent components from slipping out of the hook.
- Defective rigging equipment shall be tagged and removed from service.
- Only qualified operators may operate power equipment. Seat belts must be worn wear applicable.

- Cranes and Hoists
- Safe lifting procedures for cranes and hoists must be developed and documented.
- Crane and hoist operators and qualified riggers must conduct rigging equipment inspections prior to each use on each shift and as necessary during its use to ensure that it is safe.
- All operators of cranes and hoists should have received training that addresses safe operating practices for all crane types that they will be operating on site.
- Preventative maintenance must be conducted on cranes and hoists in accordance with manufacturer's guidance or local regulatory requirements.
- Contractors must submit copies of detailed and documented annual inspections conducted by qualified individuals.
- Riding on hooks, headache balls or slings of hoisting equipment is strictly prohibited.

ELECTRICAL

- Electrical equipment shall not be installed, repaired, or removed except by trained qualified electricians.
- Electrically operated equipment (stationary and portable) must be grounded.
- When extension cords, power tools or equipment cords are frayed or worn, or when bare wire is showing, the equipment must be tagged and taken out of service.
- Do not use electrical tape on extension cords.
- Temporary cords should be supported a minimum of 8' above the floor in egress walkways, corridors and areas requiring employee access.
- Temporary lighting must be guarded.
- All 120-volt, single phase 15 and 20-ampere receptacle outlets on construction sites, which are not a part of the permanent wiring of the building or structure and are in use by employees, shall have approved Ground Fault Circuit Interruption (GFCI) for personnel protection. When using the permanent receptacles, GFCI devices must be installed on each extension cord prior to the source receptacle.
- Lock-out/Tag-out programs represent a lifesaving control. Compliance with Owner's procedures is mandatory.
- Equipment-specific energy control procedures are required for all lock-out/ tag-out operations.
- Extension cords must be at least 16-gauge heavy duty 3—wire with a UL approved three prong grounded plug.
- 110-volt outlets on portable generators and welders shall be 3-way (NEMA 5-15R) grounded to the frame. The power lead shall be connected through a Ground Fault Circuit Interrupter.

CONTRACTOR HIGH RISK OPERATIONS/HIGH HAZARD ACTIVITIES

All major construction activities on this project must be carefully analyzed to determine appropriate safety controls to ensure worker safety and health in accordance with Federal, State, and local regulations and Owner compliance. Reviewing the construction activities prior to the CM's arrival on site or the start of any special construction activity allows all parties to plan for safety.

Work that has a high risk of resulting in a serious worker exposure, injury, or death or an environmental violation is considered a high-risk operation. A Task Hazard Analysis or Mitigation Plan is a procedure which identifies potential hazards specific to a scope of work or activity and defines actions required by specifying locations, safety precautions, activities involved and the work sequencing so that the operation will take place in the safest manner possible. A Task Hazard Analysis or Mitigation Plan will be required for, but not limited to, all of the following activities: Operations involving the shut-down and start-up of fire alarm systems, fire protection systems and sprinkler systems in occupied facilities, operations involving shut down and start-up of process piping, electrical systems, hydraulic systems and elevators/escalators; trenches and excavations greater than 5 feet in depth or that require a shoring system; elevated work activities including work on a roof or major scaffold; work to be performed on existing equipment; installation or removal of equipment or machinery, work involving existing piping, vents, or drains, piping tie-ins and line breaking; any hazardous painting, floor or wall coating (epoxy paints, electro-static painting, cocooning); asbestos abatement; working on/with lead containing materials; demolition work; structural steel erection; major scaffold erection; use of ladders above 24 feet; elevated work requiring the use of fall protection; hot work (welding, cutting, brazing) in hazardous areas or near hazardous materials; passivation; confined space entry; control of hazardous energy and line breaking (lock out/tag out); any activity which will impede a sidewalk, roadway, or building entrance (in occupied facilities or public areas); crane and/or hoist operations; Critical lifts (defined as any lift meeting one of the following four criteria) - lifts which exceed 75% of the cranes rated capacity or other lifting equipment configuration, lifts that require the use of more than one crane or in combination with other lifting equipment approved for hoisting or rigging purpose, lifts which are located in an area or areas where conditions present exposures to electrical hazards, underground hazards, overhead piping systems, vessels, operational buildings, etc., lift s of equipment which are identified as specialized equipment, "one of a kind" which has been designed, engineered and fabricated for a specific process of the owner. This will include equipment specified by the owner such as glass-lined reactors, vessels, etc.; and any other unusual activity that may require review of the tasks and hazards involved.

A Task Hazard Analysis/Mitigation Plan must be documented by the CM/Subcontractor to ensure a safe working environment. Procedures regarding work permits (where applicable) should be defined in the THA.

All attachments (training documents, crane location plans, crane swing radius information, Material Safety Data Sheets, etc.) must be included with the mitigation plan submission. The THA must be submitted to the Owner for review a minimum of 48 hours prior to the scheduled operation.

The CM's competent person must review the Task Hazard Analysis with the work crew prior to the commencement of the activity and on a daily basis or as conditions (such as weather) change.

Reference guidance document *Task Hazard Analysis Framework for Contractor High Risk Operations* located on GE Corporate Contractor Safety Support Central.

LOCK OUT TAG OUT

The LOTO standard applies, but is not limited to, activities that are performed on a machine, a piece of equipment, a process, or circuit. Primary, secondary, stored and single source energy sources require a lockout when performing servicing and/or maintenance activities. Primary

energy sources are the main energy sources such as electricity, gas, fluids, etc., provided to machines, equipment, processes and circuits. Shut down machinery with moving parts or process equipment in service before adjustments or repairs. Owner's LOTO procedures must be followed.

If shut down is not feasible a risk assessment must be used. The risk assessment explores the safest conditions possible for individual work assignments. Risk assessment establishes safe practices and alternative methods to reduce the possibility of injury when normal LOTO procedures cannot be applied. A task hazard analysis (mitigation plan) and written procedures specific for the job must be completed and reviewed with Owner prior to start.

Never remove warning or danger tags or locks on any apparatus, valves or switches unless you have been instructed to do so, and then only by the persons who attached them.

Contractors who are involved with equipment/systems and are potentially exposed must implement procedures that provide protection equal to or better than the General Electric LOTO program. LOTO programs for outside services or contractors must be reviewed by authorized General Electric personnel.

The contractor supervisor must be made aware of the overall LOTO procedure and informed of the equipment specific procedure by an Owner Authorized Representative.

Contractors must place their own locks and tags (one lock, one key, one person) and verify LOTO by try-out. As a best practice, the Owner's Authorized Representative may perform the LOTO step-by-step process. The contractor will then be required to attach and secure their individual LOTO locks and red tags to the same energy-isolating devices that the Owner representative has locked out.

All Contractor workers involved in a LOTO operation must have documentation of LOTO training. This documentation must be available for audit at the work site.

CONFINED SPACE

A confined space is an enclosed area that has each of the following four characteristics: 1) Large enough and so configured that an worker can bodily enter and perform assigned work, 2) Has limited means for worker entry and exit due to the number, size, or location of openings, 3) Is not designed for continuous worker occupancy, 4) Contains or may contain a serious safety or health hazard. Such hazards include currently or potentially hazardous atmospheres, potential worker entrapment (from inwardly converging walls or downward sloping floor), or potential worker engulfed by stored materials. Examples of confined spaces include tanks, vessels, pits, sewers, pipelines, boilers and utility vaults.

Entry into a confined space shall be conducted only if necessary to do assigned work. Whenever possible, assigned work shall be completed from outside the space.

Entry into a confined space is prohibited until atmospheric testing of the space and applicable entry procedures have been documented and permits completed.

All Contractor entrants and attendants must have documentation of confined space entry/attendant training.

Additional respiratory protection training and documentation will be required (if respiratory protection is needed).

This documentation must be available for audit at the work site.

All entrants and attendants must be informed of the entry procedures and mitigation plan prior to the entry.

The use of retrieval equipment is required for all confined space entries. The number of entrants must be equal to the number attendants and to the number of retrieval devices available.

STRUCTURAL STEEL ERECTION

The safety standards for structural steel erection will follow the OSHA regulations for Steel Erection Subpart R (1926.750-1926.761 inclusive of Appendices A-H) dated January 18, 2001 and revised on July 18, 2001 with the following exceptions and additions:

All workers, including connectors and dickers, must be protected from falls at or greater than six (6) feet (1.8m).

Multiple lift rigging procedures (Christmas treeing) is strictly prohibited.

The use of a Controlled Decking Zone (CDZ) is prohibited.

Cranes used in steel erection activities shall be visually inspected prior to each shift by a competent person. The inspection must include observation for deficiencies during operation. The inspection must be written and a copy submitted to Owner daily. Deficiencies constituting a hazard require that the hoisting equipment be removed from service until the deficiency is corrected.

At the end of the shift or when environmental or jobsite conditions require, metal decking must be secured against displacement.

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

Wire mesh, exterior plywood or equivalent must be installed around columns where planks or metal decking do not fit tightly. The materials used must provide fall protection for personnel and prevent objects from falling through.

All columns must be anchored by a minimum of four (4) anchor bolts.

Anchor bolts should not be repaired, replaced or field modified without the approval of the project structural engineer of record.

APPENDIX C

PROJECT SITE SAFETY RULES

Project Site Safety Rules

1. The Project has established the following as serious safety infractions and may be cause for immediate dismissal of an individual from the Site. These serious infractions are:
    - Non-compliance with site fall protection requirements
    - Violation of Confined Space Policy
    - Disregard of Lock-out Tag-out procedures
    - Physical aggression toward another worker
    - Possession of weapons, alcohol, or illegal drugs
    - Failure of substance abuse test or failure to submit to a substance abuse test upon request
    - Gross disregard for the safety of self or other site personnel
2. Working on a roof within 6 feet (1.8 meters) of the edge or an opening requires appropriate 100% fall protection (guardrail systems, safety net systems, or personal fall arrest systems).
3. Employees walking or working on the decks of barges, support vessels, floating platforms, and piers or docks shall be protected with U.S. Coast Guard-approved personal flotation devices. Fall protection shall also be provided if there is a possibility that persons could fall six or more feet to a lower level, deck, tethered vessel, or dock/pier. Barges or other marine equipment shall comply with the strictest OSHA, federal, state or local regulations regarding fall protection that may apply.
4. Use of Safety Monitor System (SMS), Controlled Access Zone (CAZ), or Controlled Decking Zone (CDZ) will not be accepted unless prior approval from CM has been received.
5. Hoisting of personnel on a personnel platform by a crane or derrick is prohibited, except when the erection, use, and dismantling of conventional means of reaching the worksite, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous or is not possible because of structural design or worksite conditions. This type of operation shall meet the requirements of OSHA 1926.1431.
6. Never raise a load over people or occupied buildings. Tag lines shall be used to control every load. Rigging operations utilizing chains is not permitted without prior approval from the CM Project Safety Manager. Multiple-lift rigging is strictly prohibited. All materials shall be rigged to prevent unintentional displacement. Hooks with self-closing safety latches shall be used to prevent components from slipping out of the hook. Crane and hoist operators and qualified riggers shall conduct rigging equipment inspections prior to each use on each shift and as necessary during its use to ensure that it is safe. Rigging shall be in good condition, appropriate for the lift and tagged with a manufacturer’s rating tag. Defective rigging equipment and rigging without a manufacturer’s rating tag shall be labeled “Do Not Use,” and removed from service. See the GE Crane Safety Manual for additional requirements.
7. Preventative maintenance shall be conducted on cranes and hoists in accordance with manufacturer's guidance or local regulatory requirements.

8. Riding on hooks, headache balls or slings of hoisting equipment, as well as riding on loads, is strictly prohibited.
9. Scaffolds shall be built to OSHA standards (1926.451). In addition:
   - All scaffolds shall be inspected before use and shall be designed for the safe working load. Handrails and toeboards shall be used on all scaffolds and the scaffold secured as required. Rolling tower scaffolds shall be locked while the scaffold is in use.
   - Scaffold platforms more than 6 feet (1.8m) above any working surface shall be equipped with a guardrail system – Top rails 42 inches (1.1 meters) plus or minus 3 inches (8 centimeters), mid rails (midway between the top rail and the scaffold platform) and toe boards or personal fall arrest systems shall be implemented.
   - No scaffold shall be erected, moved, dismantled or altered except by trained and qualified personnel under the authority of the competent person.
   - The Scaffold Tag System shall be implemented using red, yellow and green tags.
   - The main scaffold platform, as well as outriggers and platforms below the working/walking level shall be fully planked.
10. Electrical equipment shall not be installed, repaired, or removed except by trained qualified electricians.
11. Do not use electrical tape to repair extension cords. Temporary cords should be supported a minimum of 8 feet above the floor in egress walkways, corridors and areas requiring employee access. Temporary cords may not impede the function of fire doors, without alternate, effective means of fire control. Temporary lighting shall be guarded.
12. All 120-volt, single phase 15- and 20-ampere receptacle outlets which are not a part of the permanent wiring of the building or structure and are in use by employees shall have approved Ground Fault Circuit Interruption (GFCI) for personnel protection. When using the permanent receptacles, GFCI devices shall be installed on each extension cord prior to the source receptacle.
13. Extension cords shall be greater than 16-gauge heavy-duty 3-wire with UL approved three-prong, grounded, and weather protected plug ends.
14. All temporary power supplied by generators shall be ground fault protected. The power lead shall be connected through a Ground Fault Circuit Interrupter. Bonding of the neutral wire to ground is required for systems that provide a neutral conductor, e.g., Single phase 240/120. A test program that assures proper wiring, grounding and GFCI operation shall be implemented. Testing shall be required before first use and at least monthly.
15. Gasoline and similar flammable liquids shall be stored only in approved metal safety containers and in areas free of fire hazards.
16. The use of gasoline and propane powered equipment inside a building is strictly prohibited, unless authorized in advance by the CM, filter cake buildings excepted.
17. Open fires are strictly prohibited.

18. Every hot work operation shall have a properly trained and equipped fire watch with appropriate fire extinguishers for the specific hazard in the work area. The fire watch shall remain in the work area for at least 60 minutes after the hot work activity is completed. If indicated by the CM and when indicated on the Hot Work Permit, the fire watch or designee must continue monitoring for an additional three hours. When the four-hour monitoring is completed, the fire safety supervisor shall inspect the area once more. A hot work permit system shall be used.
19. Defective tools and equipment shall be taken out of service, tagged "Do Not Use," and shall be removed from the site or properly repaired before reuse.
20. Compressed gas cylinders shall remain standing and securely tied off, whether empty or full. Valves shall be closed on all empty cylinders. Protection caps shall remain on cylinders when not in use. Tags or an equivalent method shall be used to identify whether a cylinder is empty or full.
21. When moving cylinders by crane or derrick, a cradle, boat or suitable platform shall be used. Slings or hooks shall not be used.
22. When cylinders are not in use, they shall be secured and capped. If cylinders are not used within a 24-hour period, they are considered to be in storage, and shall be secured, capped and separated. Separate oxygen and fuel gas cylinders by a minimum of 20 feet or a 5-foot-high, ½-hour fire-rated barrier.
23. A motor vehicle engine shall not be left running if the vehicle/equipment is unattended unless it is necessary in the normal operational requirement of the unit. Unattended means that the operator has left the normal control position of the vehicle.
24. Vehicle seat belts shall be worn in vehicles operated on the Project Site if available.
25. Riding in the back of pick-up trucks is prohibited.
26. Talking on cell phones (hands free or hand held) while operating project vehicles is prohibited.
27. Project vehicles shall be equipped with maps to nearest pre-notified medical facility. At the beginning of project operations, drivers of the support vehicles shall become familiar with the emergency route and the travel time required.
28. Park in designated contractor-parking areas. The driver of any motor vehicle on company property is responsible for its safe condition and use. The vehicle owner shall promptly correct any malfunction of brakes, lights, horn, leaks, exhaust system or any other defect that affects physical or environmental safety. The driver is required to have a valid driver's license and the vehicle shall have a valid license plate and registration. All traffic rules shall be obeyed and pedestrians have the right of way at the Project Site. Any leaks or spills associated with company or personal vehicles that occur onsite must be reported to the CM.
29. Contractor shall assign a spotter for equipment not equipped with backup alarms if there is a blind spot present, or if a heightened risk to personnel or property exists from a backing operation.

30. The use of metal, wood, and job-made wooden ladders must meet the requirements of OSHA and are only be allowed only upon approval from the CM. All step and/or extension ladders purchased or brought onto the job site shall be heavy duty, industrial strength fiberglass/composite construction.
31. Stepladders shall be fully open when in use and cannot be used as straight ladders.
32. All ladders should be examined for defects prior to each use. Defective ladders should be removed from service. Always face a ladder when ascending or descending it. Both hands should be used to grip, do not carry any items up the ladder when climbing. Ladders should be tied off or another worker should be available to hold the ladder. Straight and extension ladders shall extend 3 feet beyond the top landing. The base of the ladder shall be set out at least one-fourth of the ladder height measured from bottom to point of bearing.
33. Contractors are responsible for cleaning up and removing hazardous and non-hazardous waste generated on the project site.
34. Each Contractor shall be responsible to maintain areas where he is performing work free from waste materials, debris and rubbish. Waste material shall be disposed of offsite.
35. All protruding nails in form lumber, boards, etc., shall be withdrawn or bent into the wood before the wood is stacked or piled.
36. Rags, packing materials, paper cups, rubbish and accumulations of sawdust shall be collected daily and placed in proper containers.
37. Contractor shall provide a proper collection container and floor protection/secondary containment when using cutting oil, solder flux, hydraulic oil, and other fluids. In the event of a spill, immediately install acceptable containment barriers and implement spill response procedures. Refer to Specification Section 13870 for spill control and containment requirements.
38. The safety standards for structural steel erection will follow the OSHA regulations for Steel Erection Subpart R (1926.750-1926.761 inclusive of Appendices A-H) dated January 18, 2001 and revised on July 18, 2001 with the following exceptions and additions:
    - All workers including connectors and deckers shall be protected from falls at or greater than 6 feet (1.8 meters).
    - Multiple lift rigging procedures (Christmas treeing) is strictly prohibited.
    - The use of a Controlled Decking Zone (CDZ) is prohibited.
    - At the end of the shift or when environmental or jobsite conditions require, metal decking shall be secured against displacement.
    - All columns shall be anchored by a minimum of four anchor bolts.
39. The Contractor shall maintain a strict policy prohibiting all forms of harassment of any person for any reason, including race, sex, color, religion, age, disability or veteran status. Furthermore, it shall prohibit harassment in any form, including verbal, physical, and visual harassment.
40. Alcoholic beverages, illegal or recreational drugs and people under the influence of these substances are not permitted on the Project Site.

41. Weapons and firearms are strictly prohibited on the Project Site.
42. No food or drink will be allowed in any contract work area except in a designated eating area.
43. Audio devices, earbuds and headsets are prohibited on the Project Site.
44. No cameras or video equipment are permitted on the Project Site except as necessary to document the progress of the work and as may be allowed under the specific Project Site Security guidelines.
45. Smoking is not permitted on the Project Site except in designated smoking areas only. All designated areas must be delineated by flagging tape or other means and be equipped with a butt can and a fire extinguisher.
46. Horseplay and fighting are prohibited on the Project Site.
47. Where danger from equipment, falling objects, contaminated material or other activities may exist, Exclusion Zones shall be created. The perimeter of Exclusion Zones shall be fenced and gated. Two or more strands of red DANGER or DO NOT ENTER tape may be used as a temporary control measure with CM approval.
48. Protect floor openings by providing adequate barricades and secured covers. All covers shall be painted with high visibility paint or shall be marked with the word “HOLE” or “COVER” to provide warning of the hazard.
49. No one will be allowed to enter the Project Site without proper identification. All trade workers, vendors, and visitors shall comply with the CM’s badge and access program.
50. Do not prop open exit doors or any fire rated door which is designed to remain closed.
51. Throwing or dropping materials from one level to another is prohibited.
52. No toxic chemicals or other types of pollutants may be disposed of in the Project Site sewerage systems, either storm or sanitary.
53. All gas cans, which shall be a metal safety type, and other liquid chemicals shall remain in secondary containment devices when not in use.
54. All deliveries and use of special equipment will be through areas designated by the CM. The CM will designate staging and storage areas for construction use. All contractors shall schedule and coordinate deliveries in order to minimize the necessity of storing materials prior to installation.
55. Any disregard for the provisions of these health and safety Specifications shall be deemed just and sufficient cause for ordering the stoppage of all Work until the matter has been rectified to the satisfaction of the CM.
56. The dredging operations contractor shall be prepared to properly identify, evaluate, mitigate, and dispose of all suspect hazardous materials uncovered during their dredging activities. This would include, but is not limited to, the discovery of drums and other containers, compressed gas cylinders, foreign debris, unexploded ordnance and any other unidentified materials that may contain hazardous substances or present specials hazards to their crew and surrounding community.

57. Any work that has the potential to place workers within six feet of a water body, including rivers, streams, creeks, canals, storm water basins, and swamps will require a Water Operations Permit application to be submitted to the CM for review and approval. Work within six feet of or on water bodies may not begin until the Water Operations Permit has been approved by the CM. Updated permits shall be submitted to the CM when any information on the permit changes**.**
58. If the work involves the use of a boat or vessel, a fully completed Float Plan must be provided to the CM every day BEFORE the boat or vessel departs from its mooring or launch location. If Vessel Traffic Service (VTS) is being used and can be reliably contacted within the entire area where work is intended to be performed, boats will not be required to complete a Float Plan, but will be required to follow the procedures in use by VTS.
59. Workers shall not tamper with the meter housing or the enclosure of any sources of ionizing radiation. Any evidence of meter housing or enclosure damage is to be reported to the CM immediately.
60. Contractor shall check work areas for bee or wasp nests. Any identified bee or wasp nest shall be removed before work begins or continues in that area.
61. Manual movement of materials involving two or more personnel shall follow standard safe lifting practices. Where possible, the use of mechanical means rather than a two-man lift is preferred.
62. A GPS-based navigation system is required on all manned project vessels, except skiffs.
63. Contractor field personnel working on the river or canal shall wear a float coat (top half of a Mustang Suit) or a one-piece survival suit when the water temperature is between 40 and 50 degrees Fahrenheit. When the water temperature is less than 40 degrees Fahrenheit, field personnel shall wear either a float coat and bib-overalls (a full two-piece Mustang Suit), or a one-piece survival suit. Suits or float coats shall be USCG-approved. If extremely cold or severe weather conditions are forecast, work activities may be postponed.
64. Using compressed air can lead to different types of injuries including penetration of the skin, embolism, damage to internal tissues and organs, eyes, and ears. Personnel need to verify that the hose is in good condition and properly connected. Keep air hoses off the floor where they can be tripping hazards or become damaged. Prevent sharp objects from rubbing against air hoses. Use the lowest pressure that will do the job.
65. Access, ingress and egress, to elevated concrete work is essential to the safe and quality placement of concrete work. Work involving concrete should consider protective measures such as staging, platforms, handrails, and other passive forms of employee protection.
66. Identify all hand safety hazards as part of the job planning process BEFORE starting to work. Remember that gloves are a secondary level of defense when it comes to hand safety; the primary way to avoid hand injuries is by proper hand placement and using the right tool for the job. When using any cutting tool, set up your work so that you cut away from your body or anyone else working nearby, and pay attention to the location of your free hand when cutting.

67. Portable electrical tools and equipment shall be UL listed, double insulated tools or be grounded through a third wire in the cord. The ground wire connection shall not be defeated. Tools with damaged or defective cords should not be used. Taped splices are not permitted. Power tools that may be used in a wet location or a construction site shall have must be in good working order and used with ground fault circuit interrupt (GFCI) protection. All electrical cords and extension cords must be inspected prior to use.
68. A Lock/out/Tagout procedure is required for all work on electrical equipment and shall be implemented in accordance with the Contractor's Control of Hazardous Energy (Lockout/Tagout) Procedure. Only Qualified Persons shall perform any work associated with energized equipment.
69. Excavations and trenching activities require complete analysis of existing underground utilities, soils, sloping and shoring methods, equipment, and engineering if depth of trench or excavations exceeds four feet. Underground utilities include such things as electric lines, communications lines, pipelines, or sewer lines that are buried below the surface. These must be located before intrusive activities begin. Location methods could include a geophysical survey, the use of SOFT DIG technology, and/or hand dig. A JSA and permit is required for all intrusive work.
70. All construction equipment will be inspected prior to arrival on site and daily throughout the project. Quacker style backup alarms must be operable on all equipment.
71. Prior to an initial line break, an investigation of the piping system will be performed by the Contractor to determine the points of attachment and valve shutoffs, previously held contents and location of low points in piping runs. The primary control for protecting personnel during a line break will be to isolate (block – bleed – block or equivalent procedure) the piping system(s) and identify and clear any of the hazards that may exist. The initial line break will be made by loosening bolts and placing a slip blank in between the flange and gaskets.
72. Before the start of work, all work areas and mobilization pathways will be evaluated to determine if overhead obstructions (OHOs) are present. OHOs include electrical and communications lines, piping, bridges, and crosswalks. All equipment high profile equipment must remain a safe (minimum 20-foot) distance from overhead power lines.
73. Evaluate the tools to be used and the ways that workers are protected from the hazards associated with the use of tools. Consider tool maintenance requirements; electrical requirements; the use of ground fault circuit interrupters, grounding, extension cords, and tool inspection procedures; and employee training and PPE requirements.
74. Prior to mobilization of equipment, conduct an initial site inspection for pre-work planning. The inspection should cover potential exposures such as the location of electrical lines, underground utilities, nearby structures, traffic conditions, site security needs, public exposures general liability, and other potential exposures.
75. Subcontractors erecting steel must comply with applicable regulations of OSHA 1926.750 and the Steel Erection Negotiated Rule Advisory Committee (SENRAC).

76. Plan the traffic controls for delivery of equipment or materials as well as any equipment operations. Control measures include warning signs, flagmen, traffic stoppage and control, and unloading procedures.
77. Analyze work adjacent to, in, or over water, including lakes, canals, dams, treatment plants, water tanks, clarifiers, and reservoirs, for hazards. Make provisions for change out of wet socks and clothing to prevent extended periods of working in wet clothing.

APPENDIX D

GE MASTER LOTO PROGRAM

GENERAL ELECTRIC COMPANY

LOCKOUT TAGOUT (LOTO) PROGRAM

Effective Date: May 24, 2010

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1.0 INTRODUCTION

The purpose of this program is to establish comprehensive General Electric Lockout and Tagout (LOTO) expectations and requirements. It establishes General Electric's expectations regarding safe methods of controlling energy during servicing and/or maintenance of machines and equipment. This program was designed to prevent injuries caused by unexpected activation of hazardous energies. Unexpected release of hazardous energy can include any unintended motion, energization, start-up or release of stored energy, deliberate or otherwise, from the perspective of the person(s) at risk.

This program provides for decision-making flexibility regarding hazardous energy control methodology. Alternative methods, when used, are based upon risk assessment. However, LOTO continues to be emphasized as the primary hazardous energy control approach.

The General Electric LOTO program will help the facility or operation/organization comply with country-specific regulatory requirements and the company EHS policy.

This program constitutes the minimum global General Electric Company LOTO expectations. The most important element of the program is that General Electric personnel and contractors shall not perform activities, as defined in Paragraph 2.3.1, with equipment energized. In special situations, a risk assessment process may be used to document the necessity to work on energized equipment (e.g., it is not possible to perform the task while using LOTO). In these situations, alternative energy control procedures providing equivalent protection to employees are required. There are other requirements and country specific regulations that will also need to be reviewed and addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment. This program provides General Electric's expectations regarding:

- responsibilities of all personnel involved in hazardous energy control;
- design issues that influence the methods of controlling energy sources;
- hazardous energy control program elements necessary for employee protection;
- development of alternative methods of energy control for tasks that are routine, repetitive and integral to the process, or where traditional Lockout/Tagout prohibits the completion of those tasks;
- special applications where traditional methods of hazardous energy control are inappropriate or impractical;
- communication and training requirements for involved personnel;
- management review of the total hazardous energy control process to ensure its functioning effectiveness.

1.1 Top Ten Safety Activities for LOTO

The top ten core requirements for using LOTO to prevent injuries are:

1. **One Lock, One Key, One Person:** The basis of LOTO is that any individual has "total control" of the lockout of the machine, equipment, process or circuit that is being serviced and/or maintained. This concept assures the individual sole lockout responsibilities.
2. **Effective Training:** Understanding lockout responsibilities, processes, methods and requirements result from effective LOTO training practices. The knowledge attained through training is reflected by practices of the site/operation. Effective training is proven by periodic inspection and includes provisions for demonstration and performance feedback.
3. **Alternative Methods:** Complete LOTO is always the first choice. Alternative methods are only permitted if 1) LOTO is not feasible or 2) the activity is considered to be routine, repetitive and integral to the production process. The alternative methods must be developed through Risk Assessment that includes identification, review and communication of additional regulatory requirements such that adequate protection is provided.
4. **Authorized/Affected Individuals:** Authorized individuals must be knowledgeable and able to perform all aspects of the LOTO process. Affected individuals must understand and respect the LOTO and not attempt to modify or remove LOTO done by others.
5. **The Proper Tools:** LOTO is conducted with a specific set of tools. These tools include keys, locks, multiple lockout devices, red tags and transition tags. Proper use and application of these tools is learned through this program and effective training.
6. **Equipment-specific LOTO Procedures:** Equipment-specific LOTO procedures provide detailed guidelines for safe lockout of each machine, equipment, process or circuit that is being serviced and/or maintained.
7. **LOTO Verification:** A "Zero Energy State" must exist in the machine, equipment, process or circuit before servicing and/or maintenance activities can begin. The best method possible must be used to verify that energy has stopped, released, dissipated or drained completely. Verification provides certainty that energization cannot occur while work is being performed. The verification (or "tryout") step must be included in each equipment or process-specific LOTO procedure.
8. **Shift or Personnel Changes:** The maximum permitted duration for a LOTO is one shift or the end of the task, whichever is shorter. Continuity of the LOTO process must occur as shifts or personnel change. This applies to both individual and group LOTO. It is important to assure that the LOTO process remains intact during these transition times by using direct LOTO hand-off, Transition Locks or other approved methods.

9. **LOTO for Contract Activities:** Whether contractors are working at a site/operation or General Electric individuals are performing contract work, it is of the utmost importance that all aspects of the General Electric LOTO policy are adhered to. As a best practice, the General Electric authorized representative may perform the LOTO step-by-step process (refer to Paragraph 5.2.1). The outside service or contractor will then be required to attach and secure Individual LOTO Locks and red tags to the same energy-isolating devices that the General Electric representative has locked out. This is commonly called "GE first on / last off".

10. **Risk Assessment:** Risk assessment explores the safest conditions possible for individual work assignments. Risk assessment establishes safe practices and alternative methods to reduce the possibility of injury when normal LOTO procedures cannot be applied. The risk assessment must also include identification and implementation of control measures for other regulatory requirements.

2.0 SCOPE, PURPOSE AND APPLICATION

2.1 SCOPE

This program establishes requirements for the control of hazardous energy associated with machines, equipment, processes and circuits that could cause injury to personnel.

This standard covers maintenance and/or servicing of equipment when unexpected energization or start-up of the equipment, or release of stored energy, could cause injury to employees. In addition, this program establishes minimum performance requirements for the control of hazardous energy. A key element of this program is the development of equipment or process-specific LOTO procedures for specific equipment.

2.2 PURPOSE

The primary purpose of this program is to furnish LOTO procedures that will significantly reduce the risk of injury for all General Electric employees and contractors. This standard establishes requirements and performance objectives for procedures, techniques, designs and methods that protect personnel where injury can occur as a result of the unexpected release of hazardous energy.

Total energy isolation is the expected method of energy control. There are provisions for alternative actions that must be followed when energy isolation is not possible. (Paragraph 2.3.2 discusses this further.)

2.3 APPLICATION

2.3.1 LOTO Application

This standard applies to, but is not limited to, activities that are performed on a machine, a piece of equipment, a process or circuit. Primary, secondary, stored and single source energy sources require a lockout when performing servicing and/or maintenance activities. Primary energy sources are the main energy sources, such as electricity, gas, fluids, etc., provided to machines, equipment, processes and circuits.

Secondary energy sources are downstream from the primary (or main) energy source. Secondary energy lockout points are used to isolate a specific component of a system without the necessity of locking out the entire system.

Stored energy must also be taken into consideration. Stored energy, such as motion, pressure, gravity, capacitance or temperature, is a potential hazard that still exists after a primary energy source has been locked out. For example, a pump motor for a hydraulic system may be locked out, effectively stopping fluid flow, but energy in the form of pressure may still exist in an accumulator. This pressure in the accumulator should be bled off before work proceeds. All stored energy must be controlled to ensure complete machine safety.

Single source machines are machines, equipment, processes and circuits that can be completely deactivated through the isolation and locking out of a single energy source.

Below is a listing of typical activities in which energy control procedures apply:

- erecting
- installing
- constructing
- repairing
- adjusting
- inspecting
- unjamming
- setting up
- troubleshooting
- testing
- cleaning
- dismantling
- servicing
- maintaining
- lubricating

LOTO applies to all sources of energy, including, but not limited to, those energy sources listed below:

- Primary and Secondary Energy Sources
  - Electrical
  - Pneumatic
  - Hydraulic
  - Gases
  - Water
  - Steam
  - Chemical/Coolant

- Radiation
- Magnetic

- Stored Energy Sources
  - Rotation (mechanical motion that can cause machine or equipment movement): flywheels, circular blades, etc.
  - Gravity (suspended material or parts that will move when energy is disconnected): dies, heads, elevators, etc.
  - Mechanical Energy (stored mechanical energy that can cause machine or equipment movement): compressed or extended springs, etc.
  - Thermal Energy (extreme heat above 140 degrees Fahrenheit, or cold below 41 degrees Fahrenheit): ovens, boiling water, chillers, etc.
  - Electrical Energy (stored electricity): batteries, capacitors, etc.
  - Hydraulic Energy (residual pressure): accumulators, lines, cylinders, etc.
  - Pneumatic (residual pressure): storage or surge tanks, lines, etc.
  - Gas (residual pressure): pipes, tanks, etc.
  - Water (residual pressure or stored): pipes, tanks, etc.
  - Steam (residual pressure): pipes, boilers, etc.
  - Chemicals/Coolant (residual pressure or stored): pipes, tanks, containers, etc.

2.3.2 Alternative Methods

When LOTO is not used for tasks specified in Paragraph 2.3.1 that are routine, repetitive and integral to the process, alternative methods of energy control may be used. The alternative methods are based on risk assessment and shall provide effective personal protection. There are other requirements and country specific regulations that will also need to be reviewed and addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment. (Refer to Section 5.3 and APPENDIX A.)

The reason for operator intervention (i.e., perform the task) is to sustain the machine, equipment, process or circuit continuity within the nominal performance range and output quality. This usually occurs when the machine, equipment, process or circuit is operating normally and the need for periodic service is predictable based on operating experience and product demands. Also, the tasks do not require that the machine, equipment, process or circuit be taken out of the operational mode to accomplish them.

Each site/operation shall be required to inventory and examine all tasks deemed to be "routine", "repetitive" and "integral to the process" and develop alternative methods based on risk assessment. If the tasks being reviewed do not substantially conform to the criteria, then LOTO must be used. Examples of tasks that may fall onto the inventory could include daily lubrication routines and tool changes.

NOTE

Minor tool changes and/or adjustment, set-up, unjamming, part location and cleaning do not require LOTO unless these conditions exist:

- bypassing or removing of guards or safety devices.
- placement of any body part in the machine, equipment, process or circuit operating area.
- no alternative method has been assigned to the task.
- task-specific training has not been provided.

If the situation does not fall under the "routine and repetitive" exception, and LOTO is not feasible for the given situation, an alternative procedure based on Risk Assessment must also be developed. This alternative risk assessment and procedure must also include a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment.

The site or operation must only allow for the use of an alternative method if it is very clear that complete LOTO cannot be used in the situation. Alternative methods are not be allowed where LOTO is feasible and the alternative methods if they simply present an easier, faster, less complex, or less costly approach to energy control. Examples of tasks that may not be feasible with complete LOTO could include robot teaching and electrical troubleshooting

3.0 LOTO DEFINITIONS

Adjacent Equipment/ Process: Adjacent machine energy sources are the primary and stored energy sources of a machine, equipment, process and circuit that, while not related to the primary machine, their nearness may present a hazard to persons working on the primary machine. To ensure safety, hazardous energy from adjacent equipment/processes should be identified. The minimum depth of clear working space on energized equipment, and the determination of the safe working distance needs to be determined.

Affected Individual: An individual who operates equipment on which maintenance or servicing is being performed under LOTO, or an individual who works in the area where such maintenance or servicing is being performed. This individual is not authorized to perform LOTO.

Alarm: An audible or visual means to alert personnel to an impending hazard, e.g., motion, or that a failure or malfunction of a machine, equipment, process and circuit has occurred.

Alternative Methods: Methods developed for energy control and protection of personnel for situations where complete LOTO cannot be used. Methods are developed based on risk assessment of the machine, equipment, process and circuit. This alternative risk assessment and procedure must also include a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment.

(Refer to Paragraph 5.3 and APPENDIX A.)

Associated Equipment/Process: Associated energy sources are those energy sources that interface with the primary piece of machine, equipment, process and circuit, but whose power is not dependent upon that machine, equipment, process and circuit. For example, a drill fixture may receive parts from a robot that takes parts off a conveyor, but removing power from the drill fixture does not remove power from the robot or the conveyor. The robot and conveyor may each be powered independently, but their physical association with the drill fixture is such that, for ultimate safety, these pieces must also be locked out. Therefore, both the robot and the conveyor have associated energy sources that must be identified.

Authorized Individual: A person who is properly trained and authorized to perform hazardous energy control (LOTO). Also known as Authorized Employee.

Control Header or Circuit:	The means of initiating or interrupting energy to a machine, equipment, process and circuit; also the circuit of a control apparatus or system that directs the performance of a machine, equipment, process or circuit but does not directly interrupt the flow of energy. Control headers or circuits may be hydraulic, pneumatic, electric or electro-mechanical.
Control Reliability:	A method to ensure that a device or system will stop or prevent initiation of hazardous motion in the event of a single component failure within the device or system.
Control System:	Sensors, manual input and mode selection elements, interlocking and decision-making circuitry, and output elements provided to the operating devices or mechanisms of the machine, equipment, process and circuit.
De-energized:	Physically isolated from all energy sources and not containing residual or stored energy. A zero energy state is verified as existing.
Dissipate:	The process of removing stored energy from a machine, equipment, process or circuit. The energy source steadily declines to a zero value after the energy source has been shut off and locked.
Energized:	Connected to an energy supply 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: a manually operated electrical circuit breaker, a disconnect switch, 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, a line valve, a block and any similar device used to block or isolate energy.

A device that utilizes a positive means, such as a lock, to hold an energy isolating system in a safe position and prevent the equipment from being energized.

Energy isolating devices also include blank flanges and bolted slip blinds. The authorized employee applying the device will have exclusive control of the device.

NOTE: Locks and multiple lock adapters are Lockout Devices, **not** Energy Isolating Devices

Energy Source: A resource that produces power, or has the potential to produce power, in forms of electricity, flow, pressure or movement.

Extended LOTO A process where GE LOTO Supervisor inserts his/her lock and tag at customer lockout device or group lockbox or other comparable mechanism and takes the key and places it in a group lockout box in GE work space (such as a trailer) and then ensures that all GE or affiliate employees place their personal lock and tag on the group lockout box in GE work space

NOTE: Extended LOTO can only be performed at customer sites where customer prohibits all GE or affiliate employees to insert their personal lock & tag in their lockout device or group lock box or other comparable mechanism.

Exclusive Personal Control: A means by which a single person controls equipment that may impact his/her safety.

Feasibility (Infeasibility) A high standard of determining whether or not something can be done or is "feasible" to do. For GE purposes there are three potential elements in feasibility determination. (1) Cost. Costs associated with safety are generally considered reasonable or "feasible" unless they would have a significant adverse impact on the profitability of the business. (2) Technical. Something is NOT feasible when it can be shown through a documented analysis that the necessary equipment or engineering technology is unavailable. (3) Operational. Due to the nature of a specific business it may not be reasonable or "feasible" to use certain controls or methods. For example, in a distributed or services workforce, it may not be possible or "feasible" to bring all employees together frequently for training.

NOTE: When an operation has determined through a feasibility study that certain company expectations are not feasible, the following steps are to be taken: (1) Use risk assessment to develop alternative control methods providing equivalent protection to employees. (2) Review with the business level EHS team.

General LOTO Lock: A key lock that is not assigned to an individual employee as an Individual LOTO Lock. This lock has only one key and master keys are not available. This lock may be used to lock out individual energy-isolating devices or energy sources when group or complex group LOTO is used. This lock may be left on for durations of greater than one shift. This lock is unique within the facility and is to be used only for LOTO.

Guard: A physical barrier or device that prevents access to areas of the machine, equipment, process and circuit where a hazard exists.

Hardwired: Operates independently of any programmable logic control devices.

Hazardous Energy: Any electrical, mechanical, hydraulic, pneumatic, chemical, nuclear, thermal, gravity or other energy (including potential and/or kinetic) that could cause injury to personnel.

Individual LOTO Lock: A type of key lock that is used for no other purpose in the facility/operation, having one key, and for which master keys are not available. Such locks are individually assigned (personal lock) to authorized individuals, or can be obtained from a central repository of LOTO devices, whereupon they become personal locks while in use by an individual. LOTO Locks are typically colored red.

Integrator: An entity that is responsible for assembling a group of interrelated or interacting machine, equipment, process and circuit components.

Interlock: A device or system whereby the status of one control or mechanism allows or prevents the operation of another.

Lockout Device: A positive means, such as a lock, that secures an energy isolating device in the safe position and prevents the energizing of a machine, equipment, process and circuit.

LOTO (lockout/tagout): The placement of a lock and red tag on the energy-isolating device in accordance with an established procedure, indicating that the energy isolating device shall not be operated until removal of the lock and red tag, in accordance with an established procedure.

Manufacturer: An entity that designs, fabricates, assembles or supplies machines, equipment, processes and circuits.

Modifier: An entity that changes or alters an existing machine, equipment, process or circuit so that its operation is affected in regard to the control of hazardous energy.

Red Tag "Danger Do Not Operate": Red tags (must be red in color) are used with every Personal LOTO Lock to indicate that the energy source is locked out and an authorized employee is actively working on the machine, equipment, process or circuit. Red tags may also be used with General Locks, but are not required to be used with General Locks. See Figure 2 for an example red tag design

Remanufacturer: Any entity whose business is the redesign or reconstruction of a machine or equipment.

Risk Assessment: A comprehensive evaluation of the probability and the degree of the possible injury or damage to health in a hazardous situation. The risk assessment is used to select appropriate safeguarding. This risk assessment must also include a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment. (Refer to Para 5.3.1 and APPENDIX A.)

Safe Working Distance When a risk assessment has determined that energy isolation is not feasible and work is going to be conducted on equipment that is unable to be de-energized, there are no other alternatives, and/or there are components on adjacent equipment that are energized and pose a hazard to the workers, a safe working distance must be determined and communicated to the workers in accordance to regulations within the country where work is being performed.

Safety Signs: A visual alerting device in the form of a sign, label, decal, placard or other marking that advises the observer of the nature and degree of the potential hazard(s) that can cause injury or death.

Servicing and/or Maintenance: Any activities to machine, equipment, process and circuit that represent repairs, preventive maintenance, modifications and installation (refer to Paragraph 2.3.1). These activities require that the machine, equipment, process or circuit, or their components, be at a "zero energy state". The personnel performing these activities must employ LOTO in accordance with established procedures. When LOTO of the machine, equipment, process and circuit cannot be performed, alternative methods shall be employed. This risk assessment to identify alternative methods must also include a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures, some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment.

(refer to Paragraph 5.3 and APPENDIX A).

Site/Operation: An entity that utilizes machines, equipment, processes and circuits covered by this procedure, and is responsible for personnel associated with hazardous energy control. This also includes customer locations where General Electric personnel may render services at the customer's request.

Tagout Device: A prominent warning, such as a tag and its method of attachment, that secures an energy-isolating device in a safe position and prevents the energizing of a machine, equipment, process or circuit.

Transition Lock: A key lock for which multiple keys may be available and is used on equipment or processes when they are not actively being serviced. Key control or access must be limited to a small, closely controlled group of authorized individuals. This lock must used in combination with a Transition tag "Caution do not Operate" to indicate an unsafe to operate condition. This lock must not be used as an Individual LOTO Lock and may never be used on equipment that is being actively serviced. This lock is also used with a Transition tag for the transition of complex/group LOTO when there is a gap between active work shifts.

Transition tag "Caution Do Not Operate": Transition tags (must be yellow in color) are used to indicate that a machine, equipment, process or circuit is out of service or inoperable, but no one is actively working on the system. Transition tags are not to be used in place of red tags. No activity to the machine, equipment, process and circuit may occur when a transition tag is placed. Transition tags are to be used only when energy control is needed for servicing or maintenance. Transition tags are not to be used as general "out of service" tags and may only be applied by Authorized Employees. See Figure 2 for an example transition tag design.

4.0 RESPONSIBILITIES

4.1 SITE/OPERATION

The site/operation shall be responsible for complying with the applicable provisions of this program by establishing an effective program for the protection of individuals from hazardous energy during activities listed in Paragraph 2.3.1.

The site/operation shall fully implement the provisions of this program within six (6) months of the effective date. New site/operations or acquisitions shall fully implement this program within six (6) months of initial operations as GE.

When General Electric is retained as a service provider at a customer site, General Electric personnel will adhere to this program, although special circumstances may require utilization of alternative actions. Upon request of the customer and approval by a qualified General Electric authorized employee, General Electric personnel may follow the customer's LOTO program, provided the program ensures equal or greater protection to authorized individuals. For additional information, refer to APPENDIX E.1 - Field Services.

4.2 AUTHORIZED INDIVIDUALS

Authorized individuals shall be identified by site/operation and be responsible for performing hazardous energy control in compliance with the site-specific program, procedures and detailed training provided to them by the General Electric business and/or site/operation.

4.3 AFFECTED INDIVIDUALS

Affected individuals consist of all personnel who are not authorized individuals and who must receive LOTO awareness training, which will include the importance of not attempting to start up a locked out machine, equipment, process or circuit. Affected individuals need to recognize and understand LOTO procedures.

5.0 HAZARDOUS ENERGY CONTROL PROGRAM

5.1 LOTO PROGRAM

The site/operation/service organization shall establish a written program for hazardous energy control that details the requirements of the LOTO program and the development and approval of alternative methods where appropriate. The written program shall be based on this LOTO program and the General Electric Framework Workplan for Health and Safety Framework Element 21, Lockout-Tagout. The purpose of the program is to ensure that risk of exposure to hazards will be eliminated or minimized before any authorized individual performs any activity where the unexpected energizing, start-up or release of stored energy could occur and cause injury (see Figure 1).

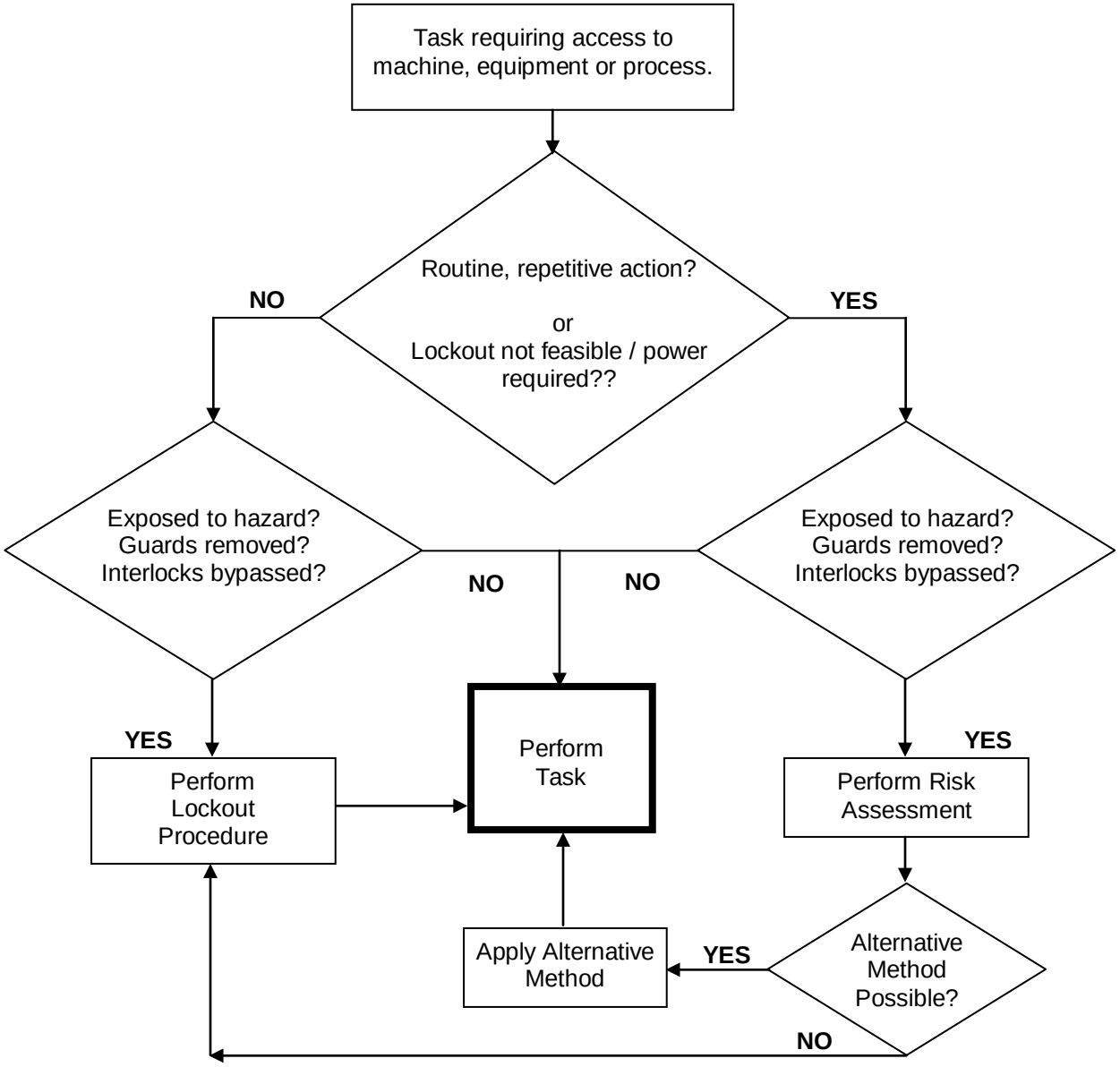


Figure 1. Decision Matrix for Safeguarding Hazardous Energy

5.1.1 Key Elements of the LOTO Program

The LOTO program shall consist of the following elements to provide effective protection of personnel:

- survey and inventory of all hazardous energy (electrical, pneumatic, hydraulic, etc.);
- identification of all isolation points (i.e., by labeling each point or specifically indicating the location of the isolation points in the written equipment specific LOTO procedures);
- identification of energy-isolating devices needed;
- selection and procurement of protective materials and hardware;
- assignment of duties and responsibilities;
- written procedures (site specific and equipment/process specific) documenting the shut-down, de-energization, verification, re-energization and start-up sequences; for machines, equipment and processes;
- training, re-training and evaluation of personnel;
- periodic inspections;
- auditing of program elements.

5.1.2 General Requirements for LOTO

LOTO shall be used on all energy-isolating devices capable of being locked out. An energy-isolating device is capable of being locked out if it has one of the following:

- a hasp or other means of attachment to which, or through which, a lock can be affixed;
- a locking mechanism built into it;
- a means to achieve lockout without the need to dismantle, rebuild or replace the energy-isolating device, or permanently alter its energy control capability.

Performing maintenance or servicing tasks covered by this program while the equipment or process is energized is prohibited, unless the following apply:

- the Risk Assessment (RA) documents the necessity of working energized;
- the RA is approved by both operations leadership and EHS;
- the RA establishes the alternative procedures to be used;
- This risk assessment must also include a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures, some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment.

- authorized employees who will perform the task have been trained on the alternative procedures;
- other training required by regulation has been completed.

Tagout only is prohibited unless a risk assessment documents the inability to lockout and develops approved alternative methods. If an energy-isolating device is not capable of being locked out or modified to accept lockout, a tagout program shall be used as defined by the risk assessment for the equipment or process. When field service employees work in industries where lockout is not used (U.S. power generation and distribution industries are regulated under a special LOTO standard that does not require LOTO), the risk assessment process may be used to assess or develop alternative procedures. This risk assessment can be performed in advance, and can apply to all similar work situations for that business. (Refer to Paragraph 5.3 and APPENDIX A.)

When a tagout device is used on an energy-isolating device that is NOT capable of being locked out, the tagout device shall be attached at the same location where the lockout device would have been attached, and the site/operation (or Services Project Leader) shall demonstrate, through a risk assessment, that the tagout program adequately controls risk.

In demonstrating that an effective level of safety is achieved in the tagout program, the site/operation shall demonstrate full compliance with all tagout-related provisions of this program, together with such elements as are necessary to provide equivalent safety available from the use of a lockout device. Additional protective means shall include, but are not limited to, the following: safe electrical work practices; safe working distance. (This should

be a hyperlink to the definitions section above.

- the removal of an isolating circuit element by removal of fuses, blocking of a controlling switch, or opening an extra disconnecting device;
- the removal of a valve handle to reduce the likelihood of inadvertent energization.

5.1.3 Equipment-specific LOTO Procedures

5.1.3.1 An important element of the overall hazardous energy control program is the development of equipment/process-specific procedures for all machines, equipment, processes and circuits. The procedures identify the machine, equipment, process and circuit and/or component name, energy type and magnitude, location and methods required to bring energy sources to a zero level. These procedures must be detailed and specific to the piece of equipment to be locked out, and if a specific order of lockout steps is necessary, that order must be clearly established.

5.1.3.2 Where an operation has more than one piece of similar equipment or more than one identical system or process line, the same procedure may apply to all, provided the actual energy

isolation procedures and energy-isolating device locations are the same for all equipment. This practice is subject to verification that all such pieces of equipment have been verified to operate in the same manner. These procedures shall be posted or otherwise readily available for authorized individuals to review and use. For example, a facility that has three identical mechanical power presses may have one procedure covering these three mechanical power presses. Similarly, another facility with six identical milling machines may have one procedure covering the six milling machines, provided that the locations of disconnects for each machine are clearly indicated in the procedure.

5.1.3.3 Plug-and-cord connected equipment: Where a machine, equipment, process or circuit has a single energy source that will accomplish complete deactivation, written procedures shall not be required as long as the disconnect for this energy source remains under the sole control of the authorized individual. This means within sight and arm's reach. This only applies to work on single energy source plug-and-cord connected electrical equipment for which exposure to the hazards of unexpected energization or start up of the equipment is controlled by unplugging the equipment from the energy source and by the plug being under the exclusive control of the individual performing the maintenance or servicing activity. If the plug cannot be maintained under the exclusive control of the individual, a lockout device must be used on the plug and an equipment specific procedure is required.

5.1.3.4 LOTO procedures for single energy source equipment that is not cord & plug connected may be handled as follows: Equipment for which the single energy disconnect is labeled, and the energy disconnect is immediately and obviously visible from the location of the equipment may be covered by a single equipment-specific LOTO procedure covering all equipment of this type at the site or operation. Individual equipment specific procedures are required for all other single source equipment that does not meet the conditions above.

5.1.3.5 Procedure Elements. The procedures shall clearly and specifically establish the requirements for effective isolation of the machine, equipment, process and circuit. Procedures shall include the following:

- identification of the machine, equipment, process and circuit;
- energy sources and magnitudes (i.e., 480V electrical, 90 psi air);
- listing of all required energy-isolating devices;
- specific procedural steps to obtain a zero energy state (shutting down, isolating, blocking and securing machine, equipment, process and circuit to control hazardous energy; dissipating stored electrical, kinetic, or potential energy);
- specific procedural steps for completing tryout, or verification that the machine, equipment, process and circuit has been fully de-energized;

- specific procedural steps for the placement, removal and transfer of lockout devices or tagout devices and the responsibility for them.

5.1.3.6 The site/operation shall prepare a written LOTO program detailing the development of LOTO procedures used at the facility. The procedures shall specify that prior to the performance of any servicing and/or maintenance activities, all potentially hazardous energy shall be identified, isolated, brought to a zero energy state, then locked out or tagged out.

5.1.3.7 The site/operation shall establish guidelines for consistent formatting of written procedures. For example:

- Validation: a knowledgeable person responsible for that procedure shall verify each procedure for its accuracy, completeness and energy control effectiveness. Validation must confirm that a zero energy state exists when procedures are performed.
- Approval: Each procedure shall be approved by the site/operation designee before implementation.
- Document Maintenance: The site/operation shall ensure that procedures are kept current and up to date by means of a change management system. Periodic reviews of procedures shall be conducted by the site/operation to ensure they are current. When a procedure has been revised, the current and previous revision of each procedure shall be retained. The date of creation, revision and update of each procedure shall be maintained.
- For customer locations where GE personnel may render services at the customer's request, refer to guidelines in APPENDIX E.1.1.

5.1.3.8 Protective Materials and Hardware. All applicable protective materials and hardware required to effect isolation of energy shall be provided by site/operation.

Each lockout device and tagout device shall be uniquely identified; shall be the only device(s) used for controlling hazardous energy; shall not be used for other purposes; and shall meet the following requirements:

- Lockout and tagout devices, including their means of attachment, shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.
- Lockout and tagout devices shall be standardized within the facility in at least one of the following criteria: color, shape, size, or specific markings; and additionally, in the case of tagout devices, print and format shall be standardized.
- Lockout and tagout devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal without the use of excessive force or destructive techniques.
- Locks shall have only a single key for which master keys are not available. NOTE: Transition Locks may have more than one key.

- Lockout and tagout devices shall indicate the identity of the authorized individual applying the devices.
- Red tags shall be affixed to every LOTO lock. Red tags will have the “Danger” header and a field for the date LOTO was applied. The red tag will indicate that the equipment is locked out and servicing and/or maintenance is actively being performed. Using a comment area on the tag can provide additional information about lockout, servicing and/or maintenance conditions. Red tags are not used as lockout devices alone. An example Red tag design is shown in Figure 2.
- Transition tags shall be affixed to a machine, equipment, process or circuit indicating an “out of service” or inoperable condition. A transition tag indicates that the machine, equipment, process or circuit is not operating and no service and/or maintenance activity is occurring. The header shall read “Caution” followed by “Do Not Operate”. Using a comment area on the tag can provide additional information about lockout, servicing and/or maintenance conditions. Transition tags are not used as lockout devices alone. An example design of a Transition tag is shown in Figure 2.
- Except where infeasible or prohibited by local regulation, Transition Locks shall be applied along with transition tags to prevent the inadvertent start-up of the equipment/process/circuit.
- "Out of service" tags may be used to indicate a long-term out-of-service condition and must be distinct in design (at least one of the following: color, pattern, warning text, etc.) from any tags used for LOTO or Transition purposes
- Tagout devices shall be constructed and printed so that exposure to weather conditions, wet and damp locations or corrosive environments will not cause the tag to deteriorate or the message on the tag to become illegible.
- Tagout devices shall warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as one of the following: “Do Not Start,” or “Do Not Operate.”
- For customer site work, all applicable protective materials and hardware required to effect isolation of energy shall be provided by site/operation. Please refer to APPENDIX E.1.2.

Figure 2: Example designs of Red Tag and Transition Tag

5.1.3.9 All energy-isolating devices shall be identified by adequately labeling, marking or specifically identifying in the written LOTO equipment procedures to indicate their function, unless they are located and arranged so their purpose is evident. The identification shall include the equipment supplied, the energy type and magnitude. The marking shall be of sufficient durability to withstand the anticipated environment. LOTO procedures must clearly identify the exact locations of the energy-isolating devices by photographs, location maps or other means. The purpose of energy isolating device identification is to eliminate all possible sources of confusion for the authorized employee.

Marking of energy isolation devices shall be uniform within GE owned or controlled site/operations, and where allowed at customer locations.

Examples of marking and labeling include attached or embossed markings and signs such as: “Main Breaker (440 V) Press 3”, “Natural Gas (50 psi) Shutoff Process Line 2”, “Drive Power Isolation Axis X Only”, “High Pressure (600 psi) Return Line Disconnect”.

Electrical boxes can be labeled directly on the box. Valves can be labeled on the valve body or with a suspended sign or tag.

5.1.3.10 LOTO shall be performed only by authorized individuals. Authorized individuals may include, but are not limited to, maintenance, engineers, production managers and technicians. Authorized individuals isolate energy sources using Individual LOTO Locks and red tags provided by the site/operation.

5.2 LOTO METHODS

The selected method of hazardous energy control depends on whether the task can be performed with or without energized conditions. In all cases, the primary method of control shall be LOTO as specified in Paragraph 5.2.1. Develop and insert flow chart that includes LOTO to NFPA 70E to safe working distance to LOTO, etc).

5.2.1 When LOTO is not used for tasks that are routine, repetitive and integral to the process (refer to Paragraph 2.3.2), or performing LOTO would prohibit the completion of a task, alternative methods shall be used. However, before adopting alternative methods of control, the site/operation shall conduct a risk assessment that demonstrates the adequacy of the evaluation and the effectiveness of the protective measures (see Paragraph 5.3.1). LOTO Step-By-Step Process

Authorized individuals who are trained in the LOTO program are ready to perform the LOTO process. The step-by-step process defines the actions required in the LOTO process. The following actions should be done in the following sequence:

1. Preparation for shutdown: Authorized individuals shall understand the applicable procedures, acquire the necessary protective materials and hardware, identify the notification requirements, determine associated or adjacent machine, equipment, process and circuit and assess the consequences of the shutdown.
2. Notification of personnel: Personnel who may be affected shall be notified prior to the application and after the removal of lockout devices or tagout devices. (Personnel may include operators, technicians, engineers or area managers.)
3. Machine, equipment, process and circuit shutdown: Authorized individuals shall follow procedures established by site/operation including alternative methods and adherence to newly developed risk assessment to de-energize or shutdown machines, equipment, processes and/or circuits. The operator or technician may be required to ensure sequential shutdown. (Sequential shutdown decreases potential hazards and reduces possibilities of machine damage.)
4. Machine, equipment, process and circuit isolation: Authorized individuals physically locate all energy-isolating devices (disconnects, valves, etc.) required by the equipment-specific LOTO procedure. The energy-isolating devices are then positioned (closed, blocked, etc.) to stop energy flow to the machine, equipment, process and circuit. The authorized individuals shall verify the condition of the energy-isolating devices and their capability to stop energy flow.

NOTE

Partial or localized LOTO may be used on complex machinery, equipment, processes and circuits where it is necessary to:

- isolate power or motion for a specific component while maintaining power to other systems,
- support utilities and other devices and components.

Such procedures shall be documented in the equipment-specific LOTO procedure, or may be established through the risk assessment procedures. If the scope of work or job tasks change or take place during the work being performed, a new risk assessment must be developed and adhered to prior to

continuation of the task. Lockout or tagout device application: The authorized individuals shall attach and secure lockout or tagout devices. Use the following guidelines:

- Individual LOTO Lock and red tag shall be attached and secured to the machine, equipment, process or circuit energy-isolating device (disconnect, valves, etc.). When an energy isolating location is not designed to accept a lock, use of a lockout device such as a clamshell, ball valve, circuit breaker, wall switch or gate valve is required. Note that "1 lock, 1 key, 1 person" is the rule that must be followed.

NOTE

Group lockout with lock box may also be used in complex, multi-person applications. See Paragraph 5.2.5 for an explanation of complex/group lockout.

- Verify that the energy-isolating devices remain "locked out" and in a "safe" or "off " position.

- Where a red tag cannot be attached and secured directly to the energy isolating device, the red tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the machine, equipment, process or circuit. In addition, a tag shall be placed at the operator's control position to alert personnel that the machine, equipment, process and circuit are de-energized. For example, where an electrical bus with integral isolating switches is located overhead, the tag would be placed conspicuously on the operator panel warning not to use the equipment.

5. Controlling stored energy: The authorized individual shall ensure that all potentially hazardous energy (stored, residual, chemical or potential) is relieved, dissipated, restrained, drained or otherwise controlled. Additional measures may be necessary to prevent re-accumulation of energy to protect individuals. Examples of stored energy systems include accumulators, capacitors, gravity, surge tanks, chemical lines and springs.

Verification of isolation: The authorized individual shall verify that isolation and de-energization have been accomplished using the procedures in the equipment-specific LOTO procedure prior to starting servicing and/or maintenance on machines, equipment, processes and circuits that have been locked out or tagged out. Verification must confirm that the machine, equipment, process or circuit has achieved a "zero" energy state such as 0 electricity, 0 pneumatic, 0 fluid or gas pressures, etc. (Verification of a zero energy state can be accomplished by test equipment, circuit activation attempts, gages, visual inspection, etc.) Return to service: The authorized individual shall perform the following before returning the equipment to service:

- Inspect the work area to ensure that non-essential items have been removed, guards are in place, the machine, equipment, process or circuit is operationally intact, and all personnel are in a safe location.
- Remove locks, tags and lockout devices from each energy-isolating device by the authorized individual who applied the device or by compliance with Paragraph 5.2.4.
- Notify affected personnel that energy is about to be restored to the machine, equipment, process and circuit.
- Visually inspect and/or cycle test the equipment for servicing and/or maintenance task completion. If the task is completed the machine, equipment, process and circuit may be returned to service. If the task is not completed, repeat the necessary LOTO steps.
- Follow the proper sequential startup steps for the equipment, process or circuit.

5.2.2 Lock Application and Usage

Table 1 below summarizes the application and use of the three different types of locks covered in this program.

Table 1. Lock Usage

Lock Type	Purpose	Duration of Use	Lock Color	Key	Tags
General	Not assigned to an individual employee and used to lock out individual energy-isolating devices or energy sources when group or complex group LOTO is used.	Multiple shift use is permissible.	Specific lock color is not required but lock must be unique and used for LOTO only.	Only one key; master keys are not available.	Not required, but may be used.
Individual	Assigned to and used by authorized individuals only.	Single shift use only.	Specific lock color is not required but red is typically used.	Only one key; master keys are not available.	Red tags required.
Transition	Used on equipment or processes when they are not actively being serviced.	Multiple shift use is permissible.	Specific lock color is not required but lock must be unique and used for LOTO only.	Multiple keys are permissible and made available but key control or access is limited to a small, controlled group.	Transition tags required.

5.2.3 Provisions for Energy Control Interruption

In situations in which LOTO must be temporarily removed from the energy-isolating device(s) and the machine, equipment, process and circuit must be either fully or partially energized to test, troubleshoot or position the machine, equipment, process or circuit or a component thereof, the sequence of actions detailed in Paragraph 5.2.1, Step 0 shall be followed.

When the energy is no longer needed, re-apply LOTO according to the appropriate instruction found in Paragraph 5.2.1.

5.2.4 Procedures for LOTO Device Removal Without Authorized Employee

When the authorized individual who applied the LOTO device is not available to remove it, that device may be removed under the direction of the site/operation leadership, provided that specific procedures and training for such removal have been developed, documented and incorporated into the energy control program. This system should be comprised of at least three individuals knowledgeable of the work being performed in addition to the following elements:

- verification by the appropriate supervisory personnel that the authorized individual who applied the device is not reasonably available or not at the facility;

- ensuring that the authorized individual has been informed before he/she resumes work at that facility that his/her lockout or tagout device has been removed.

5.2.5 Group and Complex Group LOTO

Machine, equipment, process and circuit may require servicing and/or maintenance by more than one authorized individual. Each authorized individual performing service and/or maintenance must apply his/her Individual LOTO Lock. Every authorized individual who applies an Individual LOTO Lock shall verify that the machine, equipment, process or circuit has attained a zero energy state or observe the verification process. Multiple lock application can be accomplished with the following:

- multiple lock devices (hasps) that accommodate several Individual LOTO Locks;
- The use of General LOTO Locks and a lock box. For example, if a machine with multiple energy sources is going to be serviced by multiple personnel, it may be useful to use General LOTO Locks at the energy sources. Keys for the General LOTO Locks are held in lock boxes to which employees attach their Individual LOTO Locks.
- Lock boxes when an energy-isolating device can accommodate only one key. This key is placed inside the lock box and all authorized individuals servicing and/or maintaining the machine, equipment, process and circuit secure and attach their Individual LOTO Locks.

Complex group LOTO conditions arise when all energy-isolating devices protecting the affected work activity are secured by LOTO but are not controlled directly or via lock box by each authorized individual, and more than one of the following conditions applies;

- a significant number of energy-isolating devices or authorized individuals are involved;
- the energy isolating device(s) is relatively inaccessible;
- there is interdependence and interrelationship of the system components.

For cases similar to that mentioned above, the site/operation shall designate authorized individuals who shall be responsible for ensuring an equivalent level of personal protection for each member of the group. Methods of achieving this protection may include utilizing individual continuous accountability methods such as work permits, control boards, etc. Verification shall take place to determine the effectiveness of the energy isolation. For customer site guidelines, refer to APPENDIX E.1.3.

NOTE

In the servicing and/or maintenance of sophisticated and complex process equipment utilized in the petroleum, utility, metal and chemical industries, adaptation and modification of normal group LOTO procedures may be necessary to ensure the safety of the employees performing the servicing and/or maintenance.

Refer to the Group/Complex LOTO decision tree in APPENDIX C.

5.2.6 LOTO Supervisor

Rare circumstances may exist in which it is safer to rely on a single authorized individual to oversee LOTO for other employees, rather than train all individual employees in proper LOTO procedures. These circumstances may occur when, due to individual employee skill level and system complexity, a greater hazard may occur when normal LOTO is practiced. This section creates a limited authorization to allow a qualified authorized individual to oversee LOTO protection for one or more non-authorized employees. These employees will be given locks by the LOTO Supervisor and shown where to place them to assure their individual control of the energy source(s) while working. Any authorized individual who is asked to serve in a LOTO Supervisor role must acknowledge that they are accepting responsibility for the safety of all personnel to be protected by the LOTO. Per the requirements listed below, a site/operation may implement a LOTO Supervisor system when:

- A risk assessment has been completed that documents the greater hazard that would be controlled by using the LOTO Supervisor method, and the specific alternative procedures to be implemented.
- The global Business Level Health & Safety Leader (not a sub-business within one of the major GE businesses) has reviewed the risk assessment and provided documented approval of the need for the use of the LOTO Supervisor approach and the specific alternative procedures to be used. Such approvals may be in the form of a blanket approval or procedure for LOTO Supervisor applications that are expected to be repeated periodically.
- All employees to be protected by LOTO receive training on the procedures the LOTO Supervisor follows. The employees have the right to either perform LOTO verification or observe the LOTO Supervisor perform verification.
- The LOTO Supervisor must be present on the facility at all times that the LOTO is in place, and must be in possession of a list of all employees protected by the LOTO.
- Lockouts under the LOTO Supervisor method are limited to the length of the task or the end of the shift, whichever is shorter.

For group verification guidelines, refer to APPENDIX E.2.

Placement of a LOTO under the LOTO Supervisor method involves the following steps:

- Place the LOTO following the procedures in Section 5.2.1 LOTO Step-by-Step Process, and the equipment-specific LOTO procedure for the equipment or process being locked out.
- Inform the employees to be protected by the LOTO of their right to perform the verification step, or observe the LOTO Supervisor perform verification, and provide the employees with the opportunity to exercise this right.

5.2.7 Shift or Personnel Changes

The maximum permitted duration for a LOTO is one shift or the end of the task, whichever is shorter. Specific procedures shall be utilized during shift or personnel changes to ensure the continuity of LOTO protection. This includes provisions for the orderly transfer of LOTO devices between off-going and on-coming authorized individuals. There are two distinct methods of shift or personnel change LOTO transition. These methods should never be mixed or combined. (See Figure 3)

Option 1: The immediate hand-off of LOTO in progress. Authorized individuals of the outgoing shift remove their Individual LOTO Locks and red tags. Authorized individuals of the next shift simultaneously apply and secure their Individual LOTO Locks and red tags at the same energy-isolating device and verify that a zero energy state exists in the system via the "tryout" process.

Option 2: Application of Transition Locks. Authorized individuals use this method when servicing and/or maintenance continues over multiple shifts, but there is no immediate hand-off of LOTO in progress. The steps of the method are listed below:

- The authorized individual that was performing servicing and/or maintenance removes his/her Individual LOTO Lock and red tag.
- A Transition Lock and transition tag are then attached and secured to the same energy-isolating device.
- The Transition Lock and transition tag remain in place until the next worker arrives to continue the work.
- The transfer key will be controlled by the next shift maintenance supervisor or similar authorized person.
- The next worker to work on this machine (second authorized individual) removes the Transition Lock(s) and transition tag(s) and applies his/her Individual LOTO Lock(s) and red tag(s).
- Second authorized individual verifies “zero” energy with the “tryout” process. Note that if the original worker will be the one to continue the work on the next day, this person will keep control of the key(s) belonging to the Transition Lock(s). Alternatively, all authorized employees in a department (for example, Maintenance) may hold a key for the department Transition Locks.

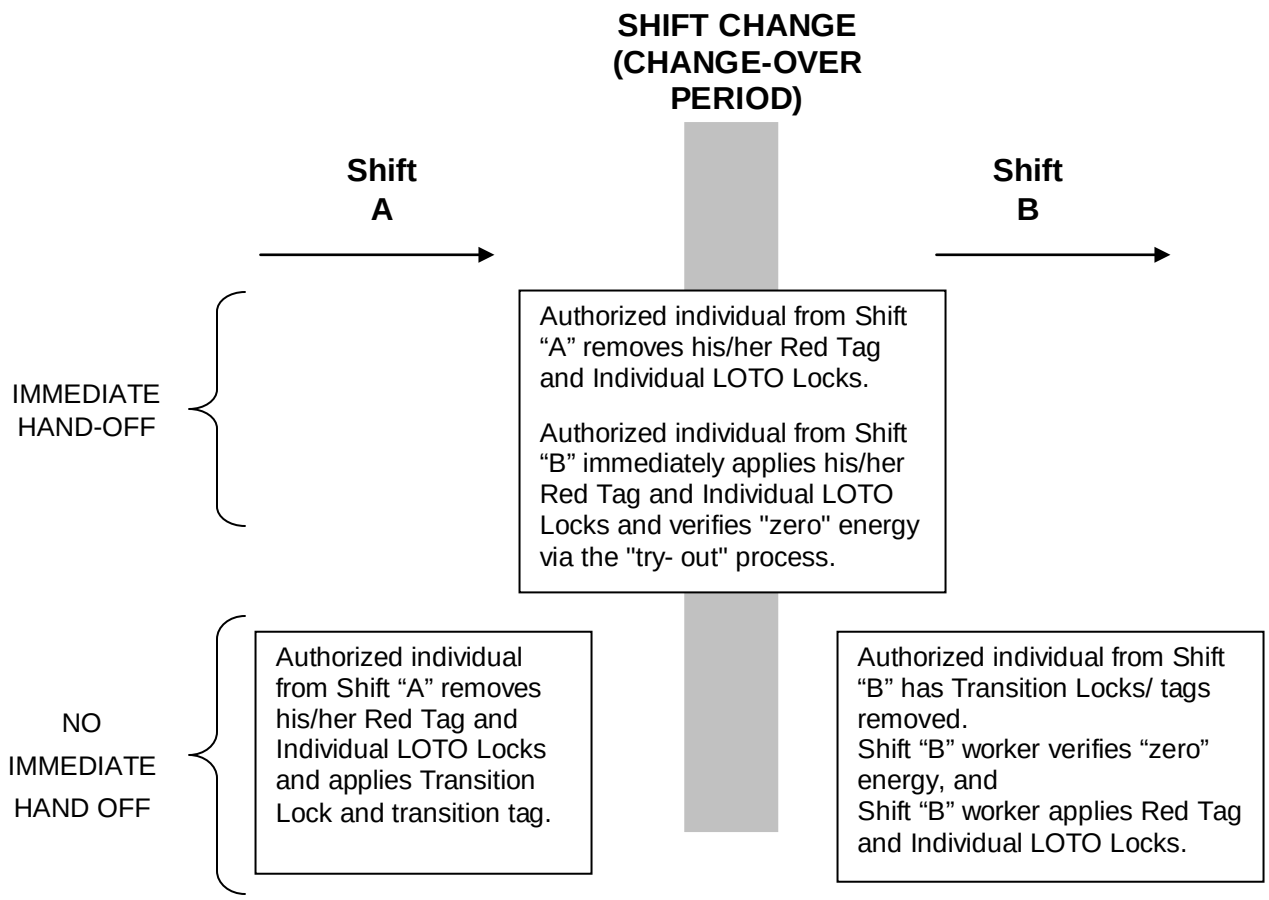


Figure 3. Sample of LOTO Shift or Personnel Changes

NOTE

Original LOTO (red tag and Individual LOTO Lock) may remain in place if the worker who originally applied them has not physically left the site, and the servicing and/or maintenance will be completed within the same shift. For example, if servicing and/or maintenance is temporarily interrupted while waiting for a part, the original LOTO can remain in place. If the servicing and/or maintenance is not completed within that original shift, the procedures using Transition Locks will need to be followed.

If the equipment or process is in an "out of service" condition, then the transition locks and tags may not be used. "Out of service" tags or another tagging methods shall be used in these situations.

Communication is an important part of the shift or personnel change process. LOTO and servicing and/or maintenance information must be exchanged between authorized "red" and "transition" tags, both of which have remark areas to provide additional information.

During the shift or personnel change process, every authorized individual who applies a Individual LOTO Lock shall verify (or observe verification) that the machine, equipment, process or circuit has attained a "zero" energy state.

NOTEs

Field Service personnel must coordinate LOTO procedures at the customers' sites with their customer representative. Generally, energy isolation devices cannot be secured without permission from the customer, and in concert with the site personnel. Further, isolation devices are removed only after communication with the customer representative.

Customer sites with GE controlled work environment and where the **customer prohibits** the use of transition lock & tag, an authorized employee may leave his/her LOTO locks & tags on the lockout device, lockbox or other comparable mechanism for the duration greater than one (1) shift, provided the following controls are in place: (1) The LOTO Supervisor must perform prior to each shift a re-verification of critical energy isolation source(s) for the LOTOed system before giving authorization to his/her employee to resume work, (2) Affected GE businesses must include the above provision in their business level LOTO Procedure. Sites where customer controls the work environment, GE LOTO Supervisor, at the beginning of each work shift must review customer energy isolation source(s), re-verify critical isolation source (s) and make necessary changes to the onsite GE LOTO process, if required before authorizing his/her employees to resume work on customer LOTOed equipment/systems

5.2.8 Remote or Noncontiguous Locations

DELETED

5.2.9 Outside Service or Contractor Personnel

The LOTO program and procedures of outside services or contractors must provide protection equal to or better than the General Electric LOTO program. General Electric requires that LOTO programs for outside services or contractors are reviewed by authorized General Electric personnel. General Electric and outside service or contractor personnel shall each designate a representative responsible for determining their relationship, responsibilities and obligations regarding hazardous energy control prior to the outside service or contractor starting work or providing services.

As a best practice, the General Electric authorized representative may perform the LOTO step-by-step process (refer to Paragraph 5.2.1). The outside service or contractor will then be required to attach and secure Individual LOTO Locks and red tags to the same energy-isolating devices that the General Electric representative has locked out.

5.2.9.1 Hazard Notification. General Electric personnel shall inform the outside service or contractor-designated representative of any special or unique hazards that are related to the machinery, equipment, process or circuit and that may endanger the outside service or contractor employees.

5.2.9.2 Program Coordination. All outside service organization or contractor programs shall be coordinated with General Electric's hazardous energy control program when there is integration of job tasks. Protection for all individuals within the facility who may be affected shall be mutually understood, communicated and agreed upon between the parties.

5.2.9.3 Communications. General Electric personnel and outside services or contractors shall keep each other informed of any activities or conditions that may adversely affect the application of hazardous energy control or impact the normal operation of machines, equipment, or processes and circuits. The General Electric representative should supply the service or contractor with a copy of the operation/site-specific LOTO program. The General Electric representative should review with outside services and contractors all expectations, rules and hardware involved in the LOTO process. All written copies of the contractors' LOTO program and all project safety information shall be kept on file with the General Electric representative for the life of the project.

NOTE

Examples of activities or conditions that warrant communication between the parties include interruption of energy supply, disabling a fire protection/security system, emergency alarm systems, hazardous area ventilation and special equipment that is needed for energy isolation.

5.2.9.4 General Electric as the Outside Service. The responsibility of General Electric personnel when involved in providing services includes:

- complying with the General Electric LOTO program;
- assessing and making determination (by a qualified General Electric Authorized Employee) that customer LOTO programs provide equivalent protection as General Electric programs where the customer wants/requires adherence to their procedures;
- communicating with the customer regarding LOTO requirements and conditions;
- reporting deviations and/or discrepancies to your Business Level Health and Safety or EHS Leader;
- discontinuing work when presented with an unsafe condition.
- Conducting this risk assessment that includes a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE,

approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment.

5.3 Field service personnel should request customer equipment-specific LOTO procedures when performing servicing and/or maintenance activities. Risk assessment must be performed to establish energy control procedures when customer LOTO documentation does not exist. Risk assessment on customer equipment should involve a customer representative knowledgeable on the equipment whenever possible. ALTERNATIVE METHODS

When LOTO is not used for tasks that are routine, repetitive and integral to the production process (refer to Paragraph 2.3.1), or traditional LOTO prohibits the completion of those tasks, then an alternative method of control shall be used.

Selection of an alternative control method by the site/operation or the field service personnel shall be based on a risk assessment of the machine, equipment, process and circuit as specified in Paragraph 5.3.1. The risk assessment shall take into consideration that existing safeguards provided with the machine, equipment, process and circuit may need to be removed or modified to perform a given task.

The alternative method selected shall have detailed procedures developed and documented for the control of hazardous energy and authorized employees shall be trained in these procedures prior to implementation.

The process for developing alternative procedures can also be applied to situations where a customer requests that General Electric employees use customer LOTO procedures. A knowledgeable authorized employee can review the customer procedures to determine whether they are at least as protective as General Electric procedures. If so, then General Electric employees may be trained on and utilize the customer procedures.

NOTE

- Activities that might be performed using alternative methods include die changing, production part jam clearing, make-ready, lubrication, tool changes and set-up.
- It is important that the correct devices are selected for the application. An engineering review will ensure that proper safety devices are utilized. If the engineering review identifies an application where special engineered devices such as blocks, racks, supports, pins, etc. are required, these devices shall be designed and built using adequate safety factors.

5.3.1 Risk Assessment

Risk assessment shall be performed to determine alternative methods for tasks that either a) cannot be performed under LOTO or b) are routine repetitive and integral to the production process. Risk assessment determines an overall safety strategy for a machine, equipment, process or circuit that does not require LOTO. The results of risk assessment include:

- awareness of hazards related to the task to be performed;
- familiarity with the task process;
- availability of reference documents (risk assessment forms (see APPENDIX A));
- identification of personal protective equipment for use during task performance.
- Includes a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment.

Please refer to Alternative Methods in Paragraph 2.3.2.

General Electric risk assessment procedures are detailed in APPENDIX A.

5.3.2 Hierarchy of Alternative Control Implementation

A hierarchical process shall be employed in the selection of alternative control methodologies in the following order of preference:

- eliminate the hazard through design;
- use administrative controls (such as safe work procedures, practices and training) as specified in Paragraph 5.4;
- use personal protective equipment as specified in Paragraph 5.3.4.

When the alternative methodology has been determined, appropriate communication and training of individuals shall be developed and provided.

NOTE

The objective of this process is to select the highest level of feasible control(s). In many cases, application of any single control methodology is not adequate to provide an effective level of protection for personnel. It may be necessary to use a combination of the methodologies to provide individuals with equivalent protection to LOTO.

5.3.3 Exclusive Personal Control

The site/operation or field service personnel shall provide a means of exclusive personal control to prevent exposure to the hazardous energy. Equipment, procedures and methods are designed so that authorized personnel performing alternative methods have absolute control. Some exclusive personal control examples include the following:

- a robot teach pendant may be considered an exclusive control device if the operator is holding the pendant at all times, the robot is in slow speed (teach mode) and the pendant has an automatic off switch if it is not held;
- manually-actuated controls within sight and arm's reach may be considered an exclusive control device.

For extended LOTO system guidelines, refer to APPENDIX E.1.3.

5.3.4 Personal Protective Equipment

When engineered safeguards, warning/alerting techniques, safe work procedures or any combination of these factors do not provide an acceptable level of protection for the authorized individual performing the work, then the use of personal protective equipment identified from the risk assessment will be required.

5.4 COMMUNICATION AND TRAINING

5.4.1 Communication

The operations leader for the site operation shall be responsible for ensuring that all affected and authorized individuals are informed regarding the provisions of the hazardous energy control program. The operations leader for the operation shall also be responsible for ensuring that appropriate authorized individuals are apprised of aspects of the hazardous energy control program such as changes in the program, incident experience, progress against the plan, performance data, auditing results and other pertinent details.

5.4.2 Training Overview

Authorized individuals shall be trained prior to performing any type of LOTO activity. Affected individuals shall also be trained per this program. Table 2 is a summary of the training requirements. Table 3 summarizes the training frequency requirements. (Paragraphs 5.4.3 and 5.4.4 provide additional training details for these individuals.)

Table 2. Training Requirements

	Affected Individuals	Authorized Individuals
Applications	Yes	Yes

Definitions	Yes	Yes
Elements	Yes	Yes
Requirements	Yes	Yes
Machine Specific Procedures	No	Yes
Step-by-Step Methods	No	Yes
Shift Personnel Change	*	Yes
Alternate Methods	**	Yes

* Must understand the continuity of LOTO when shifts change.

** May be involved in the use of some alternate methods that do not require LOTO (e.g., dressing weld tips, nozzle changes, etc.).

Table 3. Training Frequency Summary

	Affected Individuals	Authorized Individuals
Initial training	**Required** (on topics outlined in Table 2)	**Required** (on topics outlined in Table 2)
Initial demonstration	Not applicable	**Required** (must be observed and verified by another authorized employee, i.e. "hands on")
Annual refresher training	Recommended	Recommended
Annual demonstration	Not applicable	**Required** (must be observed and verified by another authorized employee) Note: for distributed or field workforces, live "hands on" observation is required every third year and in the other years may be accomplished by use of computer simulated demonstrations

5.4.3 Affected Individual Training

The site/operation shall provide all affected individuals with LOTO awareness training. This training allows affected individuals to identify LOTO situations, understand their responsibilities and to take no action that might defeat the LOTO. Training requirements and objectives are listed below:

- Training shall be specific to the site/operation written program.
- Affected individuals shall recognize that authorized employees are performing service and/or maintenance to the machine, equipment, process and circuit that require LOTO.
- Affected individuals shall be able to identify locked out equipment.

- Affected individuals shall have a general understanding of shift or personnel LOTO changes.
- Affected individuals shall recognize that a transition tag indicates a "Do Not Operate" situation.

Every effort should be made to structure training to make it understandable to all affected individuals regardless of their level of education, primary language or disabilities. Annual refresher training should be conducted to maintain an appropriate level of awareness.

5.4.4 Authorized Individual Training

The site/operation shall provide initial training, prior to performing a LOTO that will demonstrate that all authorized individuals understand the purpose and function of the energy control program. Training shall be such that all authorized individuals have an understanding that is appropriate for the level of hazard exposure they may encounter. Training requirements and objectives are listed below:

- Individual training shall be carried out prior to authorized individuals performing service and/or maintenance tasks or being potentially exposed to hazardous energy.
- Training shall be specific to the site/operation written program.
- Field Service personnel shall receive training on electrical safety and the General Electric LOTO programs. Specific information regarding hazardous energy in the field locations shall be discussed during pre-job safety meetings with customer representatives.
- Field Service Personnel: If the scope of work or job tasks change or take place during the work being performed, a new risk assessment must be developed and adhered to prior to continuation of the task.

- Each authorized individual shall receive training in the type of energy that might be encountered during servicing and/or maintenance and methods or means to control and isolate that energy.
- The site/operation shall document that all initial and additional training has been conducted. The documentation shall contain each individual's name, dates of training and the training topic.

Each person completing the training MUST be required to successfully demonstrate LOTO to an authorized employee prior to being authorized to perform LOTO without direct supervision. Hands-on demonstration is required during initial training, and must be repeated annually under the observation of an authorized individual. The only exception to the annual hands-on requirement is discussed in Paragraph 5.4.6. The site/operation should avoid exclusive use of generic training programs to ensure that authorized individuals adequately

understand the site/operation-specific program. Documentation of the information covered during training shall be maintained.

Training methods may include, but are not limited to, formal instruction (direct instructor contact), computer-based or interactive training.

Annual refresher training should be conducted to maintain an appropriate level of awareness.

5.4.5 Additional Training

Retraining shall be provided for all authorized individuals whenever there is a change in their job assignments, a change in machine, equipment, process or circuit that presents a new hazard, or when there is a change in the energy control procedures.

Additional retraining shall also be conducted immediately whenever an audit reveals, or whenever the site/operation has other reason to believe, that the authorized individual's knowledge or use of the energy control procedures is inadequate or inconsistent with the requirements.

5.4.6 Demonstration of Training

The site/operation shall conduct an annual demonstration of the effectiveness of the training that is conducted for each authorized individual. This "hands on" demonstration, which must be observed and verified by another authorized individual, is to be an independent verification to identify and correct any deviations or inadequacies, and be a review with each authorized individual, to verify that the authorized individual accurately understands and executes their responsibilities under the LOTO procedure. The demonstration shall be done in such a way as to ensure that authorized individuals demonstrate the following:

- knowledge of the program and responsibilities of an Authorized Individual/Employee
- recognition and understanding of hazardous energy types;
- use of appropriate hazardous energy control procedures;
- identification and correction of any deviations and deficiencies.

Authorized individuals who do not demonstrate an adequate level of knowledge or use of appropriate hazardous energy control procedures shall be retrained.

Annual demonstration training shall not be conducted on a "reciprocal" basis such that 2 Authorized Employees observe/inspect and approve each other on the same day or using the same equipment (regardless of day).

For remote or distributed field service work forces, demonstration that is observed and verified by another authorized employee may not be feasible each year. In these situations, simulation demonstrations may be acceptable. At a minimum, there must be a live person-to-

person demonstration following the authorized employees initial training session. In these situations, the site/operation must also have a random auditing process in place. This process should ensure that a reasonable number of authorized employees are checked for demonstration each year. At a minimum, live person-to-person demonstrations must occur every three years and a computer simulation can be used for the other two years in the three year cycle.

Documentation that the Demonstration component of LOTO training has been completed shall include the date, name of the person observing/inspecting and approving the Demonstration, and the specific equipment used for the Demonstration.

5.5 PROGRAM REVIEW

The site/operation shall annually assess the condition and effectiveness of each of the elements of the hazardous energy control program as described in General Electric Health and Safety Framework Scorecard Element 21. At a minimum, the assessment shall include:

- the written program;
- specific machine, equipment, process and circuit procedures;
- LOTO hardware;
- energy-isolating devices;
- alternative methods;
- communication and training.

5.5.1 Auditing and Inspections

The site/operation should determine the frequency of auditing (e.g., monthly) and an appropriate sample size. The audits should be random and address all shifts, days of operation, groups, non-standard work situations and individual personnel. Knowledgeable personnel should conduct visual observations of authorized individuals performing specific procedures. Feedback and documentation shall follow the observations. See APPENDIX D for a sample application inspection form.

5.5.2 Performance Feedback

The site/operation shall establish a documented system that inspects performance by authorized individuals and also provides both positive and negative feedback to appropriate individuals and supervisors regarding the hazardous energy control program. Where deficiencies are found, corrective action shall be taken and appropriate individuals informed of the required improvements. Appropriate disciplinary actions shall be implemented when defects are identified during the audit or when this General Electric program is not being followed by affected or authorized employees. When necessary, employee violations of this program shall be documented and appropriate disciplinary action taken. The enforcement of this program, and all safety regulations, can result in disciplinary procedures up to and including termination.

6.0 DESIGN

6.1 GENERAL ELECTRIC EQUIPMENT

All machines, equipment, processes and circuits that are to be delivered to General Electric shall be designed, manufactured, supplied and installed so that the site/operation can comply with the energy control guidelines explained in this program. It is General Electric's responsibility to review the suppliers' product to ensure that safety issues are addressed. The paragraphs in this section define what is expected of suppliers.

Modifications affecting energy isolation shall comply with or exceed these standard requirements. Machine, equipment, process and circuit design should incorporate employee safety as a priority. A risk assessment shall be performed during the engineering design stage of development. The risk assessment performs two functions; first, it determines the need for energy control devices and systems; second, it determines the appropriate type of energy control that is required.

6.1.1 Exposure Minimization

Verify that General Electric machines, equipment, processes and circuits employ available safeguards that are reliable, work to minimize hazard exposure and minimize any adverse effect on the process. The machines, equipment, processes and circuits should be designed or modified so that personnel are not exposed to hazardous energy during routine and repetitive servicing and maintenance activities.

NOTE

This can be accomplished by positioning controls outside hazardous areas, adding controls at appropriate locations, providing external lubrication points or providing guarding.

6.1.2 Partial Energization

For those functions when partial energization is necessary, General Electric authorized individuals shall perform a risk assessment similar to that outlined in APPENDIX A to determine the safest method of machine, equipment, process and circuit access. When it is necessary for machines, equipment, processes and circuits to remain partially energized (e.g., in order to hold parts, save information, retain heat or provide local lighting), alternative control methodologies shall be provided for personnel safety and includes a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment energy isolating devices.

Verify that machines, equipment, processes and circuits are designed, manufactured, supplied and installed with energy-isolating devices to enable compliance with the requirements in Paragraph 5.2. Consideration shall be given to the intended use of the machine, equipment, process and circuit. Devices shall be capable of controlling or dissipating hazardous energy, or both. The devices should be an integral part of the machine, equipment, process and circuit.

6.2 ENERGY ISOLATING DEVICES

Verify that machines, equipment, processes and circuits are designed, manufactured, supplied and installed with energy-isolating devices to enable compliance with the requirements in Paragraph 5.2. Consideration shall be given to the intended use of the machine, equipment, process and circuit. Devices shall be capable of controlling or dissipating hazardous energy, or both. The devices should be an integral part of the machine, equipment, process and circuit.

6.2.1 Location

Verify that energy-isolating devices shall be accessible and, when feasible, be conveniently located to facilitate the application of lockout devices during service and maintenance.

NOTE

Energy-isolating devices are best located outside any hazardous areas, and at a convenient height away from any adjacent walking areas (i.e., not overhead, on ladders or under machinery).

6.2.2 Identification

Verify that all energy-isolating devices shall be adequately labeled or marked unless they are located and arranged so their purpose is clearly evident. The identification should be of consistent format within each facility or operation and shall include the following:

- machine, equipment, process and circuit supplied;
- energy type and magnitude. Examples of appropriate labeling or marking (tags, embossing, engraving, stenciling, etc.) language is as follows:
  - Main Power Press 3 (480V);
  - Natural Gas-Process Line 2;
  - Hydraulic Pump Discharge (800 psi);
  - Bay A Compressed Air (100 psi).

NOTE

The potential for error will be reduced if personnel are not expected to rely on memory or experience when determining which isolating devices apply to which machine, equipment, process and circuit. When placarding or posting contains the required energy isolating device identification, individual devices may be marked or coded and their identity referenced on the placard or posting information. Where conditions such as security are warranted, coded identification is acceptable.

6.2.3 Capability

Verify that energy-isolating devices shall be capable of either being locked or otherwise secured in an effective isolating position. Examples of effective isolating devices may include, but are not limited to the following:

- levers with aligning lock tabs (holes);
- ball cocks with aligning lock tags;
- locking covers that only work when the switch is in the safe position;

- wheels with locking tabs (and position indicators);
- physical blocks with locking, aligning tabs.

6.3 SPECIAL TOOLS OR DEVICES

If special tools or devices are necessary for servicing and/or maintaining the machine, equipment, process or circuit or their component parts, the tools or devices shall be provided with the machine, equipment, process or circuit.

6.4 WARNINGS AND SPECIAL INSTRUCTIONS

It is the responsibility of the manufacturer to determine if warnings and special instructions are necessary for servicing and/or maintaining the machine, equipment, process or circuit. General Electric shall require appropriate information from the manufacturer, integrator, modifier or remanufacturer in a written manual. In addition, where the manufacturer determines that warnings or special instructions should be located in the area of the hazard on a label, placard or sign, the manufacturer shall so affix or provide appropriate placard material to the site/operation for later installation.

6.5 COMPONENT ISOLATION

Verify that the machine, equipment, process or circuit installation shall provide for the local isolation of component parts or component systems if they are to be serviced or maintained separately. The number and location of energy-isolating devices shall be determined by the configuration of the machine, equipment, process or circuit and the intended application. Warning labels should be affixed to the machine, equipment, process and circuit when remote or separate sources of hazardous energy must be controlled.

6.6 DOCUMENTATION REQUIREMENTS

Each site shall require that written manual(s) (documentation) be provided by the manufacturers, systems integrators, modifiers and remanufacturers. The written manual (documentation) must detail:

- the specific location and procedures for use of the provided energy-isolating devices;
- step-by-step procedures for servicing and/or maintenance on any machine, equipment, process and circuit that must be performed under partial energization based on the results of a risk assessment;
- specific instructions for safely addressing such conditions as malfunctioning, jamming, misfeeding or other interruptions of the operation;
- installation instructions intended for the installer of the machine, equipment, process or circuit that identify the location of necessary energy-isolating devices.

6.7 STORED AND RESIDUAL ENERGY

When stored or residual energy has been determined to be a hazard, a means for non-hazardous dissipation or safe restraint of the stored or residual energy shall be incorporated into the machine, equipment, process and circuit. Devices and methods used for the dissipation of stored energy shall be designed with a means or method of verifying their position and state.

When machinery run-down or coasting is determined to be a hazard, guarding shall be installed that protects against the hazard or prevents access until the motion has ceased.

6.8 TOOL CHANGE, SET-UP

Some activities, such as set-up or troubleshooting, may require full or partial energization. For activities such as this, alternate protection systems are required. Alternate protection systems shall be used to ensure that a device or system will stop or prevent initiation of hazardous motion or release of hazardous energy in the event of a single component failure within the device or system. Typical methods of accomplishing this task are:

- a hardwired, control-reliable (redundant and safety relay monitored) safety interlock system;
- safety-rated, multiple-channel, Programmable Logic Controllers (PLC), when manufactured specifically for safety applications, applied per manufacturer's instructions, and a risk assessment is performed (see sample in APPENDIX A).

If control systems such as those listed above are not available, then LOTO procedures must be applied.

6.9 PHYSICAL SAFEGUARDS

Verify that physical safeguards (e.g., pins, blanks, blocks, restraints, chains or blinds) shall be designed, with the appropriate safety factor, to withstand all forces to which they will be subjected. Physical safeguards vary for different stored energy sources. Fabrication of special safeguard devices may be required when risk assessment of machines, equipment, processes and circuits is completed. Physical safeguards must be designed to minimize hazardous exposure.

APPENDIX A
RISK ASSESSMENT AND RISK REDUCTION

RISK ASSESSMENT

Risk assessment is an analytical tool consisting of a number of discrete steps intended to ensure that hazards are properly identified, that associated risks are evaluated and that appropriate measures are taken to reduce those risks to an acceptable level. Elements of a risk assessment process include the following steps:

1. Identify all tasks: All tasks and activities should be considered. Examples of activities for which tasks should be identified include set up, installation, removal, maintenance, operating, adjusting, cleaning, troubleshooting and programming.
2. Identify hazards: Hazards associated with each task, such as mechanical, electrical, thermal, pneumatic, hydraulic, radiation, residual or stored energy, motion, fuels and human factors should be considered. Associated hazards for a particular task not related to hazardous energy release may also need to be reviewed. Consideration should include human error, management system deficiencies and foreseeable improper use of equipment.
3. Identification of other applicable regulatory requirements: includes a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment.
4. Assess the severity of harm: Severity of harm addresses the degree of injury or illness that could occur. The degrees are based on extent of injury or illness (from death to no injury), and extent of treatment involved. The following is an example of severity levels:
   - Catastrophic - death or permanently disabling injury or illness (unable to return to work)
   - Serious - severe debilitating injury or illness (able to return to work at some point)
   - Moderate - significant injury or illness requiring more than first aid (able to return to same job)
   - Minor - no injury or slight injury requiring no more than first aid (little or no lost work time)

   (Note: When determining risk, the worst credible severity of harm is to be selected.)

5. Assess the probability of occurrence of harm:
   - Probability of occurrence of harm is estimated by taking into account the frequency, duration and extent of exposure, training and awareness, and the presentation of the hazard. The following is an example of probability levels:
     - Very likely - near certain to occur
     - Likely - may occur
     - Unlikely - not likely to occur
     - Remote - so unlikely as to be near zero
   - When estimating probability, the highest credible level of probability is to be selected. The following factors are considered important in estimating the probability of occurrence of harm:
     - exposure to a hazard;
     - personnel who perform tasks;
     - machine/task history;
     - workplace environment;
     - human factors;
     - reliability of safety functions;
     - possibility to defeat or circumvent protective measures;
     - ability to maintain protective measures.
6. Evaluate the risk: Based on the results of Steps 4 and 5 above, the level of risk is estimated by applying the level of severity of harm and the probability of occurrence of that harm to *Table A-1*.

Table A-1. Risk Estimation Matrix

Probability of Occurrence of Harm	**Severity of Harm**			
	Catastrophic	**Serious**	**Moderate**	**Minor**
Very Likely	High	High	High	Medium
Likely	High	High	Medium	Low
Unlikely	Medium	Medium	Low	Negligible
Remote	Low	Low	Negligible	Negligible
An example: a ‘serious’ severity of harm and a ‘likely’ probability of occurrence of that harm yield a ‘high’ level of risk.				

RISK REDUCTION (IMPLEMENTATION)

Risk reduction is a hierarchical process employed to reduce or control risk by the following:

- elimination through design;

- use of engineered safeguards;
- awareness means including warning and alerting techniques;
- administrative controls including safe work procedures and training;
- use of personal protective equipment;
- training.

Often, for any particular machine, equipment, process and circuit, the solution may include aspects of each of these elements. The risk reduction process should involve the affected personnel, should be documented and should adhere to the process outlined below and illustrated in .

The following questions should be asked to determine the adequacy of the risk reduction process:

- Is the safety level adequate? Can the task be performed without causing injury or damage to health?
- Have appropriate safety measures been taken for all tasks or activities? Are the measures taken compatible with each other?
- Do the safety measures generate any new, unexpected hazards or problems?

A.1.1 Risk Reduction by Design

Risk reduction should first attempt to eliminate the hazard through design. The primary objective in implementing design features is to eliminate hazards or reduce their risk by substitution.

A.1.2 Risk Reduction by Use of Engineered Safeguards

Safeguards or safety devices should be used to protect personnel from hazards that cannot be reasonably eliminated or sufficiently reduced by design.

Safeguards or safety devices and the safety control system (electrical, pneumatic, hydraulic, etc.) should be of a suitable reliability for the risk reduction that is required.

NOTE

Examples of engineered safeguards include guards (both fixed and interlocked), trapped key devices, and trip devices (light curtains, laser scanners, pressure mats, safety rated switches, etc.). Safety devices include, emergency stop buttons, enabling or hold-to-run devices, etc.

A.1.3 Risk Reduction by Use of Warning and Alerting Techniques

Warning and alerting techniques should be used to protect personnel from hazards that cannot be reasonably eliminated or sufficiently reduced by design, engineered safeguards, or a combination of these elements.

NOTE

Examples of warning and alerting techniques include attendants, audible and visual signals, barricades, signs and tags.

A.1.4 Risk Reduction by Use of Administrative Controls

Additional risk reduction is achieved by the use of administrative controls including safe work procedures, standard practices and checklists and training. These should be used to control risk that cannot be reasonably eliminated or sufficiently reduced by the use of design, engineered safeguards, warning and alerting techniques or a combination of these elements. Training should be used as a complement to all the risk reduction methods described here.

NOTE

Examples of safe work procedures, practices and training include standard operating instructions, illumination, pre-job review and establishing safe distances from a hazard. Examples of types of training that can be used to develop proficiency of authorized individuals may include computer-based simulation, drills, classroom programs or exercises.

A.1.5 Risk Reduction by Use of Personal Protective Equipment

Additional risk reduction is achieved by effective use of prescribed personal protective equipment (PPE). Strong administrative procedures must be in place for the PPE to be an effective safeguard.

NOTE

Personal protective equipment can include safety eyewear or shields, footwear, protective gloves (insulating or cut resistant) and protective headgear.

REVIEW THE RISK ASSESSMENT AND RISK REDUCTION

The risk assessment and risk reduction should be reviewed at the following times:

- following its implementation to ensure solutions are effective and in place;
- following an incident or near miss;
- whenever new tasks or activities are required;
- whenever there are modifications to the machine, equipment, process or circuit;

- on a periodic basis.

Figure A.1
(Informative)

Sample Risk Assessment for Alternative Methods

(Severity and probability estimation based on machine with no safeguards in place.)
(All risks initially determined to be intolerable without additional safeguarding.)

Department: 26 **Operation:** Block Machining
Task: Tool change-mill cutter at station 12 left.

Date: _____

			Before Risk Reduction			After Risk Reduction	
Task	**Hazards**	**Number of People Exposed to Risk**	**Severity/Probability** **Severity:** Catastrophic, Serious, Moderate, Minor **Probability:** Very Likely, Likely, Unlikely, Remote	**Risk Level** **High** **Medium** **Low** **Negligible**	**Protective Measures (Alternative Methods)**	**Severity/Probability** **Severity:** Catastrophic, Serious, Moderate, Minor **Probability:** Very Likely, Likely, Unlikely, Remote	**Risk Level** **High** **Medium** **Low** **Negligible**
Identify replacement tool	Cuts from sharp tooling		Moderate/Likely	Medium	Gloves and procedures	Moderate/Remote	Negligible
Inspect tool	Cuts from sharp tooling		Moderate/Likely	Medium	Gloves and procedures	Moderate/Remote	Negligible
Remove old cutter	- Crushing from transfer bar movement		Catastrophic/Likely	High	Interlocked guard with trapped key	Catastrophic/Remote	Low
	- Crushing, entanglement, cuts from mill cutter movement if energized		Serious/Likely	High	Interlocked guard with trapped key	Serious/Remote	Low
	- Cuts from sharp tooling		Moderate/Likely	Medium	Gloves and tool assist	Moderate/Remote	Negligible
	- Coolant in eyes		Moderate/Likely	Medium	Safety glasses	Moderate/Remote	Negligible
	- Burn from hot cutter		Moderate/Likely	Medium	Procedures and gloves	Moderate/Remote	Negligible
Install new cutter	- Crushing from transfer bar movement		Catastrophic/Likely	High	Interlocked guard with trapped key	Catastrophic/Remote	Low
	- Crushing, entanglement, cuts from mill cutter movement if energized		Serious/Likely	High	Interlocked guard with trapped key	Serious/Remote	Low
	- Cuts from sharp tooling		Moderate/Very Likely	Medium	Gloves and tool assist	Moderate/Remote	Negligible

Figure A-1. Sample Risk Assessment for Alternative Methods

Risk Assessment for Alternative Methods

Department: **Operation:**
Task:
Remarks and/or special conditions

Date: _____

			Before Risk Reduction			After Risk Reduction	
Task	**Hazards**	**Number of People Exposed to Risk**	**Severity/Probability** **Severity:** Catastrophic, Serious, Moderate, Minor **Probability:** Very Likely, Likely, Unlikely, Remote	**Risk Level** **High** **Medium** **Low** **Negligible**	**Protective Measures (Alternative Methods)**	**Severity/Probability** **Severity:** Catastrophic, Serious, Moderate, Minor **Probability:** Very Likely, Likely, Unlikely, Remote	**Risk Level** **High** **Medium** **Low** **Negligible**

Figure A- 2. Blank Risk Assessment Form

APPENDIX B
SAMPLE OF AN ENERGY CONTROL PROCEDURE

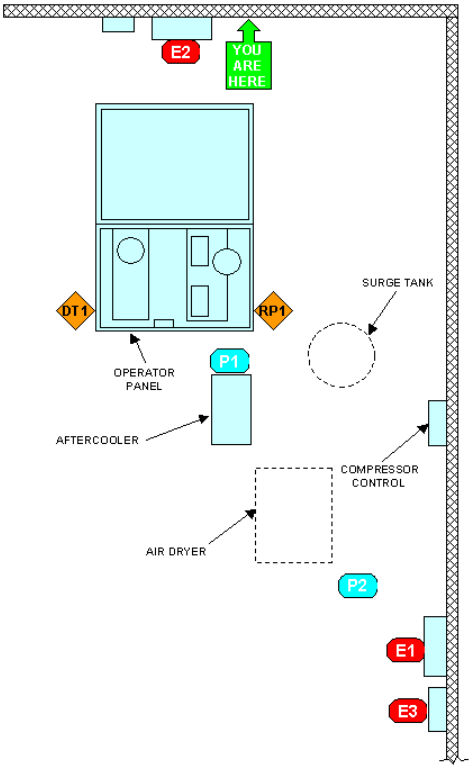
REMEMBER LOCKOUT

Safety Lockout / Tagout

STANDBY AIR COMPRESSOR

TORONTO, ONTARIO

Sheet 1 of 1



REMEMBER LOCKOUT

- Notify All Affected Personnel Before Servicing Equipment And Before Returning Equipment To Service
- Refer To Company Lockout Procedure For Lockout Requirements And Safe Practices
- Always Perform Check To Verify Energy Is Controlled
- Assure Release Of All Stored Energy
- Only Work Under Your APPROVED Lock

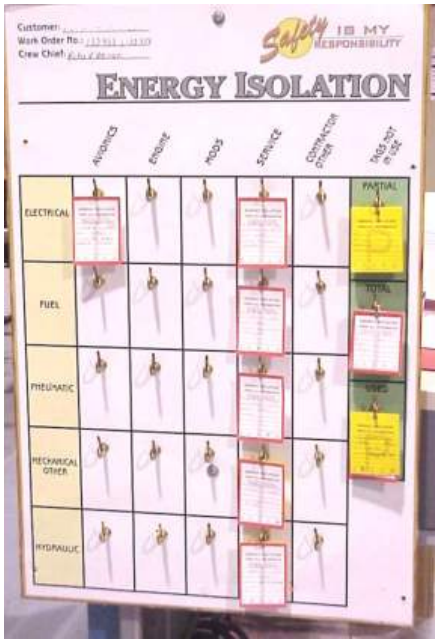
Always Perform Controlled Shutdown Before Locking Out Disconnects

Energy Type and Source	Lockout Location		Procedure for Locking Out and/or Releasing Energies	Verify Procedure
Electrical 600 Volts	E1	Main Standby Air Compressor Electrical Disconnect	Place disconnect switch in the off position and apply safety lock. Shuts off electrical power to the Standby Air Compressor circuits.	The Standby Air Compressor electrical circuits and indicators powered by this disconnect switch should not turn on and no action should occur.
Electrical 600 Volts	E2	Standby Air Compressor Electrical Disconnect	Place disconnect switch in the off position and apply safety lock. Shuts off electrical power to the Standby Air Compressor circuits.	The Standby Air Compressor electrical circuits and indicators powered by this disconnect switch should not turn on and no action should occur.
Electrical 600 Volts	E3	Standby and Main Air Compressor Controls Electrical Disconnect	Place disconnect switch in the off position and apply safety lock. Shuts off electrical power to the Standby and Main Air Compressor Controls circuits.	The Standby and Main Air Compressor Controls electrical circuits and indicators powered by this disconnect switch should not turn on and no action should occur.
Pneumatic 120 PSI	P1	Main Air Dryer Air Supply Shutoff Valve	Close shutoff valve and apply safety lock. Isolates air pressure from the Air Dryer circuits.	Attempt to manually operate Air Dryer pneumatic circuits. No action should occur.
Pneumatic 120 PSI	P2	Main Air Dryer Air Return Shutoff Valve	Close shutoff valve and apply safety lock. Isolates air pressure from the Air Dryer circuits.	Attempt to manually operate Air Dryer pneumatic circuits. No action should occur.
Pneumatic Pressure 120 PSI	RP1	Air Compressor Pressure Relief Valve	Lock out pneumatic supply. Open relief valve to release pressure from Air Compressor.	Visually confirm that pneumatic relief valve is in the open position.
Dissipate Thermal 180 °F	DT1	Hot Equipment Air Compressor	Isolate and lock out equipment heat source. Allow enough time for the equipment to cool down before proceeding.	Visually confirm that the appropriate heat source is locked out and the allotted time has passed for the equipment to cool.

IF SYSTEM CANNOT BE LOCKED OUT OR IF SYSTEM FAILS VERIFICATION CONTACT YOUR SUPERVISOR. STOP

EHS REVIEW		MANUFACTURING REVIEW	
APPROVAL NAME		APPROVAL NAME	
DATE		DATE	

APPENDIX C
GROUP LOTO



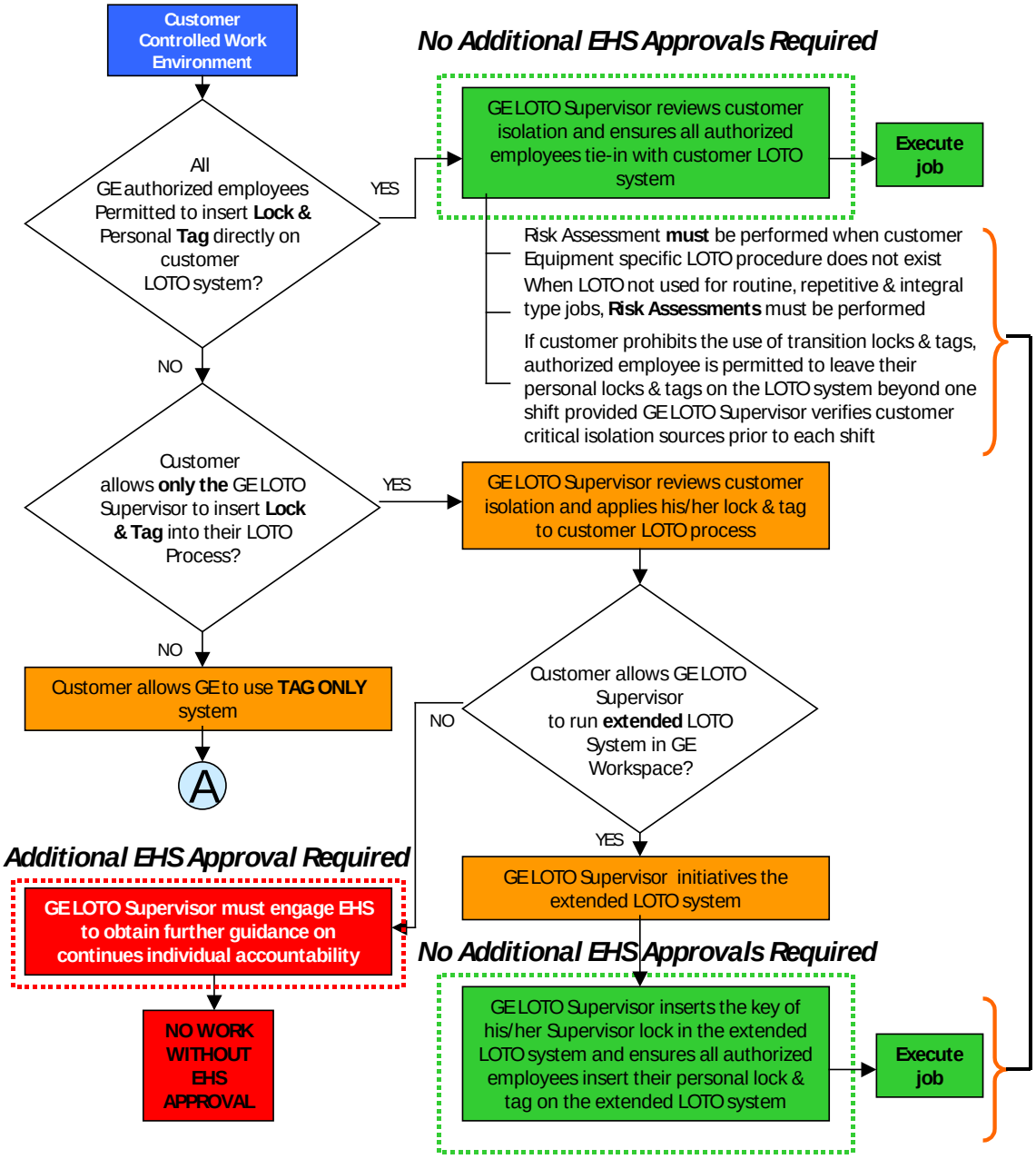
Lockout Board

Multiple Locking Hasps

Lock Box

GROUP/ COMPLEX LOTO… Approvals & Decision Tree

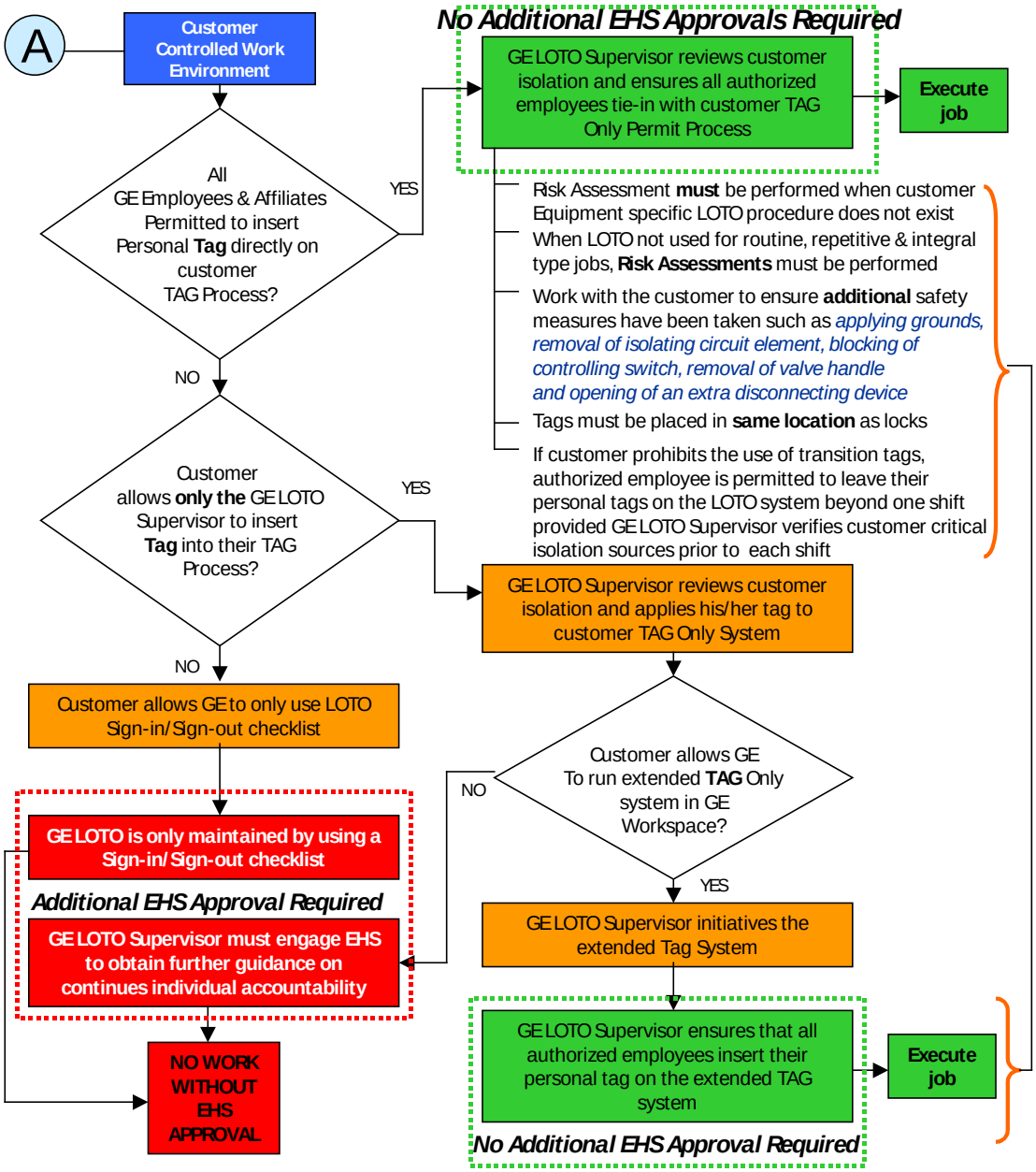
Customer sites where use of Lock AND TAG is permitted



*If at a site, customer allows the use of locks, GE LOTO Supervisor **must** ensure that all authorized employees have their own personal LOTO locks & tags*

Sites where customer uses TAG ONLY system

NOTE: If GE authorized employees are required to insert LOTO device directly on energy isolation device then US OSHA regulations require a use of **lock** if the system is capable of being locked out



*Proactively work with the customer rep to allow GE authorized employees to use their Personal **Lock & tag** in customer isolation permit system or **GE extended LOTO system***

APPENDIX D
ENERGY CONTROL PROGRAM INSPECTION REPORT FORM

(2 pages)

Department: _____ Equipment: _____

Machine Number: _____ Task Location: _____

Date: ___/___/___ Shift: _____ Time: _____AM/PM

Authorized person(s) name(s): Training?

_____ Yes _____ No _____

_____ Yes _____ No _____

_____ Yes _____ No _____

_____ Yes _____ No _____

Affected person(s) name(s): Training?

_____ Yes _____ No _____

_____ Yes _____ No _____

_____ Yes _____ No _____

_____ Yes _____ No _____

Were all affected persons notified of lockout?

Yes _____ No _____ If yes, by whom _____

Name(s) of authorized/affected person(s) supervisor(s)

_____ _____

_____ _____

Written Lockout procedure available? (If yes, state where located)

Yes _____ No _____ _____

Is lockout procedure being followed? Yes _____ No ____

Is procedure posted? Yes _____ No ____

Is procedure in diagram form? Yes _____ No ____

Is procedure adequate? Yes _____ No ____

Has lockout been performed by all persons involved? Yes _____ No _____

Was the equipment or process locked out? Yes _____ No _____

Name all required energy-isolating devices

_____ _____

_____ _____

_____

_____ _____

Can energy-isolating devices be locked out? Yes _____ No _____

Where blocks or pins are necessary, were they used? Yes _____ No _____

Stage deficiencies requiring corrective action:

_____

_____

Did each authorized person lockout all required energy sources with their own locks? Yes _____ No _____

If not, what action was taken:

_____

Did each authorized person verify lockout? Yes _____ No _____

If not, what changes were needed:

_____

CORRECTIVE ACTION(S) RECOMMENDED:

_____

_____

INSPECTION PERFORMED BY:

Date: ___/___/___ Time: _____AM/PM

APPENDIX E

SPECIAL CONSIDERATIONS FOR LOTO

E.1 FIELD SERVICES

E.1.1

For customer site work, field services personnel must request customer equipment specific LOTO Procedures but there is no requirement to convert customer document in GE format. If customers request GE field services personnel to develop equipment specific LOTO procedures then GE standard templates should be used unless customer requests site-specific format.

E.1.2

For customer site work under GE controlled work environment, field services personnel must have access to single keyed LOTO lock & tag and other LOTO devices such as cables, switches, etc to secure energy isolation sources. Sites where customer controls the work environment, field services personnel must have at a minimum access to single keyed LOTO lock & tag

E.1.3

Sites where customer controls the work environment and if the customer does not permit GE field services personnel to insert his/her lock & tag in the their LOTO system, then GE LOTO Supervisor must use extended LOTO system for ensuring an equivalent level of personal protection for each member of the group. Example of extended LOTO system: **Step 1:** GE LOTO Supervisor inserts his/her personal lock on the customer LOTO control system such as a lockbox, permit board, etc, **Step 2:** GE LOTO Supervisor then places the key in a lock box or other comparable device in GE workspace and applies the LOTO Supervisor lock to the device, **Step 3:** GE LOTO Supervisor then ensures that all GE affected employees & contractors place their individual LOTO locks & tags on the lock box, **Step 4: Each shift LOTO Supervisor verifies the LOTO**

E.2 GROUP VERIFICATION

Each authorized employee has the right to perform verification or observe the LOTO Supervisor perform verification. Except where prohibited by regulation, Authorized Employees also have the right to accept verification performed by the GE LOTO Supervisor on their behalf.

E.3 SINGLE SHIFT LOTO

For single shift LOTO guidelines, refer to Paragraph 5.2.7.

APPENDIX F

CUSTOMER LOTO PROGRAM EVALUATION CHECKLIST

(Example)

"Customer LOTO
Program Evaluatiojn (

(Double lick above icon to open Excel file)

Customer LOTO Audit

No	Question	Answer			Comments
	LOTO Process application	Yes	No	N/A	
1	Is LOTO a local reglatory requirment.				
2	Is there a LOTO process in place.				
3	Does the LOTO program include application of Locks on all (applicable) equipment.				
4	Does the LOTO program include application of Tags on all applicable equipment.				
5	Are LOTO locks unique and distinct from all other locks in use at the site.				
6	Are locks only used for LOTO and for no other purpose.				
7	Are all LOTO devices standardised within the facility.				
8	Do LOTO locks have only one key and are not designed to work with a master key.				
9	Are LOTO mechanical devices capable of with standing the work environments they will be installed in.				
10	Are LOTO mechanical devices robust enough to preventing accidental removal/detachment.				
11	Is there a written record of who installed the LOTO device's and date they were applied?				
12	Have methods or means to isolate or control all sources of energy been identified in the LOTO process.				
13	Are the employees of the customer, who have responsibility for the management, supervision and application of the customers system, identified.				

14	Are LOTO procedures in place specific to each piece of equipment.				
15	Are all machines, equipment, processes and circuits capable of being locked out.				
16	Is there an schedule/list of all tasks where a full LOTO cannot be applied.				
17	Are equipment walk-downs and LOTO verifications conducted.				
18	Does the verification process include contractors.				
19	Is there a corrective process in place if the LOTO proceduresare not followed by parties working under the LOTO.				
20	Does the site conduct LOTO inspections or audits to verify that proper practices are being followed.				
	Procedure Review				
21	Is there a procedure for special situations such as a shift change, abandoned locks or tags etc.				
22	Does the LOTO program require verification that stored energy is dissipated and a record kept.				
23	Does the customer LOTO system require that equipment specific LOTO procedures are developed for all applicable equipment.				
24	Are all sources of energy or other hazards associated with the work identified in the procedure. (i.e., electrical, hydraulic, pneumatic, gravity, steam, springs, cooling water, etc.)				
25	Does the customer LOTO procedure require verification that power is isolated from exposed electrical conductors via voltage checks equipment.				

	Pre-Job Planning			
26	Are pre-Job planning meeting conducted.			
27	Where pre-prepared LOTO plans are utilized for previous work, are they reviewed for accuracy before use.			
28	Where pre-prepared LOTO plans are utilized, have methods or means to shutdown sources of energy been identified reviewed for accuracy.			
29	Do contractors receive the customer LOTO program.			
30	Do contractors agree to abide by the site LOTO program.			
31	Are contractors required to place their own individual LOTO locks and tags to the same energy isolating devices that the customer has locked out.			
	Training			
32	Do all authorised employees receive formal LOTO training.			
33	Are all authorised individuals required to successfully demonstrate LOTO prior to being authorized to perform LOTO without direct supervision.			
34	Do all authorized employees regularly (annually) complete LOTO demonstration training.			
35	Are LOTO & energy control plans prepared by trained and authorised employees.			
36	Do all appropriate contractors engaged in the LOTO process receive LOTO awareness training.			

37	Are training records maintained to identify individuals requiring refresher training?			
	GE Participation in Customer LOTO program			
38	Does the Customer program provide safety from the system.			
39	Is there an equipment specific LOTO process used.			
40	If there is not an equipment specific LOTO in place is the system in use robust to ensure LOTO is correctly managed.			
41	Will GE be able to apply it's own locks and tags.			
42	Will GE be able to apply a group lock box.			
43	Has customer agreed to modification to its LOTO system/program to help GE meet its LOTO standard.			
	Comments & Corrective Action			
	Audit Performed By (*Print Name*)	Signiture		
	Title	Date		

APPENDIX E

GE CONFINED SPACE MANUAL

Confined Space Manual

General Electric Company
Corporate Environmental Programs
Fairfield, Connecticut

November 2008

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1. Scope and Application

1.1. This document presents GE's minimum global requirements for confined space entry operations, and must be complied with when they exceed local regulations. All operations are expected to be familiar with the regulatory requirements applicable to them, and to comply with those regulations where the requirements exceed those established by this Manual. Key areas where GE requirements may differ from local regulations include:

- 1.1.1. The distinction between confined space and permit space and the procedures required for each
- 1.1.2. Rescue requirements
- 1.1.3. Training requirements
- 1.1.4. Space Reclassification procedures

1.2. Businesses have the flexibility to determine how they will address the criteria presented in this document, but they must address all applicable requirements.

1.3. GE Businesses have the discretion to require more restrictive performance than specified in this manual. Contact your business level Health and Safety Leader to discuss your business's requirements.

1.4. Model forms and checklists in the document may be used as is, or redesigned/expanded to better-fit business needs, as long as the core content in the model forms is retained. Regulatory references from the U.S. and the U.K. were determined to be the best available practices and were used as primary references.

1.5. In the absence of regulatory specific guidance and where the guidance is less protective than that provided by this document, the GE requirements must be followed.

1.6. The highest levels of employee protection are required for permit space entry (see definition in Section 2), and because of the hazards present in permit spaces, section 8.1 establishes that permit space entry must be a last resort after other options to complete the work have been found infeasible. Available methods to avoid permit space entry operations include the following:

- 1.6.1. Redesign or re-engineer the task so that permit space entry is not necessary (Example: develop a tool that can be used to collect a sample without entering the space, which is defined as breaking the plane of the permit space entry point with ANY PART of the body).
- 1.6.2. Determine whether the Alternate Entry Procedures in Section 10 apply.
- **1.6.3.** Determine whether the space can be reclassified as confined space (non-permit space) using the procedures in Section 11.

2. Definitions

2.1. **Acceptable Entry Conditions** means the conditions that must exist in a permit space to allow entry and to ensure that employees involved can safely enter and work within the space

2.2. **Alternate Entry** means a permit space with only atmospheric hazards which can be controlled by only using forced air ventilation and atmospheric testing. Requires the partial completion of a entry permit

2.3. **Attendant** means an individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the GE permit space program

2.4. **Authorized Entrant** means an employee who is properly trained, competent and authorized by GE to enter a permit space

2.5. **Blanking or Blinding** means 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

2.6. **Confined Space** means a space that:

2.6.1. Is large enough and so configured that an employee can bodily enter and perform assigned work; and

2.6.2. Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, bins, hoppers, vaults, pits, and excavations are spaces that may have limited means of entry); and

2.6.3. Is not designed for continuous employee occupancy

2.7. **Double Block and Bleed** means the closure of a line, duct, or pipe by closing and locking two in-line valves and by opening and locking a drain or vent valve in the line between the two closed valves

2.8. **Emergency** means any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants

2.9. **Engulfment** means the surrounding and effective capture of a person 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 the body to cause death by strangulation, constriction, or crushing

2.10. **Entry** means the action by which a person passes through an opening into a permit 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

2.11. **Entry Permit** means the written or printed document that is provided by GE to allow and control entry into a permit space

2.12. **Entry Supervisor** means the person (such as the foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this section

2.13. **Field Calibrating** means the testing instrument is shown calibration gas and the user verifies that the reading is within a predefined amount. Oxygen is calibrated to 21% oxygen in clean ambient air.

2.14. **Hazardous Atmosphere** means an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness

2.15. **Hot Work Permit** means GE's written authorization to perform operations (for example, riveting, welding, cutting, burning, grinding and heating) capable of providing a source of ignition

2.16. **Immediately Dangerous to Life or Health (IDLH)** means any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space

2.17. **Inerting** means the displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible. This procedure produces an IDLH oxygen-deficient atmosphere

2.18. **Isolation** means the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout of all sources of energy; or blocking or disconnecting all mechanical linkages

2.19. **Line Breaking** means the intentional disconnection of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury

2.20. **Oxygen-deficient atmosphere** means an atmosphere containing less than 19.5 percent oxygen by volume

2.21. **Oxygen-Enriched Atmosphere** means an atmosphere containing more than 23.5 percent oxygen by volume

2.22. **Permit** Space means a space meeting the definition of a confined space in Section 2.6 that also has one or more of the following characteristics:
- 2.22.1. Contains or has a potential to contain a hazardous atmosphere
- 2.22.2. Contains a material that has the potential for engulfing an entrant
- 2.22.3. 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
- 2.22.4. Contains any other recognized serious safety or health hazard. Serious safety and health hazards include the potential to cause any one of the conditions listed below:
  - 2.22.4.1. Disabling injuries that would prevent self-rescue by the employee
  - 2.22.4.2. Permanently disabling injuries or non-curable conditions
  - 2.22.4.3. Amputation
  - 2.22.4.4. Death

The mere presence of physical or mechanical hazards does not require a confined space to be classified as a permit space. The Entry Supervisor or qualified EHS representative must evaluate the hazards and determine whether they meet the criteria in 2.22.4.1 through 2.22.4.4. ADDITIONALLY, Section 11 allows permit spaces to be reclassified as confined spaces if all hazards are eliminated.

2.23. **Permit-Required Confined Space Program** (permit space program) means GE's overall program for controlling and protecting employees from, permit space hazards and for regulating employee entry into permit spaces

2.24. **Prohibited Condition** means any condition in a permit space that is not allowed by the permit prior to entry or during the period when entry is authorized

2.25. **Risk Assessment** means a process to identify and evaluate physical, chemical and biological hazards to prospective entrants, and develop the means to control those hazards

2.26. **Rescue Service** means the personnel designated to rescue employees from permit spaces

2.27. **Retrieval System** means the equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device appropriately anchored) used for non-entry rescue of persons from permit spaces

2.28. **Testing** means the process by which the hazards that may confront entrants of a permit space are identified, evaluated and documented

2.29. **Hazard Elimination** means removal of the hazard from the confined space. Methods to eliminate hazards include but are not limited to line breaking, blanking, physical electrical disconnection such as disconnecting wiring, removal of flowable materials from the space, electrical mechanical LOTO using GE Master LOTO Procedures, or other similar procedures.

2.30. **Hazard Mitigation** means the use of established GE procedures which have been determined to be of sufficient reliability to be the basis for potential reclassification of permit spaces to confined (non-permit) spaces, except where prohibited by regulation. Methods accepted for hazard mitigation are strictly limited to those listed under the Hazard Mitigation section of Attachment H to this document.

In the US, OSHA has issued interpretive guidance that for flowable hazards, LOTO does NOT constitute elimination of the hazard but is considered Hazard Control. Hazard Control does NOT allow a permit space to be reclassified as a non-permit space.

2.31. **Hazard Control** means the implementation of safety practices and equipment not meeting the definition of Hazard Elimination or Mitigation. These methods are NOT allowed as the basis for reclassification of permit spaces to non-permit.

2.32. **MOC means Management of Change.**

3. Roles and Responsibilities

3.1. Business-Level EHS

- 3.1.1. Provide guidance to operations/regions in determining if a space is Confined or Permit Space
- 3.1.2. Support operations/regions in development of location-specific Permit Space Program
- 3.1.3. Provide guidance on monitoring result interpretation, as requested to support the site operations
- 3.1.4. Audit programs to ensure compliant with regulatory and company requirements

3.2. Manager

- 3.2.1. Commit the resources necessary to develop and implement a Permit Space Program
- 3.2.2. Identify individuals who meet the specific requirements to be an Entry Supervisor
- 3.2.3. Verify that employees are completely trained for Permit Space operations prior to engaging in entry operations, and that refresher training is completed in a timely manner
- 3.2.4. Verify that only qualified instructors provide Permit Space Entry training. Qualified instructors have experience and training in Confined Space Entry operations, carry a CIH or CSP registration, or are approved by the Business H&S Leader
- 3.2.5. Verify that all necessary personnel adhere to all of the requirements listed in this procedure
- 3.2.6. Take appropriate disciplinary action for any violation of the Permit Space Entry Procedure
- 3.2.7. Assign an individual within each project to act as the project Entry Supervisor.

3.3. EHS Representative/ Confined Space Coordinator

- 3.3.1. Develop and maintain an inventory of Permit Spaces (Appendix A)
- 3.3.2. Verify that all authorized employees are trained on the Permit Space Program
- 3.3.3. Verify that all affected employees are made aware of permit spaces and their hazards
- 3.3.4. Conduct auditing of program to ensure compliance
- 3.3.5. Periodically review completed/cancelled permits to ensure compliance and identify lessons learned
- 3.3.6. Develop appropriate Emergency Response plans and capabilities
- 3.3.7. Ensure monitoring and emergency response equipment is in compliance with applicable regulation/standards

3.4. Entry Supervisor

- 3.4.1. Knows the hazards that may be faced during entry, including information on the mode of entry into the body, signs or symptoms, and consequences of the exposure
- 3.4.2. Verifies that appropriate entries have been made on the entry permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin
- 3.4.3. Terminates the entry and cancels the permit as required
- 3.4.4. Verifies that rescue services are available and that the means for summoning them are operable
- 3.4.5. Prohibits entry of unauthorized individuals who attempt to enter the permit space during entry operations
- 3.4.6. Determines that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained whenever responsibility for a permit space operation is transferred and at intervals dictated by the hazards and operations performed within the space.

3.5. Permit Space Entrants

- 3.5.1. Know the hazards that may be faced during entry, including information on the mode of entry into the body, signs or symptoms, and consequences of the exposure
- 3.5.2. Properly use equipment as required
- 3.5.3. Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space
- 3.5.4. Alert the attendant whenever:

3.5.4.1. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation
3.5.4.2. The entrant detects a prohibited condition

3.5.5. Exit from the permit space as quickly as possible whenever:
3.5.5.1. An order to evacuate is given by the attendant or the entry supervisor
3.5.5.2. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation
3.5.5.3. The entrant detects a prohibited condition
3.5.5.4. An evacuation alarm is activated

3.6. Permit Space Attendants
3.6.1. Knows the hazards that may be faced during entry, including information on the mode of entry into the body, signs or symptoms, and consequences of the exposure
3.6.2. Is aware of possible behavioral effects of hazard exposure in authorized entrants
3.6.3. Continuously maintains an accurate count of authorized entrants in the permit space and ensures that the means used to identify authorized entrants accurately identifies who is in the permit space
3.6.4. Remains outside the permit space during entry operations until relieved by another attendant
3.6.5. Communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space
3.6.6. Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions;
3.6.6.1. If the attendant detects a prohibited condition
3.6.6.2. If the attendant detects the behavioral effects of hazard exposure in an authorized entrant
3.6.6.3. If the attendant detects a situation outside the space that could endanger themselves or the authorized entrants
3.6.6.4. If the attendant cannot effectively and safely perform all the duties required
3.6.7. Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards
3.6.8. Performs non-entry rescues as specified by the rescue procedure
3.6.9. Performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

3.7. Rescue Team
3.7.1. Participate in training and drills
3.7.2. Respond immediately to rescue calls from the Attendant or any other person recognizing a need for rescue from the confined space
3.7.3. Have current certification in first-aid and CPR

4. Identification/Classification

4.1. Each business must identify all spaces that meet the definition of a Confined Space and list them on an inventory (Attachment A). This excludes non-GE facilities not under operational control by GE. Field service operations should inventory the types of spaces they can reasonably anticipate entering.

4.2. The Confined spaces identified must then be evaluated to determine if they meet the requirements of a Permit Space

4.3. The inventory shall include the location of the space, it's classification (confined or permit) and reasoning for its classification. Field service operations do not need to complete the location of spaces at non-GE facilities not under operational control by GE, but are required to enter the expected space classification. Some spaces may be expected to be confined spaces or permit spaces depending on the operations conducted. This should be noted in the inventory.

4.4. Any new spaces that have not been classified (confined or permit) shall be handled as a permit space until reviewed

4.5. The inventory shall be communicated and made readily available to employees

4.6. A space must be evaluated or reevaluated to verify it's classification (confined or permit space) where a Management of Change (MOC) identifies a possible change to the space.

4.7. Annually, a review of the list should be done to verify all spaces have been identified

4.8. If your location does not identify any confined spaces then documentation of the assessment must be kept and no written permit space program is required.

4.9. If your location has only confined spaces or has both confined and permit spaces but decides that its employees will not enter permit spaces, you must take effective measure to prevent employees and contractors from entering the permit spaces and develop a written Permit Space Program that is available to employees and covers the following sections of this manual:
- 4.9.1. Scope and Application
- 4.9.2. Definitions
- 4.9.3. Roles and Responsibilities
- 4.9.4. Identification/Classification
- 4.9.5. Confined Spaces
- 4.9.6. Labeling of Permit Spaces
- 4.9.7. Training (Awareness Only)
- 4.9.8. Contractors

4.10. If your business decides that its employees will enter permit spaces (Alternate, Reclassification or Entry Permitting) you must develop and implement a written Permit Space Program that is available to employees and complies with all parts of this manual.

4.11. The location must consult with and make information available to affected employees on the development and implementation of all aspects of the Permit Space Program.

5. Confined Spaces

5.1. Those spaces classified as Confined Spaces, as apposed to permit spaces, have no further work restrictions applied to them and are not covered by any further requirements of this manual.

5.2. If classification of a space as confined space requires entry to complete the evaluation, such entry must be made following permit space entry procedures.

5.3. The Risk Assessment required by this manual for permit spaces may be required for all confined spaces by country-specific regulations. Each location must review their program against local regulations to verify compliance.

6. Labeling of Permit Spaces

6.1. If permit spaces are present at the facility, you must inform potentially exposed employees of the existence and location of and the danger posed by the permit spaces. This may be accomplished by posting danger signs (Attachment B) or by any other equally effective means.

6.2. Signs must be in the local language(s) such that all affected employees can understand the postings.

6.3. Signs should be maintained in a legible condition

6.4. The signs should contain a warning that a permit is required before entry

6.5. Access locations for all permit spaces should be labeled

7. Permit Space Risk Assessment

7.1. Permit spaces must have a risk assessment completed prior to entering the space. The risk assessment may be completed as:
- 7.1.1. As a stand-alone document (Regulatory required in some countries) or
- 7.1.2. As part of the entry permitting process

7.2. It is recommended that all known permit spaces receive a stand-alone assessment that is used to assist in the issuing of an entry permit. A Permit Space Risk Assessment (Attachment C) is provided for completing stand-alone assessments.

7.3. Either type of risk assessment should identify the typical work that is performed in the permit space, the specific hazards known or anticipated, and the control measures to be implemented to eliminate or reduce each of the hazards to an acceptable level as well as the emergency arrangements that must be made before work starts

7.4. No entry permit shall be issued until the risk assessment has been reviewed and discussed by all persons engaged in the activity. Personnel who enter confined spaces must be informed of known or potential hazards associated with the permit spaces to be entered.

7.5. The stand-alone risk assessment for a space must be developed or re-evaluated if a MOC is implemented that might result in a possible change to the space.

8. Entry - Last Resort

8.1. Entry into permit spaces may only be considered when all other options for completing the task have been explored and deemed infeasible

8.2. Whenever feasible, operations should be done remotely, or equipment and procedures should be modified to eliminate the need for employees or contractors to enter any permit space

8.3. Whenever feasible, design and construction of facilities and systems, equipment purchase and installation should consider the elimination of all permit spaces that could require entry for maintenance, inspection, or testing

8.4. Where feasible, work involving permit spaces is to be planned so that entry is avoided. Some suggestions for entry avoidance are:
- 8.4.1. Modify the permit space so that entry is not necessary
- 8.4.2. Modify the permit space so that it no longer meets the definition of a permit space
- 8.4.3. Perform the work from the outside - e.g. inspections, sampling and cleaning operations can be carried out using appropriate equipment and tools.

9. Permit Space Entry Options

9.1. Entry requirements for Permit Spaces are dependant upon the hazards and controls measures available. The entry methods include:
- 9.1.1. Alternate Entry Procedure
- 9.1.2. Reclassification Entry Procedure
- 9.1.3. Permit Space Entry Procedure
  - 9.1.3.1. IDLH Space Precautions

10. Alternate Entry Procedure

10.1. **These entry procedures can only be used when a permit space has only an actual or potential Atmospheric Hazard and it can be demonstrated that continuous forced air ventilation alone is sufficient to maintain that permit space safe for entry.**

10.2. Initial atmospheric testing data is required to demonstrate ventilation alone is sufficient. If an employee must enter the space to conduct atmospheric testing, then Permit Space Entry Procedures must be followed

10.3. The forced air ventilation must be directed as to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees have left the space

10.4. The air supply for the forced air ventilation shall be from a clean source and may not increase the hazards in the space

10.5. There must be no hazardous atmosphere inside the space before any authorized entry

10.6. The Entry Permit must be completed up to the Alternate Entry Procedure Section (Attachment D) and must be signed by an entry supervisor and communicated to entry employees

10.7. The atmosphere within the space shall be periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere. Any employee who enters the space must be provided with an opportunity to observe the periodic testing

10.8. If a hazardous atmosphere is detected during entry:
- 10.8.1. Each employee shall leave the space immediately
- 10.8.2. The space shall be evaluated to determine how the hazardous atmosphere developed; and
- 10.8.3. Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place
- 10.8.4. Re-entry into the space must follow Permit Space Entry Procedures

11. Reclassification Entry Procedure

11.1. If all atmospheric and/or physical/mechanical hazards in the permit space can be eliminated or mitigated (not controlled), the permit space may be reclassified as a Confined Space for the entry. Methods to eliminate or mitigate hazards are discussed in Attachment H.

11.2. If it is necessary to enter the permit space to eliminate or mitigate hazards, employees must follow the Permit Space Entry Procedure. If testing and inspection during that permit entry demonstrate that the hazards within the permit space have been eliminated or mitigated, the entry may be reclassified as a Confined Space for as long as the hazards remain eliminated or mitigated.

11.3. If forced air ventilation is required to control atmospheric hazards then reclassification is not allowed and space must be entered using Alternate Entry (if atmospheric hazard is the only hazard) or Permit Space Entry Procedures

11.4. The Entry Permit must be completed up to the Reclassification Section (Attachment D) and must be signed by an Entry Supervisor and communicated to entry employees

11.5. If hazards are detected during the entry:
- 11.5.1. Each employee in the space shall exit immediately
- 11.5.2. The space shall be evaluated to determine how the hazards developed and
- 11.5.3. Implement measures to protect employees from the hazards before any subsequent entry takes place
- 11.5.4. Re-entry into the space must follow Permit Space Entry Procedures

12. Permit Space Entry Procedure

12.1. Permit Space Entry Procedures typically follow these steps:

12.1.1. Notification is made that permit space entry in required
12.1.2. Trained Entry Supervisor, Entrant(s) and Attendant(s) are identified
12.1.3. Space is prepared for evaluation
12.1.4. Entry Supervisor uses Risk Assessment and/or Entry Permit to identify actual or potential hazards, controls and emergency response preparations
12.1.5. If IDLH conditions are identified, entry into the space must be reviewed and approved by Business Level H&S Team
12.1.6. Entrant(s) and Attendant implement controls
12.1.7. Atmospheric Testing is conducted and determination made if additional controls needed
12.1.8. Entry Supervisor, Entrant(s) and Attendant(s) conduct pre-entry briefing to review Atmospheric Testing (Required), Entry Permit (Required) and Risk Assessment (if available)
12.1.9. Completed Entry Permit is posted at or near permit space entrance
12.1.10. Work begins with Entry Supervisor periodically checking in on the site and ensuring periodic atmospheric testing is being done
12.1.11. Once work is completed, Entrant(s) remove all tools, equipment and begins permit space back to normal
12.1.12. Entry Supervisor conducts a final review of area to ensure all controls have been removed, required communication made and space is safe to return to normal
12.1.13. Entry Supervisor documents on Entry Permit when permit is cancelled and follows locations document control procedure to maintain permit

12.2. The following sections of this manual have been developed to provide further detail concerning the Permit Space Entry Procedure:

12.2.1. Entry Permit
12.2.2. Hazard Identification/Control
12.2.3. Atmospheric Testing
12.2.4. IDLH Space Precautions
12.2.5. Rescue and Emergency Services
12.2.6. Contractors
12.2.7. Training

13. Entry Permit

13.1. The Entry Permit (Attachment D) is the tool that identifies and documents safe working conditions during entry into permit spaces with known hazards or with unknown or potentially hazardous atmospheres. A business can design a business-specific Entry Permit as long as it meets all of the criteria listed in section 13.4.

13.2. Before each entry into a permit space, the Entry Supervisor must complete an entry permit

13.3. The entry permit guides the Entry Supervisor and workers through a systematic evaluation of the space to be entered. The permit establishes appropriate conditions for entry and work in the space.

13.4. The entry permit must contain the following items:

13.4.1. The permit space to be entered
13.4.2. The purpose of the entry
13.4.3. The date and the authorized duration of the entry permit
13.4.4. The authorized entrants within the permit space, by name or by such other means (for example, through the use of rosters or tracking systems) as will enable the attendant to determine quickly and accurately, for the duration of the permit, which authorized entrants are inside the permit space
13.4.5. The personnel, by name, currently serving as attendants
13.4.6. The individual, by name, currently serving as entry supervisor, with a space for the signature or initials of the entry supervisor who originally authorized entry

13.4.7. The hazards of the permit space to be entered
13.4.8. The measures used to isolate the permit space and to eliminate or control permit space hazards before entry. NOTE: Those measures can include the lockout of equipment and procedures for purging, inerting, ventilating, and flushing permit spaces
13.4.9. The acceptable entry conditions
13.4.10. The results of initial and periodic atmospheric testing accompanied by the names or initials of the testers and by an indication of when the tests were performed
13.4.11. The rescue and emergency services that can be summoned and the means (such as the equipment to use and the numbers to call) for summoning those services
13.4.12. The communication procedures used by authorized entrants and attendants to maintain contact during the entry
13.4.13. The equipment required for the entry, such as personal protective equipment, testing equipment, communications equipment, alarm systems, and rescue equipment
13.4.14. Any other information whose inclusion is necessary, given the circumstances of the particular permit space, in order to ensure employee safety
13.4.15. Any additional permits, such as hot work or customer entry permits, that have been issued to authorize work in the permit space.

13.5. An Entry Supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as required for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.
13.5.1. If an Entry Supervisor is going to serve as an entrant, it is recommended that the Entry Supervisor role be transferred to another qualified individual remaining outside the space

13.6. The duration of the entry permit may not exceed the time required to complete the assigned task or job identified on the permit and may not exceed one shift (e.g. 8 hrs). For a entry permit to be renewed, several conditions shall be met before each re-entry into the permit space:
13.6.1. Atmospheric testing shall be conducted and the results must be within acceptable limits
13.6.2. If atmospheric test results are not within acceptable limits, precautions to protect entrants against the hazards should be addressed on the permit and should be in place
13.6.3. The Entry Supervisor shall verify that all precautions and other measures called for on the permit are still in effect.

13.7. Only operations or work originally approved on the permit shall be conducted in the space. A new permit should be issued or the original permit revised and reissued whenever changing work conditions or work activities introduce new hazards into the space.

13.8. The permit requirements and the steps taken to fulfill those requirements must be communicated to all employees involved in the operation prior to entry operations

13.9. The completed permit must be posted conspicuously at or near permit space entrance

13.10. Each location must use a standard Entry Permit for all entries

13.11. When working at non-GE locations it is recommended that a Customer Confined Space Program Checklist (Attachment E) be completed to evaluate the customers permit space program against GE's requirements.

13.12. When working at a non-GE location where the owner/operator completes an entry permit, the GE entrant must complete a GE Entry Permit as a means to verify correct entry procedures are being followed. The GE entrant should observe the atmospheric testing performed by the owner/operator if it is to be used as the initial testing to enter the space, to verify the following:
13.12.1. Testing meets the minimum GE requirements in the Atmospheric Testing section of this Manual
13.12.2. The manufacturer calibration of the instruments used is verified as current, and
13.12.3. The field calibration is observed and done correctly

13.13. When working at non-GE locations, if it is determined that the owner/operator permit space entry procedures do not meet GE requirements and/or use of GE procedures is denied, entry is prohibited until EHS reviews and approves entry procedures that provide equivalent protection to GE procedures.

13.14. Each location must retain each cancelled entry permit for at least one year to facilitate the review of the program. Any problems encountered during an entry operation should be noted on the entry permit so that appropriate revisions to the program can be made.

13.15. Completed entry permits must be periodically reviewed for completeness and accuracy. It's recommended this review be done no later than 30 days after submittal of completed permit.

14. Hazard Identification/Control

14.1. The following hazards are common in permit spaces:

14.1.1. Lack of Oxygen - This can occur because other gases or vapors displace Oxygen or because Oxygen is consumed. Air in spaces that are closed for an extended period may become deficient in oxygen due to oxidation of metals or from biological activity.

14.1.2. Oxygen-Enriched Atmospheres - Oxygen content greater than 23 percent by volume increases fire hazard.

14.1.3. Flammable or Combustible Atmosphere - Gases, vapors and liquids may accumulate in the space or may be present as residues

14.1.4. Electric Shock or Ignition of Flammable/ Combustibles - Portable lights, tools, or associated electrical equipment may cause shock or ignition of gases and vapors.

14.1.5. Injury from Mechanical Equipment not initially controlled through LOTO - Pumps, mixers, conveyors, etc., inadvertently activated or unguarded

14.1.6. Temperature Extremes - Vessels with steam jackets could rapidly heat to an unsafe temperature and those with cooling or cryogenics could expose entrants to extreme cold. The equipment itself may be designed to have a temperature extreme as well.

14.1.7. Exposure to Hazardous Substances - This may result from gradual release of substances from sludge, scale or slow chemical reactions that, over time, allow significant gas or vapor concentrations to develop. Contaminants can also enter from other sources through ducts and piping not initially controlled through LOTO.

14.2. Hazards in and around permit spaces must be controlled. Controls include changes in the work processes and/or working environment with the objective of:

14.2.1. Eliminating hazards

14.2.2. Reducing hazards below harmful levels

14.2.3. Preventing the hazards from coming into contact with the workers

14.3. The Hierarchy of Controls should be followed in controlling confined space hazards:

14.3.1. Engineering controls, such as ventilation to limit exposure to hazards

14.3.2. Work practice controls, such as wetting of hazardous dusts, frequent cleaning, LOTO

14.3.3. Use of personal protective equipment such as air purifying or supplied-air respirators.

14.4. Engineering Controls

14.4.1. Engineering controls are those controls that eliminate or reduce the hazard through implementation of sound engineering practices.

14.4.2. Examples include: guarding, ventilation systems, etc.

14.5. Work Practice (Administrative) Controls

14.5.1. Work practice (administrative) controls are those controls that eliminate or reduce the hazard through changes in the work practice.

14.5.2. Examples include: Cleaning/decontamination of vessels, rotating of workers, LOTO, etc.

14.6. Personal Protective Equipment (PPE)

14.6.1. If the hazard cannot be eliminated or reduced to a safe level through engineering and/or work practice controls, PPE should be used.

14.6.2. The Entry Supervisor should determine PPE needed by all personnel entering the confined space, including rescue teams.

14.6.3. Examples include: Harness, Respirator, Gloves, etc.

14.7. Isolation of Hazardous Energy - Lockout / Tagout

14.7.1. All energy sources that could pose a hazard to an entrant in a permit space must be isolated (secured, relieved, disconnected and/or restrained) and verified to be at a zero active state before entering

14.7.2. In permit spaces where complete isolation is not possible, provisions must be made to isolate hazards to the maximum extent possible and the issue must be noted on the associated permit space risk assessment.

14.7.3. Special precautions should be taken when entering double walled, jacketed, or internally insulated permit spaces that may discharge hazardous material through the vessel's internal wall

14.7.4. Where there is a need to test, position or activate equipment by temporarily removing the lock, the requirements of the GE LOTO Procedure must be followed

14.8. Any conditions making it unsafe to remove an entrance cover or open an access door or panel must be eliminated before the space is opened.

14.9. Once open, the entry point must be promptly guarded by a railing or other temporary barrier that will prevent anyone from falling through the opening. This barrier should protect each employee working in the space from foreign objects entering the space. If the opening is located in a traffic area, adequate barriers should be erected

14.10. Means for safe entry and exit must be provided for permit spaces. Each entry and exit point should be evaluated to identify the hazards and select the most effective methods and equipment to enable employees to safely enter and exit the space.

14.11. All individuals involved with an entry must be provided with the appropriate equipment to meet the permit space conditions identified. All equipment should be tested for proper function and integrity prior to use. As appropriate, equipment should be intrinsically safe. Equipment may include, but not limited to:

14.11.1. PPE (Coveralls, chemical suits, head covering, hearing protection, respiratory protection, gloves, apron, footwear, or foot protection)

14.11.2. Ventilation Equipment – as needed to ensure acceptable entry conditions.

14.11.3. Communication Equipment – as needed to allow communication at all times between entrant and the attendant.

14.11.4. Lighting – as needed to allow entrant(s) to work safely and to exit the space quickly in an emergency.

14.11.5. Entry/Egress Equipment – ladders, hoists or other means to enter and exit the space.

14.12. To facilitate non-entry rescue, retrieval systems or methods must be used whenever an entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. The Entry Supervisor must make this decision.

14.13. Retrieval systems shall meet the following requirements.

14.13.1. Each entrant shall use a full body harness, with a retrieval line attached at the center of the entrant's back near shoulder level, above the entrant's head, or at another point which the Entry Supervisor determines presents a profile small enough for the successful removal of the entrant.

14.13.2. Wristlets may be used in lieu of the full body harness if Entry Supervisor can demonstrate that the use of a full body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative.

14.13.3. The other end of the retrieval line shall be attached to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary.

14.13.4. A mechanical device shall be available to retrieve personnel from vertical type permit spaces more than 5 feet (1.52 m) deep

14.14. If fall protection is necessary for entry into the space, and the equipment is involved in a fall or a rescue from a top-entry space, the equipment must be taken out of service. Consult the GE Fall Protection Manual for guidance.

15. Atmospheric Testing

15.1. Atmospheric testing is required prior to entry into any permit space to verify that acceptable conditions exist for entry into the space

15.2. If a person must go into the space to conduct the atmospheric testing, all Permit Entry Procedures (i.e., rescue team, attendant, entry supervisor) must be in place prior to entering.

15.3. The internal atmosphere must be tested with a calibrated, direct-reading instrument for the following, in the order given:
15.3.1. Oxygen content
15.3.2. Combustible gases and vapors
15.3.3. Carbon Monoxide
15.3.4. Toxic gases and vapors expected to be present in the space

15.4. Direct-reading instruments must be used for measuring Oxygen and Combustible gasses and vapor levels within a space and should be used for Carbon Monoxide, Toxic gases and vapor testing as well. The use of detector tubes for atmospheric testing of spaces should only be used when other options are not readily available.

15.5. Testing equipment used in specialty areas should be listed or approved for use in such areas. This listing or approval should be from nationally recognized testing laboratories such as Underwriters Laboratories or Factory Mutual Systems.

15.6. The atmosphere of a permit space should be analyzed using equipment of sufficient sensitivity and specificity.

15.7. The analysis should identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry procedures can be developed and acceptable entry conditions stipulated for that space. Testing, evaluating and develop appropriate control measures must be done by a person trained in Atmospheric Testing

15.8. Testing results must be documented on the Entry Permit

15.9. The atmosphere must be periodically retested to verify that atmospheric conditions remain within acceptable entry parameters when a potential for a hazardous atmosphere exists.

15.10. If the permit space is vacated for any period of time, the atmosphere of the space must be retested before re-entry is permitted.

15.11. The atmosphere of a permit space should be considered within acceptable limits whenever the following conditions are maintained:
15.11.1. Oxygen - 19.5% to 23.5%
15.11.2. Flammability - less than 10% of the Lower Explosion Limit (LEL), also know as the Lower Flammable Limit (LFL)
15.11.3. Carbon monoxide - less than 25 ppm (or lower if required by local regulation)
15.11.4. Toxic Materials - less than recognized published exposure levels using the established GE priority of the lowest or most protective limit among the following: ACGIH Threshold Limit Values, local regulatory occupational exposure limits, or GE-specified occupational exposure limits

15.12. Whenever atmospheric testing levels are not within acceptable limits, entry shall be prohibited until appropriate controls are implemented, and re-testing indicates the levels are within acceptable levels or appropriate personal protective equipment is identified and used to protect workers. If this is unable to occur or atmospheric testing levels exceed IDLH levels listed in the *NIOSH Pocket Guide to Chemical Hazards* (available on the GE IH SupportCentral community: http://supportcentral.ge.com/products/sup_products.asp?prod_id=27882) or similar reference, the space must be classified as IDLH and those additional precautions must be implemented before entering.

15.13. If the source of the contaminant cannot be determined or controlled, corrective actions must be adequate to deal with the worst possible condition in the permit space and continuous atmospheric monitoring must be conducted

15.14. If there is the possibility that the permit space atmosphere can become unacceptable while the work is in progress, the atmosphere should be constantly monitored and procedures and equipment should be provided to allow the employees to quickly and safely exit the space

15.15. Testing of spaces with Top Entrances should follow this process:

15.15.1. From each entrance, drop the sampling probe of the meter to the bottom of the space. Additionally, use other available openings, which would facilitate air testing for that permit space

15.15.2. Slowly raise the sampling probe, stopping at intervals of three feet (1 meter) to verify that the atmosphere is not contaminated. The rate of sampling should be slowed to accommodate detector response due to the length of the sampling line

15.15.3. Record atmospheric testing data on the entry permit

15.16. Testing of spaces having a Side or Bottom Entrance should follow this process:

15.16.1. From each entrance, move the sampling probe to the opposite side of the space. Use rods, poles or other means to extend the probe to the opposite side of the space

15.16.2. Slowly test all areas inside the permit space. The rate of sampling must be slowed to accommodate detector response due to the length of the sampling line and probe

15.16.3. Record air testing data on the confined space permit

15.17. All equipment used for atmospheric testing must be maintained according to manufacturer's recommendations and factory calibrated at the required frequency

15.18. All testing equipment must have its calibration checked immediately prior to use. The calibration checks must be performed in accordance with the manufacturer's requirements and should include:

15.18.1. Fresh air check (Oxygen)

15.18.2. Zero check (CO, LEL, etc.)

15.18.3. Span check (LEL, VOCs, CO)

15.19. Instrument calibration documentation will be reviewed annually.

15.20. Instruments failing calibration must not be used, and must be taken out of service and repaired or replaced

16. IDLH Space Precautions

16.1. Entry into permit spaces containing an IDLH atmosphere is prohibited unless the proposed entry receives prior review and approval from the business level health & safety leader or industrial hygienist, and specific entry procedures are established.

16.2. Respirators for IDLH atmospheres must be:

16.2.1. A certified full facepiece pressure demand SCBA for a minimum service life of thirty minutes, or

16.2.2. A combination full facepiece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply

16.3. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

16.4. Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the attendant

16.5. The emergency rescue services are on standby outside the permit space

16.6. The emergency rescue operations must be equipped with at least:
- 16.6.1. Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied-air respirator with auxiliary SCBA; and
- 16.6.2. Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres

17. **Rescue and Emergency Services**

17.1. If permit spaces are to be entered at a location, emergency rescue plans must be developed

17.2. Entry rescue personnel and equipment are required to be able to respond and arrive at the location of the permit space entry whenever the permit space contains hazards capable of causing serious accidents such as those involving falls, suffocation, asphyxiation, electrocution, amputation, or similar serious hazards. When a qualified Entry Supervisor or qualified EHS representative determines that a permit space does not present serious hazards triggering the requirement of 4-minute entry rescue response time, the rationale for this determination must be documented on the GE Entry Permit. Examples of permit spaces that may not require 4-minute entry rescue response time include:
- 17.2.1. **Sewer lift station** with built in power ventilation system considered designed for human occupancy. The definition is clear for those spaces where a known or suspect hazard is considered and eliminated or controlled in the design of a workplace. When hazards are eliminated and/or managed through the application of engineering controls for the safety and health of the humans who will be occupying the space, the employee protective measures, intended by the standard, have been met. Where it can be shown that the manufacturer has considered the hazards of sewage and its by-products in the design of their pump station so humans can work in the space. Design measures such as barrier separation from the sewage, powered ventilation providing a minimum of 20 air changes an hour, automatic-on and timed (ventilation) control, lighting and even optional heating or air conditioning demonstrates that this unit was designed to accommodate the worker who will enter it.

17.3. When 4-minute response time is required, on-site rescue teams, off-site local services or a contracted service may be used for entry rescue. Whichever rescue service is selected, they must to able to respond and arrive at the location of the permit space entry within 4 minutes of being called.

17.4. Attachment F (or equivalent) must be completed when evaluating off-site or contracted rescue services. This document shall also be used when GE employees are relying on customer or site owner/operator entry rescue services.

17.5. If an outside rescue service is used, they:
- 17.5.1. Must be made aware of the hazards of the permit spaces
- 17.5.2. Must have access to comparable permit spaces or afforded the opportunity to practice at the location where they will be doing a possible rescue in order to develop rescue plans
- 17.5.3. Should conduct an annual drill on-site as part of the agreement

17.6. If the location selects on-site rescue services then the following measures must be taken:
- 17.6.1. Provide affected employees with the personal protective equipment (PPE) needed to conduct permit space rescues safely and train affected employees so they are proficient in the use of that PPE, at no cost to those employees
- 17.6.2. Train affected employees to perform assigned rescue duties. The employer must ensure that such employees successfully complete the training required to establish proficiency as an authorized entrant

17.6.3. Train affected employees in basic first-aid and cardiopulmonary resuscitation (CPR). At least one member of the rescue team holding CPR certification must be available but it is recommended that at least two available members are CPR certified

17.6.4. Ensure that affected employees practice making permit space rescues at least once every 12 months, by means of simulated rescue operations in which they remove dummies, manikins, or actual persons from the actual permit spaces or from representative permit spaces.

17.6.5. Representative permit spaces shall, with respect to opening size, configuration, and accessibility, simulate the types of permit spaces from which rescue is to be performed.

17.7. Rescue services must be coordinated ahead of time. Coordination must include contacting the rescue service and alerting them to the entry schedule, and verifying that trained personnel (minimum of 2 or more rescuers other than the Attendant is recommended) and necessary equipment are available during the period of entry, and can respond to the location of the entry within the required 4 minute timeframe.

17.8. If permit space has a IDLH condition, rescue services must be on stand-by outside the permit space with necessary rescue equipment

17.9. A method for contacting the emergency and rescue services must be clearly identified on the entry permit and communicated to the Attendant

17.10. If an injured entrant is exposed to a substance for which a Material Safety Data Sheet (MSDS) or other similar written information is required to be kept at the worksite, that MSDS or written information shall be made available to the medical facility treating the exposed entrant

18. **Contractors**

18.1. A GE contractor representative is designated for each contractor in accordance with Element 10 of the GE Health and Safety Framework. This representative is responsible for the overall safety and health coordination and oversight of the contractor, as well as the interaction of the contractor with GE employees.

18.2. The GE representative must:

18.2.1. Inform the contractor that the workplace contains permit spaces and that entry is allowed only through compliance with a Permit Space Entry Program

18.2.2. Apprise the contractor of the elements, including the hazards identified and the host employer's experience with the space, that make the space in question a permit space. If available, the risk assessment should also be shared

18.2.3. Apprise the contractor of any precautions or procedures that GE and the host employer have implemented for the protection of employees in or near permit spaces where contractor personnel will be working

18.2.4. Review the permit space program the contractor intends to follow and training certifications for entrants/attendants and rescue team. The Contractor Program Checklist, Attachment G, can be used to assist in conducting the review.

18.2.5. Coordinate entry operations to ensure the GE Permit Space Program is followed when both GE and contractor personnel will be working in or near permit spaces

18.2.6. Debrief the contractor at the conclusion of the entry operations regarding the permit space program followed and regarding any hazards confronted or created in permit spaces during entry operations

18.2.7. For field service operations, field engineers, field technicians, or sales personnel may be designated as the GE representative to oversee the contractor as long as they are qualified to fulfill these duties.

18.3. Contractor employees involved in permit space entry activities must be trained according to their role and level of responsibility. Training must be in accordance with the applicable regulatory requirements and the Contractor's Confined Space Entry program, as accepted following the review required by Element 10 of the GE Health & Safety Framework.

18.4. Contractors are required to submit copies of employee applicable training records (e.g., confined space entry, LOTO, asbestos removal, etc.).

18.5. Periodic H&S inspections should be done to verify contractors are complying with entry requirements. When safety-related problems are noted the GE representative has the authority to stop work until the problems are corrected.

18.6. GE has the right to terminate the contract for safety violations. All cost associated to this termination shall be the responsibility of the contractor. These terms are to be included in all contracts.

18.7. Contractors should have their own equipment and calibrated multi-gas meter to perform ongoing air monitoring and during the entry. Contractors should not be using GE's safety equipment.

19. Training

19.1. All persons providing Permit Space Entry training must have documented training and experience in each specific subject that they present, as approved by the business level EHS team. An example of a qualified permit space entry instructor would be a qualified Entry Supervisor with good verbal communications skills.

19.2. Each GE location must provide Confined Space Awareness Training, MyLearning EHS-190 can be used, to all employees whose work may be affected by confined spaces or entry activities. The training must cover:
- 19.2.1. The existence of confined and permit spaces in their work areas
- 19.2.2. Labeling methods and warnings
- 19.2.3. Understand the dangers of unauthorized entry

19.3. Each GE location must provide training so that all employees whose work involves dealing with permit spaces acquire the understanding, knowledge, and skills necessary for the safe performance of their duties. Training should be provided to each affected employee:
- 19.3.1. Before the employee is first assigned duties
- 19.3.2. Before there is a change in assigned duties
- 19.3.3. Whenever there is a change in permit space operations that presents a hazard for which an employee has not been trained
- 19.3.4. Whenever GE has reason to believe either that there are deviations from the permit space entry procedures or that there are inadequacies in the employee's knowledge or use of these procedures.

19.4. Training for Entry Supervisors should include:
- 19.4.1. Duties and responsibilities as a member of the permit space entry team
- 19.4.2. Explanation of the general hazards associated with confined and permit spaces
- 19.4.3. Discussion of specific permit space hazards associated with the site, location or operation
- 19.4.4. Reason for, proper use, and limitations of PPE and other safety equipment required for entry into permit spaces
- 19.4.5. Explanation of permits and other procedural requirements for conducting a permit space entry
- 19.4.6. A clear understanding of what conditions would prohibit entry
- 19.4.7. Understanding of what emergency equipment/preparations are required and how to respond to emergencies
- 19.4.8. Description of how to recognize symptoms of overexposure to probable air contaminants in themselves and co-workers, and method(s) for alerting attendants
- 19.4.9. Other training may be required for the Entry Supervisor if the permit space dictates a need. Other training may include but is not limited to: LOTO Authorized, Electrical Safety, Fall Protection, etc.

Training for Entry Supervisors	GE Course
Confined Space Entry Supervisor Training	Minimum of MyLearning, EHS-200 plus the following: Instrumentation training, Non-Entry Rescue, Summoning Entry Rescue Service, Communication with Entrants

19.5. Training for Atmospheric Testing Personnel should include:
- 19.5.1. Proper use of the equipment
- 19.5.2. Knowledge of calibration
- 19.5.3. Knowledge of sampling strategies and techniques
- 19.5.4. Knowledge of Occupational Exposure Limits, TLVs, LELs, UELs, etc.
- 19.5.5. Other training may be required for Atmospheric Testing Personnel if the permit space dictates a need. Other training may include but is not limited to: LOTO Authorized, Electrical Safety, Fall Protection, etc.

Training for Atmospheric Monitoring Personnel	GE Course
Instrumentation Training	Local responsibility with equipment to be used

19.6. Training for Entrants should include:
- 19.6.1. Explanation of the general hazards associated with confined and permit spaces
- 19.6.2. Discussion of specific permit space hazards associated with the site, location or operation
- 19.6.3. Reason for, proper use, and limitations of PPE and other safety equipment required for entry into permit spaces
- 19.6.4. Explanation of permits and other procedural requirements for conducting a permit space entry
- 19.6.5. Description of how to recognize symptoms of overexposure to probable air contaminants in themselves and co-workers, and method(s) for alerting attendants
- 19.6.6. Self-rescue techniques
- 19.6.7. Hands-on demonstration of Entry Permitting process and equipment they would use while entering a space (i.e. Harness, life line, Retrieval Device, etc)
- 19.6.8. Other training may be required for the entrant if the permit space dictates a need. Other training may include but is not limited to: LOTO Authorized, Electrical Safety, Fall Protection, etc.

Training for Confined Space Entrants	GE Course
Confined Space Entry Training	MyLearning, EHS-200

19.7. Training for Attendants should include the following:
- 19.7.1. Explanation of the general hazards associated with confined and permit spaces
- 19.7.2. Discussion of specific permit space hazards associated with the site, location or operation
- 19.7.3. Reason for, proper use, and limitations of PPE and other safety equipment required for entry into permit spaces
- 19.7.4. Explanation of permits and other procedural requirements for conducting a permit space entry
- 19.7.5. Description of how to recognize symptoms of overexposure to probable air contaminants by entrants
- 19.7.6. Procedures for summoning rescue or other emergency services, and
- 19.7.7. Proper utilization of equipment used for communicating with entry and emergency/rescue personnel
- 19.7.8. Non-Entry Rescue procedures

19.7.9. Other training may be required for the attendant if the permit space dictates a need. Other training may include but is not limited to: LOTO Authorized, Electrical Safety, Fall Protection, etc.

Training for Confined Space Attendants	GE Course
Non-Entry Rescue	Local responsibility with equipment to be used
Summoning Entry Rescue Service	Local responsibility based on local procedures
Communication with Entrants	Local responsibility based on methods available
Confined Space Entry Training	MyLearning, EHS-200

19.8. Training for Emergency Response Personnel should include:

19.8.1. Rescue plan and procedures developed for each type of permit space that are anticipated to be encountered,

19.8.2. Use of emergency rescue equipment,

19.8.3. First aid and CPR techniques, and

19.8.4. Work location and permit space configuration to minimize response time

19.8.5. Initial and annual hands-on demonstration of a simulated rescue to reinforce training

19.8.6. Other training may be required for the Emergency Response Personnel if the permit space dictates a need. Other training may include but is not limited to: LOTO Authorized, Electrical Safety, Fall Protection, etc.

19.8.7. Training sessions should be repeated as often as necessary (Recommendation: Annually for those performing rescue infrequently and every 3 years for those performing rescue services frequently) to maintain an acceptable level of personnel competence.

Training for Emergency Response Personnel	GE Course
Confined Space Entry Training	MyLearning, EHS-200
First Aid / CPR	Red Cross, Red Crescent, or other qualified local resource
Use of Emergency Rescue Equipment	Local responsibility with equip to be used

Refresher training for Entry Supervisors, Entrants, and Attendants is **required e very two years, or whenever it is found that deviations from established procedures are occurring or employee knowledge about how to execute the procedures is inadequate.**

19.9. All training must be documented and at least include each employee's name, the signatures or initials of the trainers, and the dates of training. The certification shall be available for inspection by employees and their authorized representatives.

20. Program Review and Record Keeping

20.1. Targeted inspections of active permit space work activities must be made on a regular basis to verify that procedures are being followed. A specific inspection schedule should be established and can be linked to Element 8, or independent of Element 8.

20.2. Each GE location should conduct an annual audit of the site's permit space program by completing the Confined Space Entry Self Assessment in PowerSuite.

20.3. A review and update of locations written program must take place annually and after:

20.3.1. There is reason to believe that the measures taken under the permit space program may not protect employees

20.3.2. Any unauthorized entry of a permit space
20.3.3. The detection of a permit space hazard not covered by the entry permit
20.3.4. The detection of a condition prohibited by the entry permit
20.3.5. The occurrence of an injury or near-miss during permit entry
20.3.6. A change in the use or configuration of a permit space
20.3.7. A employee complains about the effectiveness of the program
20.3.8. As part of the Health & Safety Framework annual program review under Element 20.

Attachment A

Confined Space Inventory

		Confined Space				Permit Space				
Space Identification	Date Reviewed	Is large enough and so configured that an employee can bodily enter and perform assigned work	Has limited or restriced means for entry or exit	Is not designed for continuous employee occupancy	Is space a Confined Space? (Yes, continue to Permit Space. No, Stop)	Contains or has a potential to contain a hazardous atmosphere	Contains a materail 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 that slopes downward and tapers to a smaller cross-section	Contains any other recognized SERIOUS safety or health hazard	Is confined space a permit space?

Attachment B
Example Permit Required Confined Space Label

Attachment C

Permit Space Risk Assessment

Date Evaluation Performed: _____ Evaluation Performed By: _____

SPACE & LOCATION		HAZARDS														Personal Protective Equipment				Rescue Services	
Space label and location		ATMOSPHERIC						PHYSICAL								All equipment required to enter the space				Describe rescue equipment / services	
Space Identification	**Number of Entry Points**	**Oxygen (deficient/ enrich)**	**Explosive (Gas/Vapors)**	**Explosive (Dust)**	**Carbon Monoxide**	**Hydrogen Sulfide**	**Other Toxic Hazards**	**Mechanical**	**Electrical**	**Process Lines (In/Out)**	**Configuration (entrapment)**	**Engulfment (solid / liquid)**	**Temperature Extreme (Hot/Cold)**	**Fall Hazard (People/Equip/Materials)**	**Restricted Entry/Exit**	**Chemical PPE**	**Respiratory PPE**	**Other PPE**	**Describe Other PPE Required (air purifying respirator, SCBA, welding prot., gloves, chemical prot., etc.)**	**Rescue Equipment (life line, body harness, tripod, man winch, fall arrest unit, radios, etc.)**	**Off-site Rescue Services**

Attachment D

CONFINED SPACE ENTRY PERMIT

ANY CHANGE IN THE CONFINED SPACES ENVIRONMENT, OR A LACK OF OCCUPANCY, SHALL REQUIRED NEW MONITORING PRIOR TO THE RE-COMMENCEMENT OF WORK.

SPACE TO BE ENTERED _____

PURPOSE OF THE ENTRY _____

DATE PERMIT ISSUED _____

AUTHORIZED DURATION OF PERMIT _____

PRINT NAME OF ENTRY SUPERVISOR _____

SPACE HAZARDS	YES	NO		YES	NO
ATMOSPHERIC			FALLS FROM HEIGHT		
MECHANICAL			HEAT		
ELECTRICAL			ADJACENT WORK		
CHEMICAL			WORK BEING PERFORMED		
ENGULFMENT			CONFIGURATION		
NOISE			OTHER		

HAZARD CONTROLS	YES	NO		YES	NO
LOTO			CLEANING AND PURGING		
BLANKING OR HAZARD ELIMINATION			ADDITIONAL WORK PERMITS		
NATURAL VENTILATION			CONTINUOUS AIR MONITORING		
MECHANICAL VENTILATION			OTHER		

EQUIPMENT NEEDED	YES	NO		YES	NO
GLOVES			AIR MONITOR		
PROTECTIVE CLOTHING			AIR BLOWER		
SAFETY SHOES/BOOTS			FLOOD LIGHTS / FLASHLIGHTS		
HARD HAT			RADIOS / CELL PHONE		
SAFETY GLASSES/GOGGLES/ FACE SHIELD			GFCI		
LADDER			EYE WASH/SHOWER ACCESS		
FIRE EXTINGUISHER			OTHER		
FIRE BLANKETS/SHIELD			OTHER		

ATMOSPHERIC TESTING

MONITORING EQUIPMENT USED _____

MONITOR CALIBRATION DATE _____

PERSON PERFORMING TESTS (PRINT NAME) _____

PERSON PERFORMING TEST (SIGNATURE) _____

	SAFE OPER. LIMIT	TESTING TIME / RESULTS	TESTING TIME / RESULTS
OXYGEN (O2)	19.5 - 23.5%		
LOWER FLAMMABILITY LIMIT	< 10%		
CARBON MONOXIDE	< 25 PPM		
OTHER			

ENTRY PERSONNEL

NAME(S) OF ENTRANTS	CS TRAINING DATE	NAME(S) OF ATTENDANTS	CS TRAINING DATE

ALTERNATE ENTRY PROCEDURE

ALL INFORMATION REQUIRED ABOVE THIS SECTION MUST BE COMPLETED BEFORE REVIEWING A PERMIT SPACE FOR THE ALTERNATE ENTRY.

DOES SPACE ONLY HAVE ATMOSPHERIC HAZARDS?	YES	NO	If YES, CONTINUE TO NEXT QUESTION. IF NO, MOVE TO RECLASSIFICATION PROCEDURE
IS CONTINUOUS FORCE AIR VENTILATION ADEQUATE?	YES	NO	IF YES, CONTINUE TO NEXT QUESTION. IF NO, MOVE TO PERMIT SPACE PROCEDURE.
IS AIR SUPPLY FOR VENTILATION FROM A CLEAN SOURCE?	YES	NO	IF YES, CONTINUE TO NEXT QUESTION. IF NO, MOVE TO PERMIT SPACE PROCEDURE.
CAN TESTING BE CONDUCTED FROM OUTSIDE THE SPACE?	YES	NO	IF YES, CONTINUE TO NEXT QUESTION. IF NO, MOVE TO PERMIT SPACE PROCEDURE.
HAS TESTING CONFIRMED HAZARD IS CONTROLLED?	YES	NO	If YES, CONTINUE TO NEXT QUESTION. IF NO, MOVE TO RECLASSIFICATION PROCEDURE
WILL PERIODIC ATMOSPHERIC TESTING OCCUR?	YES	NO	IF YES, ENTRY SUPERVISOR SIGNS AND WORK BEGINS, IF NO MOVE TO PERMIT SPACE PROCEDURE

BY SIGNING BELOW, I UNDERSTAND THE REQUIREMENTS FOR AN ALTERNATE ENTRY AND HAVE VERIFIED THEY HAVE BEEN ACHIEVED. I ALSO UNDERSTAND THAT NO ATTENDANT OR OTHER CONTROLS ARE REQUIRED FOR THIS SPACE AND ALL INFORMATION ON THIS ENTRY PERMIT HAS BEEN REVIEWED WITH THE ENTRANT(S).

SIGNATURE OF ENTRY SUPERVISOR: _____

IF ALTERNATE ENTRY PROCEDURE USED, STOP FILLING OUT ENTRY PERMIT HERE

RECLASSIFICATION PROCEDURE

ALL INFORMATION REQUIRED ABOVE THIS SECTION MUST BE COMPLETED BEFORE REVIEWING A PERMIT SPACE FOR RE-CLASSIFICATION

CAN HAZARDS BE ELIMINATED FROM OUTSIDE THE SPACE?	YES	NO	IF YES, CONTINUE TO NEXT QUESTION. IF NO, MOVE TO PERMIT SPACE PROCEDURE
HAVE ALL HAZARDS BEEN ELIMINATED?	YES	NO	IF YES, CONTINUE TO NEXT QUESTION. IF NO, MOVE TO PERMIT SPACE PROCEDURE
FORCED AIR VENTILATION IS NOT NEEDED?	YES	NO	IF YES, ENTRY SUPERVISOR SIGNS BELOW AND WORK BEGINS. IF NO, MOVE TO PERMIT SPACE PROC.

BY SIGNING BELOW, I UNDERSTAND THE REQUIREMENTS FOR A RECLASSIFICATION OF A PERMIT SPACE AND HAVE VERIFIED THEY HAVE BEEN ACHIEVED. I ALSO UNDERSTAND THAT NO ATTENDANT OR OTHER CONTROLS ARE REQUIRED FOR THIS SPACE AND ALL INFORMATION LISTED ON THIS ENTRY PERMIT HAS BEEN REVIEWED WITH THE ENTRANT(S).

SIGNATURE OF ENTRY SUPERVISOR: _____

IF RECLASSIFICATION PROCEDURE USED, STOP FILLING OUT ENTRY PERMIT HERE

PERMIT SPACE PROCEDURE

ALL INFORMATION REQUIRED ABOVE THIS SECTION MUST BE COMPLETED PRIOR TO COMPLETING PERMIT SPACE PROCEDURES

SPACE HAZARDS COULD RESULT IN A?	YES	NO		YES	NO
FALL			DISABLING INJURY THAT COULD PREVENT SELF RESCUE		
AMPUTATION			PERMANENTLY DISABLING INJURY		
SUFFOCATION/ASPHYXIATION			DEATH		
ELECTROCUTION					

IF YOU ANSWER YES TO ANY OF THESE THEN 4 MINUTE RESCUE RESPONSE IS REQUIRED

RESCUE PREPARATIONS	YES	NO		YES	NO
OUTSIDE RESPONSE PROVIDER			RESCUE ON STAND-BY		
RESCUE TEAM ON SITE					

RESCUE EQUIPMENT	YES	NO		YES	NO
LIFELINE			FIRE EXTINGUISHER		
FULL BODY HARNESS			ESCAPE RESPIRATOR		
ANKLETS			CARTRIDGE RESPIRATOR		
WRISTLETS			AIR SUPPLIED RESPIRATOR		
WINCH			SCBA		
TRIPOD			OTHER		
RADIOS / CELL PHONE			OTHER		

COMMUNICATION MEANS BETWEEN ENTRANT/ATTENDANT: _____

EMERGENCY CONTACT NUMBER: _____

IN THE EVENT OF AN EMERGENCY, ATTENDANT MUST:

_____

_____

PRE-ENTRY MEETING CONDUCTED? YES NO

WE HAVE REVIEWED THE WORK AUTHORIZED BY THIS PERMIT AND THE INFORMATION CONTAINED HERE-IN. ALL WRITTEN INSTRUCTIONS, SAFETY PROCEDURES AND EQUIPMENTS HAVE BEEN RECEIVED AND ARE UNDERSTOOD.

	SIGNATURE	DATE
ENTRY SUPERVISOR		
PERMIT ISSUER		
ENTRANT		
ENTRANT		
ATTENDANT		

THIS COMPLETED PERMIT MUST BE POSTED AT THE CONFINED SPACE AND AVAILABLE FOR REVIEW.

POST ENTRY VERIFICATION

THE ENTRY SUPERVISOR MUST REVIEW WORK SITE POST EVENT TO ENSURE EQUIPMENT IS BACK IN SAFE CONDITION AND ALL NEEDED EQUIPMENT/TOOLS HAVE BEEN ACCOUNTED FOR.

TIME ENTRY COMPLETED, AM/PM _____

DATE _____

SIGNATURE ENTRY SUPERVISOR

THIS COMPLETED PERMIT MUST BE KEPT ON FILE FOR 1 YEAR AND MUST BE READILY AVAILABLE FOR INSPECTION/REVIEW

PERMIT REVIEW ISSUES: _____

Attachment E

Customer Confined Space Program Checklist

It is recommended that these questions t be asked and answered before any Field Sales/Service employee performs a confined space entry at a customer site to verify that GE or equivalent procedures will be used. This section of the checklist can and should be done as far in advance as possible so any issues identified can be corrected. Any question that is answered "no" must be reviewed with an EHS or operations leader knowledgeable on GE permit space entry procedures.

Customer Site Name:_____ Reason for Entry:_____

Questions	Guidance	**YES** = Continue with work **NO** = Work can not proceed until corrective actions taken
Have you reviewed and do you understand GE's Confined Space Entry Program?	Each employee must review the specific Confined Space Program for his or her site/region.	YES NO
If you are required to follow the customers confined space program, have you reviewed it and does it meet the GE requirements?	This review must ensure the customers program covers all the components of the GE program. Answer NO to this question if you do not feel knowledgeable enough to do this review.	YES NO
Have you completed the appropriate training for you to enter the confined space?	The minimum GE requirement is GE-EHS-200 Confined Space Entry Authorized in MyLearning which includes a 2 hour online / teleconference session. Your customer may require more training be sure to check with them.	YES NO
Do you have an attendant who will be watching you and be in constant communication with you during the entry?	You must have an attendant for a permit space entry. The attendant must be knowledgeable of how to notify the rescue team in the event of an emergency.	YES NO
Has the attendant been trained in Confined Space Entry?	If GE employee is serving as attendant then they must have completed GE-EHS-200. If using non-GE employee you must obtain documentation that employee has received confined space training.	YES NO
Is there a confined space entry permit in place that requires the same type of information that the GE permit does?	The permit should clearly state: o The hazards of the space o How they have been controlled o The atmospheric testing equipment and results o The Emergency Response Procedures for the entry o The required PPE/equipment for entry o The required confined space supervisor signature If the customer is issuing the permit, you must review it and sign off or acknowledge that you agree the space is safe to enter.	YES NO
Are emergency response capabilities clearly communicated, do you understand them and are they appropriate?	Confined space rescue typically falls into one of the following categories: o Self-Rescue – Meaning the entrant/attendant notice a concern and the entrant can take him/her self out of the space. Cannot alone be considered adequate rescue. o Non-Entry Rescue – Meaning the attendant uses a mechanical device to lift/pull the entrant out of a space without entering the space. Cannot alone be considered adequate rescue. o Entry Rescue – Means the customer/site either has an on-site or off-site local or contracted rescue team who is capable of entering the space to conduct a rescue. You must confirm with customer that the entry rescue team is able to arrive within 4 minutes of notification. You must discuss with the customer the Entry Rescue plans they have in place and determine if it is adequate.	YES NO
Do you know what Personal Protective Equipment will be needed for entry and do you have it available?	Based off the type of space and the hazards associated with the space, you must evaluate what PPE will be necessary and ensure it is available.	YES NO

Only after all questions above are answered **YES** can authorization be given to proceed.

_____

Name of Employee Completing Form Signature Date

_____

Name of Employee Granting Authorization Signature Title Date Authorization Granted

Attachment F

Outside Rescue Service Provider Evaluation

This form should be used as a tool to assist in evaluating outsider service providers who will be assigned responsibility for serving as the locations permit space rescue.

Name of Rescue Provider: _____ Service Provider Contact: _____

Criterion	Yes	No	Required Action
Does the rescue service have trained personnel in sufficient numbers?			
Are the trained personnel available at the time that entry will take place?			
Does the service have the capability to reach the permit space within 4 minutes after notification?			
Is the service equipped to perform the needed rescue services? • Response vehicle(s) • Breathing Equipment • Rescue Litters • Block and tackle • Personal Protective Equipment • First Aid Supplies			
Has the rescue services been made aware of the hazards of the locations permit spaces?			
Have rescue service personnel conducted a visit in order to assure that they are familiar with the location and the permit spaces? (Note: if local government rescue resources have confirmed ability to respond within 4 minutes and decline to visit the space, this should be documented on the entry permit and the entry may proceed)			
Has the service been given an opportunity to examine the space(s) where they may be performing a rescue in order to develop rescue plans and practice rescues?			
Has an annual drill been conducted and is it included as part of the service contract?			

If all questions above have been answered YES, then the location can use that company as its permit space rescue provider.

Name of Person Evaluating Provider: _____

Date Evaluation Occurred: _____

Attachment G

Contractor Confined Space Program Checklist

Before contractors are allowed to perform entries into permit spaces, a review of their written program and training must be done. This checklist should be used to ensure all parts of the program are reviewed. Completed copies of this checklist must be retained for auditing purposes.

Contractor Name: _____

WRITTEN PROGRAM
Does the Contractors written program cover the following topics:

Roles and Responsibilities	YES	NO
Entry Procedures	YES	NO
Hazard Identification Process	YES	NO
Hazard Control Steps	YES	NO
Atmospheric Testing	YES	NO
Rescue Procedures	YES	NO
Employee Training	YES	NO

All areas must have a YES answer before moving ahead. Any NO's must have documented actions taken to ensure the program is acceptable.

TRAINING
Have you reviewed the Contractors training records and do they verify the following training has been completed:

Entry Supervisor/Permit Issuer Training	YES	NO
Entrant Training	YES	NO
Attendant Training	YES	NO
Atmospheric Testing Training	YES	NO
CPR/First Aid Trainig	YES	NO
Rescue Training	YES	NO

All areas must have a YES answer before moving ahead. Any NO's must have documented actions taken to ensure training is acceptable.

AUTHORIZATION

I have review the contractors program and training records and they meet regulatory requirements.

_____	_____	_____	_____
Name of Approver	Signature	Title	Date

Attachment - H
Methods for Hazard Elimination or Mitigation

Under US OSHA rules, "Control" of a hazard is insufficient basis for reclassifying a permit-required confined space as a confined space. In OSHA's view, "Control" is any action to reduce or minimize the risk other than "Elimination." Thus, even the steps identified as "Mitigation" below are insufficient as a basis for reclassification. In order to minimize confusion, we have retained the OSHA definition of "Control" as a means of reducing or managing the hazard that does not allow reclassification. We have created a new term – "Mitigate" – that means actions taken to reduce a hazard that, when approved by CEP and properly implemented, we believe is sufficient basis for reclassifying a permit space to a confined space. CEP-approved methods of mitigation are limited to those listed this Attachment. This applies only to those countries where allowed by regulation, and specifically does not apply to US operations.

Hazard elimination or mitigation in accordance with this Attachment is required to allow a permit space to be reclassified as a confined space.

Elimination

Hazard elimination is removal of the hazard from within, or the ability to affect, the confined space during entry. It includes methods such as the following:

- Line breaking. This requires that a physical "break" or separation of the line be made, such that, it is impossible for materials to flow into the confined space or permit space being worked.
- Blanking. This requires installation of 1 or more "pancake blinds" or flat flanges into a material supply line, such that, material flow is completed blocked. Use of >1 pancake blind, is considered the best practice.
- Electrical-mechanical LOTO in strict accordance with GE Master LOTO Procedures. Note that if energy storage such as capacitors is part of the system, these must be fully grounded and discharged as part of the LOTO. Physical electrical disconnection, disconnecting wiring, or removing fuses are also acceptable methods.
- Providing engineering controls such as guardrail protected work platforms or locations, as defined in the GE Fall Protection Manual.
- Removal of flowable materials from the space
- Other similar methods that eliminate the hazard(s)

Mitigation

Hazard mitigation is establishment of affirmative safety procedures and/or equipment of sufficient rigor and reliability that it may be considered to provide equivalent protection as hazard elimination. Hazard mitigation is limited to those methods listed below.

- LOTO of flowable materials (for example: liquids, gases, or loose particulates) in strict accordance with the GE Master LOTO Procedure, including double-block and bleed methods for lines connected to the confined space or permit space.
- Personal fall protection in strict accordance with the GE Fall Protection Manual.

APPENDIX F

GE FALL PROTECTION MANUAL

GE Fall Protection Manual

General Electric
Corporate Environmental Programs
Fairfield, Connecticut

Version 7.0
January 2009

TOPIC **SECTION**

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Fall Hazards 2

Fall Protection System Components 3

Fall Protection System Categories 4

Selection of Proper Fall Protection 5

Inspection of Fall Protection Systems 6

Fall Protection Training 7

Working Platforms and Aerial Lifts 8

Vehicle Mounted Elevating Work Platforms 9

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Skylights and Translucent Roofing Panels 11

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Work on Roof Tops 13

Fall Rescue and Orthostatic Intolerance 14

Terms and Definitions 15

Appendices 16

Appendix A: Sample Fall Protection Program

Appendix B: Site Specific Applications

References and Resources 17

General Electric Requirements and Expectations

This document and the guidance contained within it are for the GE requirements globally and the regulatory requirements (US) for fall protection.

General Electric facilities outside of the United States, and outside of the jurisdiction of the US Department of Labor – Occupational Safety and Health Administration (OSHA), and the American National Standards Institute (ANSI), must review the specific Country, State, City and local regulations where they operate to assure compliance is being met.

GE Businesses have the discretion to require more restrictive performance than what is in the GE Fall Protection Programs requirements. Contact your business level H&S Leader to fully understand your business requirements.

.

In the absence of specific regulatory guidance and where the guidance is less protective than that provided by this document, the GE requirements must be followed.

This manual is intended to aid the user in the proper identification and control of fall hazards present in the workplace. When establishing any fall protection system, always follow these basic DOs and DON'Ts:

• **DOs**	• **DON'Ts**
• Evaluate each different fall hazard scenario separately.	• Assume all fall hazard scenarios are the same.
• Implement a complete fall protection program, including documenting: hazard identification, selection of fall protection, equipment inspection and employee training.	• Implement a fragmented fall protection program without all critical components, including hazard identification, selection of fall protection, equipment inspection and employee training.
• Follow all established government regulations for work at elevated heights.	• Disregard established government regulations for working at elevated heights.
• Use fall protection equipment whenever a fall hazard is present.	• Use fall protection equipment only when time and equipment is available.
• Ensure all employees are properly trained on fall protection and its proper use.	• Assume employees understand the proper use the equipment.
• Follow all manufacturer's recommendations and equipment specifications.	• Disregard the manufacturer's recommendations or equipment specifications.
• Utilize qualified person(s) to design each fall protection systems.	• Allow unqualified person(s) to design fall protection systems.
• Evaluate the effectiveness of the program on a regular basis.	• Assume the program will not change with changes in the facility, as well as new equipment and technology.

This manual does not cover the following fall hazard areas:

- Safety Nets
- Steel Erection
- Scaffolding
- Special Application Equipment or Areas

If these areas are encountered, reference the applicable government standard regulating these activities.

Fall hazards are present in all industries, but are most notable in the construction industry. In the United States alone, falls in construction are the leading cause of worker fatalities. It is estimated that an average of 150 to 200 workers are killed and more than 100,000 are injured annually as a result of falls at construction sites (*OSHA Document 3146-1998, Fall Protection in Construction*). This alone describes the magnitude and severity of injuries resulting from fall hazards. With regards to fall hazards in industry, we do not see the same frequency of exposure to fall hazards as we do in construction, but we do see the same type and magnitude (severity) of fall hazard accidents. Examples of accidents include:

- During installation of an equipment platform, an employee welding a support post inadvertently steps backwards off the backside of an unguarded platform.
- A folding ladder set up on an unstable surface results in a fall when an employee changing a light bulb reaches too far for the light.
- An employee working on top of an outdoor railcar slips on the wet grating and falls to the ground.
- An employee working on top of a truck or van loses balance and falls.
- A maintenance worker performing repair work on an overhead pipe chase loses his balance and falls to the ground after the wrench slipped off the pipe flange.

Repair of Overhead Pipe Chase

Each of these cases has the potential to cause employee death or serious physical injury. As with all injuries, these incidents result in personal and financial suffering for both the employee and the employer.

Accident investigations associated with these type of workplace falls have identified that the root cause of most falls can be linked to either human error or equipment-related issues, and sometimes both. Accident investigations, in turn, find many similar root causes:

- Inadequate employee training to identify the existence of a fall hazard.
- Improper selection of fall protection equipment.
- Improper use of fall protection equipment.
- Inadequate equipment inspection resulting in equipment failure.
- Poor housekeeping on the work surface.

Building Repair Work

These findings are all correctable and support the fact that these fall related accidents are indeed preventable, when provisions are established to properly recognize, evaluate and control these hazards. That is, a documented functional fall protection program containing at least the following elements:

- Identification and evaluation of fall hazards.
- Selection and use of fall hazard controls.
- Established equipment use, inspection and maintenance guidelines.
- Employee training.

Construction Activities

The first step in building an effective fall protection program is the identification of fall hazards in the workplace. Every workplace is different and may contain a variety of fall hazards, severity of fall hazards and frequency of exposure to these hazards. For these reasons, a comprehensive fall hazard assessment initiates the fall protection process. This includes an evaluation of indoor and outdoor fall hazards, as well as other conditions that may only be encountered temporarily during maintenance or construction activities.

Before we begin our fall hazard assessment, we must first answer the question:

"What constitutes a fall hazard?"

The most conservative definition of a fall hazard for this application is any situation in which a fall from an elevated height could result in an injury. As you can see, this definition does not define a specific height at which the fall could result in an injury. Depending on the individual situation, an injury could result from a fall at any height above floor level. The following criteria may be used to determine whether a fall hazard is present:

- Fall hazards are present when work is conducted at unprotected (without standard guardrails or similar protection) heights at or exceeding four (4) feet (1.2 m) above the lower level in general industry settings and heights at or exceeding six (6) feet (1.8 m) above the lower level in construction settings.
- Fall hazards are present at unprotected work heights below four (4) feet (1.8 m) when work is conducted above dangerous equipment or processes.

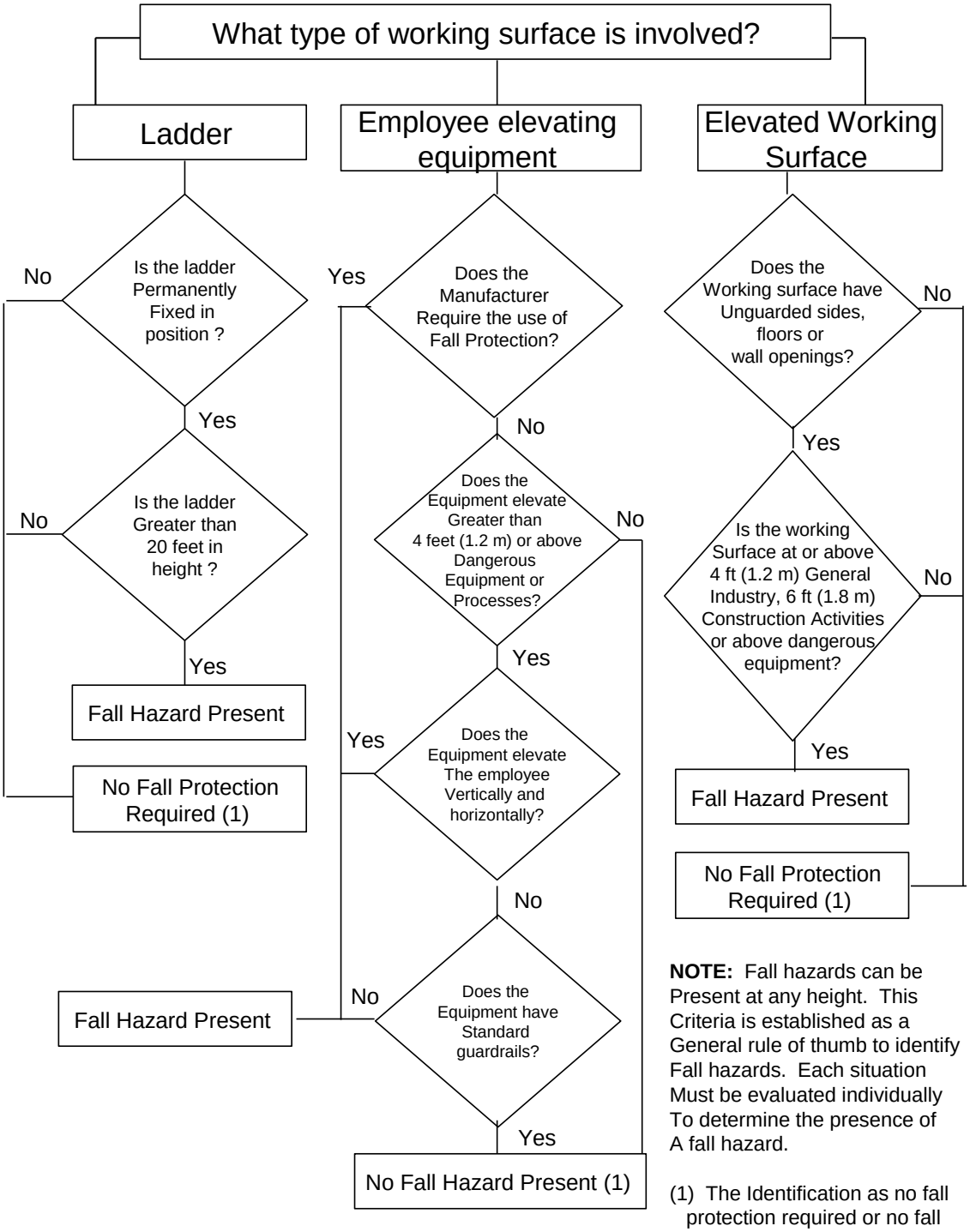
According to OSHA, fall hazards are present at four (4) feet (1.2 m) in general industry. This includes all non-construction applications.

According to OSHA, fall hazards are present at six (6) feet (1.8 m) in construction. Construction refers to the actual erection, assembly, and finishing of a building.

The fall hazard assessment can be better understood through the use of a *fall hazard assessment flow chart*. The chart systematically evaluates three different work situations to determine if a fall hazard is present. These situations include work on:

- Ladders - Fixed and Portable
- Employee Elevating Equipment (such as boom or articulating lifts)
- Elevated Work Surfaces (such as platforms, railcars, beams, roofs, etc.)

FALL HAZARD ASSESSMENT FLOW CHART



NOTE: Fall hazards can be Present at any height. This Criteria is established as a General rule of thumb to identify Fall hazards. Each situation Must be evaluated individually To determine the presence of A fall hazard.

(1) The Identification as no fall protection required or no fall Hazard present does not mean that general safe work practices are not required.

When fall hazards are identified at the site, there are two different approaches to control the hazard. These approaches include:

- Eliminate the fall hazards.
- Provide fall protection controls.

Frequently the best option is a combination of both elimination and fall protection. Some fall hazards are eliminated, while others that are not deemed feasible to eliminate are controlled with fall protection. It is important to remember that these options must be evaluated for each fall hazard situation. The fall hazard options are determined by any number of factors, including:

- Probability of a fall, based on the conditions of the work location and the type of work to be conducted.
- Potential injury resulting from a fall.
- Frequency employees are exposed to the fall hazard.
- Number of employees exposed to the fall hazard.
- Feasibility of controlling the hazard.
- Cost associated with controlling the hazard.

Elimination		**Fall Protection**
←		→
(Feasible)	**Elimination**	*(Not Feasible)*
(Cost Effective)	**Cost**	*(Not Cost Effective)*
(High)	**Severity**	*(Low/High)*
(Frequent)	**Exposure**	(*Infrequent/Frequent)*

The following section will discuss the fall hazard elimination option, while the remainder of the document will discuss fall protection controls.

Elimination of Fall Hazards

Elimination is obviously the best option for the control of fall hazards, but is not always feasible or cost effective to implement. The methods of elimination may include a variety of approaches, such as:

- Providing guardrails for work platforms.
- Providing guardrails or covers for floor or wall openings.
- Relocating equipment or controls to eliminate the need to access locations with fall hazards.

In making a decision regarding elimination of the fall hazard or providing fall protection, it is important to also look at the time and cost associated with each option. A simple fall protection system will require at least the purchase and installation of a tie off device, lanyard and full body harness, in addition to employee training time, and time spent setting up, using and caring for the equipment on each job requiring its use. If fall hazards can be eliminated, even if only for the most frequently performed task, this is time and money that can be saved and used elsewhere.

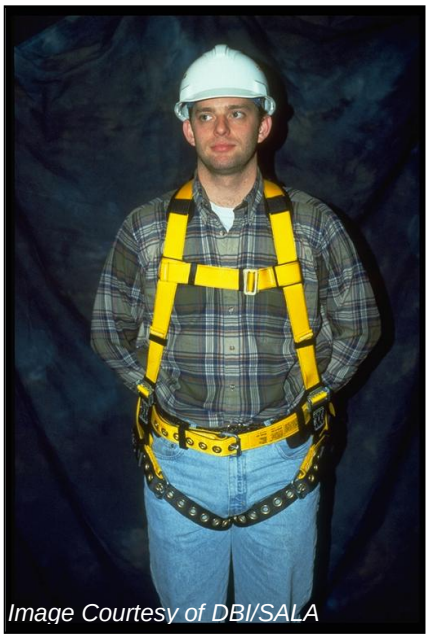
Once the decision to utilize fall protection to control the fall hazards has been made, it is important to understand the components of a fall protection system. All fall protection systems must consist of three key components:

❶ *Body Wear*: Support equipment worn by the user.

❷ *Connecting Device*: Device used to connect the body wear to the anchor point.

❸ *Anchor Point*: Secure point of attachment for the connection device and fall protection system.

❶



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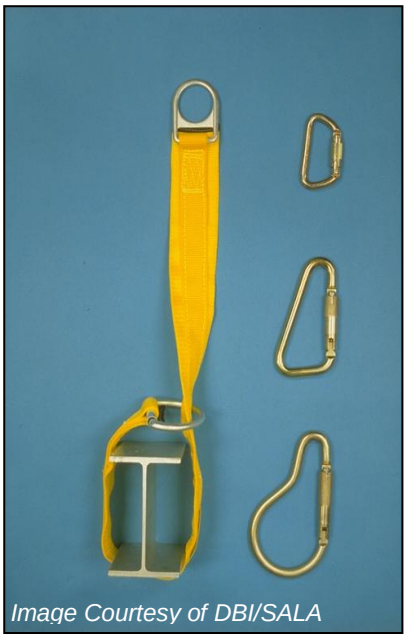


These components are discussed in the following sections.

Body Wear

Body wear is the protective equipment worn by the person performing the fall hazard work. The body wear usually consists of a full body harness. While there are essentially two types of body wear available for use with fall protection systems: full body harness and safety belt. **GE Does not allow the use of a safety belt**. Full body harnesses that are available on the market are equipped with integrated positioning devices that were historically only available in safety belts. Body wear is typically made of nylon, polyester or similar webbing straps. The purpose of body wear is to distribute the force exerted on the body in the event of a fall. Most full body harnesses secure the legs, waist, chest and shoulders. Body wear (for a full body harness) is attached to a connecting device by the D-ring in the center of the back near the shoulders. The connecting device is then connected to an anchor point.

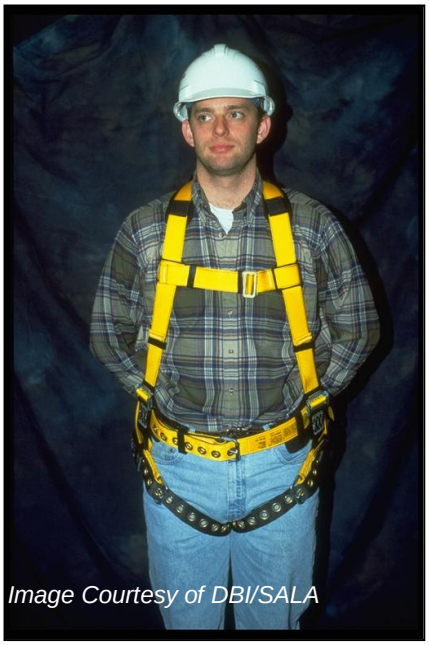


Image Courtesy of DBI/SALA

At all levels of fall protection, the body wear of choice is the full body harness. This device provides the best distribution of force in the event of a fall. For example, a free fall from 6 feet (1.8 m) (allowable under most standards today) can generate up to 1,800 pounds (8005 N) of force. This is obviously best distributed by a full body harness. In addition, the full body harness suspends the victim in an upright position while waiting for assistance in the event of a fall. For these reasons, it is a requirement that safety belts are not allowed within GE. The physical shock to the midsection or suspension from a body belt are not desirable in the event of a fall. Safety belts today find their best application in positioning type fall protection systems.

Full body harnesses are required for all personal fall protection systems

Safety belts and/or Positioning Belts are NOT ALLOWED for use within GE.

Full Body Harness with Integrated Positioning Device

Images Courtesy of DBI/SAL

Connecting Devices
The connection device is the device used to connect the body wear to the anchor point. These devices vary depending on the different applications, but mainly consist of:

❶ **Safety Lanyard**

The safety lanyard is a connection device linking the body wear to the anchor point or as a connection device to a lifeline system. Lanyards are typically short lines made of rope, strap, webbing, cable or similar materials with connectors on both ends. Many lanyards have shock-absorbing features to provide additional force reduction (up to 80%) in the event of a fall. However, shock-absorbing lanyards may not be applicable in all situations, particularly where fall distances need to be minimized. When a fall occurs, the lanyard acts as a fixed (or shock-absorbing) arresting system.

Shock-Absorbing Lanyard

Safety lanyards should not be attached to a retractable lifeline since they may add additional free fall distance to the overall system, which cannot exceed six (6) feet (1.8 m)

Situations may arise where a worker needs to detach and reattach the lanyard to a new anchorage point, such as when moving either horizontally or laterally. In order to avoid any period of time, however brief, that the worker is not protected, the “Y” lanyard technique is required. Two safety lanyards must be used, and the “old” lanyard must not be detached from the anchorage point until the “new” lanyard is attached to the “new” anchorage point. Simply detaching and reattaching a single lanyard is not permitted.

Y-Lanyards

Images Courtesy of DBI/SALA

Connecting Devices

❷ Retractable Lifeline

The retractable lifeline is a self-contained device linking the body wear to the anchor point. The device acts as a continuously taut lanyard, allowing the user to travel varying distances and directions while still attached to a fall protection device. As the user moves away from the device, the device lets out the lifeline and retracts as the user moves closer to the device. Keeping the lifeline taut at all times. Most lifelines are webbing, cable or similar material with a connector on the end. This system gives the user the ability to move in various directions within the safe working distance of the lifeline. When a fall occurs, a locking mechanism in the device stops the lifeline, which then acts as a fixed arresting system.

Connecting Devices

❸ Vertical Lifeline (Rope Grab)

The vertical lifeline is a connection device used in conjunction with an attached fall arrest device, such as the rope grab, between the body wear and the anchor point. Typically a lifeline is suspended vertically from an anchor point located overhead. Most lifelines are a cable, nylon rope, or similar material with connectors on one or both ends. The user is able to attach their body wear to the lifeline with a safety lanyard and the rope grab or similar fall-arresting device. This system gives the user the ability to move limited horizontal distances and different vertical heights when the system is adjusted. When a fall occurs, the fall-arresting device locks and the lifeline acts as a fixed arresting system.

Vertical Lifeline

Only one user is allowed per vertical lifeline, since a fall by one user would shock the lifeline and potentially cause other users on the same system to fall.

Vertical Lifeline

Connecting Devices

❹ Horizontal Lifeline

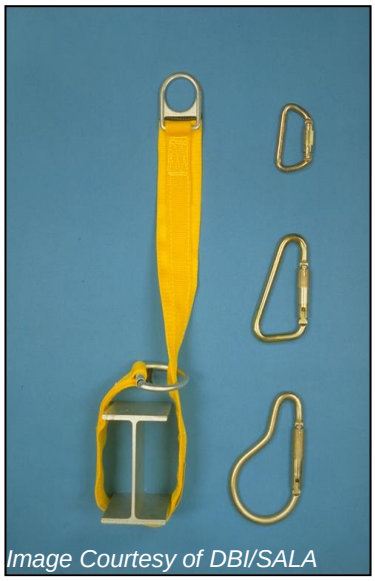
The horizontal lifeline is a connection device used in conjunction with an attached fall arrest device between the body wear and the anchor point. Typically a flexible lifeline is suspended horizontally (relatively taut) between two fixed anchor points at a level even or above the user. Most lifelines are cable or similar material. The user is able to attach their body wear to the lifeline with a safety lanyard and fall arresting device. This system gives the user the ability to move horizontally the length of the lifeline. Provided the lifeline meets the proper rating, multiple users are allowed on the horizontal lifeline. When a fall occurs, the lifeline acts as a fixed arresting system.

Image Courtesy of DBI/SALA

Anchor Point

The anchor point (or “tie off” point) is one of the most critical components of the fall arrest system. It is the secure point of attachment for the connection device of the personal fall protection system. The anchor point is typically a beam (or trolley on beam) or other similarly sturdy support structure located above or at an even level with the user. Anchor points positioned above the user are preferable because they reduce the distance of free fall. The connection to the anchor point should be a direct connection with a locking snap-hook with a spring-loaded keeper, cross arm strap, eye bolt or other method to properly secure the connection device.

The anchor point must be capable of withstanding a static force of 5,000 pounds (22,241 N), per employee attached and increased by a factor of .2 (20%) for each additional lanyard.



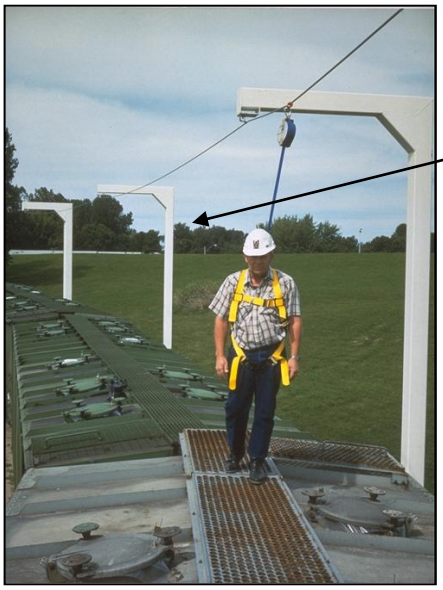
Left and Right: Anchor Point

Knots are not permitted as a means to tie off, since they considerably reduce the support strength. Lifelines should not be wrapped directly around the support structure.

When fall protection is selected as the means to control the fall hazard, there are four different categories of fall protection systems available for use, depending on the individual application. These fall protection systems include:

❶ *Fall Arrest*
❷ *Positioning and Restraint*
❸ *Suspension*
❹ *Retrieval*

❶



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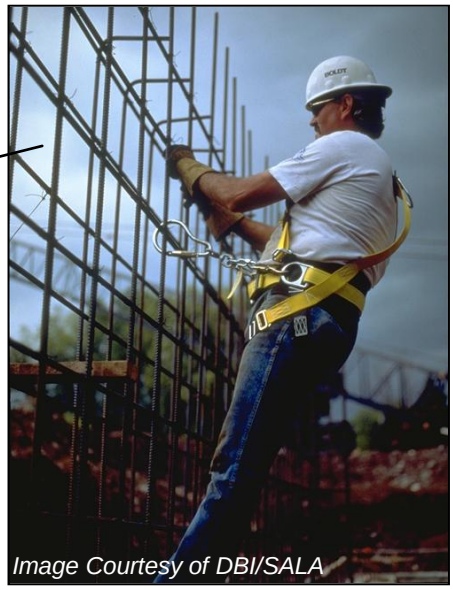


❸

These categories are discussed i

Fall Arrest Systems

The fall arrest system is the most commonly found method of fall protection. The fall arrest system is designed as a passive system activated only when a fall has occurred. Fall arrest systems consist of a variety of different configurations, each providing protection for the specific application. Some applications of the fall arrest system include:

- Employee working on a platform without guardrails.
- Employee working on top of a railcar or flat bed truck > 4 ft (1.2 m).
- Employee climbing up an unguarded ladder exceeding 20 feet (6.096 m).

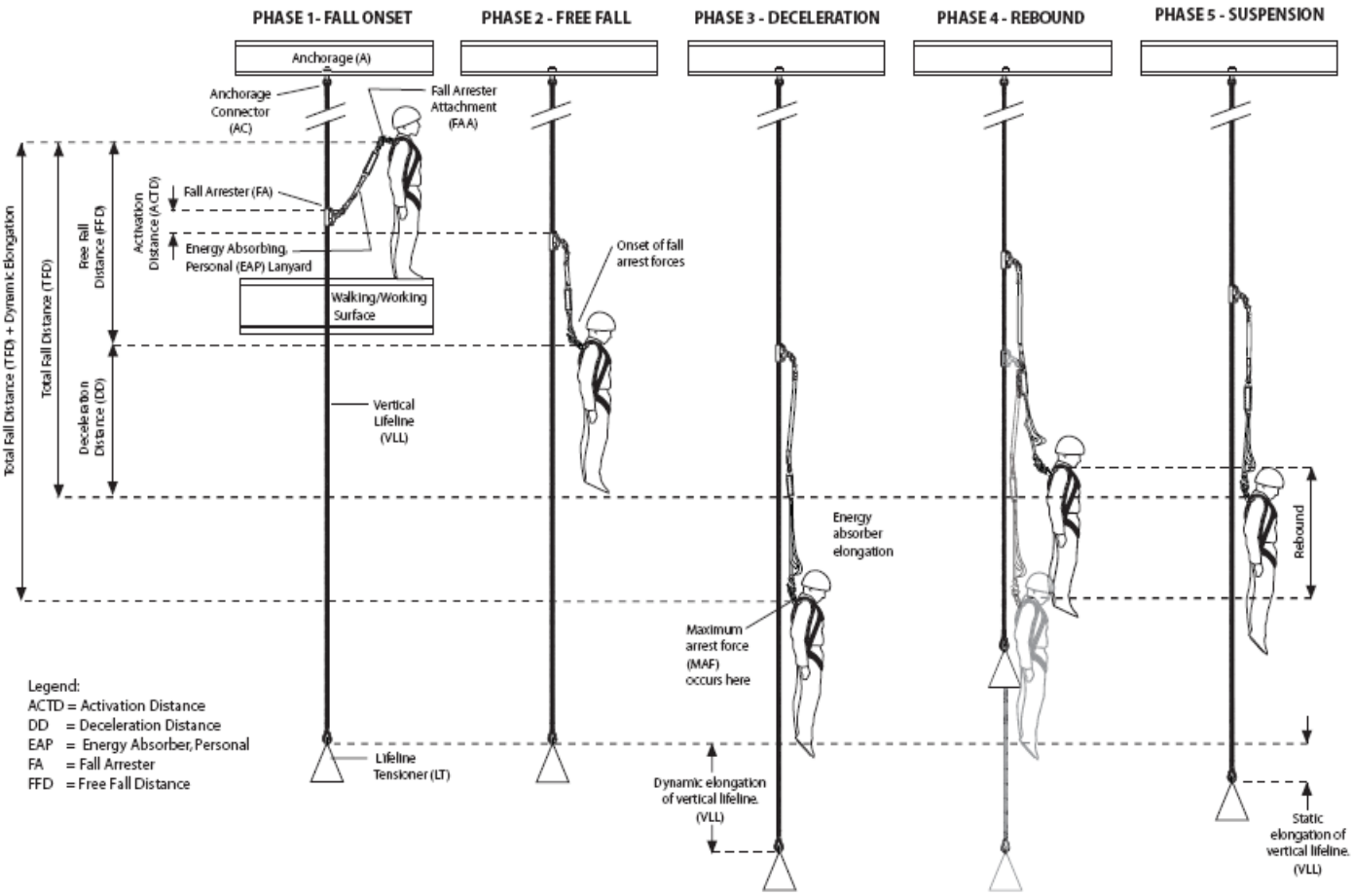
To better understand the fall arrest system, we first must understand how far we are permitted to safely fall with respect to the limitation of the fall protection equipment. Obviously, we must stop the fall before the user contacts a lower level or equipment below. The distance of the actual fall depends on the free fall distance and the deceleration distance.

Free Fall Distance – This is the distance the user falls before the system begins the arresting (stopping) process. Free fall must not exceed six (6) feet (1.8 m). Free fall distances will vary with the length of the connection device or lanyard and the location of the anchor point.

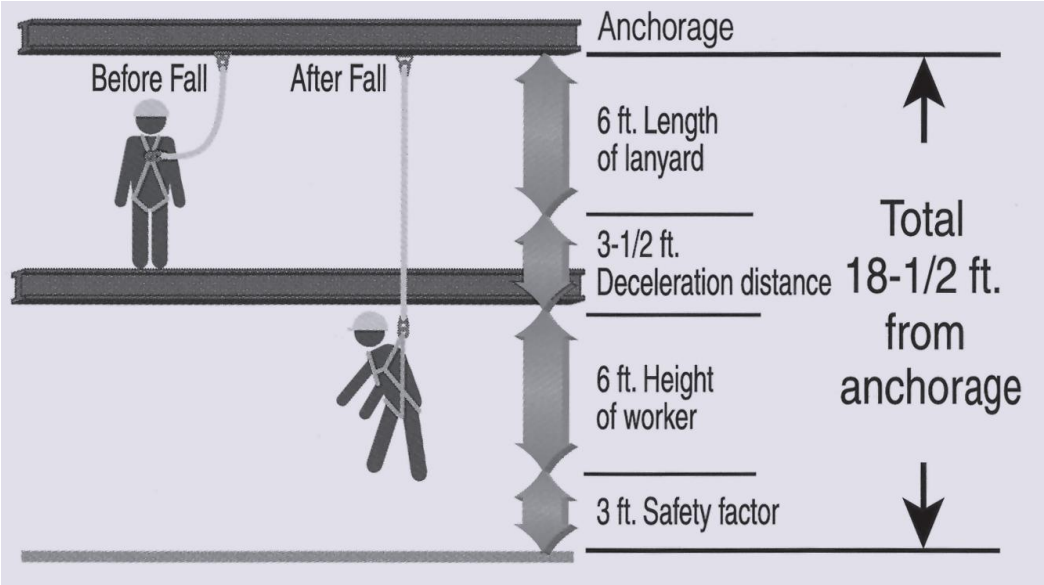
Deceleration Distance – This is the distance the user continues to fall from the time the fall arresting system begins the arresting process until the user comes to a complete stop. Deceleration distance must not exceed three and one half (3½) feet (1.07 m). Deceleration distances will vary with the force of the free fall and deceleration properties of the individual fall arresting devices, such as that for the retractable lifeline or the elongation of the shock-absorbing lanyard.

When the free fall distance and the deceleration distance are combined, the user has the potential to fall 9½ feet (2.9 m) from the level on which they are working. Add to that the average height of the user as 6 feet (1.8 m) and the required height of the anchor point becomes at least 15½ feet (4.73 m) above the lower level to properly control a fall. When 15½ feet (4.73 m) are not available, the fall protection system must be modified for the specific application.

Geometry of a Fall



Calculating Potential Fall Distance



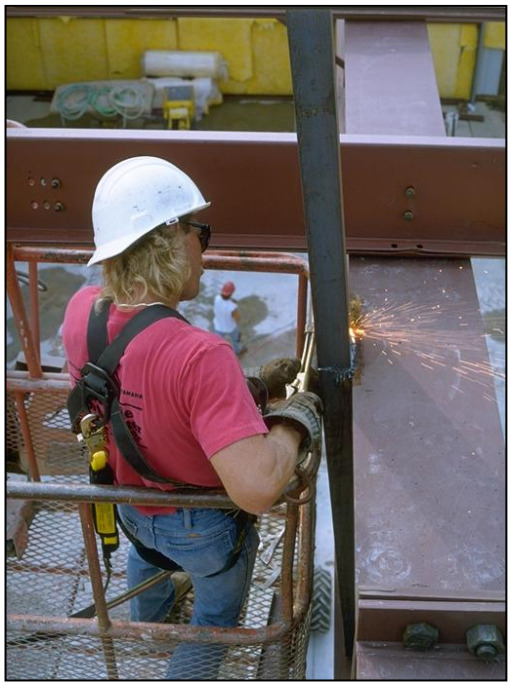
Fall Arrest Systems

The fall arrest system consists of at least:

- Body gear, such as a full body harness.

- Connecting devices, such as a safety lanyard, horizontal/vertical lifeline or retractable lifeline.
- Anchor point, such as a fixed or traveling point.

Image Courtesy of DBI/SALA



Positioning and Restraint Systems

The positioning fall protection system is designed to hold or support the user at an elevated surface, typically in an activity where both hands need to be free to perform work. The positioning system is an active system, which is engaged each time the user leans back or rests of the support system. The system should be set up to allow for a maximum of two (2) feet (0.61 m) of free fall. Some applications of the positioning system include:

- Employee cleaning a window from the window ledge.
- Employee working on a rebar structure.

Positioning System

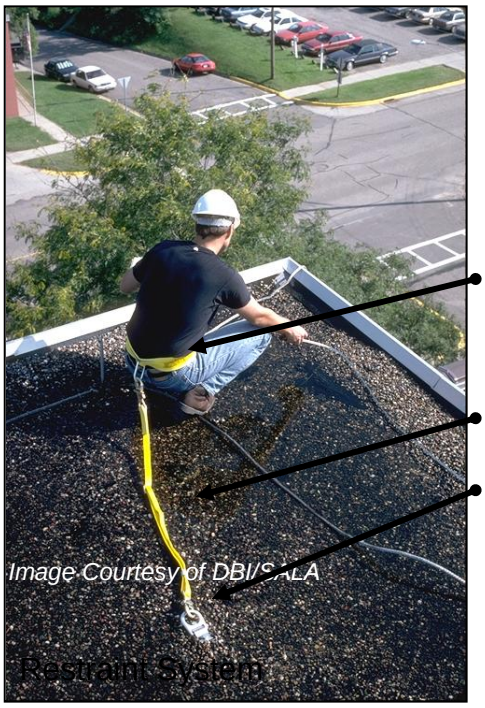
The positioning system does not provide a complete fall protection system. Since the positioning system does not provide full time fall protection, the system should be used in conjunction with a fall arrest system to provide complete fall protection.

The positioning system consists of at least:

- Body gear, such as a full body harness. (Note: These systems are the only systems where a safety belt is still acceptable body wear. In this system, the belt is used as a physical restraint or with only limited free fall potential.)
- Connecting devices, such as rebar lanyard.
- Anchor point, such as any properly rated fixed point.

Positioning and Restraint Systems

The restraint fall protection system is designed to physically restrain the user from reaching a point where a fall could occur. The system limits the length of the connection device or positions the anchor point such that the user is prevented from reaching the point of the fall hazard. The effect is to eliminate the need for actual fall protection. Some applications of the restraint system include:



Restraint System

- Employee working near the edge of an unguarded platform.
- Employee working near the edge of the roof.

The restraint system consists of at least:

Body gear, such as a full body harness. (Note: While this picture shows a worker in a safety belt, not a full body harness, Safety belts are not allowed within the GE company)

Connecting devices, such as a restraint lanyard.

Anchor point, such as any properly rated fixed point.

Suspension Systems

The suspension fall protection system is designed to lower and support an employee at an elevated height, typically in an activity where both hands need to be free to perform work. The suspension system is an active system, which is engaged at all times during use. The system is set up to allow no potential for free fall, as it supports the user. Some applications of the positioning system include:

- Window washers and painters.
- Lowering employees from above with no other means of entry.

Image Courtesy of DBI/SALA

Since the suspension system does not provide provisions for fall protection, the suspension system should be used in conjunction with a fall arrest system to provide a complete fall protection system.

The suspension system consists of at least:

- Body gear, such as a full body harness.
- Connecting devices, such as a work line.
- Anchor point, such as a fixed point.
- Positioning device, such as a boatswain's chair.

Retrieval Systems

The retrieval fall protection system is designed to retrieve a user from a location above the position of the user. The most common use of the retrieval system is for confined space applications where employees may need to be extracted from manholes, tanks or other physical structures in the event of an emergency.

The retrieval system consists of at least:

Anchor point, such as a tripod.

Connecting devices, such as a retractable lifeline or lifeline and winch.

Body gear, such as a full body harness.

Retrieval System

Selection
Elimination is obviously the best option for the control of fall hazards, but is not always feasible or cost effective to implement. The methods of elimination may include a variety of approaches, such as:

- Providing guardrails for work platforms.
- Providing guardrails or covers for floor or wall openings.
- Relocating equipment or controls to eliminate the need to access locations with fall hazards.

When elimination and/or fixed engineering controls (passive systems) are not feasible, personal fall protection systems must be utilized.

The selection of personal fall protection must take many variables into account. A functioning fall protection system must be designed not only to provide protection to the user, but also allow them the ability to perform the job task required without (or with minimal) limitations. The first rule in the selection of fall protection is:

Fall protection must be selected by a trained and qualified person.

When designing site-specific fall protection systems, a professional engineer is necessary to certify the design and proper rating for the system. Selection of proper fall protection is critical to the safety of the user. An improperly selected fall protection system or component could increase the hazard to the user resulting in serious injury or death.

The manufacturer or manufacturer's representative is typically a good resource in the selection of the fall protection system. You will find that the fall protection manufacturer will typically provide information on the specific limitations, use, inspection and maintenance of each fall protection component and system. These guidelines should be followed and used in the selection of the proper equipment for the application. Most of the manufacturer's representatives are also trained on the fall protection equipment available and can assist in the selection of individual components or complete systems. These resources are especially helpful when non-routine applications are encountered requiring unique fall protection designs. When available, consult with your local manufacturer's fall protection representative as part of your selection process.

As with the use of any protective equipment, it is important to ensure that the proper fall protection is selected for each individual situation. Most applications have a variety of different factors that need to be considered before the proper fall protection can be selected.

Selection Checklist

- ☑ Severity and magnitude of the fall hazard.
- ☑ Number and frequency of employees exposed to the fall hazard.
- ☑ Permanent or temporary fall hazard.
- ☑ Need for user mobility (vertical and horizontal) to perform the job task.
- ☑ Location of fixed anchor points or availability of temporary anchor points.
- ☑ Safe falling distance available above the lower level or equipment accounting for free fall and deceleration distance.
- ☑ Potential for the user to swing into other hazards in the event of a fall.
- ☑ Manufacturers use limitations for the fall protection equipment.
- ☑ Work being performed (such as on a narrow ledge, unstable work platform, performing heavy labor, etc.) increasing the potential for a fall.
- ☑ Environmental conditions (such as outdoors in the wind, rain or snow, slippery work surfaces, etc.) increasing the potential for a fall.
- ☑ Rescue required in the event of a fall.

These and other factors specific to the situation must be evaluated as part of the selection of any complete fall protection system.

The selection of the specific type of fall protection system is typically not a very difficult decision. Generally speaking, the fall arrest system is the most common means of fall protection when work is performed at an elevated height. Fall arrest systems are designed to provide protection for a magnitude of different applications. The other types of fall protection are catered more specifically to defined use applications. In some cases these fall protection systems will also require a fall arrest system to provide full employee protection. The recommended system applications and their typical use are described in the following table.

Fall Protection System	**Recommended:**	**Typical Applications:**
Fall Arrest	• Any potential for falls from an elevated height.	• Working on elevated platforms or work surfaces. • Working on top of railcars. • Climbing a fixed ladders. • In conjunction with positioning, restraint and suspension systems.
Positioning	• Work in a fixed position with accessible anchor point(s). • No potential for free fall.	• Cleaning windows from a window ledge. • Working on a rebar structure.
Restraint	• No exposure to the fall hazard (within 6 feet) (1.83 m)).	• Work performed on a roof or ledge structures.
Suspension	• No potential for free fall. • Access only from above.	• Window washers and painters. • Suspension into a tank or other structure.
Retrieval	• User removal from above the working area.	• Confined space entry.

The next few sections present some selection recommendations for complete fall protection systems. It is essential to evaluate and select fall protection equipment specific to each individual application. The system must be comprised of at least:

- Body Wear
- Connection Device
- Anchor Point

While there are essentially two types of body wear available for use with fall protection systems: full body harness and safety belt. GE Does not allow the use of a safety belt. Full body harnesses that are available on the market are equipped with integrated positioning devices that were historically only available in safety belts. The recommended applications for each of these are described in the following table.

Fall Protection	Recommended:	Not Recommended:
Full Body Harness	• Any potential for free fall. • Use within manufacturer's limitations.	• Use outside manufacturer's limitations.
Full body Harness with Safety D-Ring Positioning Device	• No potential for free fall. • Positioning or restraining protection only. • Use within manufacturer's limitations.	• Any potential for free fall. • Use outside manufacturer's limitations.

Besides selecting fall protection for the actual fall hazard criteria, it is also important to select equipment that will stand up to the work environment. This not only protects the integrity of the equipment, but also extends its service life. When selecting components of the fall protection system, the following environmental factors must be evaluated:

- Work exposure to welding, abrasion, chemicals, grease, oil, etc.
- Environmental exposure to weather, temperature extremes, moisture, UV exposure, etc.

Consult the manufacturer or manufacturer's representative for appropriate equipment for use in the required conditions.

There are a variety of connection devices that can be used in any complete fall protection system. Each device has its specific applications, while some of the devices can be used in many overlapping applications. The recommended applications for these devices are described in the following table. Please refer to the manufactures recommendations for utilization (mixing) of various manufacturers products with other manufacturers products.

Fall Protection	**Recommended:**	**Not Recommended:**
Shock-Absorbing Lanyard	• Adequate height above the lower level to accommodate the deceleration distance (expansion) of the lanyard. • Use within manufacturer's limitations.	• Inadequate height above the lower level to accommodate the deceleration distance (expansion) of the lanyard. • Use with a retractable lifeline. • Use outside manufacturer's limitations.
Safety Lanyard (non-shock absorbing)	• Potential for only minimal free fall. • Inadequate height to the lower level to accommodate the deceleration distance (expansion) of the shock absorbing lanyard. • Use within manufacturer's limitations.	• Potential for moderate to maximum free fall. • Use outside manufacturer's limitations.
Retractable Lifeline	• Anchor point available overhead. • Swing from the fall will not direct the user into other structures or hazards. • Adequate height to the lower level to accommodate the deceleration distance of the retractable lifeline. • User requires horizontal and/or vertical travel. • Use within manufacturer's limitations.	• No anchor point available overhead. • Swing from the fall will direct the user into other structures or hazards. • Inadequate height to the lower level to accommodate the deceleration distance of the retractable lifeline. • Use outside manufacturer's limitations.

Fall Protection	Recommended:	Not Recommended:
Vertical Lifeline (Rope Grab)	• Anchor point available overhead. • Swing from the fall will not direct the user into other structures or hazards. • User requires no or limited horizontal or vertical travel. • Single user on the system. • Use within manufacturer's limitations.	• No anchor point available overhead. • Swing from the fall will direct the user into other structures or hazards. • User requires frequent horizontal and vertical travel. • Multiple users on the same system. • Use outside manufacturer's limitations.
Horizontal Lifeline	• Anchor point available at each end of the work area. • User requires frequent horizontal travel. • Multiple users on the system (provided the proper rating). • Use within manufacturer's limitations.	• No anchor point available at each end of the work area. • User requires vertical travel. • Use outside manufacturer's limitations.

Warning: When selecting or designing fall protection systems, it is important to remain clear of electrical hazards. Under the right circumstances, fall protection equipment may be electrically conductive and possibly cause electrical shock or electrocution. Keep fall protection, particularly with swing hazards, clear of all electrical hazards.

Another decision as part of the connection device (as well as the anchor point) is whether the system should be permanent or temporary. Many times this is dictated solely by the specific situation. Again, the varying factors of the application must be evaluated to determine the type of structure to be installed. For example, if inspection of the top hatch of a railcar is needed on a daily basis, it is probably most practical to install a permanent fall protection system over the railcar, if feasible. However, if the same railcar needs to be inspected only once every 6 months, it is probably most practical to utilize a temporary fall protection system to access the hatch. When making the decision regarding permanent or temporary systems, all of these factors must be considered.

All connection devices must have minimum strength of 5,000 lbs. (2268 kg) per user. Also, all “connectors” found on the connection devices must have locking snap-hooks with a spring loaded keeper to prevent the hook from accidentally opening, called “roll out”.

It is also important to select the connection device most appropriate for the working conditions. Refer to the Selection of Body Wear section discussing the work environment conditions.

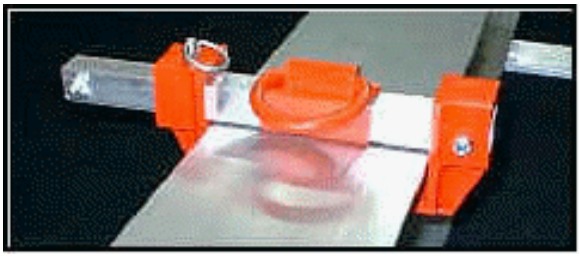
Anchor points must be selected according to the individual fall hazard situation. In many cases it is the availability of the anchor point that determines the type of fall protection systems that is used. Therefore, the first step is to identify any potential permanent or temporary anchor points in the area.

Anchor Point Checklist

- ☑ Capable of supporting 5,000 pounds (2268 kg) per employee on the system, increased by a factor of .2 (20%) for each additional lanyard.
- ☑ Free of rough or sharp edges that can damage the connector or lifeline.
- ☑ Positioned at a height to maintain free fall to six (6) feet (1.83 m) or less.
- ☑ Positioned at a height to prevent the user from contacting the ground or equipment below, accounting for free fall distance, deceleration distance and worker height.
- ☑ Positioned to prevent swing into surrounding structures or equipment in the event of a fall.

Once the potential anchor points are selected, the proper device must be selected as the tie off to the anchor point. These tie-off devices can include:

- Cross arm strap over an I-beam
- Eye bolt or support bar with a locking snap hook.
- Other similar methods to secure the connection device to the anchor point.



In all cases the anchor point and connection device must be capable of supporting the load capacities for the fall protection system. These capacities are typically approved by an engineer or other qualified person. Remember, lifelines should not be wrapped directly around the support structure, and knots are not permitted as a means to tie off since they considerably reduce the support strength.

As with all protective equipment, the equipment will only protect workers when it is functioning properly. The same holds true for fall protection equipment.

Fall protection equipment must be visually inspected by the user prior to each use and periodically by a competent person to ensure the equipment is in good working order and ready for use.

If any equipment is found to be in disrepair, and or not meeting/passing inspection criteria, it is to be taken out of service immediately.

If a fall arrest system is used to control a fall, all affected components of the system must be taken out of service and inspected to ensure they are in functional condition. Some components, such as the shock absorbing lanyard or retractable lifeline, must be returned to the manufacturer for recertification following their use in a fall situation.

Inspection and maintenance procedures for fall protection equipment are typically available through the manufacturers. It should be noted, a higher level of liability and risk may occur when the manufactures guidelines are not followed.

Below is an example of the Inspection Frequency criteria as outlined by MSA North America for their APTURA™ LT12 Self Retracting Lanyard.

"10.1 INSPECTION FREQUENCY
The APTURA SRL must be inspected by the user before each use. Additionally, the APTURA SRL must be inspected by a competent person other than the user at intervals of no more than six months. The competent person inspection is referred to as Formal Inspection. An inspection log must be filled out during the Formal Inspection, see section 11.0. In addition, the inspection log on the APTURA SRL label must be marked or punched to indicate when the last Formal Inspection occurred."

When manufacturers inspection and frequency guidelines are not available, the following basic inspection and maintenance procedures outlined below should be followed.

All fall protection equipment found to be defective must be removed from service immediately until properly repaired or replaced. Equipment must only be repaired by a qualified person familiar with the fall protection equipment.

Equipment Inspection Guidelines

To maintain their service life and high performance, all harnesses and fall protection system components should be inspected frequently. Visual inspection before each use should become routine, and also a routine inspection by a competent person. If any of the conditions listed below are found the equipment should be replaced before being used. The guidelines below will assist employees when conducting pre-use inspections of fall arrest components. The manufacturers inspection guidelines must also be followed. All fall protection equipment found to be defective must be removed from service immediately until properly repaired or replaced. Equipment must only be repaired by a qualified person familiar with the fall protection equipment.

Full Body Harness Inspection

Webbing: Begin at one end; hold the body side of the belt toward you, grasping the belt with your hands six to eight inches (15.2 – 20.3 cm) apart. Bend the belt in an inverted "U." Watch for frayed edges, broken fibers, pulled stitches, cuts or chemical damage. Inspect for frayed or broken strands. Follow this procedure the entire length of the webbing, inspecting both sides of each strap. Broken webbing strands generally appear as tufts on the webbing surface. Any broken, cut or burnt stitches will be readily seen. Webbing should not have additional punched holes.

D-rings/Back Pads: Inspect for distortion, cracks, breaks, and rough or sharp edges. The D-ring bar should be at a 90-degree angle with the long axis of the belt and should pivot freely.

Grommets and Rivets: Attachments of buckles and D-rings should be given special attention. Note any unusual wear, frayed or cut fibers, or distortion of the buckles. Rivets should be tight and un-removable with fingers. Body side rivet base and outside rivets should be flat against the material. Bent rivets will fail under stress.

Tongue and Tongue Buckle: The tongue and tongue buckle receive heavy wear from repeated buckling and unbuckling. They should be free of distortion in shape and motion and free from sharp edges. They should overlap the buckle frame and move freely back and forth in their socket. The roller should turn freely on frame.

Friction Buckle: Inspect the buckle for distortion. The outer bar or center bars must be straight. Pay special attention to corners and attachment points of the center bar.

Lanyard Inspection

When inspecting lanyards, begin at one end and work to the opposite end. Slowly rotate the lanyard so that the entire circumference is checked. Spliced ends require particular

attention. Hardware should be examined under procedures detailed below.

Lanyard Hardware
Snaps: Inspect closely for hook and eye distortion, cracks, corrosion, or pitted surfaces. The keeper or latch should seat into the nose without binding and should not be distorted or obstructed. The keeper spring should exert sufficient force to firmly close the keeper. Keeper rocks must provide the keeper from opening when the keeper closes. Keeper locks must prevent the keeper from opening when the keeper closes.

Thimbles: The thimble (protective plastic sleeve) must be firmly seated in the eye of the splice, and the splice should have no loose or cut strands. The edges of the thimble should be free of sharp edges, distortion, or cracks.

Wire Rope Lanyard – While rotating the wire rope lanyard, watch for cuts, frayed areas, or unusual wearing patterns on the wire. Broken strands will separate from the body of the lanyard.

Web Lanyard – While bending webbing over a pipe or mandrel, observe each side of the webbed lanyard. This will reveal any cuts or breaks. Swelling, discoloration, cracks and charring are obvious signs of chemical or heat damage. Observe closely for any breaks in stitching.

Rope Lanyard – Rotate the rope lanyard while inspecting from end-to-end for any fuzzy, worn, broken or cut fibers. Weakened areas from extreme loads will appear as a noticeable change in original diameter. The rope diameter should be uniform throughout, following a short break-in period.

Shock Absorber Pack – The outer portion of the pack should be examined for burn holes and tears. Stitching on areas where the pack is sewn to D-rings, belts or lanyards should be examined for loose strands, rips and deterioration.

Shock-Absorbing Lanyard – Shock-absorbing lanyards should be examined as a web lanyard (described in item 3 above). However, also look for the warning flag or signs of deployment. If the flag has been activated, remove this shock-absorbing lanyard from service.

Self-Retracting Lifeline Inspection
Housing – Before every use, inspect the unit’s housing for loose fasteners and bent, cracked, distorted, worn, malfunctioning or damaged parts.

Lifeline – Test the lifeline retraction and tension by pulling out several feet of the lifeline and allow it to retract back into the unit. Always maintain a light tension on the lifeline as it retracts. The lifeline should pull out freely and retract all the way back into the unit. Do not use the unit if the lifeline does not retract. The lifeline must be checked regularly for signs of damage. Inspect for cuts, burns, corrosion, kinks, frays or worn areas. Inspect any sewing (web lifelines) for loose, broken or damaged stitching.

Braking Mechanism – The braking mechanism must be tested by grasping the lifeline above the impact indicator and applying a sharp steady pull downward, which will engage the brakes. There should be no slippage of the lifeline while the brakes are engaged, once tension is released, the brakes will disengage and the unit will return to the retractable mode. Do not use the unit if the brakes do not engage.

Care of Fall Protection Equipment

Cleaning

Basic care of all safety equipment will prolong the durable life of the unit and will contribute toward the performance of its vital safety function. Proper storage and maintenance after use are as important as cleansing the equipment of dirt, corrosives or contaminants. Storage areas should be clean, dry and free of exposure to fumes or corrosive elements. The storage area should be clean, dry and free of exposure to fumes or corrosive elements. Manufacturers specifications should always be followed for proper maintenance and cleaning of equipment.

Nylon or Polyester – Remove all surface dirt with a sponge dampened in plain water. Squeeze the sponge dry. Dip the sponge in a mild solution of water and commercial soap or detergent. Work up a thick lather with a vigorous back and forth motion; then wipe with a clean cloth. Hang freely to dry, but away from excessive heat.

Self Retracting Lifeline Housing – Periodically clean the unit using a damp cloth and mild detergent. Towel dry.

Drying

Equipment should dry thoroughly without close exposure to heat, steam or long periods of sunlight.

Adverse Impacts to Fall Protection System Components

Heat

In excessive heat, nylon becomes brittle and has a shriveled brownish appearance. Fibers will break when flexed and should not be used above 180 degrees Fahrenheit (82.2 degrees Celsius).

Chemical
Change in color usually appears as a brownish smear or smudge. Transverse cracks appear when belt is bent over tight. This causes a loss of elasticity in the belt.

Ultraviolet Rays
Do not store webbing and rope lanyards in direct sunlight, because ultraviolet rays can reduce the strength of some material.

Molten Metal or Flame
Webbing and rope strands may be fused together by molten metal or flame. Watch for hard, shiny spots or a hard and brittle feel. Webbing will not support combustion, nylon will.

Paint and Solvents
Paint will penetrate and dry, restricting movements of fibers. Drying agents and solvents in some paints will appear as chemical damage.

Examples of Defective Fall Protection Equipment

Carabiner with Corrosion

Deployed Shock Absorbing lanyard

Harness with cut on plastic spreader

ds

Harness with cut on webbing

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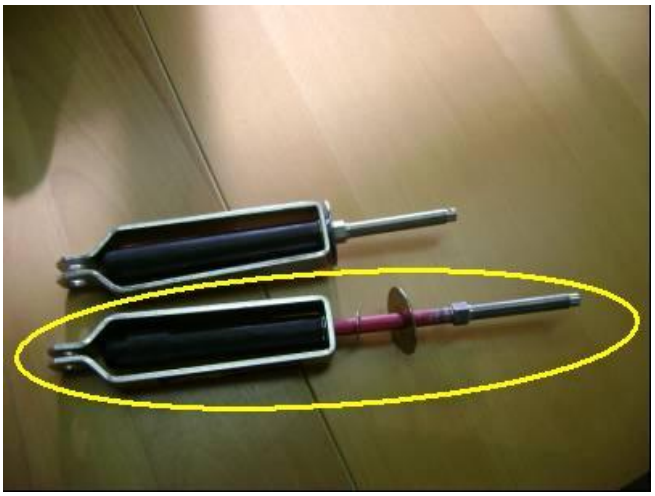
Self-Retracting lifeline with indicator showing deployment

Deployed in-line shock absorber for horizontal lifeline



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Partially deployed constant force roof top post

Fully deployed constant force roof top post

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Employee fall hazard training is critical to ensuring a complete fall protection program. As with all training, the employee must first be instructed on the proper identification of fall hazards before they are able to protect themselves from the hazard. The training program must be site-specific and include at a minimum the following elements:

- Facility specific Fall Protection program requirements
- Types of general fall hazards.
- Identification of site-specific fall hazards.
- Means to eliminate or minimize fall hazards.
- Types of fall protection used at the site.
- Limitations of fall protection.
- Use and care of fall protection, (including demonstration of donning and doffing equipment)
- Inspection of fall protection.

Fall protection training should be a combination of classroom and/or on-line and hands-on training. The classroom training should cover the fall protection fundamentals, while hands-on training should be site-specific on the particular applications. Since the misuse of this equipment can result in serious injury or even death, it is extremely important that employees are able to physically demonstrate their ability to properly use the equipment. Each employee must be able to demonstrate this understanding prior to any unsupervised exposure to fall hazards and use of fall protection equipment.

Classroom Training

Hands-On Training

GE MyLearning Training

GE-EHS-320 Fall Protection Awareness (Initial)
Description: This course is intended for all employees who work at elevated heights.
In this course, you will learn about the general causes of falls, types of fall protection used, and safe work practices to prevent falls from occurring.

GE-EHS-320R Fall Protection Awareness (Refresher)
Description: This course is intended for use as a refresher course for all employees who work at elevated heights.

GE-EHS-CEP-70 Fall Protection Competent Person
Description: This course is intended for GE employees who are to perform work as a Competent Person in Fall Protection.
In this course you will learn about identifying and assessing worksite fall risks and hazards, the different types of active and passive fall protection systems, and the proper selection, usage and care of fall protection equipment.

Fixed Elevated Work Platforms

Fixed elevated work platforms present a fall hazard if the platform contains unguarded edges, floor or wall openings, or openings for ladders. As discussed in the previous sections, when work is conducted at unprotected heights and/or exceeding four (4) feet (1.2 m) above the lower level or above dangerous equipment or processes, a fall hazard is present that must be addressed through either elimination or fall protection.

The best control on elevated work platforms is to eliminate the fall hazard. In most cases, the installation of guardrails is the most feasible and practical control. When guardrails cannot be installed or during the process of being installed on a work platform, fall protection or other protective means must be utilized to control the fall hazard.

Guardrail Systems

The platform must include a guardrail system around the entire periphery. If the guardrail system is removable or can be lowered, the means used to secure it in the normal operating position shall be readily accessible for inspection and maintenance.

The guardrail system must include a top rail around the upper periphery. The height of the top rail above the platform must be 42 inches +/- 3 inches (1.07m +/- 0.08m). The guardrail must include a midrail approximately midway between the top rail and the platform surface. Each top rail, midrail or equivalent vertical barrier must withstand a concentrated test load of 200 pounds (889.6 N) applied at any point in all directions. Equivalent structure may be used in place of top rails provided they meet the strength requirements.

Flexible materials such as cables, chains, and ropes may not be used in the guardrail system, except they may be used as a midrail at access openings 30 inches (0.76m) wide, or less.

The platform must include toe boards on all sides. The minimum toe board height is four (4) inches (0.076 m). Toe boards may be omitted at the access opening(s).

Atypical Fixed Work Platforms

Atypical fixed work platforms include rail cars, tank cars, and other fixed platforms. These platforms must be equipped with guardrail systems, or personal fall protection must be used.

Tank cars are typically equipped with guardrails surrounding the area of the top valve. The guardrails are designed to meet Department of Transportation (DOT) standards, but do not meet the above criteria. Personal fall protection must be worn when working on the top level of a tank car.

To understand the proper control of platform fall hazards through elimination, it is important to define the criteria for the use and installation of guardrails. The following guidelines present basic inspection criteria.

Working Platform Guidelines

- Guarded with a standard guardrail (toprail, midrail and toeboard) at all exposed edges or opening.
- Standard toprail positioned 42 inches +/- 3 inches (1.07m +/- 0.08m) from the floor of the platform.
- Constructed of smooth surfaced pipe railing, wood, chain or similar materials.
- Removable guardrails positioned in place when not removed for their intended purpose. Removable guardrails positioned at no more that two (2) sides of any platform opening.
- Open floor or wall openings provided with either a removable standard guardrail or an attendant.
- Ladderway entrances protected by a swinging guardrail, chains**, removable guardrail or so offset that an employee cannot walk directly into the opening.

  ** It should be noted that chains may be permissible in countries outside of the United States. The use of chains to guard ladderway openings within the US is a de minimis violation under the OSHA regulations and is not allowed.
- Guardrail posts not exceeding eight (8) feet (2.4 m) on centers and guardrail ends not extending past the terminal post of the railing.
- Midrail positioned approximately halfway between the top rail and the floor of the platform.
- Guardrail and posts capable of withstanding a minimum of 200 pounds (889.6 N) of force in any direction. Heavier stock, closer spacing of posts, bracing or other means provided where there is the potential for additional forces on the guardrail.
- Toeboard provided when persons can pass below the exposed edge, moving machinery is located on the platform or there is equipment, people, or processes below which falling material could cause a hazard. Toeboard extends at least four (4) inches (.076 m) up from the floor.
- Additional paneling or screening from the toeboard upward to the top height of the hazard where there is the potential for falling material above the toeboard.
- Toeboards (except removable style) not permitted in entranceways, such as ladder or floor openings.

Self-propelled elevated working platforms pose similar hazards to fixed platforms with the additional characteristic of being mobile. They are power operated with primary functions (including drive controls) located on the platform. These platforms use guardrail systems, including toprail, midrail, and toeboards are the primary engineering control for the protection of workers from falls.

The platform must include a guardrail system around its periphery. The requirements for these guardrails are the same as those presented for fixed elevated working platforms.

Where such guardrail systems exist, the use of Personal Fall Protection Systems is not a regulatory requirement for employees while operating or utilizing Self-Propelled Elevating Work Platforms and is not required under the GE Fall Protection Guidelines.

Some organizations and facilities have implemented requirements for workers to wear personal fall protection systems (PFP's) utilizing full body harnesses, positioning devices (belts), lanyards, etc. If worksite rules require occupants of the platform to wear restraint or body positioning devices, occupants shall comply with instructions provided by the aerial platform manufacturer regarding anchorages. The requirements for anchorage points state "each anchorage shall be capable of withstanding a static force of 5,000 pounds (22,241 N), increased by a factor of .2 (20%) for each additional lanyard, without reaching ultimate strength. The strength requirement shall only apply to the anchorage(s) and their attachment to the aerial platform."

Historically, anchorage points for PFP's were not standard issue on Self-propelled aerial lift platforms. While retrofit packages may currently be available from manufacturers, facility audits have identified lift platforms where maintenance personnel have welded eyehooks to platforms as tie off points. These may not meet the 5,000-pound (22,241 N) structural integrity requirement. This practice must not continue. For the equipment where modifications have been made, outside of manufacturers retro-fit kits, written approval must be received from the manufacturer allowing this.

Modifications or alterations of the aerial platform or the fabrication and attaching of frameworks, or the mounting of attachments for holding tools or materials onto the platform or the guardrail system shall only be accomplished with the prior written permission of the manufacturer.

If a facility has installed anchorage hooks/points to the platform or guardrails that were not pre-approved by the manufacturer prior to installation, these anchorage points do

not meet the regulatory requirements. For such modifications, manufacturer approval must be obtained or the modifications must be removed.

In some cases workers have utilized the toprail or the midrail of the guardrail system as the anchorage point for the workers PFP. The guardrail system is not designed for or regulated to meet the anchorage point requirements, and is not structurally adequate to be used as a PFP anchorage point.

Operation Warning and Instructions

The guardrail system of the aerial platform provides fall protection. If worksite rules require an occupant(s) of the platform to wear restraint or body positioning devices, occupants shall comply with instructions provided by the aerial platform manufacturer regarding anchorage(s).

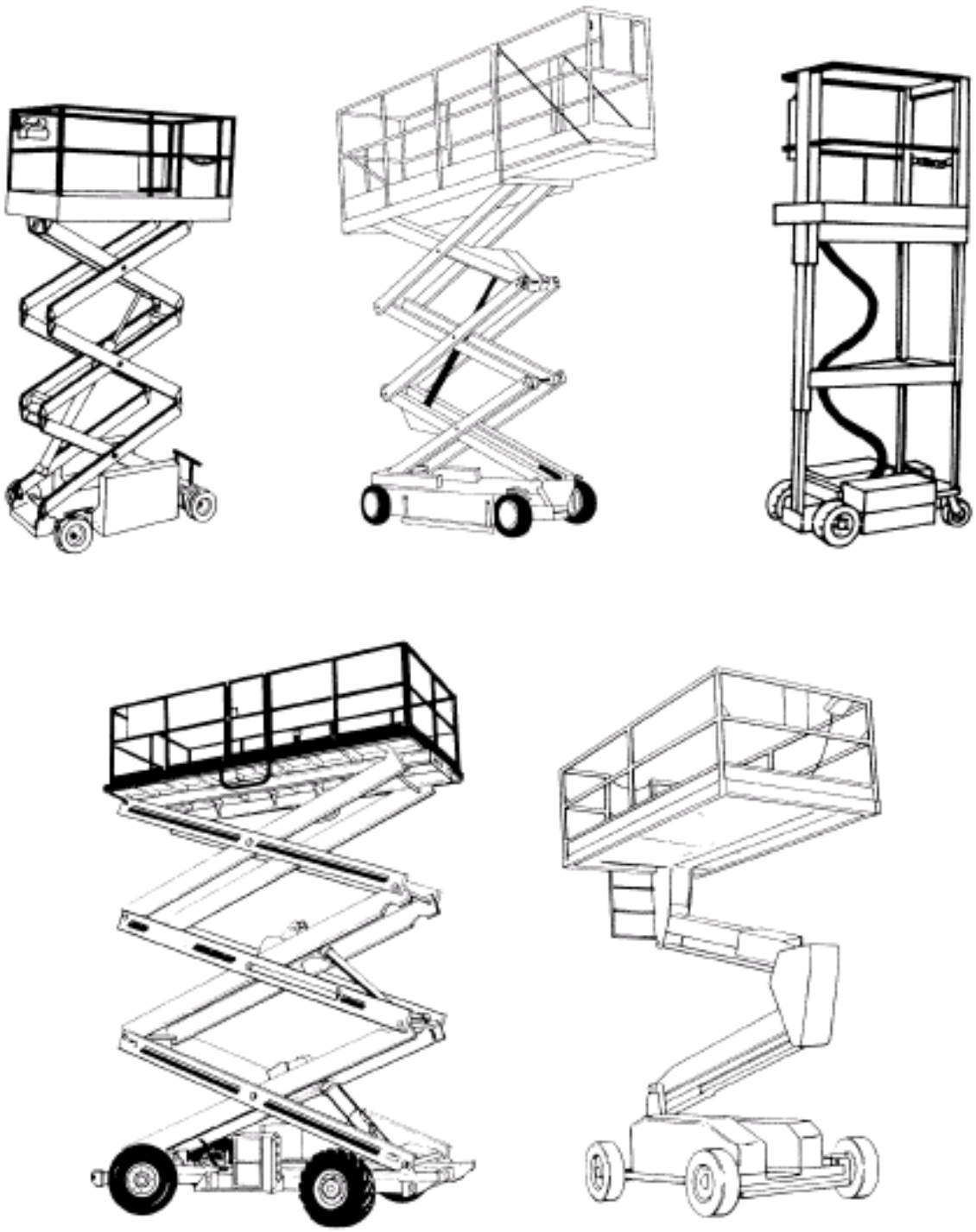
Personnel shall maintain a firm footing on the platform floor while working thereon. Climbing by occupants on the midrail or toprail of the aerial platform is prohibited. The use of planks, ladders, or any other devices on the platform is prohibited.

Modifications or alteration of an aerial platform or the fabrication and attaching of frameworks, or the mounting of attachments for holding tools or materials onto the platform or the guardrail system shall only be accomplished with the prior written permission of the manufacturer.

Modification, alteration or remanufacture of an aerial platform shall be made only with prior written permission of the manufacturer.

ANSI/SIA A92.6-1999

Figure 1 Typical Examples of Equipment Covered



Boom-Supported Elevating Work Platforms

Boom-supported elevating work platforms are self-propelled units having a platform that can be positioned completely beyond the base. These platforms are used to position personnel, along with their necessary tools and materials at work locations. Primary functions (including drive controls) are located on the platform.

Guardrail systems, inclusive of toprail, midrail, and toeboards are the primary engineering control for the protection of workers from falls while utilizing Boom-supported Elevating Work Platforms. Personal fall protection must also be used.

Personal fall protection systems must be used by employees while operating or utilizing Boom-Supported Self-Propelled Elevating Work Platforms. This is a regulatory requirement as well as a requirement of the GE Fall Protection Guidelines.

The occupants of the Boom-supported Elevating Work Platform must secure their PFPs to an anchorage point provided by the manufacturer and designed to withstand a static force of 5,000 pounds (22,300 N).

Employees may not utilize the toprail or the midrail of the guardrail system as the anchorage point for the PFP. The guardrail system is not designed for or structurally adequate to be used as a PFP anchorage point. The same requirements and warnings regarding the installation of anchorage points on self-propelled aerial lift platforms apply to boom-supported elevated work platforms.

Personnel shall maintain a firm footing on the platform floor while working on boom-supported aerial lift platforms. Climbing on the midrail or toprail of the aerial platform is prohibited. The use of planks, ladders, or any other devices on the aerial platform for achieving height or reach is prohibited.

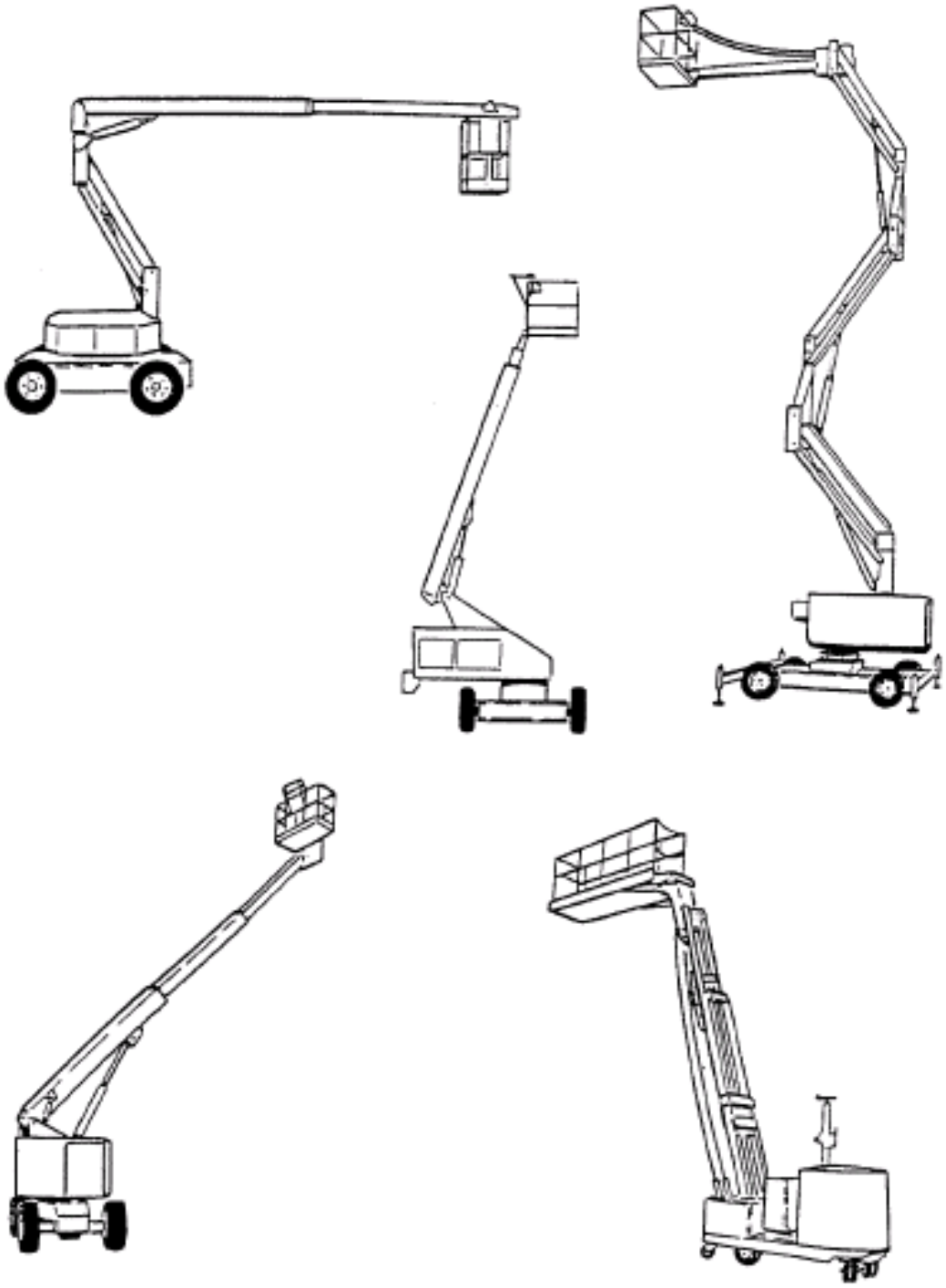


Figure 1 - Examples of A92.5 Aerial Platforms

Work on Top of Pipe Racks, Trucks, Vans, and Other Vehicles

Other work platforms or walking surfaces such as on the top of trucks, vans, rail and tanker trucks are subject to the same fall protection requirements. If work is conducted at unprotected heights at or exceeding four (4) feet (1.22 m) above the ground or above dangerous equipment or processes, a fall hazard is present that must be addressed through either elimination or fall protection.

It should be noted, while the walking surface or bed of a transport truck may be under the four (4) foot (1.22 m) requirement, if the employee/worker climbs onto or on top of equipment or materials that are located on the flatbed portion and the level that they are on top of is exceeding four (4) feet (1.22 m) above the ground, then fall protection is required.

The best control is to install guardrails on the truck or van. When guardrails cannot be installed, fall protection or other protective means must be utilized.

News truck with guardrails

Railcar access platform with fall arrest *

Loading Flat bed trucks with fall arrest *

* Images used with permission by Tritech Fall Protection http://www.tritechfallprotection.com/

Horizontal fall protection on pipe rack *

Dual truck tarping station with fall arrest *

Mobile platform for tanker trucks *

Dual fall arrest system for rail car access *

Retractable lifeline for airplane access *

Fall arrest and platform for tanker truck access *

Images used with permission by Tritech Fall Protection http://www.tritechfallprotection.com/

For purposes of this section of the GE Fall Protection Program, a Vehicle-mounted Elevating Work Platform is any vehicle-mounted device that is used to position

personnel that is attached to a forklift truck. A platform attached to the forks of a forklift would not be considered an aerial device or aerial lift.

Aerial devices (aerial lifts) are covered in the GE Fall Protection Program under *Fixed Elevated Work Platforms.*

Each facility shall review the specific regulatory requirements for their Country, State, and local codes to ensure that they are met, at a minimum. Where specific regulations do not exist, the GE Fall Protection Program's requirements must be followed.

Elevating Work Platforms

There are cases where facilities use the addition of a work platform to a powered industrial truck for elevating personnel. Only operator-up high-lift trucks have been designed to lift personnel. If a vehicle mounted work platform is used on trucks designed and intended for handling materials, the requirements of the GE Fall Protection Program shall be met for the protection of personnel.

Image Courtesy of TriTech Fall Protection Systems

Image Courtesy of TriTech Fall Protection Systems

Written Program

Whenever a forklift truck is used to elevate personnel, the facility shall develop a written program and the following precautions shall be implemented for the protection of the personnel.

The facility shall develop written procedures that:

- Assure that this type of device cannot be used with a forklift unless the manufacturer of the forklift has approved the use of the basket with their equipment.
- Assures that the Platform is secured to the lifting carriage or forks of the industrial truck.
- The mast is in the vertical position – do not operate on a side slope.
- The platform is horizontal and centered and not tilted forward or rearward when elevated.
- Assures that before and during Lateral Movement of the unit that the platform has been lowered to base level.
- All travel controls are in the neutral position and the parking brake is set.
- Avoid overhead obstructions and electrical wires.
- Have a trained operator in position to control the truck, or available to operate controls.
- Require tools and materials have been secured from falling or have been removed prior to use of the unit.
- Ensure that personnel shall not be permitted to ride inside of the forklift truck vehicle mounted work platform while in transport.
- Ensure the area surrounding the unit shall be cleared of employees and equipment before lowering.
- Assess the area the unit is being moved through to ensure there is a firm footing and is cleared of obstructions.
- Prohibit the use of any device to achieve additional height on/inside the unit.
- Each unit shall be secured to prevent unintended motion while in use.
- All units shall be given a visual inspection prior to use for defects that could cause employee injury, unit failure, or incident.
- Ensure that manufacturers' specifications for inspection and maintenance are met where applicable.
- Ensure that the combined weight of the platform, load, and personnel does not exceed the capacity of the forklift truck as indicated on the nameplate of the truck on which the platform is used.
- Modifications and additions, which affect capacity and safe operation, shall not be performed without manufacturers prior written approval.
- Capacity, operation, and maintenance instruction plates, tags, or decals shall be visibly displayed on the work platform.
- Ensure the vehicle-mounted platform meets at a minimum, the appropriate employee protection and fall protection systems described below:
    - Overhead protection shall be provided when employees are exposed to objects falling from above.
    - Be certain that required restraining means such as railings, chains, cable, body harnesses with positioning devices and lanyards are in place and properly used.
    - Provide protection for personnel in their normal working position on the platform from moving parts of the truck that represent a hazard.

- Employees shall be trained in the safe use of the units before they are allowed to use them.

There are certain regulatory cases where agencies will allow the employer to obtain written approval from a qualified Registered Professional Engineer after receiving no response or a negative response from the powered industrial truck manufacturer. If the manufacturer's response was negative, then the engineer, prior to granting approval for the modification or addition, would need to perform a safety analysis and address all safety and/or structural issues contained in the manufacturer's disapproval.

Vehicle-mounted platform Specifications and Requirements

The vehicle-mounted platform shall meet minimum worker protection and fall protection systems described below:

- The platform must include a guardrail system around its periphery. The requirements for these guardrails are the same as those presented for fixed elevated working platforms.

- If the guardrail system is removable or can be lowered, the means used to secure it in the normal operating position shall be readily accessible for inspection and maintenance, and must be utilized during the lift.

- The guardrail system must include a top rail around the upper periphery. The height of the top rail above the platform must be 42 inches +/- 3 inches (1.07m +/- 0.08m). The guardrail must include a midrail approximately midway between the top rail and the platform surface. Each top rail, midrail or equivalent vertical barrier must withstand a concentrated test load of 200 pounds (1340 N) applied at any point in all directions. Equivalent structure may be used in place of top rails provided they meet the strength requirements.

- To provide an access opening, the guardrail may be hinged or removable, or chains may be used if proper positioning is easily accomplished and in a secured condition prior to the lift.

- The platform must include toe boards on all sides. The minimum toe board height is four (4) inches (0.076 m). Toe boards are not required in access openings.

- Additional paneling or screening from the toe board to the mid rail/top rail where there is the potential for falling material above the toe board.

- The floor surface shall be of a slip resistant design.

- The vehicle-mounted platform shall have guarding on the mast side of the platform that prohibits the users arms or legs from being placed between the uprights of the mast or outside the running lines of the truck.

- The lift cage shall have prominently display a nameplate with the following information:
    - Maximum load capacity including the personnel and equipment.
    - Weight of the empty platform

Personal Fall Protection System utilization in Vehicle-mounted platforms

Some organizations, businesses and facilities have implemented requirements for workers to wear personal fall protection systems (PFP's) utilizing full body harnesses, positioning devices (belts), lanyards, etc. If the business and/or worksite rules require occupants of the platform to wear restraint or body positioning devices, occupants shall comply with instructions provided by the aerial platform manufacturer regarding anchorages.

The requirements for anchorage point's state "each anchorage shall be capable of withstanding a static force of 5,000 pounds (22,300 N), increased by a factor of .2 (20%) for each additional lanyard, without reaching ultimate strength. The strength requirement shall only apply to the anchorage(s) and their attachment to the aerial platform."

In some cases workers have utilized the top rail or the midrail of the guardrail system as the anchorage point for the workers personal fall protection system (PFP). The guardrail systems are typically not designed for or regulated to meet the anchorage point requirements, and is not structurally adequate to be used as a PFP anchorage point.
Workers shall not be allowed to tie off to the guardrail system unless allowed by the manufacturer in their written specifications.

Modifications or alteration of an aerial platform or the fabrication and attaching of frameworks, or the mounting of attachments for holding tools or materials onto the platform or the guardrail system shall only be accomplished with the prior written permission of the manufacturer.

Modifications and additions, which affect capacity and safe operation, shall not be performed by the user without manufacturers prior written approval. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.

Please be aware that some regulatory agencies will, in limited circumstances, allow the employer to obtain written approval from a qualified Registered Professional Engineer after receiving no response or a negative response from the powered industrial truck manufacturer. If the manufacturer's response was negative, then the engineer, prior to granting approval for the modification or addition, would need to perform a safety

analysis and address all safety and/or structural issues contained in the manufacturer's disapproval.

Working on and around ladders is hazardous. Ladders are major sources of injuries and fatalities among construction workers and within general industry applications and many of the injuries are serious enough to require time off the job.

Ladder Types

There are two basic types of ladders, portable and fixed. There are also ladder units that are considered portable, but have been reengineered for different applications: Rolling Stepladders. The rolling stepladder referred to in this document is not a Rolling Scaffold type of ladder.

Each type presents a different hazard to the employee and different means to control. Portable ladder present fall hazard typically controlled through good employee work practices and ladder use fundamentals. Portable ladders do not use fall protection as described in sections of this document. Fixed ladders, however, are controlled similar to the other fall hazards by the use of proper ladder design and use of fall protection.

Portable ladders are built of several different materials (wood, fiberglass, aluminum) and available in various designs (Solid Beam: Wood, Truss Beam: Wood, Solid Beam: Aluminum, Truss Aluminum).

Aluminum ladders conduct electricity; it is strongly recommended that portable ladders should be composed of Fiberglass, a non-conducting material. Fiberglass is a man made material that does not conduct electricity when dry. Refer to your country specific requirements/regulations on the use of Aluminum Portable ladders.

Portable Extension Ladder

Portable Step Ladder

Rolling Stepladder

Portable Ladders

Portable ladders rely almost exclusively on good employee work practices, ladder use fundamentals, and inspection for condition of use to minimize fall hazards.

When portable ladders are used for access to an upper landing surface, the side rails must extend at least 3 feet (.91 m) above the upper landing surface. When such an extension is not possible, the ladder must be secured and a grasping device such as a grab rail must be provided to assist workers in mounting and dismounting the ladder. A ladder extension must not deflect under a load that would cause the ladder to slip off its supports.

Duty Type and Load Ratings for Portable Ladders:

Within the United States, the American National Standards Institute defines the load rating of each ladder and is the information is found printed on a safety label located on every ladder's leg. The Type designation of each ladder is a rating of how much weight a single rung on the ladder can bear.

United States; ANSI Portable Ladder Load Ratings:

Type 3	(Household Use) is safety rated to hold up to 200 pounds (90.7 kg)
Type 2	(Commercial Use) is safety rated to hold up to 225 pounds (102.1 kg)
Type 1	(Industrial Use) is safety rated to hold up to 250 pounds (113.4 kg)
Type 1A	(Heavy-Duty Industrial Use) is safety rated to hold up to 300 pounds (136.1 kg)
Type 1AA	(Commercial Use) is safety rated to hold up to 375 pounds (170.1 kg)

British and European Portable Ladder Duty Ratings:

BS 1129:1990 (British) applies to wooden ladders and stepladders.
BS 2037:1990 (British) applies to aluminum ladders and stepladders.
BS EN 131:1993 (European) applies to metal and wooden ladders and stepladders.

Class 1 (Industrial) Duty rating:
130kg (20 stone) - Maximum vertical static load 175kg (27.5 stone)

Class 3 (Domestic) Duty rating:
95kg (15 stone) - Maximum vertical static load 125kg (19.5 stone).

BS EN 131:1993 (European) applies to metal and wooden ladders and stepladders. (Previous Class 2) Duty rating:
115kg (18 stone) - Maximum vertical static load 150kg (23.5 stone).

General Guidance for all Ladders

- Maintain ladders free of oil, grease and other slipping hazards.

- Do not load ladders beyond their maximum intended load nor beyond their manufacturer's rated capacity.
- Do not stand above the highest Safe Standing Level of a ladder.
  These levels are:
  - The second rung from the top of a stepladder,
  - The fourth rung from the top of an extension ladder.
- Use ladders only for their designed purpose.
- Use ladders only on stable and level surfaces unless secured to prevent accidental movement.
- Do not place a ladder on boxes, barrels or other unstable bases to obtain additional height
- Do not use ladders on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental movement. Do not use slip resistant feet as a substitute for exercising care when placing, lashing or holding a ladder upon slippery surfaces.
- Secure ladders placed in areas such as passageways, doorways or driveways, or where they can be displaced by workplace activities or traffic to prevent accidental movement. Or use a barricade to keep traffic or activity away from the ladder.
- Ladder should not be used in a strong wind
- Keep areas clear around the top and bottom of ladders.
- Do not move, shift or extend ladders while in use.
- Use ladders equipped with nonconductive side rails if the worker or the ladder could contact exposed energized electrical equipment.
- Face the ladder when moving up or down.
- Use at least one hand to grasp the ladder when climbing.
- Do not carry objects or loads that could cause loss of balance and falling.
- Ladder rungs, cleats and steps must be parallel, level and uniformly spaced when the ladder is in position for use.
- Ladders must not be tied or fastened together to create longer sections unless they are specifically designed for such use.
- Two or more separate ladders used to reach an elevated work area must be offset with a platform or landing between the ladders
- Ladder components must be surfaced to prevent snagging of clothing and injury from punctures or lacerations
- Wood ladders must not be coated with any opaque covering except for identification or warning labels, which may be placed only on one face of a side rail
- Workers should inspect ladders for visible defects prior to use and after any incident that could affect their safe use
- Portable ladders with structural defects- such as broken or missing rungs, cleats or steps, broken or split rails, corroded components or other faulty or defective components- must immediately be marked defective or tagged with "Do Not Use" or similar language and withdrawn from service until repaired.
- Ladder repairs must restore the ladder to a condition meeting its original design criteria before the ladder is returned to use.

Guidance for Portable Stepladders

- Erect a stepladder only on a flat level surface. Do not place it on a table or any similar platform for added height.
- Never use a stepladder as a straight ladder.
- Do not use the top or top step of a stepladder as a step.
- Do not step on the bucket shelf or attempt to climb or stand on the rear section supports. They are not designed to support the weight of a person.
- Do not use cross bracing on the rear section of stepladders for climbing unless the ladders are designed and provided with steps for climbing on both front and rear sections.
- A metal spreader or locking device must be provided on stepladders to hold the front and back sections in an open position when ladders are being used.
- The metal spreader or locking device on some ladders may present a pinching hazard, so keep fingers clear when setting up and taking down the ladder.
- Before climbing a stepladder, make sure that its legs are fully extended and the metal spreader is fully engaged/locked.

Guidance for Portable Extension Ladders

- All ladders must be leveled before climbing. The leveling device must be an approved or certified device.
- Be sure that all locks on an extension ladder are properly engaged
- Non-self-supporting ladders and/or extension ladders that lean against a wall or other support are to be positioned at such an angle that the horizontal distance from the top support to the foot of the ladder is about 1/4 the working length of the ladder.
- 4-to-1 Rule: Follow the “4-to-1” use rule to determine the proper ladder angle. This general rule states that for every four (4) feet (1.22 m) the ladder extends vertically from the ground to the support point, the ladder base should be one (1) foot (.30 m) out horizontally from directly below the support point. For example, if the ladder is resting on the edge of a roof 16 feet (4.87 m) above the ground, the bottom of the ladder should be 4 feet (1.22 m) out from that edge.
- Tie off the extension and single ladder at the top and bottom, or use a second person to hold the base of the ladder
- Ladders must not be tied or fastened together to provide longer sections, unless they are specifically designed for such use
- Never use a ladder for any purpose other than the one for which it was designed.
- The area around the top and bottom of ladder must be kept clear. Control or otherwise guard (such as with caution tape) ladder use area to prevent accidental contact in areas of high traffic or around door openings
- Do not use ladders near electrical wires.
- Aluminum ladders conduct electricity; It is strongly recommended that extension ladders composed of Fiberglass or a non-conducting composite material. Fiberglass is a man made material that does not conduct electricity when dry.
- Do not set up or take a ladder down when it is extended

- When working on an extension ladder; Do not stand above highest "safe standing level" prescribed by ladder's manufacturer, i.e. (above top three rungs).
- Remain within the center portion of the ladder. Never overreach from the ladder or try to move horizontally while still on the ladder. As a general rule of thumb, your belt buckle should never reach past the outside rail of the ladder (Do not extend the center of your body's torso past either side rail of ladder) i.e.. Do not over reach.
- Keep at least 3 points of contact when working, i.e. (your feet and 1 hand).
- Face ladder while ascending and descending.
- Never leave erected ladder unattended

Guidance for Rolling Stepladders

On occasion, an employee's work task requires the use of rolling stepladders for access to "out-of-reach areas". These ladder types present unique hazards that can be reduced or eliminated when the following simple safety guidelines are followed.

- Always use a ladder whenever the job requires it, rather than using a chair, box, or other item to gain access.
- Read and follow the manufacturer's instructions label affixed to the ladder
- Do not use the ladder if you have not been properly trained.
- Do not use a ladder that has loose rungs, cracked or split side rails, missing rubber foot pads, or has other visible damage
- A damaged side rail may cause one side of a ladder to give way
- Non-skid feet or will prevent a rolling ladder from slipping on a hard, smooth surface
- Do not try reaching so far that you lose your balance; move the ladder
- Any load applied to a portable ladder shall not exceed 75% of its load rating
- Allow only one person on the ladder at a time
- Do not move a rolling ladder while someone is on it
- When conducting work on a ladder, the worker's waist shall remain centered between the side rails.
- Always apply the rolling ladder breaks prior to gaining access onto the ladder
- If you are using rolling ladders which do not have brakes, use ladder chocks
- Don't use ladders in front of doors that open towards the ladder unless the door is blocked, locked, or guarded
- Ladders with broken or missing steps, rungs, cleats, rails, split wood, etc. will be taken out of service.
- Employees using rolling stairs to stock shelves often twist at the torso to retrieve items off the side of the ladder, which increases risk of back injury, use proper lifting techniques and ergonomics postures
- Employees risk falls from heights and are unable to use safety handrails while descending the ladders carrying boxes.
- Do not us boxes, wood/metal planks, makeshift devices, or other items on top of rolling ladders to increase the height.

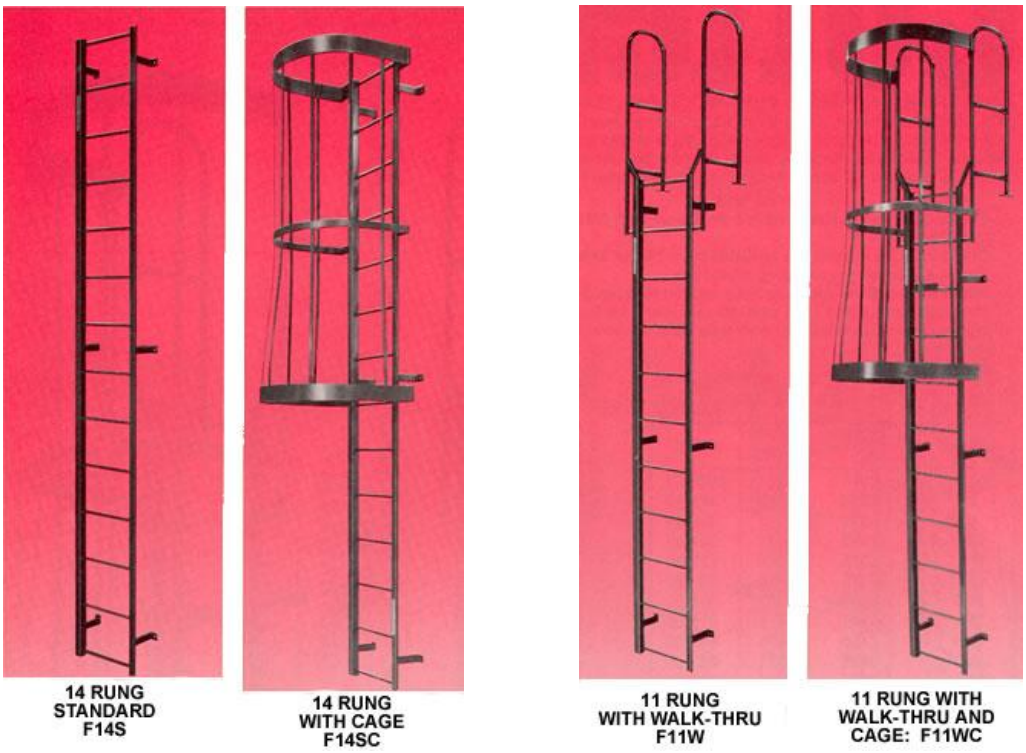
Guidance for working around/near overhead power lines
Facilities, workers, contractors, etc. should take the steps outlined in the following section to protect workers while working around overhead power lines.
This will assist in preventing contact with overhead power lines, regardless of whether the regulations are required by the locality or country regulations where the work is being performed.

- Identify the location of overhead power lines as a routine part of all initial worksite surveys for jobs involving the use of ladders. Always note power line heights and distances from work areas on site diagrams to provide key information for site supervisors and workers.
- Avoid or limit proximity to power lines whenever possible. Consider ladder length and room for ladder staging (safely raising and lowering ladders).
- Notify the local electric utility company for assistance if work needs to be done near energized, overhead power lines.
- Ensure that workers maintain a safe working distance between power lines and equipment or structures that require periodic maintenance or access.
- Do not store materials or equipment below or near overhead power lines.
- Eliminate the use of metal ladders near energized overhead power lines.
- Ensure that workers keep conductive objects at least 10 feet away from unguarded, energized lines up to 50 kilovolts. For every 10 kilovolts above 50 kilovolts, maintain an additional 4 inches (.10 m) of clearance.
- As part of the site safety program and orientation, make supervisors and workers aware of power line distances from work areas, including ladder length and ladder staging areas. Use site diagrams to communicate this information and ground level signs or taped markers to remind workers of overhead power line locations.
- For training, consider the languages and reading levels of the workers. Explain the risks and consequences of contacting overhead power lines. Explain and provide hands-on practice in recognizing hazards and avoiding unsafe conditions with ladders and overhead power lines.
- Do not use metal ladders near energized overhead power lines. Provide the appropriate American National Standards Institute (ANSI) approved ladders (or other country specific institutes recommendations) for work near energized, overhead power lines.
- Prevent movement into a power line by ensuring that ladders are stable, level, and adequately supported (i.e., tied or blocked).
- Ensure that workers are provided with a means of emergency communication and are also trained in approaching injured workers and providing aid during an electrical incident, including first aid and cardiopulmonary resuscitation (CPR).
- Workers should always “LOOK UP” and note the location of overhead power lines at the start of each job.
- Always assume all overhead lines are energized and dangerous.
- Always lower the ladder and carry it horizontally when moving it to avoid contacting overhead power lines. Have someone help carry and set up long and unwieldy ladders.

- Never touch or go near a person or equipment (such as a ladder) that is in contact with an overhead power line.
- Ensure through contract language that all contract workers and subcontractors implement safety and health programs and training specific to the worksite and the hazards present while working around overhead power lines

Fixed Ladders

Fixed ladders present a fall hazards and protection issue at all levels, however in most countries when the ladder extends to distances exceeding twenty (20) feet (6.1 m) in elevation additional protective devices are required. When this height is exceeded, special fall protection provisions or equipment must be designed into the construction of the fixed ladder.



Fixed Ladders: Standard, with Cage, and with Walk-thru railings
Images of Fixed Ladders used with permission by FS Industries http://www.fsindustries.com

If the total length of the climb on a fixed ladder equals or exceeds 24 feet (7.3 m), the ladder must be equipped with ladder safety devices; *or* self-retracting lifelines and rest platforms at intervals not to exceed 150 feet (45.7 m); *or* a cage or well and multiple ladder sections with each ladder section not to exceed 50 feet (15.2 m) in length. These ladder sections must be offset from adjacent sections and landing platforms must be provided at maximum intervals of 50 feet (15.2 m).

In addition, fixed ladders must meet the following requirements:

- Fixed ladders must be able to support at least
- Two loads of 250 pounds (114 kg) each, concentrated between any two consecutive attachments. Fixed ladders also must support added anticipated loads caused by ice buildup, winds, rigging and impact loads resulting from using ladder safety devices.
- Individual rung/step ladders must extend at least 42 inches (1.1 m) above an access level or landing platform either by the continuation of the 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.
- US Requirement: Each step or rung of a fixed ladder must be able to support a load of at least 250 pounds (114 kg) applied in the middle of the step or rung.
- EU Requirement: BS 5395: Part 3 1985: Rungs should be designed to withstand a concentrated load of 1.5Kn (152Kg) placed in any position and should be fixed securely.
- Minimum clear distance between the sides of individual rung/step ladders and between the side rails of other fixed ladders must be 16 inches (41 cm).
- Rungs of individual rung/step ladders must be shaped to prevent slipping off the end of the rungs.
- Minimum perpendicular clearance between fixed ladder rungs, cleats, and steps and any obstruction behind the ladder must be 7 inches (18 cm), except that the clearance for an elevator pit ladder must be 4.5 inches (11 cm).
- Minimum perpendicular clearance between the centerline of fixed ladder rungs, cleats and steps, and any obstruction on the climbing side of the ladder must be 30 inches (76 cm). If obstructions are unavoidable, clearance may be reduced to 24 inches (61 cm), provided a deflection device is installed to guide workers around the obstruction.
- Step-across distance between the center of the steps or rungs of fixed ladders and the nearest edge of a landing area must be no less than 7 inches (18 cm) and no more than 12 inches (30 cm). A landing platform must be provided if the step-across distance exceeds 12 inches (30 cm).
- Fixed ladders without cages or wells must have at least a 15-inch (38 cm) clearance width to the nearest permanent object on each side of the centerline of the ladder.
- Fixed ladders must be provided with cages, wells, ladder safety devices or self-retracting lifelines where the length of climb is less than 24 feet (7.3 m) but the top of the ladder is at a distance greater than 24 feet (7.3 m) above lower levels.
- Side rails of through or side-step fixed ladders must extend 42 inches (1.1 m) above the top level or landing platform served by the ladder. Parapet ladders must have an access level at the roof if the parapet is cut to permit passage through it. If the parapet is continuous, the access level is the top of the parapet.
- Fixed ladders must be used at a pitch no greater than 90 degrees from the horizontal, measured from the backside of the ladder.

Protection from falls on Upper Access Openings on Fixed Ladders

There are not specific regulatory requirements in the US and other countries that require the upper access openings or entryways to the fixed ladder to be protected with the use of swing gates or other guarding methods to protect employees from falls.

It is the expectation of the GE Company that we protect our employees from potential falls through these openings. The use of a swing gate, upper and mid-rail chains (Not allowed within the US), movable guardrail, etc. is acceptable to protect the employee from access to the fall hazard.

For the purpose of the GE Fall Protection manual, the words/terms “Skylight and Translucent Roofing Panel” will be considered of the same hazard and as one in the same.

Skylights and translucent roofing panels have been identified as a situation where an employee could step/fall through the unit/opening and an injury could result from the fall.

The definition of a fall hazard within the GE Fall Protection manual is “any situation in which a fall from an elevated height could result in an injury”.
Due to this definition, the associated hazard of the units, as well as regulatory requirements to protect personnel from falls onto or through, Skylights and Translucent Roofing Panels apply to the definition and must be guarded.

A very broad definition of “**Skylight**” and/or “**Translucent Roofing Panel**” exists and can be identified as, but not limited to:

- A window in a roof that allows natural light to illuminate a room.
- Any opening in the roof surface which is glazed with a transparent or translucent material
- A window set into a roof or ceiling to provide extra lighting. Sizes, shapes and placement vary widely
- Translucent panel formed like rib panel or flat in nature used on roof or walls in place of certain rib or flat panel sheets to supply natural light to building.

Pictorial Examples of Skylights

Images of Skylights used with permission by VELUX America, Inc. www.veluxusa.com

Translucent Panels

Translucent panels (also known as “corrugated fiberglass” (CF) Skylights) are very similar to skylights however they are not typically a raised structure since they are at the same level and having the same profile as the corrugated metal roof panels. They are at times difficult to detect by persons on the roof, especially when they become weathered or dirty.

Many country regulations consider translucent panels to be an opening through which personnel can fall and require the facility to establish employee protection requirements; typically engineering controls.

Protective methods
Skylights and translucent roofing panels lack the same structural strength as standard roofing panels and cannot support the weight of a person and/or equipment. It is due to this, that the employees must be protected from falling through these units.

There are several methods for controlling access to the fall hazards of skylights and translucent panels. The hierarchy of control should be used to protect personnel from the hazard by means of:

- Traditional guardrail systems may be implemented (meeting the required height and structural strength requirements based upon regulatory requirements. Where no regulatory requirements exist, the system must meet the GE requirements in Section 5 of the GE Fall Protection manual).
- “Passive protection” such as skylight screens to eliminate the hazard and prevent falls (meeting the structural requirements noted below).
- Personal Fall Protection Systems (Full body harness, lanyard/shock absorbing lanyard where appropriate, and a certified/rated anchor point.

No grandfathering is permitted. All new and existing installations of skylights and translucent roofing panels must meet these protection requirements at a minimum.

Image of Rhino Guardrail Skylight Kit used with permission by CAI Safety Systems www.caisafety.com
Image of KeeGuard Skylight Railing system used with permission from SRS, Safety Rail Source www.safetyrailsource.com

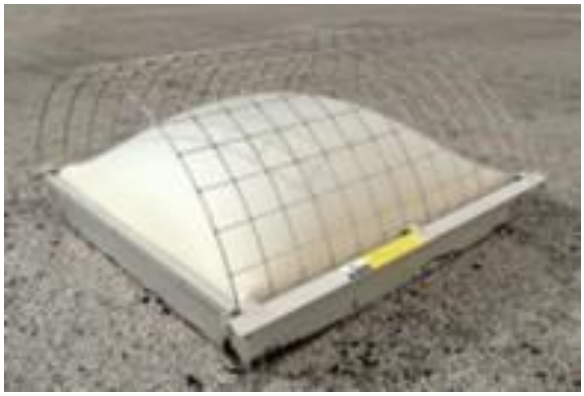


Image of FallGuard™ Skylight Screen used with permission by Plasteco, Inc. www.plasteco.com
Image of STS Skylight screen system used with permission from SRS, Safety Rail Source www.safetyrailsource.com

Structural Requirements for Skylight and Translucent Panel screens

Skylight and Translucent Panel screens shall be of such construction and mounting that they are capable of withstanding a load of 200 pounds (91kg) applied perpendicular at any one area of the screen. They shall also be of such construction and mounting that under ordinary loads or impact, they will not deflect downward sufficiently to break the glass below them. The construction shall be of grillwork with openings not more than 4 inches (10.16 cm) long or slat work with openings not more than 2 inches (5.08 cm) wide with length unrestricted.

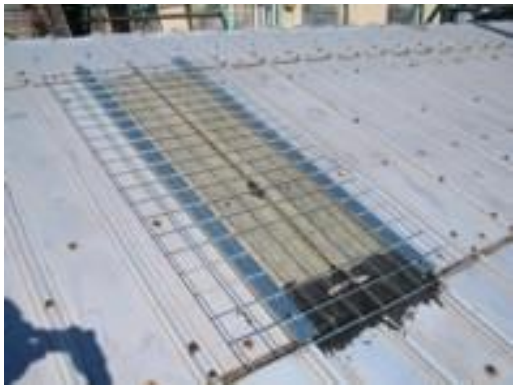


Image of FallGuard™ Skylight Screens used with permission by Plasteco, Inc. www.plasteco.com
Image of SCS Saf-T-Screen Skylight protection System with permission by SRS, Safety Rail Source www.safetyrailsource.com

Roofing hatchways/ladder way floor openings are present in many forms, sizes and types and present unique hazards due to the construction of the units themselves.

Image of Bilco Type E Roof Hatch used with permission by Bilco www.bilco.com
Image of Bilco Type L Roof Hatch used with permission by Bilco www.bilco.com
Image of Bilco Type WT - Flood tight Door used with permission by Bilco www.bilco.com

The roof hatchway is a "ladder way or stair floor opening", the roof being the floor or platform. Therefore, when the hatch is open, the hatchway must be protected. When the hinged cover for an opening is left up, there are sides exposed which must be appropriately controlled due to the potential for persons to fall into the opening, and to protect the people. The most effective means to protect people from the hazard is to guard the opening (all exposed sides) with a standard railing including a standard toe board (where required by regulation) on all exposed sides.

The entrance to opening passage should be guarded with a swinging gate or a movable guardrail section, or chains (where allowed by local/country regulations) so a person cannot walk directly into the opening, provide a means of access and, when closed, provide the appropriate protection. When a chain is used as a guarding system, historically it has been noted that the top and intermediate chain is at times not reattached after entry/use. It takes time and effort for employees to re-hook the chains. That is why it is recommended that a self-closing gate be installed and used.

Images of Bilco Bil-Guard® Hatch Railing Systems used with permission by Bilco www.bilco.com

Images of FabEnCo: A Series, XL Series, R Series, and RX Series Self-Closing Safety gates used with permission by FabEnCo www.safetygate.com

Image of KeeGuard Roof hatch/ladderway railing system used with permission from SRS, Safety Rail Source www.safetyrailsource.com

Workers may need to conduct activities on a building rooftop and will be at risk if adequate protection is not provided from the roof edge or side such as a parapet that is 42 inches high (+/- 3 inches) (1.07m +/- 0.08m), permanent or temporary guardrails or the use of an approved personal fall protection system.

It is a common misconception that the worker is safe and in regulatory compliance as long as a minimum distance of 6 feet (1.8 meters) is maintained from the unprotected edge. This “safe distance” allowance from the roof edge does not exist in the general industry regulations (US OSHA, UK HSE, EU, or other regulations).

General Electric facilities outside of the United States, and outside of the jurisdiction of the US Department of Labor – Occupational Safety and Health Administration (OSHA), and the American National Standards Institute (ANSI), must review the specific Country, State, City and local regulations where they operate to determine if there are any exemptions to assure compliance is being met.

It is the GE Company expectation that all workers will be protected from falls when conducting activities on a rooftop. There is no safe distance from an unprotected side or edge that would render fixed, temporary, or a personal fall protection system unnecessary.

Within the United States Construction standard (29 CFR 1926, Subpart M and 29 CFR 1926.502) there are specific work related exemptions:

- **Warning line system**: Only applies to low slope roofs.
- **Controlled Access Zones**: Only apply to overhand bricklaying and related leading-edge work.
- **Safety Monitoring System**: Only applies to roofing work on low-slope roofs 50 feet (15.25 meters) wide or less.

Warning Lines

When permanent or temporary guardrails are not feasible, such as on temporary platforms or roofs, safety-warning lines across the exposed fall hazard area can be used as a warning device. These warning safety lines **do not** provide fall arrest protection, but act as an early warning and barrier to employees approaching a fall hazard area.

Warning line systems and their use shall comply with the following minimum provisions:

- The warning line shall be erected around all sides of the roof work area
- When mechanical equipment is not being used, the warning line shall be erected not less than 6 feet (1.8 m) from the roof edge.
- When mechanical equipment is being used, the warning line shall be erected not less than 6 feet (1.8 m) from the roof edge which is parallel to the direction of mechanical equipment operation, and not less than 10 feet (3.1 m) from the roof edge which is perpendicular to the direction of mechanical equipment operation.

- Points of access, materials handling areas, storage areas, and hoisting areas shall be connected to the work area by an access path formed by two warning lines.
- When the path to a point of access is not in use, a rope, wire, chain, or other barricade, equivalent in strength and height to the warning line, shall be placed across the path at the point where the path intersects the warning line erected around the work area, or the path shall be offset such that a person cannot walk directly into the work area.

Warning lines shall consist of ropes, wires, or chains, and supporting stanchions erected as follows:

- The rope, wire, or chain shall be flagged at not more than 6-foot (1.8 m) intervals with high-visibility material
- The rope, wire, or chain shall be rigged and supported in such a way that its lowest point (including sag) is no less than 34 inches (.9 m) from the walking/working surface and its highest point is no more than 39 inches (1.0 m) from the walking/working surface;
- After being erected, with the rope, wire, or chain attached, stanchions shall be capable of resisting, without tipping over, a force of at least 16 pounds (71 N) applied horizontally against the stanchion, 30 inches (.8 m) above the walking/working surface, perpendicular to the warning line, and in the direction of the floor, roof, or platform edge
- The rope, wire, or chain shall have a minimum tensile strength of 500 pounds (2.22 kN), and after being attached to the stanchions, shall be capable of supporting, without breaking
- The line shall be attached at each stanchion in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in adjacent sections before the stanchion tips over.

Controlled Access Zones

Controlled access zones and their use shall comply with the following minimum provisions:

- When used to control access to areas where leading edge and other operations are taking place the controlled access zone shall be defined by a control line or by any other means that restricts access
- When control lines are used, they shall be erected not less than 6 feet (1.8 m) nor more than 25 feet (7.7 m) from the unprotected or leading edge, except when erecting precast concrete members
- The control line shall extend along the entire length of the unprotected or leading edge and shall be approximately parallel to the unprotected or leading edge
- The control line shall be connected on each side to a guardrail system or wall

Control lines shall consist of ropes, wires, tapes, or equivalent materials, and supporting stanchions as follows:

- Each line shall be flagged or otherwise clearly marked at not more than 6-foot (1.8 m) intervals with high-visibility material.
- Each line shall be rigged and supported in such a way that its lowest point (including sag) is not less than 39 inches (1 m) from the walking/working surface and its highest point is not more than 45 inches (1.3 m) [50 inches (1.3 m) when overhand bricklaying operations are being performed] from the walking/working surface
- Each line shall have a minimum breaking strength of 200 pounds (.88 kN).

Safety Monitoring Systems

Safety monitoring systems and their use shall comply with the following minimum provisions:

- Mechanical equipment shall not be used or stored in areas where safety-monitoring systems are being used to monitor employees engaged in roofing operations on low-slope roofs
- No employee, other than an employee engaged in roofing work [on low-sloped roofs] or an employee covered by a fall protection plan, shall be allowed in an area where an employee is being protected by a safety monitoring system
- Each employee working in a controlled access zone shall be directed to comply promptly with fall hazard warnings from safety monitors

- The employer shall designate a competent person to monitor the safety of other employees and the employer shall ensure that the safety monitor complies with the following requirements:
  - The safety monitor shall be competent to recognize fall hazards
  - The safety monitor shall warn the employee when it appears that the employee is unaware of a fall hazard or is acting in an unsafe manner
  - The safety monitor shall be on the same walking/working surface and within visual sighting distance of the employee being monitored
  - The safety monitor shall be close enough to communicate orally with the employee; and
  - The safety monitor shall not have other responsibilities which could take the monitor's attention from the monitoring function

A warning line system using approved stanchions

Image of Rhino Guardrail Roof Edge Kit used with permission by CAI Safety Systems www.caisafety.com

Image of KeeGuard Railing system used with permission from SRS, Safety Rail Source www.safetyrailsource.com

Workers who fall in a harness may not be able to rescue themselves. The facility must develop a rescue plan for each possible fall situation. This plan should be as safe as possible and take as little time as possible to bring a fallen worker to safety. When a fall occurs, any number of factors can create challenges to the effective rescue of the victim. Weather conditions, physical obstacles and the condition of victim can consume time and create hindrances for rescue personnel.

OSHA and other country specific regulations require that employers provide for "prompt rescue of employees in the event of a fall or shall assure that employees are able to rescue themselves." This should include identifying rescue procedures that address the potential for orthostatic intolerance and suspension trauma. Rescue procedures also should address how the rescued worker will be handled to avoid any post-rescue injuries.

The facility rescue plan should be regularly reviewed to ensure that the procedures are manageable and realistic in their time estimates. Implementing the safest and quickest rescue plan and practicing procedures to maximize preparation for a real emergency, will help to ensure effectiveness. Drills and critiques should be conducted to ensure that the procedures, skill sets of the responders, etc. are adequate and effectve.

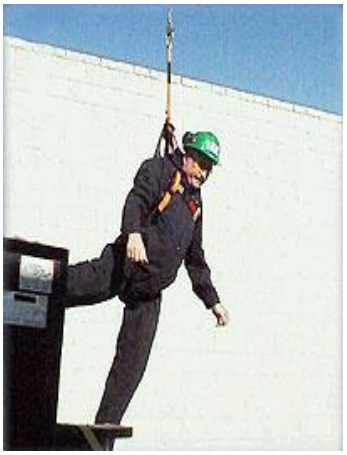
These general guidelines should be considered when developing the facility Fall-Rescue Plan:

- Development of protocols and procedures to rescue suspended workers.
- Development of protocols and procedures to prevent a prolonged suspension of workers after a fall.
- Development of procedures/processes/training for self rescue should a fall occur.
- Development of guidelines and facility specific requirements for the availability of rescue personnel, ladders or other rescue equipment (internal and external capabilities).
- Review of equipment (ladder trucks and/or equipment) to ensure they will be able to reach hanging workers.
- Development and testing of a process to ensure medical and rescue teams will respond quickly.
- Awareness and communication to emergency response teams of the potentially life threatening risks of orthostatic intolerance and suspension trauma.
- Identification and communication of orthostatic intolerance signs and symptoms to the rescue teams. (Information on orthostatic intolerance and rescue below)
- Awareness that suspended workers who are unconscious or have head injuries is particularly at risk for orthostatic intolerance.
- Awareness of the factors that can increase the risk of suspension trauma.
- Awareness that some authorities advise against moving the rescued workers to a horizontal position too quickly.
- Development of rescue and medical response procedures for handling of worker(s) to avoid any post-rescue injuries
- Conducting drills to ensure effectiveness of program/processes.

- Furthermore, once a fall event has occurred and an employee has used an ascender to return to the bucket, it is critical that the employee return to the ground as soon as safely possible because the employee's fall protection equipment is no longer acceptable for use as fall protection.

Rescue procedures should also include the following contingency-based actions:

- If self-rescue is impossible, or if rescue cannot be performed promptly, the worker should be trained to "pump" his/her legs frequently to activate the muscles and reduce the risk of venous pooling. Footholds can be used to alleviate pressure, delay symptoms, and provide support for "muscle pumping."
- Continuous monitoring of the suspended worker for signs and symptoms of orthostatic intolerance and suspension trauma.
- Ensuring that a worker receives standard trauma resuscitation once rescued. Some authorities recommend that the patient be transported with the upper body raised.
- If the worker is unconscious, keeping the worker’s air passages open and obtain first aid.
- Monitoring the worker after rescue, and ensuring that the worker is evaluated by a health-care professional. The worker should be hospitalized when appropriate. Possible delayed effects, such as kidney failure, which is not unusual in these cases, are difficult to assess on the scene.



Training

Workers must be trained in the use of personal fall arrest systems and other personal protective equipment correctly while performing their jobs.

Workers who wear fall arrest devices while working, and those who may perform rescue activities, should also be trained in:

- How to ascertain whether their personal protective equipment is properly fitted and worn, so that it performs as intended;
- How orthostatic intolerance/suspension trauma may occur;
- The factors that may increase a worker's risk;
- How to recognize the signs and symptoms identified in this bulletin; and
- The appropriate rescue procedures and methods to diminish risk while suspended.

Orthostatic intolerance and rescue

Employees who utilize Fall Protection systems and Emergency response personnel should be educated on important information about the hazards of orthostatic intolerance and suspension trauma when using fall arrest systems.

This section:

- describes the signs and symptoms of orthostatic intolerance;
- discusses how orthostatic intolerance can occur while workers are suspended following a fall; and
- outlines recommendations for preventing orthostatic intolerance, as well as recommendations for worker training and rescue.

Information on Orthostatic intolerance

Orthostatic intolerance may be defined as "the development of symptoms such as light-headedness, palpitations, tremulousness, poor concentration, fatigue, nausea, dizziness, headache, sweating, weakness and occasionally fainting during upright standing". The condition is due to a transient decrease in blood circulation to the central nervous system. While in a sedentary position, blood can accumulate in the veins. Venous pooling reduces the amount of blood return through the heart and ultimately decreases flow to the brain. Orthostatic intolerance also can occur when an individual moves suddenly after being sedentary for a long time. For example, a person may experience orthostatic intolerance when they stand up quickly after sitting still for a long time.

A well-known example of orthostatic intolerance is that of a soldier who faints while standing at attention for long period of time. The moment the soldier loses consciousness; he or she collapses into a horizontal position. With the legs, heart, and brain on the same level, blood is returned to the heart. Assuming no injuries are caused during the collapse, the individual will quickly regain consciousness and recovery is likely to be rapid. Orthostatic blood flow changes are seldom dangerous in and of themselves, but they may be associated with impaired consciousness and are a risk factor for falls and accidents. In certain circumstances, such as may occur in a harness accident, there is potential for prolonged loss of circulation to the brain and more serious consequences.

Venous pooling typically occurs in the legs due to the force of gravity and a lack of movement. Restrictive clothing or safety equipment may further decrease blood return from the legs. Some venous pooling occurs naturally when a person is standing. In the veins, blood normally is moved back to the heart through one-way valves using the normal muscular action associated with limb movement. If the legs are immobile, then these "muscle pumps" do not operate effectively, and blood can accumulate. Since veins can expand, a large volume of blood may accumulate in the veins.

An accumulation of blood in the legs reduces the amount of blood in circulation. The body reacts to this reduction by speeding up the heart rate and in an attempt to maintain sufficient blood flow to the brain. If the blood supply is significantly reduced, this reaction will not be effective. The body will abruptly slow the heart rate and blood pressure will diminish in the arteries. During severe venous pooling, the reduction in quantity and/or quality (oxygen content) of blood flowing to the brain causes fainting. This reduction also can have an effect on other vital organs, such as the kidneys. The kidneys are very sensitive to blood oxygen, and renal failure can occur with excessive venous pooling. If these conditions continue, they potentially may be fatal.

Description of Orthostatic intolerance hazard

Orthostatic intolerance may be experienced by workers using fall arrest systems. Following a fall, a worker may remain suspended in a harness. The harness may act as a tourniquet, decreasing the return of blood from the victim's legs. Sustained immobility also impairs circulation and may lead to a state of unconsciousness. Depending on the length of time the suspended worker is unconscious/immobile and the level of venous pooling, the resulting orthostatic intolerance may lead to death. While not common, such fatalities often are referred to as **"harness-induced pathology"** or **"suspension trauma."**

Signs & symptoms that may be observed in an individual who is approaching orthostatic intolerance:	
Faintness	Nausea
Breathlessness	Dizziness
Sweating	Unusually Low Heart Rate
Paleness	Unusually Low Blood Pressure
Hot Flashes	"Greying" or Loss of Vision
Increased Heart Rate	

Factors that can affect the degree of risk of suspension trauma:	
Inability to move legs	Hypothermia
Pain	Shock
Injuries during fall	Cardiovascular disease
Fatigue	Respiratory disease
Dehydration	Blood loss

Unconscious/immobile workers suspended in their harness may not be able to move their legs and will not fall into a horizontal position, as they would if they fainted while

standing. During the static upright position, venous pooling is likely to occur and cause orthostatic intolerance, especially if the suspended worker is left in place for some time. Venous pooling and orthostatic intolerance can be exacerbated by other circumstances related to the fall. For example, shock or the experience of the event that caused the fall, other injuries, the fit/ positioning of the harness, the environmental conditions, and the worker's psychological state all may increase the onset and severity of the pooling and orthostatic intolerance. Unless the worker is rescued promptly using established safe procedures, venous pooling and orthostatic intolerance could result in serious or fatal injury, as the brain, kidneys, and other organs are deprived of oxygen.

The amount of time spent in this position, with the legs below the heart, affects the manner in which the worker should be rescued. Moving the worker quickly into a horizontal position - a natural reaction - is likely to cause a large volume of deoxygenated blood to move to the heart, if the worker had been suspended for an extended period. The heart may be unable to cope with the abrupt increase in blood flow, causing cardiac arrest.
Rescue procedures must take this into account. Recommended rescue procedures are outlined below in the ***Orthostatic intolerance Recommendations section***.

Orthostatic intolerance Recommendations

Prolonged suspension from fall arrest systems can cause orthostatic intolerance, which, in turn, can result in serious physical injury, or potentially, death.

To reduce the risk associated with prolonged suspension in fall arrest systems, employers should implement plans to prevent prolonged suspension in fall protection devices. The plan should include procedures for: preventing prolonged suspension, identifying orthostatic intolerance signs and symptoms, and performing rescue and treatment as quickly as possible.

Activation Distance - The distance traveled by a fall arrester or the amount of line from a self-retracting lanyard from the start of a fall to the point where the fall arrester or self-retracting lifeline begins to apply a braking or stopping force.

Administrative Controls - Mandated written safe work practices or procedures that are designed to prevent exposure to a fall.

Anchorage - The terminating component of a fall protection system or rescue system that is intended to support any forces applied to the system including a secure point of attachment for lifelines, lanyards and deceleration devices.

Anchorage Connector - A component or subsystem that functions as an interface between the anchorage and a fall protection, work positioning, rope access, or rescue system for the purpose of coupling the system to the anchorage.

Arrest - To stop, halt, or bring to an end

Arrest Distance - The total vertical distance required to arrest a fall. The arrest distance includes the deceleration distance and activation distance.

Authorized Person - A person assigned responsibilities and that has received training to perform duties at a location where that person will/may be exposed to a fall hazard.

Capacity - The maximum weight that a component, system, or subsystem is designed to hold.

Carabiner - A connector generally comprised of a trapezoidal or oval shaped body with a closed gate or similar arrangement that may be opened to attach another object and, when released, automatically closes to retain the object.

Certification - The act of attesting in writing that the criteria established have been met.

Certified - An act or process resulting in documentation that determines and attests to criteria that meets the requirements of the company, local/state/federal regulatory agency, or a standard setting organization (i.e.: American National Standard, etc). Such act or process may be carried out by testing or applying proven analytical methods, or both, under the supervision of a qualified person or entity.

Certified Anchorage - An anchorage for fall arrest, positioning, restraint, or rescue systems that a qualified person certifies to be capable of supporting the potential fall forces that could be encountered during a fall or that meet the criteria for a certified anchorage prescribed by the company, local/state/federal regulatory agency, or a standard setting organization (i.e.: American National Standard, etc).

Cleat - A ladder crosspiece of rectangular cross section placed on edge upon which a person may step while ascending or descending a ladder.

Compatible - Capable of orderly, efficient integration and operation with other elements or components in a system, without the need of special modification or conversion, such that the connection will not fail when used in the manner intended.

Competent Person - An individual designated by the employer to be responsible for the immediate supervision, implementation, and monitoring of the employer's managed fall protection program who, through training and knowledge, is capable of identifying, evaluating, and addressing existing and potential fall hazards, and who has the employer's authority
to take prompt corrective action with regard to such hazards.

Component - An element or integral assembly of interconnected elements intended to perform
one function in the system.

Connector - A device that is used to connect parts of a personal fall arrest system or positioning device system together.

Construction - For purposes of this manual, "Construction work" means work for construction, alteration, and/or repair, including painting and decorating. Construction activities are distinguished from manufacturing, furnishing of materials, or servicing and maintenance work. The terms include, without limitation, buildings, structures, and improvements of all types, such as bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, heavy generators, railways, excavating.

Deceleration Distance - The vertical distance between the user's fall arrest attachment at the onset of fall arrest forces during a fall, and after the fall arrest attachment comes to a complete stop.

Double-cleat ladder - A ladder with a center rail to allow simultaneous two-way traffic for employees ascending or descending

D-Ring - An integral "D" shaped connector typically used in harnesses, lanyards, energy absorbers, lifelines, and anchorage connectors as an integral connector as an attachment point.

Energy (Shock) Absorber - A component whose primary function is to dissipate energy and limit deceleration forces that the system imposes on the body during fall arrest.

Equipment - A general term referring to components, subsystems or systems, in any combination, singular or plural.

Fall Arrest - The action or event of stopping a free fall or the instant where the downward free fall has been stopped.

Fall Arrest System. The collection of equipment components that are configured to arrest a free fall. The system may include but not be limited an anchor point, connection device and a body harness used to arrest an employee in a fall from a working level.

Fall Edge - The unprotected edge of a walking/working surface or an unprotected opening from which a person could fall to a lower surface or into a hazard.

Fall Hazard Assessment - A written document that contains information about existing or potential fall hazards and a method or methods for eliminating or controlling those hazards.

Fall Protection - Any equipment, device, or system that prevents an accidental fall from elevation or that mitigates the effect of such a fall.

Fixed ladder - A ladder that cannot be readily moved or carried because it is an integral part of a building or structure

Free Fall - The act of falling before a fall protection system begins to apply forces to arrest the fall.

Frontal D-Ring Attachment - An attachment element affixed to the full body harness within the vertical seven-inch sternum (breastbone) area that is designed to withstand dynamic fall arrest, restraint, and post-fall suspension forces

Guardrail System - A barrier erected to prevent employees from falling to a lower level. A passive system of horizontal rails and vertical posts that prevent a person from reaching a fall edge.

Full Body Harness - A body support designed to contain the torso and distribute the fall arrest forces over at least the upper thighs, pelvis, chest and shoulders.

Hole - An opening, void, or gap in the floor, wall or other working surface where a person could fall through onto a lower level.

Horizontal Lifeline - A component of a horizontal lifeline subsystem, consisting of a flexible line with connectors or other coupling means at both ends for securing it horizontally between two anchorages or anchorage connectors.

Inspection - An examination of equipment or systems to assess conformance to a particular standard or requirement.

Lanyard - A component consisting of a flexible rope, wire rope, or strap, that generally has a connector at each end for connecting to the body support (harness) and to a fall arrester, energy absorber, anchorage connector, or anchorage point.

Lifeline - A component of a fall protection system consisting of a flexible line designed to hang either vertically (vertical lifeline), or for connection to anchorages or anchorage connectors at both ends to span horizontally (horizontal lifeline).

Low-slope roof - Aroof having a slope less than or equal to 4 in 12 (vertical to horizontal).

Maintenance - A process for keeping the product, component or system usable and safe from degradation.

Overhand bricklaying and related work - The process of laying bricks and masonry units such that the surface of the wall to be jointed is on the opposite side of the wall from the mason, requiring the mason to lean over the wall to complete the work. Related work includes mason tending and electrical installation incorporated into the brick wall during the overhand bricklaying process.

Passive Fall Protection System - Fall protection that does not require the wearing or use of personal fall protection equipment.

Point of access - All areas used by employees for work-related passage from one area or level to another

Portable ladder - A ladder that can be readily moved or carried

Positioning System - A full body harness system configured to allow an authorized person to be supported on an elevated vertical or inclined surface, such as a wall, and work with both hands free from body support.

Program Administrator - A person authorized by their employer to be responsible for managing the employer's fall protection program.

Qualified Person - A person with a recognized degree or professional certificate and with extensive knowledge, training, and experience in the fall protection and rescue field who is capable of designing, analyzing, evaluating and specifying fall protection and rescue systems.

Rescue - The process of removing a person from danger, harm, or confinement to a safe location.

Rescue Plan - A written process that describes in a general manner how a rescue is to be approached under the specified parameters, such as location or circumstances.

Rescue Procedure - A written series of logical steps that describes the specific manner in which a rescue is to be accomplished.

Rollout - A process by which a snaphook or carabiner unintentionally disengages from another connector or object to which it is coupled.

Roof - The exterior surface on the top of a building. This does not include floors or formwork which, because a building has not been completed, temporarily become the top surface of a building.

Roofing work - Means the hoisting, storage, application, and removal of roofing materials and equipment, including related insulation, sheet metal, and vapor barrier work, but not including the construction of the roof deck.

Safety-monitoring system - Means a safety system in which a competent person is responsible for recognizing and warning employees of fall hazards

Self-Retracting Lanyard/Lifeline - A device containing a drumwound line that automatically locks at the onset of a fall to arrest the user, but that automatically pays out from and retracts onto the drum during normal movement of the person to whom the line is attached. After onset of a fall, the device automatically locks the drum and arrests the fall.

Single-cleat ladder - A ladder consisting of a pair of side rails connected together by cleats, rungs or steps

Skylight. Any opening in the roof or ceiling surface that is covered with a glazed, transparent or translucent material allowing natural light to illuminate a room. Sizes, shapes and placement vary widely.

Snaphook - A connector comprised of a hook-shaped body with a normally closed gate or similar arrangement that may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object.

Stable Surface - A walking working surface that has the strength and structural integrity to support an authorized person(s).

Steep roof – A roof having a slope greater than 4 in 12 (vertical to horizontal).

Suspension. The act of supporting 100% of a user's body weight, including equipment, for the purpose of accessing a work location with one or two points of contact.

Total Fall Distance - The total vertical distance a person falls, measured from the onset of a fall to the point where the person comes to rest after the fall is stopped.

Translucent panel - A formed panel either ribbed or flat in nature used on a roof or walls in place of certain ribbed or flat panel sheets to supply natural light to building.

User - A person who performs activities at heights while protected by a personal fall protection system.

Vertical Lifeline - A component, element or part of a lifeline subsystem consisting of a vertically suspended flexible line along which a fall arrester travels.

Warning line system - A barrier erected on a roof to warn employees 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, body belt, or safety net systems to protect employees in the area.

Appendix A

Sample Fall Protection Program

"Sample"

Fall Protection Program

for:

General Electric Company

_____

_____

_____

Approvals:

_____ _____
Top Company Official Date

_____ _____
Safety Manager Date

_____ _____
Date

_____ _____
Date

Fall Protection Policy Version 7

General Electric Company (GE) is committed to providing a workplace free from all recognized safety and health hazards. GE recognizes that falls in both general industry and construction are one of the leading causes of workplace fatalities and serious injuries. To protect the safety of employees and the best interests of the company, GE has taken a proactive approach to address fall hazards in their workplaces through the use of selected fall protection controls.

These goals will be accomplished through:

- Comprehensive fall hazard assessments.
- Proper selection, use and maintenance of fall protection controls.
- Employee fall protection training.
- Periodic reviews of fall protection program effectiveness.

Program Responsibilities:

Management is responsible to:

- Support the established policies and procedures of the program.

The Safety Department is responsible to:

- Oversee the polices and procedures of the program.
- Provide guidance on the requirements of the program.
- Perform fall hazard assessments.
- Select and establish standard operating procedures for fall protection controls.
- Coordinate activities where fall hazards are present.
- Provide fall protection safety training.
- Notify contractors of activities that involve fall hazards.
- Evaluate the effectiveness of the program on an annual basis.

The Engineering Department is responsible to:

- Assist in the design and selection of fall protection controls.

Supervisors are responsible to:

- Understand the fall hazards and fall protection controls in their area.
- Oversee activities where fall hazards are present.

Employees are responsible to:

- Understand fall hazards associated with their job task.
- Follow established fall protection policies and procedures.

Identify the specific responsibilities for these roles in your facility.

Fall Protection Procedures

Applicability

Fall hazards are present when either of the following conditions are present under General Industry Conditions:

- Work is conducted at unprotected heights at or exceeding 4 feet (1.2 m) above the lower level, such as unprotected sides or edges of a walking or working platform, floor or wall openings, ramps and other similar locations.
- Work is conducted at unprotected heights less than 4 feet (1.2 m) above the lower level, where dangerous equipment or processes are located below.

Fall hazards are present when either of the following conditions are present under Construction Conditions:

- Work is conducted at unprotected heights at or exceeding 6 feet (1.8 m) above the lower level, such as unprotected sides or edges of a walking or working platform, floor or wall openings, ramps and other similar locations.
- Work is conducted at unprotected heights less than 4 feet (1.2 m) above the lower level, where dangerous equipment or processes are located below.

Fall Hazard Assessment

A comprehensive fall hazard assessment will be conducted to identify the location and relative fall hazard associated with the activity. Fall hazards can include, but are not limited to:

- General Industry work at unprotected heights exceeding 4 feet (1.2 m) and Construction activities at unprotected heights exceeding 6 feet (1.8 m) for, or above dangerous equipment or processes.
- Wall and floor openings
- Employee elevating equipment
- Railcars
- Ladders

Complete the Fall Hazard Assessment/Inventory form identifying all potential fall hazards.

All locations requiring the use of fall protection controls will be labeled as “Notice - Fall Protection Controls Required” or similar warning.

Fall Hazard Control

Fall hazards will be addressed in the following order:

- Eliminate the fall hazard.
- If elimination is not feasible, utilize fall protection controls.

When fall protection controls are selected, they will be selected:

- To provide proper protection for the employee.
- According to manufacturer's recommendations.
- By a qualified person.

A comprehensive fall protection assessment will be conducted for all fall hazards identified at the facility.

Complete the Fall Protection Evaluation form for each fall hazard.

Inspection, Maintenance and Care

All fall protection equipment will be inspected to ensure the equipment is properly functioning. Equipment will be inspected at the following frequency:

Type of Equipment	Frequency of Inspection

Insert the type of fall protection available and the required inspection frequency. A pre-use inspection should be conducted on all equipment prior to its use.

Any fall protection equipment found to be defective will be removed from service immediately until replaced or repaired.

All fall protection equipment will be cleaned and maintained in a good working order following each use.

All fall protection equipment will be stored in a clean and dry location following each use.

Follow the manufacturer's recommendation for inspection, maintenance and storage of fall protection equipment.

Employee Training

All employees required to use fall protection or exposed to fall hazards will be provided training on the following:

- Identification and nature of fall hazards.
- Means to minimize fall hazards.
- Types and limitations of fall protection.
- Use and care of fall protection
- Inspection of fall protection.

Training will ensure the employee's understanding, knowledge and demonstrated skill to utilize the applicable fall protection equipment.

Training will be conducted:

- Prior to exposure to any fall hazards.
- As needed to ensure employees properly use the equipment.
- With changes in fall hazards or protective equipment.

Program Evaluation

The fall protection program will be reviewed on an annual basis to ensure the continued effectiveness of the policy and procedures.

The program will be updated, as needed, to reflect any changes in the policy and procedures.

Fall Hazard Assessment/Inventory
&
Fall Protection Evaluation

General Industry Fall Hazard Assessment/Inventory

(General Electric Company)

Facility:_____**Location:**_____
Contact:_____**Date of Evaluation:**_____

Location	Reason(s) for Access	Fall Hazard
		o Work at Unprotected Heights At or Exceeding 4 F (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 4 F (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 4 F (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 4 F (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 4 F (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 4 F (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____

		o Work at Unprotected Heights At or Exceeding 4 F (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 4 F (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____

General Industry Fall Protection Evaluation

(General Electric Company)

Facility: **Location:** **Contact:**_____ **Date of Evaluation:**_____	**Insert Photo**

Location of Fall Hazard: _____

Reason for Work: _____

Description of Fall Hazard:

- o Work at Unprotected Heights Exceeding 4 Feet (1.2 m)
- o Ladders
- o Wall or Floor Openings
- o Lifts
- o Railcars/Vehicles
- o Other:_____

Fall Protection Equipment Category:

- o Fall Arrest
- o Positioning
- o Suspension
- o Retrieval
- o Other:_____

Equipment Required:

Type	Equipment Location	Inspection
_____	_____	_____
_____	_____	_____
_____	_____	_____

Location of Anchor Point:_____

Description of Use Procedures:_____

_____

_____

Maintenance and Storage of Equipment:_____

_____

Limitations and Precautions:_____

_____

Construction Activities Fall Hazard Assessment/Inventory

(General Electric Company)

Facility:_____**Location:**_____
Contact:_____**Date of Evaluation:**_____

Location	Reason(s) for Access	Fall Hazard
		o Work at Unprotected Heights At or Exceeding 6 Fe (1.8 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 6 Feet (1.8 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 6 Fe (1.8 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 6 Feet (1.8 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 6 Feet (1.8 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 6 Feet (1.8 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____

		o Work at Unprotected Heights At or Exceeding 6 Feet (1.8 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 6 Feet (1.8 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____

Construction Activities Fall Protection Evaluation

(General Electric Company)

Facility: **Location:** **Contact:**_____ **Date of Evaluation:**_____	**Insert Photo**

Location of Fall Hazard: _____

Reason for Work: _____

Description of Fall Hazard:

- o Work at Unprotected Heights Exceeding 6 Feet (1.8 m)
- o Ladders
- o Wall or Floor Openings
- o Lifts
- o Railcars/Vehicles
- o Other:_____

Fall Protection Equipment Category:

- o Fall Arrest
- o Positioning
- o Suspension
- o Retrieval
- o Other:_____

Equipment Required:

Type	Equipment Location	Inspection
_____	_____	_____
_____	_____	_____
_____	_____	_____

Location of Anchor Point:_____

Description of Use Procedures:_____

_____

_____

Maintenance and Storage of Equipment:_____

_____

Limitations and Precautions:_____

_____

Appendix B

Site Specific Applications

Fall Hazard Assessment/Inventory

(General Electric Company)

Facility:_____**Location:**_____
Contact:_____**Date of Evaluation**:_____

Location	Reason(s) for Access	Fall Hazard
		o Work at Unprotected Heights At or Exceeding 4 Feet (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 4 Feet (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 4 Feet (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 4 Fe (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 4 Fe (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 4 Fe (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____

		o Work at Unprotected Heights At or Exceeding 4 Feet (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 4 Feet (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 4 Fe (1.2 m) o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____

Fall Hazard Assessment/Inventory

(General Electric Company)

Facility: GE-CEP **Location:** Fairfield, CT
Contact: John Thomas (Safety Department) **Date of Evaluation:** 1/27/99

Location	Reason(s) for Access	Fall Hazard
Railcar Unloading Station	Open railcar hatch during unloading activities.	o Work at Unprotected Heights At or Exceeding 4 Feet o Ladders o Wall or Floor Openings o Lifts ν Railcars and Vehicles o Other:_____
Forming Area Crane- East End	Repair work at crane cab station.	ν Work at Unprotected Heights At or Exceeding 4 Feet o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
Outdoor Silo – Fixed Ladder (75 feet)	Access top portions of the silo for preventive maintenance.	o Work at Unprotected Heights At or Exceeding 4 Feet ν Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
Maintenance Area – Boom Lift	Access to high bays of the facility.	o Work at Unprotected Heights At or Exceeding 4 Feet o Ladders o Wall or Floor Openings ν Lifts o Railcars and Vehicles o Other:_____
Raw Materials Platform – Open Ended Tank Access.	Raw material loading in the process tank.	o Work at Unprotected Heights At or Exceeding 4 Feet o Ladders ν Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 4 Feet o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or

		Exceeding 4 Feet o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____
		o Work at Unprotected Heights At or Exceeding 4 Feet o Ladders o Wall or Floor Openings o Lifts o Railcars and Vehicles o Other:_____

Fall Protection Evaluation

(General Electric Company)

Facility: **Location:** **Contact:**_____ **Date of Evaluation:**_____	**Insert Photo**

Location of Fall Hazard: _____

Reason for Work: _____

Description of Fall Hazard:

- o Work at Unprotected Heights Exceeding 4 Feet (1.2 m)
- o Ladders
- o Wall or Floor Openings
- o Aerial Lifts
- o Railcars/Vehicles
- o Other:_____

Fall Protection Equipment Category:

- o Fall Arrest
- o Positioning
- o Suspension
- o Retrieval
- o Other:_____

Equipment Required:

Type	Equipment Location	Inspection

Location of Anchor Point:_____

Description of Use Procedures:_____

_____

_____

Maintenance and Storage of Equipment:_____

_____

Limitations and Precautions:_____

_____

Fall Protection Evaluation

(General Electric Company)

Facility: GE – CEP
Location: Fairfield, CT

Contact: Sue Johnson (X3245)
Date of Evaluation: 2/23/99

Location of Fall Hazard: Railcar Unloading Area
Reason for Work: Sample raw materials from top of railcar.
Description of Fall Hazard:

- o Work at Unprotected Heights Exceeding 4 Feet
- o Ladders
- o Wall or Floor Openings
- o Lifts
- ν Railcars/Vehicles
- o Other:_____

Fall Protection Equipment Category:

- ν Fall Arrest
- o Positioning
- o Suspension
- o Retrieval
- o Other:_____

Equipment Required:

Type	Equipment Location	Inspection
Horizontal Lifeline	Fixed in Place	Monthly
Retractable Lifeline	Fixed in Place	Daily/Annual
Full Body Harness	Railroad Garage	Daily/Annual

Location of Anchor Point: Fixed in place horizontal lifeline.
Description of Use Procedures: Put on full body harness, while on the ground. Pull down lanyard cord to access hook for retractable lifeline. Attach the lanyard to the back of the harness.
Maintenance and Storage of Equipment: Following each use, the harness must be cleaned, as needed and hung on the storage hook in the Railroad Garage.
Limitations and Precautions: Railcar must have the brake engaged and wheel chocks set prior to access onto the railcar.

Fall Protection Evaluation

(General Electric Company)

Facility: GE – CEP
Location: Fairfield, CT

Contact: John Thomas (X324)
Date of Evaluation: 1/27/99

Location of Fall Hazard: Forming Area Crane – East End
Reason for Work: Repair work at crane cab station.
Description of Fall Hazard:

ν Work at Unprotected Heights Exceeding 4 Feet
o Ladders
o Wall or Floor Openings
o Lifts
o Railcars/Vehicles
o Other:_____

Fall Protection Equipment Category:

ν Fall Arrest
o Positioning
o Suspension
o Retrieval
o Other:_____

Equipment Required:

Type	Equipment Location	Inspection
Cross Arm Strap	Maintenance Shop	Daily/Annual
Shock-Absorbing Lanyard	Maintenance Shop	Daily/Annual
Full Body Harness	Maintenance Shop	Daily/Annual

Location of Anchor Point: Overhead crane beam.
Description of Use Procedures: Put on full body harness, while on the ground. On platform, attach cross arm strap over the crane beam, attach the lanyard to the strap, and attach the lanyard to the back of the harness.
Maintenance and Storage of Equipment: Following each use, the fall protection equipment must be cleaned and hung on the storage hooks in the Maintenance Shop.
Limitations and Precautions: Crane must be locked and tagged out prior to any activities.

No endorsement or recommendation is intended, implied or made of the resources or documents mentioned below.

Sources of Terms, Definitions, and Information:

- *OSHA Document 3146-1998, Fall Protection in Construction*
- *ANSI/ASSE Z359.0-2007*, *Definitions and Nomenclature Used for Fall Protection and Fall Arrest*
- *OSHA Document 3124-12R 2003, Stairways and Ladders*
- *OSHA Document SHIB 03-24-2004, Suspension Trauma/Orthostatic Intolerance*
- *ANSI/SIA A92.2-2001, Vehicle-Mounted Elevating and Rotating Aerial Devices*
- *ANSI/SIA A92.3-2006, Manually Propelled Elevating Aerial Platforms*
- *ANSI/SIA A92.5-1992, Boom-Supported Elevating Work Platforms*
- *ANSI/SIA A92.6-2006, Self-Propelled Elevating Work Platforms*
- *ANSI A92.7-1990 (R1998), Airline Ground Support Vehicle-Mounted Vertical Lift Devices*
- *ANSI/ASME A120.1-2006, Powered Platforms and Traveling Ladders and Gantries for Building Maintenance*
- *ANSI/A1264.1- 1995 (R2002), Safety Requirements for Workplace Floor and Wall Openings, Stairs, and Railing Systems*
- *ANSI Standard A14.3-1984, Ladders - Fixed - Safety Requirements*
- *U.S. Consumer Product Safety Commission, Fact Sheet No. 56: Ladders (March 1976).*
- *NIOSH Publication No. 2007-155, Preventing Worker Deaths and Injuries from Contacting Overhead Power Lines with Metal Ladders.*
- *American Ladder Institute:* http://www.americanladderinstitute.org
- *Health and Safety Executives, Safe Use of Ladders and Step Ladders* http://www.hse.gov.uk/foi/internalops/fod/oc/200-299/200_30.pdf
- Step Ladder Guide; http://www.abru.co.uk/pdfs/leaflets/lf12000.pdf
- *British Standard BS EN 365: 2004 Personal protective equipment against falls from a height. General requirements for instructions for use, maintenance, periodic examination, repairs, etc* http://www.hse.gov.uk/pubns/indg367.pdf

Sources of Images/Photographs and Fall Protection Equipment:

- Bilco www.bilco.com
- CAI Safety Systems www.caisafety.com
- DBI/SALA http://www.dbisala.com/
- FabEnCo www.safetygate.com
- Plasteco, Inc. www.plasteco.com
- SRS, Safety Rail Source www.safetyrailsource.com
- TriTech Fall Protection Systems http://www.tritechfallprotection.com/
- VELUX America, Inc. www.veluxusa.com

APPENDIX G

GE CRANE SAFETY MANUAL

GE Crane Safety Manual

January 1, 2012

Version 1.0

GE imagination at work

GE Crane Safety Manual

1. Scope & Application
2. Definitions
3. Summary Guidance
4. Personnel
5. Categorizing of Lift – Routine or Non-Routine?
6. Risk Assessments
7. General Guidance
8. Overhead Cranes
9. Mobile Cranes
10. Requirements for Temporary Tower Cranes
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15. Medical Qualifications
16. Contractors
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Appendix 2 – Example Material Handling (Crane/Hoist) Audit Checklist
Appendix 3 – Example Lifting SRA
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Appendix 6 – Example Lift Permit
Appendix 7 – Crane Safety Distance
Appendix 8 – Road Assessment Checklist
Appendix 9 – Example Overhead Crane Inspections
Appendix 10 – Example Mobile Crane Inspections

1. Scope & Application

1.1. This document defines GE's minimum global requirements for operations involving cranes or other lifting equipment. These requirements must be complied with when they exceed local regulations. All operations are expected to be familiar with the regulatory requirements applicable to them, and to comply with those regulations where the requirements exceed those established by this Manual.

1.2. Businesses have the flexibility to determine how they will address the criteria presented in this document, but they must address all applicable requirements.

1.3. GE Businesses have the discretion to require more restrictive performance than specified in this manual.

1.4. Model forms and checklists in the document may be used as is, or redesigned/expanded to better-fit business needs, as long as the core content in the model forms are retained.

1.5. In the absence of regulatory specific guidance and where the guidance is less protective than that provided by this document, the GE requirements must be followed.

1.6. This document identifies the requirements for all types of overhead and mobile cranes. It also details the requirements for other fixed and temporary lifting equipment, such as winches, hoists, chain blocks and the requirements for lifting equipment and load attaching ancillaries.

2. Definitions

2.1. Competent Person - The competent person is defined in this guidance as a specifically identified person who is designated as having the required level of competency to plan and supervise the specific lifting operation. The competent person should have the practical skills, theoretical knowledge and ability to carry out risk assessments, produce and assess lift plans, conduct pre-lift meetings and have the supervisory skills and experience required to manage a specific lifting operation.

2.2. Crane: A machine used for moving heavy objects, typically by suspending them from an arm or beam.

2.3. Crawler Crane - means a crane consisting of a rotating superstructure with power plant, operating machinery, and boom, mounted on a base, equipped with crawler treads for travel. Its function is to hoist and position loads at various radii.

2.4. Critical Lift - A lift that requires:
- 2.4.1. The use of 75-100% of the rated capacity of a fixed or mobile crane, or
- 2.4.2. The use of 2 or more cranes to perform the lift, or
- 2.4.3. Involves lifting of loads (with a ratio of less than 1 ton per square meter exposed to the wind) that may sail in outdoor conditions, or
- 2.4.4. Personnel lifts, or
- 2.4.5. Complex lifts at the discretion of the Competent Person or Operator (Example might include; Lifting hazardous materials, Lifting materials that could create an environmental impact, lifting over critical equipment, etc.).

2.5. Engineered Lift – A lift that exceeds the rated capacity of the crane.

2.6. Exclusion Zone – The area around the load where the only personnel present are the Operator or Lift Team members.

2.7. Hoist: A mechanical apparatus designed to raise or haul up a load.

2.8. Lift Plan - The documented detail analysis of the hazards, controls and methods to be used to execute a lift.

2.9. Lifting Team - Personnel who assist the operator while carrying out lifting operation.

2.10. Location – Includes fixed facilities, field operations and projects.

2.11. New/Modified Product Lift – A lift that involves either a new product (NPI) or a modified product where the modification would impact either the SRA or Lifting Plan.

2.12. Non-routine Lift – A lift that cannot be defined as a Routine Lift.

2.13. Normal Lift – A lift that is does not meet the requirements of being a Critical, Engineered or New Product Lift.

2.14. Operator – A person who operates the controls of a crane/hoist and implements the requirements of a SRA or Lift Plan. This can be a GE person or outside contractor.

2.15. Overhead Crane - means a crane with a movable bridge carrying a movable or fixed hoisting mechanism and traveling on an overhead fixed runway structure.

2.16. Pre-lift meeting - A briefing meeting with all relevant personnel to discuss the lift plan or SRA.

2.17. Qualified Person - A person who is sufficiently competent (includes practical and theoretical knowledge and experience of lifting equipment) and is impartial and objective. This does not mean that such persons need necessarily to be employed from an external organization. If in-house personnel are used they have to be given genuine authority and independence to ensure that examinations are properly carried out and those recommendations are addressed as appropriate.

2.18. Routine Lift - These are lifts that are carried out on a regular basis and/or integral to the production process that require no detailed engineering planning and which have been previously subject to a generic or specific SRA or Lift Plan. For example, daily or weekly frequency AND integral to the working process.

2.19. Safe Working Load (SWL) - The maximum load the lifting equipment is certified to withstand under normal use.

2.20. SRA - Safety Risk Assessment

2.21. Tag line - means a rope or line attached to a load to be lifted. The Tag line is used to steady or maneuver the load while hoisted and to remove the need for persons to be under or close a suspended load.

2.22. Technical Authority - The technical authority is defined in this guidance as someone who is technically competent and can make an informed and impartial judgment of a lifting operation plan or installation procedure and provides a technical authority review. For example, this person is typically a structural or mechanical engineer (or similar professional qualification) with specific knowledge on crane/lifting operations.

2.23. Telescopic Crane, sometimes referred to as Hydraulic crane - means a crane consisting of a rotating superstructure with power plant, operating machinery and telescopic boom, mounted

on a base or platform equipped with axles and rubber-tired wheels for travel. The base is propelled by an engine. Its function is to hoist and position loads at various radii.

2.24. Thorough Examination – An annual detailed, documented examination typically carried out by an internal or third party who has appropriate certification or documented technical competency.

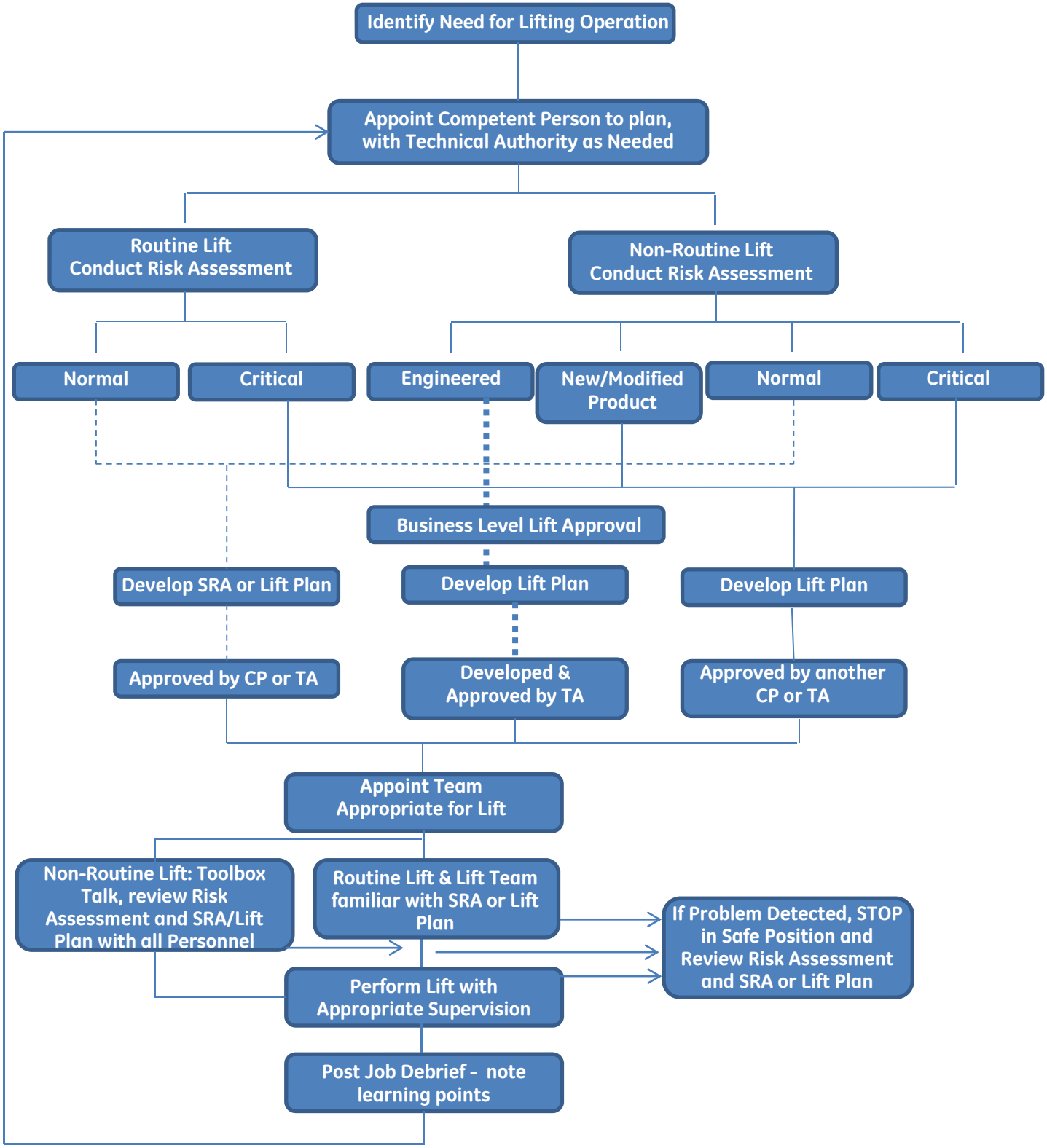
2.25. Truck Crane - means a crane consisting of a rotating superstructure with power plant, operating machinery, and boom, mounted on an automotive truck equipped with a power plant for travel. Its function is to hoist and position loads at various radii.

2.26. Rigging - means equipment to attach a load to the hoisting mechanism of a crane or winch, this can include chain or synthetic slings, D shackles, eye bolts, spreader beams etc.

2.27. Winch - means a device that may be powered or manually operated, fixed or temporarily installed to lift and position loads.

3. Summary Guidance

3.1. The following flowchart and brief description define every step within the lift planning process. The steps remain the same for each location and work activity. However, the competent person would decide which lifts lie within the appropriate planning route.



CP = Competent Person
TA = Technical Authority
SRA = Safety Risk Assessment
LP = Lift Plan

Figure 1 – Lifting Operations Flowchart

3.2. GE has identified the acronym P.I.C.K. (Plan, Inspect, Check the environment, Keep looking and listening) as a quick way for Operators and Lift Team members to evaluate the lift prior to starting. Detailed information about P.I.C.K. can be found in Appendix 1 for review and discussion with Operators and Lift Team Members.

3.3. Locations shall ensure Housekeeping and Safety Inspections include Crane/Hoist items, if applicable. See Appendix 2 for example inspection items. If the location conducts Routine – Critical Lifts, section E of Appendix 2 is mandatory for checklist used in those areas.

4. Personnel

4.1. All operations must develop a roster that outlines which personnel will be:
- 4.1.1. Technical Authority
- 4.1.2. Competent Person(s)
- 4.1.3. Operator(s)
- 4.1.4. Lift Team Member(s)

4.2. Based on the qualifications of specific personnel, it is possible that one person may fulfill multiple roles.

5. Categorizing of Lift – Routine or Non-Routine?

5.1. For each lift, the location needs to determine if the lift is defined as Routine or Non-Routine.

5.2. Routine Lifts are then classified as either being:
- 5.2.1. Normal or
- 5.2.2. Critical

5.3. A Non-Routine Lift is then classified as either being:
- 5.3.1. Normal, or
- 5.3.2. Engineered, or
- 5.3.3. New/Modified Product, or
- 5.3.4. Critical

6. Risk Assessments

6.1. Risk Assessments covering lifting activities must be developed. The following is the allowable risk assessments:
- 6.1.1. Routine, Normal Lifts – SRA(s) or Lifting Plan
- 6.1.2. Routine, Critical Lifts – Lifting Plan
- 6.1.3. Non-Routine, Normal Lifts – SRA(s) or Lifting Plan
- 6.1.4. Non-Routine, New/Modified Product Lifts – Lifting Plan
- 6.1.5. Non-Routine, Critical Lifts – Lifting Plan

6.2. A single SRA or Lift Plan (see Appendix 3 for example) can be used to cover multiple Routine-Normal Lifts and Non-Routine Normal Lifts as long as they all have the same hazards and controls.

6.3. SRA's must be developed following the requirements of Element 12 of the Health & Safety Framework but must be approved by a Competent Person or a Technical Authority.

6.4. For Non-Routine, Normal Lifts that use a SRA and involve a mobile crane, a Competent Person must confirm the SRA identifies and controls all hazards associated with each lift to be performed.

6.5. A GE Lift Plan (see Appendix 4 for example) has been provided for use. If a location has an alternative form then it must confirm the alternative form contains all the requirements of the GE Lift Plan.

6.6. Lift Plans must be developed by a Competent Person with the assistance of personnel who are familiar with the equipment if needed. This Lift Plan then must be reviewed and approved by another Competent Person and/or a Technical Authority.

6.7. The degree of detail in a Lift Plan can vary depending on the type of equipment required and the complexity of the lift but items that should be considered include:

- 6.7.1. Initial planning to ensure that the equipment provided is suitable
- 6.7.2. Planning of the individual lifts to ensure they are carried out safely
- 6.7.3. Identify and outline controls for identified risks
- 6.7.4. Should define the pre-use checks required
- 6.7.5. Cover procedures that include identification of methods of communication and language
- 6.7.6. Detail specific responsibilities if more than one company is involved
- 6.7.7. Should detail positions and working radii for any mobile cranes to be used
- 6.7.8. Should identify ground loading for mobile crane outriggers

6.8. Engineered Lifts

- 6.8.1. Engineered Lifts require business level approval by a qualified person before the lift can be executed.
- 6.8.2. Engineered Lifts are allowed only where the local regulations permit such lifts.
- 6.8.3. Engineered lifts are limited to cranes with 5T capacity or more, and no more than 2 times in any consecutive 12 month period unless the crane manufacturer and Technical Authority are consulted.
- 6.8.4. Engineered lifts must be documented in the maintenance record for the crane.
- 6.8.5. Engineered Lifts must have a Lift Plan (see Appendix 5 for example) and associated drawings developed by a Technical Authority.
- 6.8.6. A Rigging Specification Summary Drawing should be completed. The purpose of this drawing is:
  - 6.8.6.1. To summarize the results from the engineering planning;
  - 6.8.6.2. To specify requirements for the lift rigging to the rigging suppliers
  - 6.8.6.3. To act as a material take-off table and quality control check
  - 6.8.6.4. To provide the Operator with all the details required on one drawing to refer to while rigging the load.
- 6.8.7. The load shall not exceed 125% of rated crane capacity. This operation is limited to two lifts over any period of 12 consecutive months.
- 6.8.8. Cranes/Hoist involved in an Engineered Lift requires a pre and post lift Thorough Examinations.

7. General Guidance

7.1. There must be 100% visual contact with load at all times during the lift.

7.2. The Operator is responsible for the lift and ensuring it's carried out in a safe manner.

7.3. If something unexpected or different than the SRA or Lift Plan occurs during the lift, the Operator must stop all operations, if safe to do so lower the load to a safe position, move personnel to a safe position and discuss the issue with a Competent Person. The lift shall only proceed once the Competent Person has given approval.

7.4. The operator shall not engage in any activity that may divert attention while operating the lifting equipment.

7.5. All lifting operations shall be managed to ensure no load is lifted or suspended over areas where people may enter, this will require the establishment of an exclusion zone around the work area.

7.6. The total rated load of the crane shall be clearly marked on each side of the crane.

7.7. If a crane's capacity has been "de-rated" or "up-rated" there must be proper documentation available and posted on the crane to ensure the operator is aware of capacity.

7.8. The Operator must be familiar with appropriate rigging and hoisting techniques to safely attach and move the load.

7.9. The hoisting motion of all cranes shall have an over-travel limit switch/device in the hoisting direction to stop the hoisting motion

7.10. Holding brakes on hoists shall be applied automatically when power is removed.

7.11. Electrical disconnects for equipment must be accessible.

7.12. An exclusion zone shall be established around the lifting operation and enforced by the Lifting Team. If it is safe to do so, lifting operations shall be halted if unauthorized persons enter the exclusion zone.

7.13. For some lifts, locations may decide to issue a Lift Permit (see Appendix 6 for example) in addition to either an SRA or Lift Plan.

7.14. All Non-Routine - Critical, Engineered and New/Modified Product Lifts require a pre-lift meeting to discuss:
- 7.14.1. Review of the Lift Plan
- 7.14.2. Review of the Lift Permit, if applicable
- 7.14.3. Roles and Responsibilities for the lift
- 7.14.4. Operator and Lift Team positioning
- 7.14.5. Confirm correct rigging/tagging
- 7.14.6. Communication Method
- 7.14.7. Exclusion Zones, travel path and landing area
- 7.14.8. Emergency Plans

7.15. After completion of a Non-Routine Lift or any lift where an incident, unexpected occurrence, or near miss has occurred, a debrief session must be held to provide personnel an opportunity to identify:
- 7.15.1. Learning points;
- 7.15.2. Good practices;
- 7.15.3. Improvements or Corrective Actions

7.16. Any learning points noted as part of a debrief session must be reviewed by a Competent Person and documented actions taken as necessary.

7.17. Each location must have a process to remind operators to conduct a pre-lift safety check prior to proceeding with the lift. Examples of how this can be done include; pre-work P.I.C.K checklist review, a pocket card containing pre-work reminders, posters, etc.

7.18. The location shall develop a practice that maintains a safe distance from moving loads (both expected and unexpected movement) for personnel. This includes non-powered cranes, jibs, and similar lifting equipment where the operator must physically push the load to the desired landing position. Examples that could be used include:

7.18.1. 45 Degree Rule - Personnel should be positioned no less than 45 degrees from the center line of the lift or
7.18.2. 1.5x Rule - Personnel should be positioned no closer than 1.5 times the height dimension of the load. (see Appendix 7 for examples of both)
7.18.3. Tools or taglines (flexible or rigid) may be acceptable alternatives, subject to risk assessment, when distance-based methods are not feasible.

7.19. When selecting appropriate equipment for a lift, some items to be considered include:
7.19.1. Does the equipment have appropriate ratings for load size, chemical exposures, and temperature conditions?
7.19.2. Are sling and lifting attachment angles identified?
7.19.3. Are attachment points adequate?
7.19.4. How are slings to be attached?
7.19.5. Is the hook type appropriate?
7.19.6. How will manual handling of heavy rigging be done safely?
7.19.7. Is there a lifting point available directly overhead?
7.19.8. Are tag lines required and does the lifting team understand the safe use of tag lines?
7.19.9. Is a tandem lift necessary?
7.19.10. Is cross hauling required?
7.19.11. Are sheaves and attachment points adequate for the possible winch/crane loading?
7.19.12. Will lifting equipment need to be moved to another location(s) during the lift?
7.19.13. Do the chains to be used have shortening clutches to balance loads, if required? It is not permitted to twist chains to shorten individual legs.

7.20. Prior to use, Operators of lifting equipment and accessories must perform a pre-use visual and operational check in order to identify faulty equipment. Any faulty equipment identified must be marked and taken out of service for repair, disposal or replacement.

7.21. Any modifications to lifting equipment must be reviewed and approved by either the manufacturer or a Technical Authority.

7.22. If a Lifting Team is going to be used, then the following should be reviewed:
7.22.1. Is the Operator clearly identified to all of the lifting team?
7.22.2. Are all members of the team trained for their role?
7.22.3. Based off the complexity of the lift/load, are there a sufficient number of people in the lifting team?
7.22.4. Will control of the lift pass to another person at any stage and if so are these persons identified to all of the lifting team and are clear, agreed procedures in place?

7.23. Team members must be able to communicate in a common language.

7.24. The Operator and Lifting Team (where applicable) must make sure affected personnel are also warned of the lifting activity and ensure the lift path is kept clear of unauthorized personnel.

7.25. Where more than one person is involved in the lift, three-part communication shall be used prior to initiating any move or immediately successive moves with the crane. Such communication must be standardized and/or agreed to by the Operator and Lifting Team prior to initiating work. Examples of three part communication could be as simple as the following:
7.25.1. Operator – (Preparing to move load to the right) or [Is load clear?]
7.25.2. Assistant – (Understand moving load to the right) or [Yes, load is clear]
7.25.3. Operator – (Moving load to the right) or [Understand load is clear]

7.26. When there is a need to interact with or work around the load (placing or reposition landing blocks/supports, etc.) the load should be in a stopped position and the use of three-part communication is especially important.

7.27. If the Operator is not clear on a command or signal received, he/she must stop all operations until all have re-confirmed and understood commands. If a signal is not clear to any member of the Lift Team, then the stop command must be given and the signals must be reviewed with the Operator and Lifting Team prior to restarting the lift.

7.28. Prior to starting the lift, the Competent person and/or Operator should review and confirm:
- 7.28.1. Is the load suitable for a safe lift and are there are no loose parts/materials on the load which could become a hazard?
- 7.28.2. Will the load need to be rotated or changed in aspect to lift safely?
- 7.28.3. Is there adequate space to lift and maneuver the load?
- 7.28.4. Has the use of tag lines been evaluated and proper controls implemented?
- 7.28.5. Is the lift path clear?
- 7.28.6. Are there any conflicting operations (for example other crane jibs working in near areas)?
- 7.28.7. Do they have adequate boom clearances from other cranes, platforms or obstructions?
- 7.28.8. Is the set-down area suitable regarding space and weight bearing?
- 7.28.9. Does the load have a large wind impact area?
- 7.28.10. Will the load move through potential changes in environment?
- 7.28.11. Will there be effects by rain, snow, ice, wind, noise, lack of light or shadows (for example Operator looking into bright sun; or from looking from light to dark and the effect on eyes or camera lens)?

7.29. Any person shall be able to stop the lifting operation whenever there is a potential safety issue. The Operator shall immediately stop upon the communication of any stop command, and verify that it is safe to proceed.

7.30. Each location shall establish Management of Change (MOC) procedures applicable to crane operations.

7.31. Any significant MOC to an established Program, Lift Plan or SRA shall require immediate STOP WORK until the Competent Person verifies that it is safe to proceed.

7.32. Typical items that might initiate a MOC could include:
- 7.32.1. A deviation from an approved procedure;
- 7.32.2. A deviation from standard company procedures;
- 7.32.3. Unplanned modifications to equipment;
- 7.32.4. Changes to equipment;
- 7.32.5. Major changes to the sequence of operations;
- 7.32.6. Deviation from specified safe working practice or work instructions;
- 7.32.7. Use of an existing piece of equipment for an activity not included in the lift plan;
- 7.32.8. Weather and environmental issues;
- 7.32.9. Implementation of new systems, work processes, or equipment;
- 7.32.10. Significant changes of safety-critical personnel;
- 7.32.11. Change instigated and/or requested by the client or regulator or other relevant party.

8. Overhead Cranes

8.1. Where direction of travel is not obvious, direction indicator signs that correspond to symbols on the operating controls shall be clearly marked on the crane or nearby. For example, North, South, East, West.

8.2. If the crane has more than one hoist, each hoist should have the load rating clearly marked.
- 8.2.1. If you have multiple hoists on a single crane, the location must ensure lifting loads do not exceed SWL for crane.

8.3. If multiple cranes operate on one gantry, the location should consider available controls to prevent collisions. Also a good practice to prevent cranes from hitting end stops.

8.4. Before moving a load, the operator must ensure that
- 8.4.1. The load, sling or lifting device is seated in the bowl of the hook and, if required, the hook latch is secured.
- 8.4.2. The load is secured, balanced and positioned in the hook, sling or lifting device before the load is lifted more than a few inches (centimeters)
- 8.4.3. Hoist chain or rope is not damaged
- 8.4.4. Multiple part lines are not twisted around each other
- 8.4.5. The hook is brought over the load in such a manner as to minimize swinging
- 8.4.6. The rope is seated in the drum grooves and in the sheaves, if there is or has been a slack rope condition

8.5. During the lift, care must be taken that:
- 8.5.1. There is no sudden acceleration or deceleration of the moving load
- 8.5.2. The load does not contact any obstructions
- 8.5.3. The operator will test the brakes each time before a Critical Lift is performed. The brakes will be tested by lifting the load a few inches and applying the brakes.
- 8.5.4. No load will be lowered below the point where less than 3 full wraps remain on the hoisting drum.

8.6. The landing area for the load must be cleared of people, and steps taken to ensure the area will support the weight and dimensions of load being lowered.

8.7. If necessary, Lift Team members will walk the path the load will travel and verify that it is clear of debris and obstacles that might prevent safe movement of the load.

8.8. The Operator shall never leave the controls of the crane when a load is suspended on the hook of the crane unless an emergency situation requires it and doesn't allow for safe placement of the load prior to evacuating.

8.9. Cab crane engines should be stopped and all controls locked before the operator leaves the cab unless an emergency situation requires immediate evacuation. If controls are not lockable, the alternate procedure would be return controls to neutral and lock the cab door.

8.10. Crane controls should be:
- 8.10.1. Uniform across the location, where possible
- 8.10.2. Clearly marked with directions of movement labeled, corresponding to direction signs on cranes
- 8.10.3. Constructed of materials suitable for the environment

8.11. Cranes shall have a safety label affixed to the pendant, load block or in the immediate area. The label should include cautionary language against:
- 8.11.1. Lifting more than rated load
- 8.11.2. Operating hoist when load is not centered under hoist
- 8.11.3. Operating hoist with twist, damaged, or damaged chain or rope
- 8.11.4. Operating damaged or malfunctioning crane
- 8.11.5. Lifting people
- 8.11.6. Lifting loads over people
- 8.11.7. Operating a rope hoist with a rope that is not properly seated in its groove

8.11.8. Operating manual motions with other than manual power
8.11.9. Removing or obscuring the safety label

8.12. Stops shall be provided at the limits of travel of the trolley and must be designed to withstand the forces applied.

8.13. Exposed moving parts, such as gears, set screws, projecting keys, chains, and chain sprockets, which constitute a hazard under normal operating conditions, shall be guarded. Guards must be capable of supporting, without deformation, the weight of a 220lb (100kg) person unless the guard is located where it is not possible that a person will step on it.

8.14. Electrical equipment shall be located or enclosed so that under normal operating conditions, energized parts will not be exposed to inadvertent contact.

9. Mobile Cranes

9.1. Engineered lifts that exceed the safe working load of the crane are not permitted with mobile cranes.

9.2. These requirements apply wherever GE is responsible for the operation of mobile cranes, at GE facilities, customer sites or during logistics operations.

9.3. For Non-Routine, Normal Lifts that use a SRA and involve a mobile crane, a Competent Person must confirm the SRA identifies and controls all hazards associated with each lift to be performed.

9.4. Lifts should be planned for daylight operations, unless adequate artificial light can be provided where required. This shall be arranged so that it will not impair the vision of either the Operator or Lift Team.

9.5. A Competent Person shall ensure the Operator has the required documentation and that all involved in the lift understand the requirements of the:
9.5.1. SRA or Lift Plan
9.5.2. Method Statement/Operating Procedures
9.5.3. Site Emergency Plan

9.6. A Competent Person shall check the crane operator has valid data on ground capability to withstand intended loads applied by crane. Soil compaction test may be required if valid data is not available. It may be necessary to reinforce an area of ground with a crane pad during heavy lifts.

9.7. If ground conditions require it, crane mats shall be used to spread the load over a larger footprint. This requirement should be identified as part of the SRA or Lift Plan.

9.8. Where cranes are required to travel on site roads, a Competent Person shall ensure the Road Assessment Checklist (see Appendix 8 for example) has been completed and any identified issues have been addressed and controlled.

9.9. The Operator shall check test certificates and inspection logs (Daily and Monthly) for the crane(s) and ancillary lifting equipment to be used in the lift.

9.10. The Operator shall check the crane has the following features and where applicable check they are in working order:
9.10.1. Overload warning system
9.10.2. Over hoisting trip system
9.10.3. Fire extinguisher

9.10.4. No damaged windows that can restrict visibility
9.10.5. No fluid leaks
9.10.6. A boom angle indicator readable from the operator's cab shall be provided on hydraulic cranes, and is recommended for other mobile cranes.
9.10.7. A boom length indicator readable from the operator's cab shall be provided on telescopic booms used with hydraulic cranes.
9.10.8. Safety latches shall be provided on all load hooks.

9.11. The Operator shall ensure that the weather forecast has been reviewed. Some mobile cranes may have a working anemometer that can be used to provide real time data to the crane driver.

9.12. Unless the mobile crane is designed to be used for pick and carry 'free on wheels' operations, outriggers shall be used for all lifting operations. If the crane is designed for free on wheels operation, there shall be information showing the applicable lifting capacities and operating radii in the manufacturer's loading charts.

9.13. When outriggers are used they shall be fully extended or, if permitted by the manufacturer procedures, deployed as specified in the load chart.
9.13.1. The outrigger jacks must be lowered to lift all wheels clear of the ground. Then the crane must be leveled in a horizontal plane, both front to rear, and side to side. If the machine is not level, a side load may be placed on the boom, crane stability may be affected, and crane capacity is reduced.

9.14. Each outrigger must be visible to the operator or to a signalman during extension and setting.

9.15. In safe lifting operations the preferred practice is to start the lift in the lower-rated quadrant of the crane, raise the load slightly to check that the crane is stable, and then swing into the higher-rated quadrant. It is important, when swinging through one quadrant to another, to determine that the rating is adequate for the lower-rated quadrant, which is usually "over the side". It may be necessary to raise the boom to shorten the working radius and thus increase capacity.

9.16. Only Operators and Competent Person should be allowed entry to the operators cab. The Competent Person is only permitted entry to check records or data on the cranes display, and must not distract the Operator during any lifting operation.

9.17. The Operator shall never leave the controls of the crane when a load is suspended on the hook of the crane unless an emergency situation requires it and doesn't allow for safe placement of the load prior to evacuating.

9.18. The Operator shall respond to operating signals only from the designated Lifting Team member, but shall always obey a STOP signal at any time from anybody.
9.18.1. Only one Lift Team member should be permitted to give signals to the Operator unless the load is being transferred to a point which is not in full and direct view of only one Lift Team member and in such cases, a second Lift Team member must be used. Handover commands must be defined and understood by the Operator and Lift Team members prior to starting the lift.

9.19. Mobile crane engines should be stopped and all controls locked before the operator leaves the cab.

9.20. Cranes should not be left unattended near the edge of an excavation or in an area that may be made impassable or unstable by rainfall, flash flood, etc.

9.21. Cranes that will be parked in unlit areas during hours of darkness should have lights, or fluorescent signs to warn of their position if they are left on roads.

9.22. Pick and carry operations are only permitted when using cranes that were specifically designed for this activity and the following recommendations must be considered:

- 9.22.1. These cranes will always have 'free on wheels' ratings in the manufacturers supplied loading charts.
- 9.22.2. A Competent Person must develop a Lift Plan for the move and should determine the best position of the load, boom location, travel route, and speed of movement. The move should be made over ground that is firm and level.
- 9.22.3. Use the shortest boom possible.
- 9.22.4. Align the boom with the forward direction of machine travel. Maintain this boom position when turning the machine.
- 9.22.5. Keep the load as close to the ground as conditions will permit.
- 9.22.6. Do NOT travel with outriggers extended or down. They may catch on obstructions.
- 9.22.7. Use tag lines to prevent the load from swinging.

9.23. Multi crane lifting operations involves using two or more machines to lift one heavy load, or turn loads over that introduces potentially dangerous elements such as side loading of the boom, overloading, misunderstood communications, differing ground conditions, and many other hazards not encountered in single crane lifts. A Lift Plan will always be required for multi crane operations (Tandem Lifts). Additionally:

- 9.23.1. When planning multi crane lifts, the lifting capacity of each crane is downgraded. A Competent Person, usually from the crane company will identify the revised capacity for each crane, based on the manufacturers' specifications.
- 9.23.2. Extra care must be taken to ensure all personnel involved understand the Lift Plan, the crane positioning requirements, load rigging, and movements to be made. Only one Lift Team member should be responsible for signals, and two-way radio communication is almost always necessary.

9.24. Possible contact with electrical power lines is a serious hazard in mobile crane operation. Whenever possible, electrical distribution and transmission lines close to a planned lifting operation should be de-energized and visibly grounded, or insulating barriers (not a part of or an attachment to the equipment or machinery) can be erected to prevent physical contact with the lines. Otherwise, equipment or machines shall be operated near electrical power lines only in accordance with the following:

- 9.24.1. Personnel must be trained in Electrical Safety for the tasks to be performed.
- 9.24.2. For lines rated 50 kV or below, the minimum clearance between the lines and any part of the crane or load shall be 10 feet (3.05 meters).
- 9.24.3. For lines rated over 50 kV, the minimum clearance between the lines and any part of the crane or load shall be 10 feet (3.05 meters) plus 4 inches for each 10 kV over 50 kV.
- 9.24.4. If any part of the crane or load while traveling will get closer than 20 feet (7 meters) to a power line, the Operator shall ensure that a Lift Team member is dedicated to maintain continuous communication and must be positioned where they can see the crane/load proximity to the power lines. This person shall have no other duties while the crane is working in the area of the power lines.
- 9.24.5. The Operator shall ensure that suitable power line warning signs are posted. Where cranes and other equipment are required to pass under energized lines regularly 'goal posts' set below the maximum height allowed to pass under the lines shall be erected at either side of the lines.
- 9.24.6. All ground personnel must be specifically cautioned to stand clear of the crane and the load at all times.
- 9.24.7. Whenever practicable, the crane should be grounded when operating near energized power lines.

9.24.8. Ground jumper cables shall be attached to materials being lifted when an electrical charge maybe induced while working near energized transmitters or electrical power lines.

9.24.9. Lift Teams shall be provided with nonconductive poles ("hot sticks") having suitable hardware to attach the ground cable to the load.

9.24.10. Combustible and flammable materials shall be removed from the immediate area prior to lifting operations in these areas.

9.24.11. If an energized power line is inadvertently contacted, all personnel should be kept away from the crane. The operator should stay with the machine until it has been cleared.

9.25. Assembly and disassembly of mobile cranes on site must consider:

9.25.1. Operators and support crews must comply with all manufacturers' instructions relating to the assembly and disassembly, and applicable local regulatory requirements for these operations.

9.25.2. This work must be completed under the direction of a Competent Person. Some countries have additional requirements for this role, for example US OSHA requires an Assembly/Disassembly Director (AD Director) be identified to manage these operations. The Competent Person should understand the applicable requirements and check for compliance.

9.26. The Competent Person must also address hazards associated with the operation, including the following specified areas of concern:

9.26.1. Site and ground conditions

9.26.2. Blocking material, proper location of blocking

9.26.3. Verifying support crane loads

9.26.4. Boom & jib pick points, center of gravity, stability upon pin removal,

9.26.5. Risk of persons being struck by counterweights

9.26.6. Wind speed and weather.

9.27. Upon completion of assembly, but before first use, the assembled crane must have a documented inspection performed to ensure that it is configured in accordance with the manufacturer's equipment criteria.

9.28. When mobile cranes are to be moved from one location to another, the following should be implemented:

9.28.1. The boom should be carried in line with the direction of travel. It must not be at a high angle and must be lowered when descending ramps so that the boom will not bounce back over the cab.

9.28.2. Where required by manufacturers' instructions mobile cranes should be de- rigged before moving to another location. This may require the removal of counterweights and ancillaries.

9.28.3. The upper revolving deck should be secured from rotation except when necessary to negotiate turns. The revolving deck should be controlled by an operator at such times.

9.28.4. The empty hook should be secured so it will not swing free. Lift Teams should be used to direct traffic, ensure required clearances from overhead power lines and monitor clearances from other obstructions.

9.28.5. In transit with no load and with the boom lowered, the crane clearance shall be a minimum of:

9.28.5.1. 4 feet (1.3 meters) for voltages less than 0.75 kV;

9.28.5.2. 6 feet (2 meters) for voltages over 0.75 to 50 Kv,

9.28.5.3. 10 feet (3 meters) for voltages over 50 kV, up to and including 345 kV;

9.28.5.4. 16 feet (5 meters) for voltages over 345 kV, up to and including 750 kV.

10. Requirements for Temporary Tower Cranes

10.1. Selection of Tower cranes to be installed should consider the maximum foreseeable load to be lifted; operating radius and height the load will need to be raised to.

10.2. When Tower cranes are to be erected on a construction site consideration needs to be given to how the crane will be disassembled on completion of the work, when selecting the crane to be used and its position on the site.

10.3. When multiple tower cranes or tower cranes and other cranes are to be used on one site, all lifting operations need to be coordinated, particular consideration to where operational radii of the cranes overlap.

10.3.1. Where two tower cranes operate in close proximity they should be set at different heights, with control measures established to prevent loads or ropes of the higher crane coming into contact with the lower crane. These control measures can be physical stops, electronic proximity warnings, or administrative controls implemented by the Competent Person when assigning tasks.

10.4. The erection of a tower crane requires persons who are not only competent for the crane erection but also trained to work at heights, and fit enough to make the climbs and descents necessary.

10.5. Tower cranes should be erected on prepared bases that can support the loads that will be exerted. The base should be designed and approved by a Technical Authority. Where concrete bases are prepared, the concrete must be allowed to reach cured strength before the assembly of the crane begins.

10.6. Tower cranes shall be assembled under the direct supervision of a Competent Person, (in the US an A/D Director) to an agreed method statement or manufacturers procedure.

10.7. On completion of assembly of the crane a Competent Person must complete a Thorough Examination before it is used. This will include testing the operation, and load testing the crane above its safe working load. The test weight shall be determined by a Competent Person, based on manufacturer's recommendation and local regulatory requirements.

10.8. Tower cranes may require the fitting of aviation warning lights. This will be dependent on:

10.8.1. Their height
10.8.2. Location, close to airfield or military training area.
10.8.3. Local Regulatory requirements
10.8.4. For example, lights are always required if the crane exceeds 150m (500ft), but may be required above 90m (300ft) depending on location.

11. Rigging Practices

11.1. Rigging and Attachments may include:

11.1.1. Chain Slings
11.1.2. Wire rope slings
11.1.3. Synthetic slings
11.1.4. Magnetic lifting attachments
11.1.5. Vacuum lifting attachments
11.1.6. Shackles
11.1.7. Eye bolts
11.1.8. Hooks
11.1.9. Swivel Hoist Rings
11.1.10. Pull lifts/Chain falls/ Chain blocks
11.1.11. Hitches
11.1.12. Spreader beams

11.1.13. Lift Clamps
11.1.14. Custom designed lifting attachments

11.2. All rigging and attachments shall only be used by a person with documented training and who has been deemed competent.

11.3. Always inspect rigging and attachments before each use, including all parts. If damage is found, remove from service.

11.4. Equipment such as chain blocks and pull lifts shall be attached to suitable anchor points above the load before any lifting operation can commence. Where the integrity of the anchor point or its ability to support the load it is intended to lift is not known, no lifting operation shall be commenced until a Competent Person has reviewed the intended anchor point, and confirmed that it is suitable for the intended loads to be applied. Review by a Technical Authority may be necessary.

11.5. Where chains and slings are wrapped around loads with sharp edges and corners, suitable protective materials (softeners) shall be placed between the load and the slings to prevent damage to both slings and load being lifted.

11.6. The load must be attached to the hook by means of slings or other approved devices of sufficient capacity and in good condition. The Operator should determine that the sling(s) or other device(s) to be used are appropriate and that they are correctly applied before signaling to begin the lifting operation.

11.7. Job or shop made hooks, links, or makeshift fasteners, formed from bolts, rods, steel plate, etc., or other such attachments, shall not be used. All crane and rigging devices must be marked with certifications, SWL, and ratings in compliance with local regulations.

11.8. To avoid strain on the crane and sliding of the load, the crane hook should be positioned as close to the center of gravity of the load as possible, that is, the hoist line must be vertical in all directions before starting the lift. The load should be checked as soon as it has been raised slightly to ensure that it is well secured and properly balanced in the sling or lifting device.

11.9. Two or more separately rigged loads shall not be hoisted in one lift. The different weights and centers of gravity may make the combined load difficult to handle and may put a side load on the boom during swinging.

11.10. The load should be controlled at all times. Tag lines or guide ropes should be used on loads that are liable to swing or must be guided through a restricted space. Care should be taken to guard against injury to workers, structures, or scaffolds from swinging loads. When using tag lines, the line should not be wrapped around any part of the hand or body. It may be necessary to release the line quickly to avoid injury.

11.11. Wherever possible, slings should not be dragged or left lying on the ground, but should always be returned to suitable storage containers or racks between uses.

11.12. Chain Sling
11.12.1. Visually examine the sling before each use. Look for bent, stretched, gouged or damaged links and components. If damaged, remove from service immediately.
11.12.2. Determine the load weight, center of gravity, angle and lift requirements, and select the proper size, type and capacity of sling.
11.12.3. Check the working load limit on the sling identification tag. Consult manufacturer's data to determine the impact of lifting angle.
11.12.4. Ensure chains are not twisted, damaged, or knotted before a lift.

11.12.5. Slings should never be shortened with knots, bolts or other makeshift devices.
11.12.6. Protect the chain from damage by sharp edged loads with padding.
11.12.7. Do not expose alloy chains or slings to high temperatures. Temperatures in the 400F (205C) range may cause damage. Consult manufacturer's recommendations for specifics.

11.13. Wire Rope Slings
11.13.1. All wire rope slings must be marked with their rated capacity and/or be in compliance with local regulations.
11.13.2. Wire rope slings shall be used only in accordance with the manufacturer's recommendations.
11.13.3. Check the working load limit on the sling capacity tag. Consult manufacturer's data to determine the impact of the proposed lifting angle.
11.13.4. Ensure wire ropes are not twisted, kinked, bird-caged or have any other damage causing distortion of the rope's structure.
11.13.5. Slings should never be shortened with knots, bolts or other makeshift devices.
11.13.6. Ten randomly distributed broken wires in one rope lay, or five broken wires in one stand in one rope lay constitute the sling being pulled form service.
11.13.7. Protect the wire rope sling from damage by padding sharp edged.

11.14. Synthetic Slings
11.14.1. Protect nylon slings from cutting by protecting sharp edges on the load, using leather sling protectors.
11.14.2. Nylon & polyester may seriously degrade at high temperatures. Consult manufacturer's data for specific temperature ratings and consider substitution of more temperature-resistant lifting devices.
11.14.3. Nylon sling strength is severely reduced by shock loading, unbalanced loading, over loading and inadequate consideration for the effect of angle.
11.14.4. Punctures and abrasions can degrade lifting straps/lifting slings strength. Red core yarns can aid in locating damaged webbing. Any sling with red core yard showing must be immediately removed from service and destroyed.
11.14.5. Metal chips, weld spatter, heavy grit, etc. can damage a web sling both internally and externally.
11.14.6. Prolonged exposure to ultraviolet light from sunlight or arc welding can make slings appear bleached and stiff, and these should be removed from service and destroyed.
11.14.7. Sling angle can have a dramatic effect on the rated capacity of the lifting strap/lifting sling. When this angle decreases, the load on each leg increases. Consult manufacturer's data to determine load ratings at various angles. Lifting strap/lifting sling angles of less than 30 degrees are not recommended.

11.15. Magnetic Lifting Attachments
11.15.1. The lifting magnet face and the lifting magnet contact area of the load must be clean.
11.15.2. No one must be allowed to stand on top of the lifted work piece.
11.15.3. Do not allow the load or the magnet to come into contact with any obstruction.
11.15.4. Never hook two lifting magnets together to lift a load without a properly designed spreader beam.
11.15.5. Care should be taken to correctly distribute the load for the lifting magnet being used.
11.15.6. Avoid placing the magnet in a shear position where the load could slip off the lifting face.
11.15.7. Avoid uneven lifts.
11.15.8. Properties of load materials: Magnet lifting is not appropriate for all steels. For example, some stainless steels are not magnetic and other types are only partially magnetic. When handling mixed steel types, it should be recognized that

non/partially magnetic items are likely to fall away if magnetized pieces supporting them move.

11.15.9. Load weight, thickness, shape and area in contact with magnet: The surface area of the load and the proportion of the magnet face in contact with it, will dictate the number and size of magnets required for safe handling almost as much as the weight and thickness of the load. For example, a billet may only require a single two-pole magnet, whereas a thin plate section of equal weight may require a multiple arrangement of magnets. Where the surface of materials is non-uniform, for example corrugated or perforated sheet, flat lifting magnets can be used but must be rated according to the percentage of the load which actually contacts the magnet face, as well as the kind of “path” that the material offers to the magnetic flux from pole to pole.

11.15.10. Stiffness or flexibility of the load: Droop or overhang at the ends of a flexible load e.g. long bar, flat or thin sheet, may cause it to peel off the magnet under its own weight during handling operations. A number of magnets may be selected to give greater coverage over the load area rather than reliance being placed on weight-lifting ability alone. Proper configuration/positioning of the magnets should minimize the sag or drop of the overhanging portions of a load.

11.15.11. Range of sizes to be lifted and frequency of operations: Where assemblies of magnet are likely to be required to handle a range of load shapes and sizes, it is essential that the equipment supplier and/or the person carrying out the risk assessment are provided with sufficient information as to the likely demands on equipment. This should help them determine if magnetic lifting is feasible and safe and, if so, how the system should be configured so as to ensure it is safe for use.

11.15.12. Surface condition of load and magnet: The effectiveness of a magnet falls rapidly as the distance between its face and the load i.e. the air-gap, is increased. Good contact between the surfaces of the magnet and the load is essential for the magnet to achieve optimum and safe performance. To maximize contact, both the magnet face and the load surface must be as smooth and clean as possible and the air gap kept to a minimum. The surface texture or finish of the load and the presence of paint, rust, oxide scale, oil, ice and snow etc. and nonmagnetic material on either surface will increase the air-gap, thus reducing the contact and, possibly, the magnetic effectiveness.

11.15.13. Temperature of load and magnet: The temperature of the magnet and load should be taken into account as, for example, ferrous materials lose their magnetic properties with increasing temperature and cease to be magnetic at 768ºC. Magnets should not be used for hot work unless specially designed for this duty and then only within the specified operating temperature limits

11.16. Vacuum Lifting Attachments

11.16.1. Handling and precautions are similar to lifting magnets except you will have an air supply or other source to maintain vacuum.

11.17. Shackles

11.17.1. Shackles are made of drop-forged steel bent into shape. They are strong, closed attachments that will not come unhooked. The size is specified by the diameter of the body. Avoid side pulls on the shackle body.

11.17.2. Shackle pins should fit free without binding. Do not substitute a bolt for the shackle pin.

11.17.3. Each shackle body shall be permanently and legible marked by the manufacturer. Raised or stamped letters on the side of the bow shall be used to show:

11.17.3.1. Manufacturer’s name or trademark

11.17.3.2. Size

11.17.3.3. Rated capacity

11.17.4. Shackles that are not properly marked shall be permanently removed from service.

11.17.5. When shackles are used at load angles other than 90 degrees, the safe-load rating

shall be reduced accordingly.

11.18. Eye Bolts

11.18.1. Loads should always be applied to lifting eyes in the plane of the eye, not at an angle to this plane.

11.18.2. Shoulder lifting eye-bolts are always the preferred eyebolt to use.

11.18.3. Shoulder lifting eyes must be properly seated (should bear firmly against the mating part) otherwise the working loads must be reduced substantially. A steel washer or spacer may be required for proper seating.

11.18.4. No greater load should be allowed than that given under the rated capacity in the manufacturers load tables.

11.18.5. The threads of the eye bolt and the hole must be matched.

11.18.6. Lifting eyes should never be painted or otherwise coated when used for lifting, as such coatings will very likely cover flaws or make them difficult to detect.

11.18.7. To attain the rated capacity listed for regular lifting eyes, full thread engagement allowing ½ turn for alignment to the plane of the eye if necessary.

11.18.8. Shoulder lifting eyes shall have a thread engagement of at least 1.5 times the thread diameter.

11.18.9. The load angle should be reduced as applicable for angular loads. These may differ based upon manufacturer and regulatory requirements.

11.19. Hooks

11.19.1. Hooks with a self-closing safety latch shall be the default, unless a Competent Person authorizes a deviation from this requirement.

11.19.2. Any hook designed to have a latch must have a latch.

11.20. Swivel Hoist Rings

11.20.1. Always inspect the hoist ring before each use, including all parts. Hoist rings with damaged parts must be removed from service.

11.20.2. Tighten the screw to the manufacturer recommended torque value.

11.20.3. Make sure the hoist ring is free to pivot and swivel in all directions.

11.20.4. Never use a hook larger than the diameter of the hoist ring opening.

11.20.5. Do not shim or use washers between the hoist ring and the surface of the object being lifted.

11.20.6. Only install hoist rings into material with a tensile strength of at least 80,000 psi (552 MPa).

11.20.7. Make sure the thread engagement is at least 1.5 times the diameter of the eyebolt.

11.20.8. When installing a hoist ring in a through-hole with a nut and washer, use a Grade 8 nut (tensile strength of 150,000 psi), Grade 10.9 (tensile strength of 1040 MPa) that has full thread engagement.

11.20.9. Never exceed the rated load or apply shock loading to a hoist ring.

11.21. Pull Lifts/Chain Falls/ Chain Blocks

11.21.1. Follow manufacturer’s guidelines.

11.22. Hitches

11.22.1. Choker hitches reduce the load capacity of the sling because the wire rope’s ability to adjust during the lift is impaired. Consult manufacturer’s charts to determine the capacity reduction.

11.22.2. Never choke a load so that any part of one eye or splice is in the part of the sling that passes through the other eye to form the choke.

11.23. Spreader Beams

11.23.1. Follow manufacturer’s guidelines.

11.24. Lift Clamps

11.24.1. Locks must be engaged before lifting a load with a lift clamp.
11.24.2. Ensure that hooks with a latch are used with lift clamps.
11.24.3. Using a lift clamp with too-large a capacity is dangerous for light loads. Size the clamp according to the load.
11.24.4. An adequate number of lift clamps must be used to balance the load.
11.24.5. Each lift clamp must be inspected before use.
11.24.6. Never side load a lifting clamp and do not lift from the side with a vertical clamp.
11.24.7. Only one plate at a time may be lifted with a lift clamp.

11.25. Custom Design Lifting Attachments
11.25.1. Where custom attachments are required they must be designed and developed by a vendor who specializes in creating and certifying attachments.
11.25.2. If designed in-house, they must be designed by a Technical Authority and must be marked / certified as required.

12. Lifting Personnel

12.1. The need to use lifting equipment to transfer or lift people is considered a Critical Lift and must have a Lifting Plan completed. The Lifting Plan should ensure that:
12.1.1. Hazards associated with the lifting of persons are identified;
12.1.2. Risks associated with the lifting of persons are addressed;
12.1.3. Lifting equipment appropriate specifications.

12.2. The lifting of personnel should be eliminated where reasonably practicable. If, after assessment, there is no reasonably practicable alternative, the equipment used needs to be specifically designed for that purpose and operated within its design parameters.

12.3. All equipment used for lifting of persons must be reviewed by a Competent Person to ensure that risks to persons being lifted are reduced to as low as reasonably practicable. It is also necessary to check what local regulators require, for example regulators can require that all equipment suitable for lifting of persons (e.g. man baskets) needs to be clearly marked, such as ‘suitable for lifting persons’ and that any equipment not marked in this way should not be used for this purpose.

12.4. Suitable fall protection tied-off to an approved anchor point shall be used. This anchor point shall not be part of the basket or other device carrying personnel.

13. Inspection, Examination and Marking of Lifting Equipment

13.1. The identification of safe working load (SWL), operating mode and configuration for the safe use of equipment, is required to ensure that lifting equipment and accessories are used only within the range of operating parameters appropriate to their safe use. SWLs shall be clearly and permanently marked for all lifting equipment.

13.2. There are two forms of assessing lifting equipment; Inspections and Thorough Examinations and they apply differently for Cranes/Hoist vs. Rigging/Attachments.

13.3. Inspections may be carried out by Operators or other personnel with sufficient experience and competency.

13.4. Thorough Examinations must be carried out by a Qualified Person.

13.5. Minimum GE requirements are listed below for Cranes/Hoist and Mobile Cranes (see Appendix 9 and 10 for examples) unless local regulations are more stringent:
13.5.1. Pre-use Inspection (not required to be documented)
13.5.2. Monthly Inspection (must be documented)

13.5.3. Annual Thorough Examination (must be documented)

13.6. Minimum GE requirements are listed below For Rigging/Attachments unless local regulations are more stringent:
13.6.1. Pre-use Inspection (not required to be documented)
13.6.2. Annual Thorough Examination (must be documented)

13.7. Once documented Inspections or Thorough Examinations are completed, the equipment (Crane/Hoist or Rigging/Attachments) shall be marked to indicate it's approved for use. Locations shall develop a system that works best for its operations but one example is to paint or use colored types or rope as a marking on the equipment for each month and/or year:

2011	Yellow	2014	Red
2012	White	2015	Light Blue
2013	Orange	2016	Green

13.8. Thorough Examinations should take into account various items that might impact the equipment including:
13.8.1. Overall equipment condition
13.8.2. The environment in which it is to be used
13.8.3. The number and nature of lifting operations for which the equipment is used

13.9. Lifting equipment that also meets one of the following requirements shall have a Thorough Examination performed prior to use:
13.9.1. Before being brought into use for the first time, unless it has been accompanied by valid regulatory documentation
13.9.2. Where a new or applicable regulatory requirement is identified
13.9.3. Where the equipment is involved in an incident or dangerous occurrence
13.9.4. After a significant change in conditions of use. For example, after installation/assembly/relocation/modification/repair
13.9.5. After six (6) months or longer without of use
13.9.6. Each time that an exceptional circumstance (such as overload) may have jeopardized the safety of the lifting equipment

13.10. All defects identified during either an Inspection and/or Thorough Examination should be documented with corrective actions identified and tracked to closure.
13.10.1. Any identified defects that, in the opinion of the Operator or Qualified Person, could become a danger must result in the equipment being taken out of service until properly addressed.

13.11. Each location must have a process in place to:
13.11.1. Develop a documented inventory of all Cranes/Hoist and Rigging/Attachments
13.11.2. Ensure work equipment documented Inspections and Thorough Examinations are kept up to date
13.11.3. Conduct internal auditing to confirm process is working

13.12. Records for documented Inspections and Thorough Examinations must be maintained for the current year and previous 5 years.

14. Training & Competency

14.1. Training and competency for Qualified Persons must include:
14.1.1. Outside Contractor – Location must receive and verify training/certification and work experience to confirm person(s) are qualified.

14.1.2. In-house – Must receive training by a qualified 3rd party (ex. Crane Companies, Engineering Organizations, Crane Manufacturer(s), Labor or Government Agencies, etc.) that specializes in building/maintaining cranes.

14.1.2.1. For in-house, locations can send some persons to become a train-the-trainer who can then come back and train others.

14.2. Competent Persons must have work experience and/or training (that includes a practical demonstration) to confirm they have knowledge in the following:

14.2.1. GE Crane Safety Manual overview
14.2.2. Location specific Crane Safety Program and SRAs/Lifting Plans
14.2.3. Hazards associated with crane/hoist operations and rigging
14.2.4. Lifting (and rigging) planning and how to identify appropriate equipment
14.2.5. Detailed understanding of appropriate equipment operating, procedures for the types of equipment used, and safe working practices
14.2.6. Supervisory expectations to monitor and verify that employees consistently follow established procedures, or take corrective action
14.2.7. Crane operations safety audit requirements
14.2.8. A MyLearning courses, Cranes – Competent Person (GE-EHS-224-CLSRM) can be used to document the training.

14.3. Crane operators shall have licenses or certifications as required by local regulations.

14.4. Level 1 Crane Operators will be competent to perform complex lifts, including, but not limited to:

14.4.1. Flipping parts using two hooks or two cranes
14.4.2. Traveling and positioning parts weighing over 10 tons
14.4.3. Crane operation for engineered lifts
14.4.4. Multiple crane lifts
14.4.5. Communications methods, including any signaling systems to be used at the site

14.5. Level 1 Crane Operators shall have both classroom or online instruction and practical training. Training effectiveness shall be verified through a written exam and practical evaluation.

14.6. Level II Crane Operators will be competent to perform less complex lifts, not including those listed for Level I operators, but including the following:

14.6.1. Straight lifts and traveling of parts or material weighing less than 10 tons
14.6.2. Standard rigging techniques
14.6.3. Directing lifts (i.e. signaling)

14.7. Level II Crane Operators shall have both classroom or online instruction and practical evaluation. Training evaluation shall be verified through a written exam and practical evaluation.

14.8. Two online courses are available to support online instruction:

14.8.1. Overhead Cranes and Rigging for Operators (GE-EHS-465). This course is intended for employees who work with or around <u>overhead cranes</u> and rigging. In this course, the employee will learn about the safe operation of overhead cranes and rigging. The employee will need additional technical (knowledge and performance based) training before they can begin working with overhead cranes.

14.8.2. Cranes, Derricks, and Rigging (GE-EHS-220). This course is intended for all employees who work with or around <u>mobile cranes</u>, derricks, or rigging. In this course, the employee will learn about the safe operation of cranes and derricks as well as the selection and use of rigging. The employee will also learn about the importance of good communication between crane operators, riggers, and those working in the area of lifting operations.

14.9. Classroom training must at least cover:
- 14.9.1. Detailed training on location specific Crane Safety Program and SRAs/Lifting Plans
- 14.9.2. Detailed technical training on the equipment to be operated
- 14.9.3. Rigging methods
- 14.9.4. Communication methods
- 14.9.5. The level and complexity of training should be based on the actual equipment to be operated.

14.10. The practical evaluation for Level 1 Operators must include the following:
- 14.10.1. Understanding on how to review a lifting plan
- 14.10.2. Collection and inspection of the rigging equipment/lifting devices to be used
- 14.10.3. Pre use inspection of the crane
- 14.10.4. Practical exercise that includes rigging the component to be lifted per the lifting plan
- 14.10.5. Lifting the load properly
- 14.10.6. Overhead Cranes Practical (GE-EHS-465A-Level1) and/or Cranes, Derricks, and Rigging Practical (GE-EHS-220A-Level1) are available in MyLearning to document completion.

14.11. The practical evaluation for Level 2 Operators must include the following:
- 14.11.1. Collection and inspection of the rigging equipment/lifting devices to be used
- 14.11.2. Pre use inspection of the crane
- 14.11.3. Practical exercise that includes rigging the component to be lifted per the lifting plan/SRA
- 14.11.4. Lifting the load properly
- 14.11.5. Overhead Cranes Practical (GE-EHS-465A-Level2) and/or Cranes, Derricks, and Rigging Practical (GE-EHS-220A-Level2) are available in MyLearning to document completion

14.12. Team Member training must include the following topics:
- 14.12.1. Detailed training on location specific Crane Safety Program and SRAs/Lifting Plans
- 14.12.2. Communication methods
- 14.12.3. General overview training on how crane/hoist operate
- 14.12.4. Rigging methods that they would be expected to perform/inspect
- 14.12.5. The level and complexity of training shall be based on the actual equipment to be operated or used.
- 14.12.6. Note that operator training is not required if the person or persons will not operate cranes or hoists.
- 14.12.7. MyLearning GE-EHS-465 or GE-EHS-220 can be used to train Team Members but no practical is required.

14.13. In addition, and country-specific or local crane training regulation and certifications for operators and trainers must be met. Training must be performed by someone with suitable technical and operational experience and locations must document confirm the qualifications of trainers.

14.14. Re-Training
- 14.14.1. National and local regulations often contain specific re-training requirements, and operations must comply with applicable regulations.
- 14.14.2. GE minimum requirements are that re-training take place at least every 3 years, and include both online or classroom training and a practical evaluation.
- 14.14.3. Re-training shall be conducted whenever performance observations, an incident, or other information indicates re-training is needed.

15. Medical Qualification

15.1. In some countries, annual physicals are specifically required by the regulatory agency and must be complied with.

15.2. GE minimum expectation is that Operators shall have physical examinations, as specified by GE Medical, to confirm they are in good physical health with no significant impairment to eyesight, hearing, and reaction time.

16. Contractors

16.1. Where cranes are rented/hired by GE, the supplier must be a contractor approved by the business EHS and the requirements of Element 10 – Contractor Safety from the HS Framework apply.

16.2. The GE preference will always to be to arrange a 'contract lift' where the crane company manages the whole lifting operation.

16.3. GE will supply load characteristics, including where applicable sail effect and drag coefficient details to the crane company.

16.4. GE will require the crane company to provide a Lift Plan/Risk Assessment for the work to be performed.

16.5. GE will request the crane company to identify max permissible wind speeds and direction relative to crane position, for the intended worst case lifts on the Lift Plans. Also check sail effect and drag coefficient have been included in the Lift Plan calculations where applicable.

17. Customer/Rental Cranes

17.1. If a GE employee is required to use a customer's lifting equipment or rental lifting equipment then a Competent Person shall conduct a documented inspection prior to using.

17.1.1. If lifting equipment is unable to be inspected or does not pass the inspection then alternative plans to conduct the work must be developed with EHS review/approval.

17.1.2. Such inspection shall include checking for a valid certificate of test and inspection. Without such documentation, GE personnel shall not accept the equipment for the lifting task.

17.2. Written permission must be received from a customer if GE personnel are required to use their lifting equipment. This documentation must be kept on file and ready available

17.3. When GE rents lifting equipment but does not operate the following apply:

17.3.1. Equipment Inspection by a Competent Person (Can be a contractor)

17.3.2. Verification per Element 10 of the HS Framework that approved contractor is used with a qualified operator

18. Record Keeping

18.1. Information relevant to monitoring and controlling lifting operations procedures shall be retained to assist in identifying opportunities for improvements and to demonstrate the procedures to regulators or clients.

18.2. A systematic method of record retention should be operated to ensure that information is readily available to competent persons including:

18.2.1. Design specifications for the locations cranes/hoists

18.2.2. Initial load specifications, retained for life of equipment

18.2.3. Equipment Inspection and Thorough Examination records

18.2.4. Have printed company check lists for all rigging and lifting equipment, for use and retention.

18.3. All relevant documentation should be available or copied to appropriate persons at the location where the equipment is to be used and available to inspectors from the relevant enforcing authorities upon request.

18.4. An annual review of records and confirmation of compliance to GE's Crane Safety Manual must be completed. Element 13 – High Risk of the HS Framework can be done to document this review has occurred.

References:

1. International Marine Contractors Association – Guidelines for Lifting Operations

P.I.C.K.

The use of cranes and other lifting equipment is considered a high risk operation, and there is a constant battle to remain alert to what could go wrong and avoid complacency…especially where these tasks are part of routine production operations. This guidance is a tool to help all employees involved in the use of cranes and lifting equipment to remain alert to what can go wrong, consistently follow established safe work practices, and to stop when unexpected conditions occur to re-verify it is safe to proceed. We have coined the acronym P.I.C.K, which is explained below, to help keep these principles in mind.

P.I.C.K.

P - Plan

I - Inspect

C - Check the environment

K - Keep looking around (and listening)

P - Plan

- All lifting operations that meet one of the following criteria shall require a specific lift plan be prepared by an appointed Lifting Supervisor: (1) more than one crane to be attached to the load (Tandem lift), (2) lifting loads that are more than 75% of the crane/winch capacity at the intended radius, (3) loads that have the potential to have the sail or other wind affects.
- All lifting operations shall have a risk assessment for the task.
- Establish safe working locations for all personnel
- Competent Persons may be GE employees, or where cranes and lifting equipment are hired, may be employees of the company supplying the equipment.
- No load may be lifted or suspended over areas where people may enter; this usually requires the establishment of an exclusion zone around the work area.
- Verify whether a lift permit is required
- All lifting operations shall be under the direct control of competent and qualified persons assigned the role of either crane operator or rigger by their company management, including lifts performed routinely as part of production operations.
- Routine lifting operations that do not trigger the requirements for a lift plan can be managed by the assigned crane/winch operator or rigger, without the direct involvement of a lifting supervisor.
- **Where a crane operator/driver and an assistant are working together, the three part communication technique must be used prior to initiating a move (or series of immediately successive moves) with the crane**. This may be through the use of verbal communications or hand signals, but must be standardized for each site or service operation. Where hand signals are used, they must be agreed between signal person and crane operator before lifting operations commence. One way to achieve this is to have a legible chart showing and explaining the system of hand signals used posted at the jobsite.
- The Competent Person or operator shall hold a pre work/toolbox meeting (or brief communication depending on complexity of lift) with all persons involved in the lift, before the lifting operation begins. During this meeting the following should be discussed:
- Exclusion zone

- Verify that the areas where the load will be lifted, landed, and route of travel with the suspended load are inspected and free of obstructions prior to initiating the lift. This includes unobstructed access to working aisles and emergency exit routes.
- Requirements for tag lines to be used to control the load, where these are required to be anchored, suitable anchors must be provided; they should not be attached to vehicles on the site.
- Identify the one person who will be in overall control of the lifting operations. Regardless of whom this is, the crane operator always has the final say, and can stop the operation at any time.
- Crane operator(s) will stop all operations in the event of no signal or unclear command, or signals/directions from more than one person.
- Either the lifting supervisor where applicable, or the crane/winch operator must confirm the weight of the load and identify the center of gravity to determine where and how the load will be attached to the lifting equipment.
- The manufacturers load rating on any piece of lifting equipment shall never be exceeded, except in planned testing, where an overload test is required, or where an engineered lift is managed by a competent professional engineer. Engineered lifts that exceed the safe working load of the crane are not permitted with mobile cranes.
- Integrate contractors (if any) in the planning process

I -Inspect

- Inspect the load to verify its condition is suitable for a safe lift
- All Lifting equipment to be used in any lift must have a visual inspection before use, damaged equipment shall be removed from service and quarantined to prevent further use until it is either repaired or removed from site.
- Daily pre-use inspection checklists shall be completed by the operator and available for review before any lifting operation.

C - Check the environment

- Check above the load to verify clearances.
- Check the lift area, path of travel, and landing area to verify no obstructions or blocked aisles
  - Verify these areas have adequate working space, and appropriate cribbing or stands for landing the load are available.
- Establish a travel path that keeps the load as low as possible.
- Under no circumstances shall a load be lifted or carried over personnel.
- Verify any needed exclusion zone has been established.
- Verify the area where mobile cranes are to be setup is stable and capable of supporting the maximum load to be anticipated for the crane and load, including where outriggers will be placed.
- Check weather conditions if outdoors, wind speed and direction

K - Keeping looking around and listening

- Be aware of changing conditions, or conditions not anticipated in the lift planning. Your response should be to stop the work safely and re-evaluate the lift before proceeding.
- Verify that communications are working as designed. If signals or communications are unclear, stop operations to clarify.
- Verify that all personnel are in designated safe working locations.
- Verify that unauthorized personnel do not re-enter the exclusion zone.
- Stop the movement of the load upon hearing any stop command, clarify concern and whether it is safe to proceed.

Audit Checklist – based on P.I.C.K. crane safety guidance

1. Are ALL Critical, Engineered or New/Modified Product Lifts controlled by a specific lift plan?

2. Do ALL lifting operations have a risk assessment signed off by a Competent Person?

3. Has a standardized 3-part communication process been implemented for lifting operations where more than one person is involved?

4. Are pre-lift talks held by the Competent Person before any Critical, Engineered or New/Modified Lifts are conducted?

5. Are pre-use Inspections conducted by Operators?

6. Are Thorough Examinations documented and conducted as required?

7. Are Competent Persons, Operators and Lift Team members trained?

8. Prior to starting ALL lifts are the lift area, path of travel, and landing area verified to be free of obstructions and blocked aisles, and to provide adequate working space for operator or lift teams if unexpected situations arise?

9. Is it clearly understood that the operator or competent person shall stop lifting operations whenever an unexpected situation arises, and determine if it is safe to proceed? Has this ever happened, in other words, are employees actually willing to take this step?

Material Handling (Crane/Hoist) – Safety Audit Checklist

Bldg./ Area: _____ **Workstation:** _____

Description of Crane/Hoist/Forklift: _____

Date: _____ **Auditor(s):** _____

A. Housekeeping		**Yes**	**No**	**N/A**
1	Is the general work area free of congestion to minimize slip/trip/fall hazards, and allow the operator to escape in event of unexpected movement or equipment failure (crane, hoist rigging)?			
2	Is material positioned or stored to avoid contact by the load, as it is being moved w/crane/hoist?			
3	Is the travel path, from where the load is rigged to where it is unhooked, clear of obstacles for both the load and operator?			

B. Lifting Devices		**Yes**	**No**	**N/A**
1	Are all lifting devices in good condition w/current tie wrap secured to document monthly visual inspection?			
2	Are all loads within the rated capacity (must consider type of hitch and sling angle, if applicable) of the lifting device(s)?			
3	When attached for the lift, are all sling angles greater than 30 degrees?			
4	If the lifting devices include hooks, list the type of hook(s): Sling Hook w/safety latches; Sling Hook w/o safety latches; "J" Hook; Foundry Hook; Grab Hook			
5	Could a "closed-style" hook attach to the lifting point(s), perform the move and not introduce further hazards such as snagging on protrusions extending from the load?			
6	Are below-the-hook lifting devices in their original configuration or, if there have been modifications, are there certificates to document the modification?			

C. Crane/Hoist – General		**Yes**	**No**	**N/A**
1	Is the inspection card in place & current to document the monthly inspection of the crane/hoist?			
2	Are the crane/hoist controls clear and legible so the operator can readily determine each function?			
3	Are the operator(s) performing the visual/operational inspection of the crane/hoist at the start of each day – prior to use?			
4	Is the crane equipped with a functioning & adequate warning device such as a horn?			
5	If equipped, does the remote control require two-hand operation?			

D. Rigging the Load				
1	Does the operator know the weight of the load being lifted?			
2	Is a "load chart" posted nearby listing representative weights for commonly lifted parts?			
3	Is the weight of the load within the capacity of the crane/hoist?			
4	Lifts made throughout this workstation do not include critical lifts (critical lift = 75% or more of crane/hoist capacity).			
5	Is the operator capable of safely accessing the lift points of the load to connect rigging?			

E. Traveling with the Load		**Yes**	**No**	**N/A**
1	Is this currently a one-person move?			
2	Is the path of travel clear of debris or obstacles for both the load and operator?			
3	Can the operator maintain visual contact with lifting device hooks during entire move?			
4	If the load is moved over workstations, is there a process to ensure all employees are cleared from the work area prior to suspended load travel.			
5	Is the operator capable, during the entire move, of maintaining a safe separation distance (for example, 1.5 times the loads largest dimension) away from the load?			

6	Are tools available to allow the operator to control the load without manually touching it? (tag lines, push rods, etc)			
7	If the load is moved down aisles shared w/pedestrians and/or mobile equipment, is there a process to avoid contact?			
8	Is the load moved as close to the floor as possible without contacting any obstructions?			

F. Positioning/Setting the Load		**Yes**	**No**	**N/A**
1	Is the final destination at a safe distance (i.e. 1.5 x largest dimension) away from rack storage, utilities panels or operator workstations to avoid inadvertent contact?			
2	Is there sufficient room for the operator to stand in a safe location while setting the load to avoid contact if a failure occurred?			
3	Can the operator safely access the rigging to disconnect the load?			
4	When disconnected, is the rigging free & clear of the load w/no potential to snag the load prior to the next crane/hoist move?			
5	Is there sufficient clearance for the load to avoid contact that could cause slack in the sling leg(s) and allow the hook(s) to slip out of the lifting point(s) prematurely?			

G. Forklift (Jitney) Operation		**Yes**	**No**	**N/A**
1	Is the pre-use inspection for the forklift current?			
2	Is the operator traveling in reverse when the load restricts their visibility?			
3	Is material stored away from forklift travel paths to avoid contact that could cause instability and contact w/pedestrians or nearby coworkers?			
4	Are loads secured by banding, fork inserts, etc. to prevent displacement in the event of an abrupt stop, sharp turn or inadvertent contact with fixed obstacles?			
5	If aisles are shared w/pedestrians and forklifts, is the aisle at least 3 feet wider than the largest load moved down the aisle by forklift?			
6	Do all storage racks adjacent to aisles or workstations have fencing across the back to prevent material from falling from the backside of the rack?			
7	Observe forklift operation in the area. Are operator's a) stopping and sounding horns as they approach a blind intersection; b) slowing and sounding the horn as they approach pedestrians from behind; c) traveling at a safe speed?			
8	Are intersections where forklifts and pedestrians travel free from stored material or equipment so the pedestrian and/or forklift operator can see before entering the intersection?			

If you answered "No" to any of the questions above, list the question section and number (i.e. B2) and provide a description. These questions require further review by the Business Leader and EHS-TA.

	Safety Risk Assessment		

Appendix 3

Business / Operation Name

Lifting SRA for :

Crane Operator

JSA Title/Number:		EHS & Competent Person Reviewers:
Crane Operator		Name: Name:
Occupation:	**Workstation:**	**Component:**
CRANE OPERATOR	n/a	G850
Code:	**Workstation #:**	**Dept :**
096708	n/a	PDO & Materials
Equipment:		**Building:**
CRANES		Site-Wide

JSA Description:
Applies to material handling functions of designated crane operators, to include use of cab, pendant, or remote control cranes, forklifts, and locomotive/transfer cars.

General Safety Requirements
Safety glasses and safety shoes required at all times. Gloves will be worn when handling material or rigging.

Training Requirements
Crane Slings & Rigging
Cranes - Overhead and Gantry
Powered Industrial Trucks ‡
Access to Employee Exposure and Medical Records
Control of Hazardous Energy (Lockout/Tagout): Awareness
Employee Emergency Plans and Fire Prevention Plans
Fire Extinguishers, Portable
Hazard Communication
Personal Protective Equipment

ID	Tool/Process	Potential Hazards	Preventative Measures
1a	Crane Operation	Crane Failure	Before using the crane, the operator must be assured of the machine's condition by performing a pre-operations inspection: General area: Observe general area served by the crane to note any obstructions or other conditions that may hinder safe crane operations. Obstructions or hazards in the path of the operator should be noted. Control Systems: Prior to attaching load, test the bridge, trolley, and hoist travel in each direction through each speed of the controller. Ensure bridge and hoist brakes are operating properly, and familiarize yourself with the amount of drift present when bridge, trolley, and hoist controls are released.

			Safety Devices: The crane may be equipped with a travel alarm or other sound warning device, warning/power indicator lights, and fire extinguisher. If so equipped, check for proper operation. The single most important safety device on the crane is the upper limit switch. The upper limit switch stops the upward travel of the hoist and prevents the load block from contacting the upper block, drum, or hoist. Do not use the upper limit switch as a control device to stop hoisting in normal operations. To test the upper limit switch, move the crane over a clear area, and with no load, carefully jog the load block into the limit switch. If working properly, the switch will cut hoist power. Wire Rope Condition: Visually inspect the wire rope for kinking, crushing, birdcaging, high stranding, evidence of heat or chemical damage, and broken wires. Load Block Condition: Visually inspect sheaves for signs of wear, cracks, or other damage. Ensure housing plates have all bolts/pins present and are free of damage (bends or other deformations). Check hook for excessive wear, gouging, or visible cracks in the bowl and back of hook. Check that the nut on the hook shank is secure and that the hook swivels easily. If equipped, check the operation of the hook safety latch.
1b	Crane Operation	Exceeding Operational Limitations	Adhere to the following general safety guidelines: The operator must be mentally alert at all times and should not engage in or be distracted by horseplay while running the crane. As with the operation of any other piece of machinery or heavy equipment, the operator must not be under the influence of any substance, to include prescription medications that may impair judgment, coordination, or the senses. Each crane operator is directly responsible for the operation of the crane. Whenever there is any doubt as to safety, the crane operator shall stop the crane and refuse to handle loads until safety has been assured. Proper safety equipment and personal protective equipment will be used. Safety glasses and shoes will be worn at all times on the manufacturing floor. When handling slings, cut resistant gloves will be worn. Perform pre-operational inspection before first use of crane during shift. Inspect slings and rigging prior to each use. Know the load weight and assure the total load to be lifted, including rigging, does not exceed rated capacity of the crane. On near maximum loads, test hoist brakes by moving the operating device to the “OFF” position after raising the load a few inches. If the load is held, the brake is functioning properly. Avoid shock loading. Avoid side pulls. Respond only to signals from the person directing the lift, but obey a stop signal regardless of who gives it. Sound the warning device before traveling and intermittently when approaching personnel. The operator shall carry a whistle, to be used as an alert when operating cranes not

			equipped with a warning device. Avoid moving loads over personnel. Do not use the upper limit switch to stop motion under normal operating conditions. It is a protective device and is not to be used as an operating control. Do not leave a suspended load unattended.
1c	Crane Operation	Exceeding Rigging Limitations	Adhere to the following rigging safety procedures: Know the weight of the load. Attach load above center of gravity or stabilize Select hitch that will hold and control load. Know rated capacities of slings and rigging hardware. Select sling best suited for load. Inspect rigging equipment prior to use Protect slings from sharp surfaces. Protect load from rigging if necessary. Allow for increased tension caused by sling angles. Allow for low D/d ratios on wire rope slings. Equalize loading on multi-leg slings. Allow for reduction when using choker hitches. Lift load a few inches to check rigging. Start and stop lift smoothly to avoid shock loading. Maintain load control.
2a	Locomotive & Transfer Car Operation	Injury to Personnel	The following measures will be taken when operating locomotive/transfer cars: A spotter will be used when operating the locomotive to ensure personnel do not enter locomotives path from cross aisles. Free-wheel locomotive cars will be chocked when uncoupled from locomotive. Motorized transfer cars will not be left unattended while running. Operator will remain at controls of car and have ready access to emergency stop while car is in motion. Locomotive and transfer cars will be run at a nominal speed to allow rapid, safe stop in the event of an emergency. Transfer cars will not be loaded in excess of their rated capacity.

3a	Forklift Operation	Injury to Personnel	When operating a forklift, the following guidance applies: AT ALL TIMES, maintain awareness of vehicle and pedestrian traffic in your operating area. Ensure forklift is equipped with horn and rear travel warning device. Exercise particular caution at cross aisles and come to a complete stop before entering. Always wear your seatbelt.

Gensuite MSDS References

No MSDS references currently exist for this JSA.

Administer

Appendix 4

Example Lift Plan

To be completed by the competent person

Lift Plan Title: _____

Site / Project Site: _____

Client / Project / Location: _____

Lift Location: _____

Lift Type: ☐ Routine ☐ Non-routine ☐ Critical ☐ Engineered

References: Lift Plan No. _____ Procedures Ref. _____

Risk Assessment No. _____ Drawings Ref. _____

Permit to Work No. _____

Load Details / Crane Details ***(maximum hook load not to be exceeded)***

Load ID (include Load Dimensions:	Center of gravity: ☐ Obvious ☐ Estimated ☐ Drawing	Design lift conditions (maximum): Wind (knots):
Gross lift weight/max. hook load In air: ☐ Actual ☐ Assessed	Crane configuration/mode:	Maximum radius:
SWL at this radius:	Design hook height: Maximum hook height:	Other information:

Description of lifting operation

Possible safety measures to be considered ***(tick as applicable and detail in "step-by-step" section overleaf)***

To be completed onshore for safety measures included by lift supervisor

☐ Weight not verified	☐ Lifting equipment/accessories certificates	☐ Sudden changes in environmental conditions
☐ Stability of load	☐ Stability of lifting equipment	☐ Load visibility during night work
☐ High center of gravity	☐ Pre-use equipment checks	☐ Blind lifting
☐ Awkward size/shape/sharp edges	☐ Crane mode verified	☐ Lighting pick-up and set-down areas
☐ No dedicated lift points	☐ Crane stability	☐ Dynamic factors involved
☐ No certified suspension points for lifting equipment	☐ Lifting over plant/equipment/assets	☐ Competent and sufficient personnel
☐ Packing protection load/lifting equipment/assets	☐ Restricted head room	☐ Suitable adequate supervision
☐ Loose objects removed from load	☐ Lay-down area size/strength/stability	☐ Correct PPE
☐ Load on pallet requires securing	☐ Route and lay-down area clear	☐ Toolbox talk required
☐ Tag lines required	☐ Route and lay-down area obstructed	☐ Pre-use equipment check
☐ Lifting of chemicals	☐ Lay-down in operational radius of lifting equipment	☐ Working space adequate and unobstructed
☐ Access and egress for slinging	☐ Conflicting operations	☐ Aisles and exit paths unobstructed
☐ No lift point directly above load	☐ Cultural, communication, language issues	☐ Overhead clearance adequate and unobstructed
☐ Accessories/equipment fit for purpose/SWL	☐ Emergency/rescue plans	
	☐ Environment: visibility/wind speed/other	

Lifting of personnel ***(attach task risk assessment with information on the following)***

☐ Prevention of person(s) becoming stuck/trapped	☐ Environmental hazards	☐ Site-specific procedures
☐ Prevention of person(s) falling/being crushed	☐ Correct PPE/harnesses/etc.	☐ Equipment secured in transporter
☐ Communications methods	☐ Trained/competent personnel	☐ Means of rescue
	☐ Certification/pre-use of checks	☐ Limiting conditions of use

Any further safety *measures* ***(as identified in the risk assessment)***

Communications

Communications available:

☐ Radio ☐ Hand signal ☐ Voice ☐ Other (specify):

Communication checks:

☐ Primary checked ☐ Secondary checked

Lifting equipment and accessories to be *used* ***(specify type, SWL and configuration)***

Step-by-step details of lifting operation ***(Responsible)***

Technical review

Has a technical review been conducted? ☐ **Yes *(attach details)*** ☐ **No**

Sketches

Sketch detailing the rigging-up of the lifting equipment and lifting accessories *(optional)*	Sketch of initial pick-up location, load path and lay-down area *(include any obstructions or equipment clashes that may occur and how they will be avoided)*

Debrief and learning points ***(did the lift go as planned or are changes to the lift plan required?)***

Competent person(s)

Print Name _____ Signature _____ Date: _____

Print Name _____ Signature _____ Date: _____

CRITICAL / ENGINEERED LIFT PLAN

- ☐ **Critical Lift**
- ☐ **Engineered Lift**

PERSON REQUESTING THE LIFT

Print Name _____Dept/Div. _____Date _____ COMPETENT

PERSON (CP)

Print Name _____ CP must be present during the entire lift and be qualified to resolve any question or problems that might arise during the lifting operation.

DETERMINING FACTOR FOR CRITICAL LIFT

___ The use of 75-100% of the rated capacity of a fixed or mobile crane, or

___ The use of 2 or more cranes to perform the lift, or

___ Involves lifting of loads (with a ratio of less than 1 ton per square meter exposed to the wind) that may sail in outdoor conditions, or

___ Personnel lifts, or

___ Complex lifts at the discretion of the Competent Person or Operator (Example might include; Lifting hazardous materials, Lifting materials that could create an environmental impact, lifting over critical equipment, etc.).

OPERATING EQUIPMENT (mobile crane)

Type of Crane _____ Manufacturer _____ Model No. _____

Serial No. _____ Manufacturer Restriction for WIND

SPEED _____ (no lifts at wind speeds of 25 mph or greater)

Crane Equipped with Anemometer _____ (if not, use BNL Weather Station)

Copies of Latest Annual Inspection _____ Latest Calibration Date of Instruments _____

Operator Licensed for Equipment _____ Expiration Date _____

OPERATING EQUIPMENT (overhead cranes)

Type of Crane _____ Manufacturer _____

Capacity _____ Latest Calibration Date of Instruments _____

Date of Latest Annual Inspection _____ Operator's Qualification Expiration Date_____

DESCRIPTION OF ITEMS TO BE LIFTED

_____

_____

_____

HOW WEIGHT OF OBJECT OBTAINED

A. Certified Weight Scale _____ Ticket # _____

B. Calculated Independently by More than One Source

1. Source _____ Weight _____
2. Source _____ Weight _____

C. If lift is an existing item (being removed or demolished), the weight must be recalculated, taking into account all modifications, including internal, as well as an Allowance for Scale, Sediment, Sludge, and Insulation. Calculation Work Sheets SHALL be included in the LIFT PLAN and have a PE stamp or be signed off by a COMPETENT PERSON. **(When weights are calculated, a 10% tolerance margin shall be added. This value may be increased at the discretion of the Lifting Safety Committee).**

D. Shipping Manifests Weight _____ Manufacturer Data Weight _____

CENTER OF GRAVITY (CG)

CG will be marked onto load, and a drawing included showing how it was determined.

DESCRIPTION & WEIGHT OF ALL RIGGING EQUIPMENT & CRANE ATTACHMENTS

Rigging & Attachments	_____	Capacity _____	Weight _____
Types of slings	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
Shackles	_____	_____	_____
	_____	_____	_____
Lifting rings	_____	_____	_____
Eyebolts	_____	_____	_____
Rigging Hooks	_____	_____	_____
Blocks / Jib	_____	_____	_____
Spreader Bars	_____	_____	_____
Below the Hook	_____	_____	_____
Lifting Devices	_____	_____	_____

(US operations: Must comply with ASME B30.20 Standard for Design, Testing, and Appropriate Markings. Other jurisdictions should use local equivalent guidance)

200 % PROOF TEST DOCUMENTATION FOR BELOW THE HOOK RIGGING: _____

WEIGHT OF OBJECT, RIGGING EQUIPMENT, & CRANE ATTACHMENTS

Source _____ Total Weight _____

EQUIPMENT AND LIFT RELATIONSHIP

A. Maximum Operating Radius: _____ B. Planned Operating Radius: _____

C. Allowable load at maximum lift radius anticipated (from Load Chart): _____

D. Ratio of Lift to Allowable Load: _____ E. Clearance between Boom & Lift: _____ F. Clearance to Surrounding Facilities/Utilities: _____

G. Clear Path for Load Movement: _____

STABILITY OF GROUND AREA

A. Soil Bearing Capacity: _____ Source: _____ B. Mats Required: _____ Size & Number: _____

C. Underground Utilities Location: _____ D. Ratio of Soil Bearing Capacity to Actual: _____

LIFTING OPERATION

A detailed drawing, to scale, MUST be included showing the Set-up Area, Lifting Area, Load Placement Area, and Sling Attachment Points w/sling angle reduction factor. A documented Critical Lift Plan or Pre-engineered Lift Procedure, as applicable, shall be included.

INSPECTION OF CONTRACTOR'S EQUIPMENT

All contractors' Lifting and Rigging Equipment must be inspected before being brought onto the site by a competent person.

LIFT APPROVAL SIGNATURES

Professional Engineer: _____ ___

Competent Person: _____ ___ ___ ___ ___ ___ ___

Operator: _____ ___

PRE-LIFT MEETING

Date: _____ Time: _____Location: _____

LIST OF ALL ATTACHMENTS

Lift Permit

Project Name / Location: _____ Date of Lift: _____
Equipment Type: ___Crane ___Hoist
Make/Model of Crane/Hoist: _____ Rigging Drawing #: _____
Verified Weight of Load: _____ Load Dimensions (ft/mt): ___ X ___ X ___

Names		Training/Certification Date
Person In Charge:	_____	_____
Operator(s) Name:	_____	_____
	_____	_____
Signal Person(s) Name:	_____	_____
	_____	_____

1. Did the crew use the approved rigging plan to set up this lift? __Yes __ No

2. Safety Measures and Communication Assurance:

SRA/JSA completed	__ Yes	__ No	__ NA
Personnel Safety Barricades up	__ Yes	__ No	__ NA
Tail swing barricades installed	__ Yes	__ No	__ NA
Lift, Travel & Swing Area Clear	__ Yes	__ No	__ NA
Load chart utilized for exact crane model, boom type, & length	__ Yes	__ No	__ NA
Weather conditions are acceptable	__ Yes	__ No	__ NA
Crane/Hoist has Daily Inspection Completed	__ Yes	__ No	__ NA
Crane/Hoist has Annual Inspection Completed	__ Yes	__ No	__ NA
Lift personnel have proper PPE	__ Yes	__ No	__ NA
Radio Communication Available, if required	__ Yes	__ No	__ NA
Crane's or alternate air horn available	__ Yes	__ No	__ NA

3. Final Check of Machinery:

Crane/Hoist set-up & located per the Rigging Drawings	__ Yes	__ No	__ NA
Radius from Crane Center of Rotation to Load checked	__ Yes	__ No	__ NA
Boom length & number of line parts is correct	__ Yes	__ No	__ NA
Underground utilities verified & protection installed as required	__ Yes	__ No	__ NA
Crane set-up on mats if required (verify size & quantity)	__ Yes	__ No	__ NA
Crane on even terrain and level, or if Hoist is it securely anchored	__ Yes	__ No	__ NA
Safety working distance from power lines verified	__ Yes	__ No	__ NA
Crane travel paths (where applicable) leveled & compacted	__ Yes	__ No	__ NA
Travel path/lift location safe from cave-ins from nearby excavations	__ Yes	__ No	__ NA

4. Final Check of Below the Hook Lifting Devices:

Sling eyes are seated properly in the block hook(s)	__ Yes	__ No	__ NA
Hook block latches fitted and working properly	__ Yes	__ No	__ NA
Correctly rated Slings selected per rigging arrangement	__ Yes	__ No	__ NA
Correct Spreader Bar or Beam is installed (if required)	__ Yes	__ No	__ NA
Correct size shackles are installed	__ Yes	__ No	__ NA
Softeners provided at rigging bearing points (where required)	__ Yes	__ No	__ NA
Rigging has been properly inspected (Paperwork available at site/location)	__ Yes	__ No	__ NA
Tag Lines attached to control load	__ Yes	__ No	__ NA
Load will not touch boom in vertical lift.	__ Yes	__ No	__ NA

5. A brief and final description of the planned sequence of the lifting operation was discussed with all individuals involved in the lift? __ Yes __ No If no, explain why. If Yes, document any issues/concerns raised.

_____

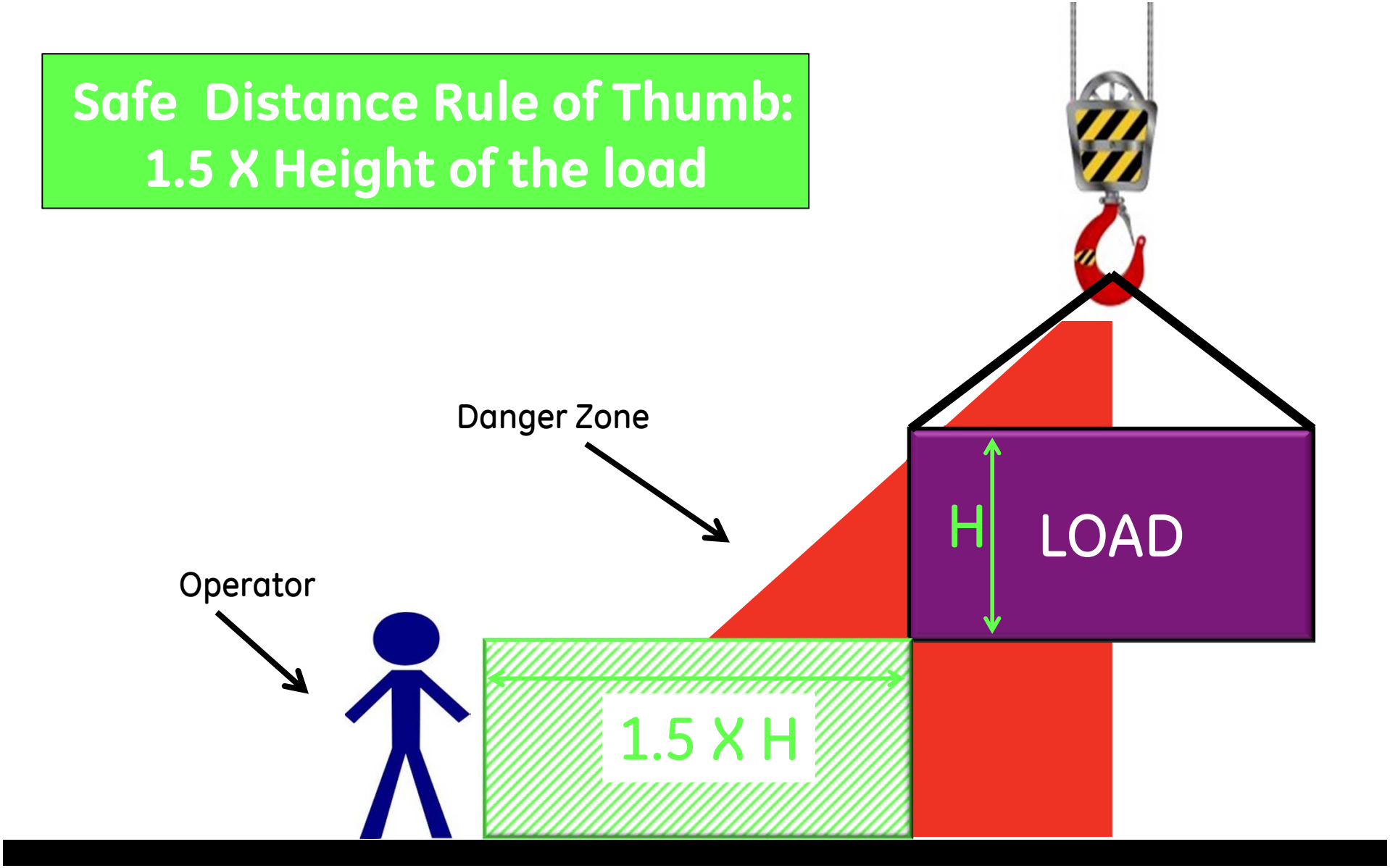
6. Authorization

A full description of the planned lift has been described and I understand my roles and responsibilities during this activity. (Signature's must be obtained by all PIC, Operator(s) and Signal Person(s) listed above)

_____ _____ _____

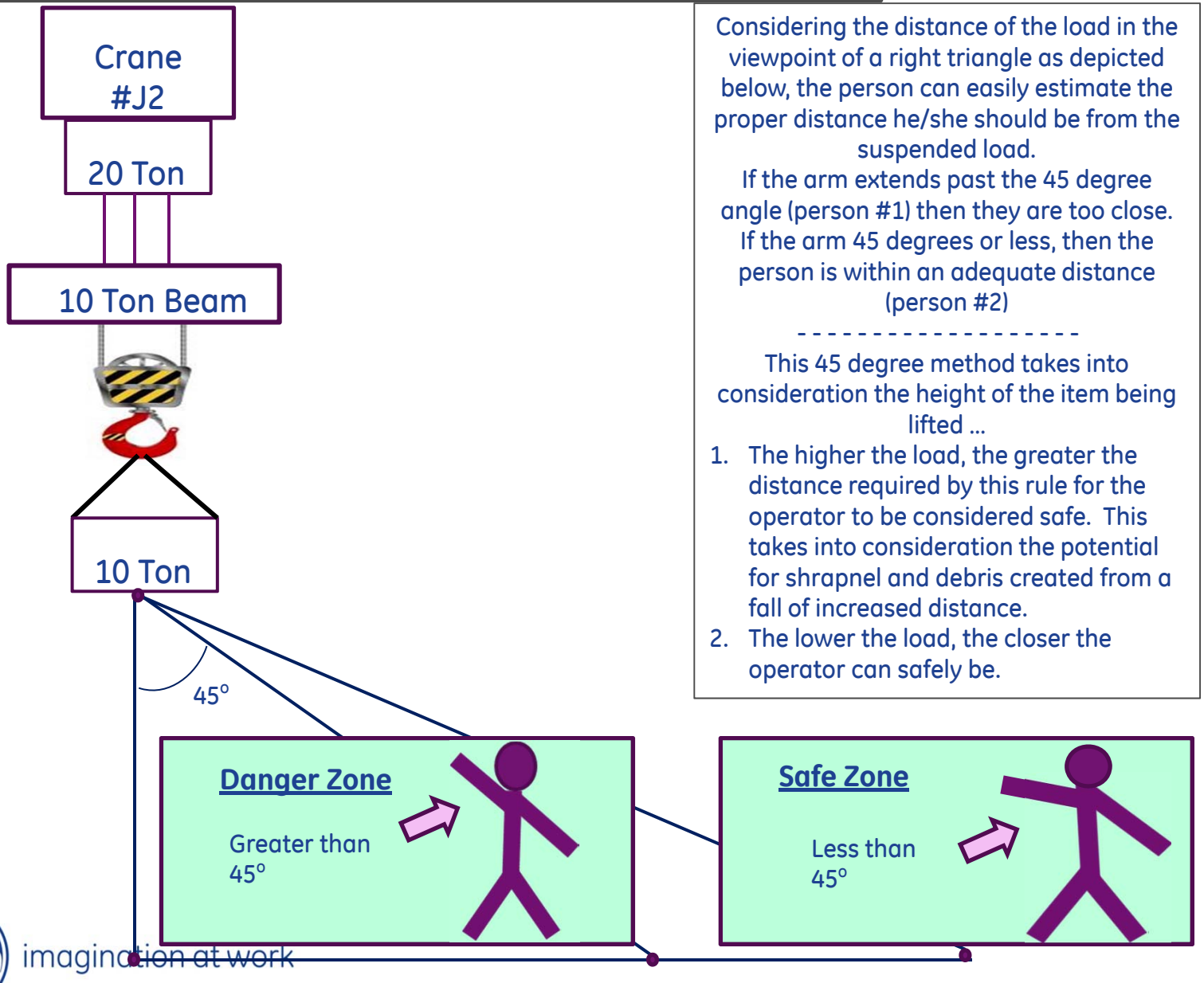
_____ _____ _____

Safe Distance Rule of Thumb: 1.5 X Height of the load



imagination at work

45° Rule of Thumb: No closer than 45° to load



Considering the distance of the load in the viewpoint of a right triangle as depicted below, the person can easily estimate the proper distance he/she should be from the suspended load.

If the arm extends past the 45 degree angle (person #1) then they are too close. If the arm 45 degrees or less, then the person is within an adequate distance (person #2)

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This 45 degree method takes into consideration the height of the item being lifted ...

1. The higher the load, the greater the distance required by this rule for the operator to be considered safe. This takes into consideration the potential for shrapnel and debris created from a fall of increased distance.
2. The lower the load, the closer the operator can safely be.

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ROAD ASSESSMENT CHECKLIST

Risk assessment checklist must be completed at the beginning of the project on each access road for a first general assessment and can be used as a report for specific problems, official site inspections, etc.

Project name: **Project location:**	
Date of assessment:	
Name of Assessor:	
Name or number of the main road access:	**Width of road access:**
Name or number of the pad(s):	**Width of pad access:**

Assessment	
Access Road and WTG pad	Clearly visible from both directions ○ Partly visible ○ Not visible ○ Comments:
Main Road at entrance:	Good ○ Sharp turn ○ Narrow ○ Loose gravel ○ Low visibility: ○ Obstructions (ex.: low trees, fences): ○ Dirt/No gravel ○
Access for Emergency vehicles:	Good ○ Fair ○ Poor ○ Room to pass other vehicles: YES ○ NO ○ ○ Access from a different location (specify):
Compaction (surface condition)	Good ○ Average ○ Low ○ Comments (ex. condition changes in bad weather):
Crane operation	Compaction sinking risk ○ Safe access to/from pad with turning room ○ Travel risk ○ Temporary power lines risk ○ Lift/lower height risk ○ Other risk:
Weather at the moment where the assessment is done. If weather changes, a new assessment must be perform.	Dry ○ Rain ○ Snow ○ Ice ○ Specify season: Comments:
Grading	Flat ○ Slight camber ○ High camber ○ Comments:
Holes	No holes ○ Few holes ○ Many holes ○ Can be easily filled ○ Comments:
Bumps	No bumps ○ Few bumps ○ Many bumps ○ Can be easily fixed ○ Comments:
Steep hills/ embankments	None ○ Low rise ○ Steep rise ○ Comments:
Ditches	None ○ Shallow ○ Deep ○ Wet ○ Dry ○ Comments:

Water hazards (Ponds, etc)	No water hazards ○ Few water hazards – specify ○ Many water hazards – specify ○ Comments:
Other hazards - Rail crossings, narrow bridges, low power lines, wildlife, prone to flood, etc	Hazards: Comments:
Parking for Site Vehicle	On approach road ○ On approach road shoulder ○ On access road ○ Blockage hazards ○ No blockage hazards ○ Other hazards eg ditch ○ Max # vehicle spaces: Comments:
Parking/Staging for receiving vehicles:	Room for receiving parking, turning, staging (100ft + trailers): Location of receiving parking and offloading:
Barriers	In place ○ Not yet in place ○ Location where barriers are: Location where barriers are needed: Comments:
Warning signs	In place ○ Not yet in place ○ Location where signs are posted: Location where signs need to be posted: Comments:
Speed limits	Speed limits are posted ○ No speed limits are posted ○ Location where speed limits are needed: Comments:

Completed assessment date: _____

Assessor/Project EHS Manager: _____

Site Manager signature: _____

Overhead and Gantry Crane Inspections

Item	Visual Monthly Note 1	Record Yearly Note 2
Operating mechanisms for proper operation, adjustment and unusual sounds	X	
Upper limit device(s) working	X	
Tanks, valves, pumps, lines and other parts of air or hydraulic systems for leakage	X	
Hooks and hook latches (if used) for damage	X	
Operating mechanisms for proper operation, adjustment and unusual sounds		X
Upper limit device(s) working		X
Tanks, valves, pumps, lines and other parts of air or hydraulic systems for leakage		X
Hooks and hook latches (if used) for damage		X
Deformed, cracked or corroded members		X
Loose or missing bolts, nuts, pins or rivets		X
Cracked or worn sheaves and drums		X
Worn, cracked or distorted parts such as pins, bearings, wheels, shafts, gears, rollers, locking and clamping devices, bumpers and stops		X
Excessive wear of brake system parts		X
Excessive wear of drive chain sprockets and excessive drive chain stretch		X
Deterioration of controllers, master switches, contacts, limit switches and push button stations, but not limited to these items		X
Wind indictor for proper operation		X
Gasoline, diesel, electric or other power plants for proper operation		X
Motion limit devices that interrupt power or cause a warning to be activated for proper performance. Each motion shall be inched or operated at low speed into the device with no load on the crane		X
Controller function labels for legibility and replacement		X

NOTES:

(1) By operator or competent person with records not required

(2) Visual inspection by a qualified person making records of conditions to provide the basis for a continuing evaluation.

(3) As in Note 2 unless conditions indicate that disassembly should be done to permit detailed inspection.

Mobile Crane Inspections

Item	Visual Daily Note 1	Record Monthly Note 2
All control mechanisms for maladjustment interfering with proper operation	X	
All control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter	X	
Operational aids for malfunction	X	
All hydraulic hoses, particularly those that flex in normal operation of crane functions	X	
Hooks and latches for deformation, chemical damage, cracks and wear	X	
Rope reeving for compliance with crane manufacturer specifications	X	
electrical apparatus for malfunctioning, signs of excessive deterioration, dirt and moisture accumulation	X	
Hydraulic system from proper oil level	X	
Tire for recommended inflation pressure	X	
All control mechanisms for maladjustment interfering with proper operation		X
All control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter		X
Operational aids for malfunction		X
All hydraulic hoses, particularly those that flex in normal operation of crane functions		X
Hooks and latches for deformation, chemical damage, cracks and wear		X
Rope reeving for compliance with crane manufacturer specifications		X
Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt and moisture accumulation		X
Hydraulic system from proper oil level		X
Tire for recommended inflation pressure		X
Deformed, cracked or corroded members in the crane structure and entire boom		X
Loose bolts or rivets		X
Cracked or worn sheaves and drums		X
Worn, cracked or distorted parts such as pins, bearings, shafts, gears, rollers and locking devices		X
Excessive wear on brake and clutch systems parts, linings, pawls and rachets		X
Any significant inaccuracies of operational aids		X
Lack of performance and compliance with safety requirements of gasoline, diesel, electric or other power plants		X
Excessive wear of chain drive sprockets and excessive chain stretch		X
Cracked crane hooks		X
Malfunctioning travel steering, braking and locking devices		X
Excessively worn or damaged tires		X
Hydraulic and pneumatic hose, fittings and tubing for: * evidence of leakage at the surface of the flexible hose or its junction with the metal and couplings * blistering or abnormal deformation of the outer covering of the hydraulic or pneumatic hose * leakage at threaded or clamped joints that can not be eliminated by normal tightening or recommended procedures * evidence of excessive abrasion or scrubbing on the outer surface of a hose, rigid tube or fitting. Means shall be taken to eliminate the interference of elements in contact or otherwise protect the components		X
Hydraulic and pneumatic pumps and motors for: * loose bolts or fasteners * leaks at joints between sections * shaft seal leaks * unusual noises or vibration * loss of operating speed * excessive heating of the fluid * loss of pressure		X

Hydraulic and pneumatic valves for: * cracks in valve housing * improper return of spool to neutral position * leaks at spools or joints * sticking spools * failure of relief valves to attain correct pressure setting * relief valve pressures as specified by the manufacturer		X
Hydraulic and pneumatic cylinders for: * drifting caused by fluid leaking across the piston * rod seals leakage * leaks at welded joints * scored, nicked or dented cylinder rods * dented case (barrel) * loose or deformed rod eyes or connecting joints		X
Hydraulic filters for: * evidence of rubber particles on the filter element, that may indicated hose, "O" ring or other rubber component deterioration * metal chips or pieces on the filter may denote failure in pumps, motors, or cylinders		X

NOTES:

(1) By operator or other designated person with records not required

(2) Visual inspection by a designed person making records of conditions to provide the basis for a continuing evaluation.