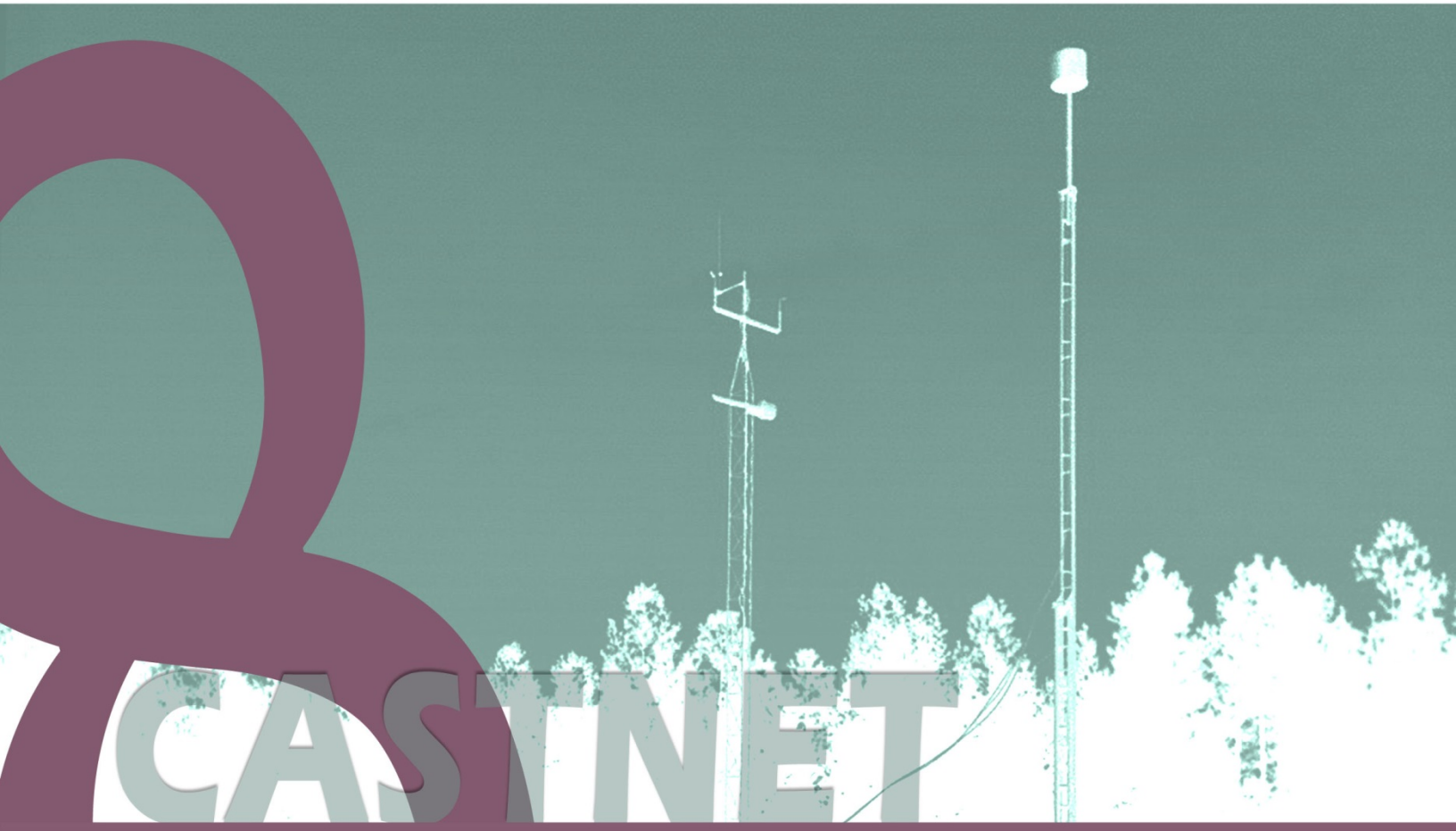
amec foster wheeler



Appendix 5: CASTNET Health and Safety Plan

The information contained in this document is for official use only.

Revision 8.3

Prepared for: US Environmental Protection Agency

Clean Air Status and Trends Network

Quality Assurance Project Plan

Revision 8.3

Appendix 5:

CASTNET Health and Safety Plan

October 2015

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler)

Health and Safety Plan (HASP) Approval

PROJECT: **Clean Air Status and Trends Network (CASTNET)**

Amec Foster Wheeler Project Number: **6064150003**

We have reviewed the attached HASP for the above referenced project. We recognize that when this form is completed, the attached HASP is approved for field activities on the above referenced project. The signatures below also act as certification of the personal protective equipment hazard assessment(s) performed for the work activities addressed by this HASP. Changes to this HASP shall be documented in writing and approved.

HASP Author: Marcus O. Stewart (Signature) — 10/28/15 (Date)

Project Manager: H. Kemp Howell (Signature) — 10-27-15 (Date)

Health and Safety Officer: Peter F. Yanczak (Signature) — 10-28-15 (Date)

CASTNET SITE HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT

I acknowledge that I understand the requirements of the CASTNET Site Health and Safety Plan (Revised October 2015) and agree to abide by the procedures and limitations specified. I also acknowledge that I have been given an opportunity to have my questions concerning the CASTNET Site Health and Safety Plan and its requirements answered prior to performing field activities. Health and safety training and medical surveillance requirements applicable to my field activities at this site are current and will not expire during on-site activities.

SIGNATURE	EMPLOYEE NUMBER	DATE

SUBCONTRACTORS

I have provided subcontractors who will be performing field activities on this site with a copy of this Site Health and Safety Plan and have thereby also informed the subcontractors that OSHA Standards 29 CFR 1910.1200, 29 CFR 1910.147 and 29 CFR 1910.66 (included as Appendices) applies to their field activities.

_____

Project Manager Date

GENERAL SAFETY RULES FOR CASTNET SITES

To maintain personal safety and ensure that the emergency response procedures can be effectively implemented, the following general safety rules and practices will be used at all CASTNET monitoring sites:

1. Common sense should prevail at all times. Each individual is responsible for safely carrying out assigned tasks so as to not endanger themselves or others around them.
2. No horseplay, drugs, alcohol, or firearms are permitted onsite and will result in immediate disciplinary procedures that may include termination of employment if observed.
3. Site work and driving will normally be accomplished between 7 a.m. to 10 p.m. to allow the greatest possibility of obtaining help in an emergency. Work outside of these hours is discouraged but may occasionally be conducted at the discretion of the individual employee in consultation with the CASTNET Field Operations Manager (FOM. Field equipment Specialists are also responsible for maintaining routine communication with the CASTNET FOM.
4. No eating or drinking will be permitted within the monitoring site while handling any sampling media or while working on electrical equipment.
5. No smoking within the shelter or within 50 feet of any site equipment. Any individual smoking in the vicinity of the site shall observe appropriate local precautions against grass fires and forest fires.
6. Safety belts shall be worn in all vehicles. The belts should be completely secured before the vehicle is put into gear and moved for any distance.
7. Injuries will be reported immediately to the employees' direct supervisor, the Health and Safety Representative, and the Work Assignment Manager.
8. Work directed by Amec Foster Wheeler shall be performed by an Amec Foster Wheeler employee, Amec Foster Wheeler consultant, or Amec Foster Wheeler subcontractor. Visitors to the site shall be directed to a safe distance from the work being performed by Amec Foster Wheeler, its consultants, or its subcontractors.
9. Emergency routes, telephone numbers of local authorities, and location of the nearest medical facility must be posted in a conspicuous location onsite.

All accidents must be reported to the Health and Safety Officer immediately. The Health and Safety Officer will then report all accident information to the Project Manager and the CASTNET Health and Safety Manager. Prompt reporting is essential for the prevention of future incidents in addition to the well-being of the affected individual or individuals.

Table of Contents

1.0 INTRODUCTION AND OVERVIEW

This HASP addresses the health and safety concerns and potential hazards associated with work tasks at the CASTNET sites. The HASP was specifically developed for the protection of individuals of the CASTNET field crew while working at these sites. This HASP and the CASTNET Corporate Health & Safety Program Manual constitute CASTNET's site health and safety program.

1.1 PROJECT INFORMATION

PROJECT: Clean Air Status and Trends Network (CASTNET)

Amec Foster Wheeler Project Number: 606415003

LOCATION: Currently, over 50 sites located throughout the United States and Canada.

1.2 PROJECT STAFFING

Project Manager	H. Kemp Howell	352-333-6612
Field Operations Manager (FOM)	Kevin P. Mishoe	352-333-6629
Health and Safety Officer	Peter F. Yanczak	352-333-3621

1.3 SUBCONTRACTORS

*Individual Site Operators
Subcontractors

*Typically employed by Standard Technology, Inc. (STI) or a state university system.

1.4 SITE DESCRIPTION AND HISTORY

The CASTNET project currently consists of over 50 meteorological and air quality monitoring sites located throughout the continental United States and Canada. These sites involve monitoring air filter concentrations (dry deposition), meteorological parameters, visibility, and other parameters. The project uses site operators (usually private individuals) who change media and inspect equipment weekly and Field Equipment Specialists (CASTNET employees) who calibrate and repair the sites biannually.

1.5 SITE TASK ASSIGNMENTS

Project tasks are primarily performed by Field Equipment Specialists with occasional participation by the FOM, Project Manager, or the Task Order Manager.

Work assignment tasks are described as follows:

Task	Description
Audit Monitoring Systems	Each meteorological and ambient measurement system is challenged with a known standard. The system response is recorded and compared with allowable tolerances.
Calibrate and Repair Monitoring Systems	Systems with out-of-tolerance response are adjusted and, in some cases, repaired or replaced.
Install Monitoring Systems	As program needs arise, new systems are installed in the field and subjected to an initial calibration. Installations range from adding a new plug-in component to setting up new shelters, power and phone service, and buried signal lines.
All Tasks	Measurements include: wind direction, wind speed, temperature, rainfall, wetness, relative humidity, solar radiation, ozone, and filter flow rate.

2.0 PERSONAL PROTECTIVE EQUIPMENT

Clothing shall be appropriate to existing conditions onsite. Long sleeves, pants and gloves providing adequate coverage shall be worn if poisonous plants are known to be in the work area (please see Appendix F).

2.1 SAFETY GLASSES

Safety glasses shall be worn while soldering, while using any power tools or striking tools (e.g., hammering), and during any other activity that may cause particles, liquids, or gases to be ejected from the work surface. CASTNET will provide prescription safety glasses (up to one set per 18-month period) to any field team member (as required). Replacement of prescription safety glasses shall be the responsibility of the individual employee.

2.2 HARD HATS AND GLASSES

Hard hats and glasses shall be worn in the vicinity of any tower when any other personnel are climbing or working above head level. Hard hats and glasses will be kept at each site.

2.3 SAFETY SHOES

Safety shoes shall be worn during any activities that may present a foot injury hazard (e.g., mowing, heavy equipment operation, or shelter placement). It is the responsibility of the individual to have safety shoes available during each field effort.

2.4 LIFELINES AND HARNESSES

Lifelines and harnesses or belts shall be worn as set forth in Section 3.5.

3.0 SAFETY OPERATING PROCEDURES

1. GENERAL

2. Common sense should prevail at all times. Each individual is responsible for safely carrying out assigned tasks so as to not endanger themselves or others around them. Field equipment specialists are also responsible for maintaining routine communication with the CASTNET FOM.
3. Site work and driving will normally be accomplished between 7 a.m. to 10 p.m. to allow the greatest possibility of obtaining help in an emergency. Work outside of these hours is discouraged but may occasionally be conducted at the discretion of the individual employee in consultation with the FOM.
4. No eating or drinking will be permitted within the monitoring site while handling any sampling media or working on electrical equipment.
5. No smoking within the shelter or within 50 feet (ft) of any site equipment. Any individual smoking in the vicinity of the site shall observe appropriate local precautions against grass fires and forest fires.
6. Safety belts shall be worn in all vehicles. The belts should be completely secured before the vehicle is put into gear and moved for any distance.
7. Injuries will be reported immediately to the employee's direct supervisor, the Health and Safety Representative and the Work Assignment Manager.
8. Work directed by Amec Foster Wheeler shall be performed by an Amec Foster Wheeler employee, Amec Foster Wheeler consultant, or Amec Foster Wheeler subcontractor.
9. Authorized visitors to the site shall be directed to a safe distance from the work being performed by Amec Foster Wheeler, its consultants, or its subcontractors.
10. Animals are not permitted inside the site boundary.

3.1 EQUIPMENT AND SUPPLIES

1. Only safety equipment that meets or exceeds ANSI standards shall be used.
2. A 16-unit first aid kit and a 1-A 10-BC rated fire extinguisher will be installed at each site shelter. Field personnel will routinely and regularly check the stock conditions of the first aid kit and the charge condition of the fire extinguisher. Any deficiencies will be reported to the FOM.
3. Emergency routes, telephone numbers of local authorities, and the location of the nearest medical facility shall be posted in a conspicuous location onsite.

3.2 WEATHER HAZARDS

1. No outdoor activity will take place during lightning, hail storms, heavy rain, blizzard conditions, or any other weather conditions that, in the opinion of the individual employee, represent an unreasonable hazard. Before arriving at each site, local conditions should be assessed to avoid danger from avalanche, wildfire, or other natural hazards.
2. Tower activity should be restricted to the daylight hours unless adequate lighting is provided for those working on the tower.

3.3 ELECTRICAL HAZARDS

1. No eating or drinking will be permitted in the vicinity of any piece of electrical equipment which has its cover removed.

2. Jewelry such as, rings, watches, bracelets, and necklaces shall not be worn while working inside electrical equipment.
3. Power supplies or other high voltage devices shall not be repaired in the field but replaced with the power source disconnected or the power shut off at the breaker in the electrical panel. Lock out/Tag out procedures (See Appendix C 29 CFR 1910.147) will be utilized to ensure that the power supply remains secure against accidental activation when more than one person is present at the site.
4. When there is a chance that activation of an electrical circuit can produce physical harm or death, then the device shall be tagged identifying such information.

3.4 TOWER SAFETY

1. No tower shall be climbed, or in the case of towers not equipped with mechanical aids designed for operation by one person (e.g., winches or tilt mechanisms), no tower shall be lowered or raised unless a second CASTNET employee, subcontractor, contracted site operator consultant, or employee of the client capable of acting as a safety backup is onsite and within sight and hearing distance.
2. Individuals working above the ground shall secure themselves to the tower with a lifeline and safety harness or belt. This equipment will be provided by CASTNET and inspected prior to use in the field. See Appendix D 29CFR 1910.66AppC for inspection and maintenance guidelines.
3. The tower shall not be climbed in high winds, if ice has accumulated on the tower, or if an electrical storm is imminent.

3.5 OTHER RULES

Safety regulations specified by any client or for any facility at which work is performed will be observed. The Project Manager will determine these requirements and take steps to ensure compliance.

4.0 PROJECT AND SITE SPECIFIC TRAINING

This HASP must be read and understood by onsite employees and subcontractors. No specialized Health and Safety training is required for this project.

5.0 PROJECT AND SITE SPECIFIC MEDICAL REQUIREMENTS

CASTNET standard medical monitoring does not apply to this project.

6.0 EMERGENCY PROCEDURES

6.1 MEDICAL EMERGENCY

Initiate first aid and seek professional medical attention for the injured person immediately. Take the injured person to a hospital emergency room or call an ambulance, as necessary.

As soon as possible, notify the injured employee's direct supervisor and the FOM or designee at Amec Foster Wheeler.

[Note: The instructions given below are for Amec Foster Wheeler employees only. Employees of STI, individual state university systems, or anyone employed through a business entity other than Amec Foster Wheeler must contact their employer to report the accident and file all necessary forms after first attending to the injury and seeking professional medical help.]

WHAT TO DO IN EVENT OF INJURY, ILLNESS OR VEHICULAR ACCIDENT

1. **Serious Injuries, call 911 immediately.**
2. **The employee or another Amec Foster Wheeler associate, if the injured employee is incapacitated must contact the employee's immediate supervisor.**
3. **The injured employee's Amec Foster Wheeler's office local health and safety representative must be notified, along with the regional safety manager within 60 minutes.**
4. **Contact WorkCare at 888-449-7787 to report the injury or illness.**
5. **Work Care Triage will dictate the course of treatment to be administered for not serious injuries.**
6. **A full report of the incident (who, what, when, and why) to be submitted to the injured employee's immediate supervisor and office HSE within 2-hours of the incident.**

6.2 HOSPITAL ROUTE DIRECTIONS AND MAP

Directions to local hospitals and clinics are posted inside each site shelter and are part of the site information notebooks carried by all field staff. Hospital directions and emergency information (i.e., phone numbers) on each site is contained in Appendix A.

6.3 EMERGENCY INFORMATION

Local emergency contacts and telephone numbers are posted inside each site shelter and are part of the site information notebooks carried by all field staff.

Appendix A

Site Emergency Information

CASTNET Site Contact List

Site Number: **147** **(ABT147)** Site Name: **Abington, CT** Updated: **9/8/2015**

Shelter Telephone: **860-974-2273**

Latitude:	41.8405	Longitude:	-72.0104
Magnetic Declination:		Elevation:	202 meters
USGS Quadrangle:	Hampton, CT	Site Deactivated:	
Site Installed:	12/28/1993	Polling ID Number:	
Calibration Group:	E2	Site Type:	Dry,Ozone,Met,Nadp
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Ted Gellert
Landowner
80 Ayers Road
Abington, CT 06230
Home: 860-974-1974 Work: Fax: e-mail:

Site Operator: Pam Brundage

4 Clinic Road
Pomfret Center, CT 06259
Home: 860-974-1633 Work: 860-974-1633 Fax: e-mail: pambrundage@charter.net

Other: 860-377-7159 Cell

Backup Site Operator: Nancy McMeriman

138 Brooklyn Road
Pomfret Center, CT 06259
Home: Work: 860-377-3232 Fax: e-mail: meadowmarsh@charter.net

Shipping Information

Federal Express: 4 Clinic Road

Promfret Center, CT 06259

CASTNET Site Contact List

Directions to Site:	From Hartford, CT take RT 84 East. At Exit #69 take RT 74 East to RT 44. Take RT 44 East to Abington. At the light in Abington, turn right (south) on RT 97. Go about 1.3 miles to a single lane paved road on the left, (Ayers Road). The road is past the apple cider store and just before the rabbit farm. There is a red barn type building on the corner. The primary contact lives 1/4 mi up the dirt road on the right. the site is further up the road past the barn, in the field.
Hazards:	Adjacent areas frequented by hunters
Emergency Contact:	Day Kimball Hospital, 320 Pomfret St, Putnam, CT
Emergency Phone:	860-928-6541, 911
Emergency Directions to Medical Facility:	From site (Ayers Road), follow Route 97 to Route 44 East. Take Route 44 East to Putnam, CT. Day Kimball Hospital is on Route 44 before you get into Putnam. 320 Pomfret Street, Putnam, CT 203.928.6541.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	OE5-699
Electric Utility:	Connecticut Light & Power 51484795034 Vendor Code 26950
Utility Phone:	800-286-2000
Telephone Company:	AT&T o/o BSI 4898121355
TelCo Phone:	800-922-1250

Comments:

CASTNET Site Contact List

Site Number: **416** **(ACA416)** Site Name: **Acadia NP, ME** Updated: **10/29/2015**

Shelter Telephone: **207-288-9322**

Latitude:	44.3771	Longitude:	-68.2608
Magnetic Declination:		Elevation:	158 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	12/1/1998	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Bill Gawley
Acadia National Park
Route 233, McFarland Hill, P.O. Box 177
Bar Harbor, ME 04609
Home: Work: 207-288-8723 Fax: e-mail: bill_gawley@nps.gov

Other: See comment section

Backup Site Operator: Chris Heilakka, Adam Thime, Shannon Wiggin

,
Home: Work: 207-288-8732 Fax: e-mail: See comment section

Shipping Information

Federal Express: Acadia National Park
Route 233, Box 177 McFarland Hill
Bar Harbor, ME 04609

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Provided by NPS
TelCo Phone:	N/A

Comments: Elizabeth Arsenault phone (voice) 207-288-8732, fax 207-288-8709, email: beth_arsenault@nps.gov. Alyssa Reischauer email alyssa_reischauer@nps.gov, phone 207-288-8731. Chris Heilakka email: chris_heilakka@nps.gov.

CASTNET Site Contact List

Site Number: **188** **(ALC188)** Site Name: **Alabama-Coushatta, TX** Updated: **10/29/2015**

Shelter Telephone: **936-563-2973**

Latitude:	30.7016	Longitude:	-94.674
Magnetic Declination:		Elevation:	105 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	4/6/2004	Polling ID Number:	
Calibration Group:	W9	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Tina Battise
Tribal Environmental Office
571 State Park Road 56
Livingston, TX 77351
Home: 936-933-1848 Work: 936-563-1100 Fax: e-mail: battise.tina@actribe.org

Site Operator: Tina Battise
Tribal Environmental Office
571 State Park Road 56
Livingston, TX 77351
Home: 936-933-1848 Work: 936-563-1100 Fax: e-mail: battise.tina@actribe.org
Other:

Backup Site Operator: Michelle Polite, Carlene Bullock
Tribal Environmental Office
571 State Park Road 56
Livingston, TX 77351
Home: 936-563-4009 Work: Fax: e-mail: carlenebullock@eastex.net

Shipping Information

Federal Express: Michelle Polite
571 State Park Road 56
Livingston, TX 77351

CASTNET Site Contact List

Directions to Site: From Livingston TX, travel 17 miles East on US 190. At top pf hill, there is a sign for Alabama-Coushatta Tribe of Texas. Turn right at sign onto Park Road 56. Continue past gift shop and administration buildings for approx 1.3 miles. Just past the reservoir, take 2nd left onto gravel road. Veer right at fork in gravel road. Veer left at the second fork. Go straight accross the clearing to the site. The site operator has an office in the building next to the gift shop on the left when you enter the park.

Hazards:

Emergency Contact: Tyler County Hospital, 1100 W. Bluff St. Woodville, TX 75979

Emergency Phone: 409-283-8141

Emergency Directions to Medical Facility: Tyler County Hospital, 1100 W. Bluff St. Woodville, TX 75979. (409) 283-8141. Leave site on Tombigbee Road. Tombigbee becomes P56 (Park road 56). At intersection of US 190 and P 56, turn right (east). Go approx 16 miles east on US 190.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments:

CASTNET Site Contact List

Site Number: **157** **(ALH157)** Site Name: **Alhambra, IL** Updated: **10/29/2015**

Shelter Telephone: **618-675-3712**

Latitude:	38.869	Longitude:	-89.6228
Magnetic Declination:		Elevation:	164 meters
USGS Quadrangle:	Pocohantas, IL	Site Deactivated:	
Site Installed:	6/28/1988	Polling ID Number:	
Calibration Group:	MW7	Site Type:	Dry,Ozone,Met,Nadp
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Walter & Betty Steiner (Landowner)

5403 S.R. 160
Highland, IL 62249
Home: 618-675-2462 Work: 618-540-8149 Fax: e-mail: wb2@agtelco.com

Site Operator: Walter Steiner

5403 S.R. 160
Highland, IL 62249
Home: 618-675-462 Work: Fax: e-mail: wb2@agtelco.com

Other: Work Cell # 618-540-8038, Other Cell # 618-540-8149

Backup Site Operator: Adam Joeseph Beck

14111 Niggli Road
Pocahontas, IL 62275
Home: 618-675-2480 Work: 618-960-0208 Fax: e-mail: abeck93@hotmail.com

Shipping Information

Federal Express: 5403 S.R. 160

Highland, IL 62249

CASTNET Site Contact List

Directions to Site:	2 sets of directions 1. FROM HIGHLANDS 2. From ST LOUIS AIRPORT. FROM HIGHLANDS... IL take 160 North through the town of Grantfork. Approx 1.2 mi north of town there is a large sign that marks the entrance to Cool Creek Estates Campground. Go 0.6 mi beyond that sign and turn right (white community township building on corner). Go to 2nd crossroads (approx 2.1 mi) and turn left, there is a pig farm on the left. Go 0.9 mi and the site is on the right, across an agricultural field. Enter through the farm just beyond the field. FROM ST LOUIS AIRPORT take the North Interbelt I-70 to 270 East. At Collinsville take 70 East. Exit I-70 at Exit #30 @ Pierron, IL (ILL-143) and go North (Left) on Steiner Rd. Turn Right at "T" (go East) onto Landolt. Go 1/4 mile and turn left (North) onto Fairview. Fairview crosses Pocahontos Rd and jogs to the right. Stay North on Fairview for 2-3 miles, you will come to a 2 story Brick House/Quonset Shed @ 5916 Fairview Road. Site 1/4 miles ESE of the Farmhouse.
Hazards:	Farm buildings, pond, lightning strikes, electric fence w/cattle
Emergency Contact:	see comments
Emergency Phone:	911
Emergency Directions to Medical Facility:	From site take a left on Fairview Road and go about a 3/4 mile. Turn right on Niggli Road and go about 2 miles to Rt 160. Take a left on Rt 160 to Highland. Continue straight on Rt 160 which becomes Poplar Street after you cross Rt 40. Continue on Poplar Street across the railroad tracks. Hospital is on right side of Poplar Street in Highland.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	6X2216
Electric Utility:	Southwestern Electric 2323006000
Utility Phone:	800-637-8667
Telephone Company:	Alhambra-Grantforks Telephone 11010817 Vender Code 26016
TelCo Phone:	618-675-3712
Comments:	For 911 system use the following street address for site: 5900 Fairview Road, Pocahontas, IL 62275. Alternate phone number for Southwestern Electric: 800-664-1025. email: wb2@agtelco.com, AT&T Raven 678-906-8117, I.P. [redacted]

CASTNET Site Contact List

Site Number: **115** **(ANA115)** Site Name: **Ann Arbor, MI** Updated: **10/29/2015**

Shelter Telephone: **734-426-0060**

Latitude:	42.4166	Longitude:	-83.9022
Magnetic Declination:		Elevation:	266 meters
USGS Quadrangle:	Pinckney, MI	Site Deactivated:	
Site Installed:	6/28/1988	Polling ID Number:	
Calibration Group:	MW8	Site Type:	Dry,Ozone,Met,Nadp
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Jeff Keeler, Business Manager
School of National Resources & Environment, Univ. of MI
440 Church St., 2038b Dana BLDG.
Ann Arbor, MI 48109-1041
Home: Work: 734-763-4533 Fax: e-mail: jskeeler@umich.edu

Site Operator: Michelle Hudson

440 Church Street G110 Dana Building
Ann Arbor, MI 48109
Home: Work: Fax: 734-936-2195 e-mail: shellhud@umich.edu

Other: 989-798-7936 Cell

Backup Site Operator: Kyung-Seo Park, Paul Drevnick

440 Church Street G504 Dana Building
Ann Arbor, MI 48109
Home: 734-678-2903 Work: Fax: e-mail: ecopark@umich.edu

Shipping Information

Federal Express: 440 Church St. G110 Dana Building

Ann Arbor, MI 48109

CASTNET Site Contact List

Directions to Site:	From Ann Arbor, MI take 94 W to exit 169 (Zeeb Road). Go North (right) towards Scio. Go 2.3 miles. Make a left on Huron River Drive (flashing red light). Follow that road to the outskirts of Dexter. After 6 miles, the pavement ends (just past junction of North Territorial). Follow North Huron River (8.1 miles) until it becomes Strawberry Lake Road at a bend to the right. About 1/10 of a mile from the bend there is a red house on the left with a large, beige, metal barn behind it. Take the next drive on left which is marked University of Michigan Research Area. Drive dead ends at site. If you come to the junction of Mast Road you have gone too far. Comment: You can not see the barn from the road when you see the house. The barn is behind the house.
Hazards:	N/A
Emergency Contact:	St. Joseph Mercy Hospital; 734-878-4909
Emergency Phone:	911
Emergency Directions to Medical Facility:	See Map. 911 address is 8102 Strawberry Lake Rd. Dexter, MI

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	6X8809
Electric Utility:	Detroit Edison 513449400011 Vendor Code 26183
Utility Phone:	800-477-4747
Telephone Company:	AT&T 73442600601876 Vendor Code 30251
TelCo Phone:	734-426-0060
Comments:	ATT REPAIR 800-727-2273; Paul Drevnick email - drevnick@umich.edu, phone - cell 508.274.0906; SNRE facility manager: Sucila Fernandes, email sucila@umich.edu, phone 734.764.9316

CASTNET Site Contact List

Site Number: **128** **(ARE128)** Site Name: **Arendtsville, PA** Updated: **10/29/2015**

Shelter Telephone: **717-677-9866**

Latitude:	39.9232	Longitude:	-77.3079
Magnetic Declination:		Elevation:	266 meters
USGS Quadrangle:	Arendtsville, PA	Site Deactivated:	
Site Installed:	6/28/1988	Polling ID Number:	
Calibration Group:	E1	Site Type:	Dry,Ozone,Met,Nadp
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Dr. James Schupp
PSU Fruit Research & Extension Center
P.O. Box 330
Biglerville, PA 17307-0330
Home: Work: 717-677-6116 Fax: 717-677-4112 e-mail:

Site Operator: Sharon Scamack
PSU Fruit Research and Extension
(home) 433 Plainview Road
Gettysburg, PA 17325
Home: 717-334-3091 Work: 717-677-6116 Fax: 717-677-4112 e-mail: sks8@psu.edu

Other:

Backup Site Operator: Kathy Wholaver
PSU Fruit Research and Extension
(home) 54 W. Hanover Street P.O. Box 636
Biglerville, PA 17307
Home: 717-677-7153 Work: 717-677-6116 Fax: 717-677-4112 e-mail: kaw37@psu.edu

Shipping Information

Federal Express: PSU Fruit Research & Extension Center
290 University Drive
Biglerville, PA 17307-0330

CASTNET Site Contact List

Directions to Site:	From Gettysburg, PA, take Hwy 34 to Biglerville. At the second red light take Hwy 234 (left) to Arendtsville. Bear to the left at stop sign 1 mile outside of Biglerville. In Arendtsville Hwy 234 comes to a T intersection. Turn left, then turn right at the very next street (Chambersburg St.) Continue on this street until you pass a guardrail on the right, look for the very next road on right and a sign that says Boyer Nursery & Orchard, Inc. Site is visible on the hill at right. Turn right on this winding road and go to barn on right. Turn right and follow gravel road through orchard to top of hill and site.
Hazards:	N/A
Emergency Contact:	Gettysburg Hospital; 717.334.2121
Emergency Phone:	911
Emergency Directions to Medical Facility:	From site go to white barn, turn left. Winding road approx .3 miles; there will be a stop sign, turn left onto Cashtown Road. Go .4 miles to stop sign (at Getty Mart), turn right, go two blocks to a stop sign, turn right onto Mummasburg Road. Go approx 5 miles toward Gettysburg. At the stop sign, turn left. Take Lincoln Avenue for 1 block, at stop sign, turn right onto Washington St., go approx 8 blocks to Gettysburg Hospital Emergency Entrance.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	X17247
Electric Utility:	528MET-ed acct #'s 100020814453 (528) and 100020814461 (128)
Utility Phone:	800-545-7741
Telephone Company:	Century Link 422889905 Vendor Code 27479
TelCo Phone:	800-786-6272
Comments:	Telephone repairs 800-786-6272. Phone company has address = Winding Road. Verizon Raven 770-530-5106,

CASTNET Site Contact List

Site Number: **135** **(ASH135)** Site Name: **Ashland, ME** Updated: **10/29/2015**

Shelter Telephone: **207-435-6482**

Latitude:	46.6038	Longitude:	-68.4132
Magnetic Declination:		Elevation:	231 meters
USGS Quadrangle:	Squa Pan, ME	Site Deactivated:	
Site Installed:	12/20/1988	Polling ID Number:	
Calibration Group:	E2	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Jodi L. Reese

53 Sheridan Road
Ashland, ME 04732
Home: 207-227-2027 Work: Fax: e-mail: jreese47905@gmail.com

Site Operator: Jodi Reese

P.O. Box 282, 53 Sheridan Road
Ashland, ME 04732
Home: 207-435-2070 Work: Fax: e-mail: jreese47905@gmail.com

Other: 207-227-2027 Cell

Backup Site Operator: Everett Reese, Heather Stokes

53 Sheridan Road
Ashland, ME 04732
Home: 207-435-2070 Work: Fax: e-mail: everettreese1966@gmail.com

Shipping Information

Federal Express: Jodi Reese
53 Sheridan Road
Ashland, ME 04732

CASTNET Site Contact List

Directions to Site:	From Presque Isle, ME take 163 to Ashland (approx 20 miles; go through town to T junction of Hwy 11 (Ashland 1 Stop in front of you) turn left (South), go 1.5 mi, go right on Goding Road, go straight for 1.0 miles to site (do not follow hard curve to left of road). Keyed.

Hazards:	N/A
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	From site go east on Goding Road for 1.0 mile, turn north on Rt. 11. At the flashing red light on the intersection of Rt. 11 and 163, turn east and go approx 1/2 mile, turn north on Walker Street, Aroostock Valley Medical Center is first turn on the right.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Maine Public Service 347286 Vendor Code 26868
Utility Phone:	877-655-4448
Telephone Company:	Verizon - Fairpoint 2074356482739 Vendor Code 25919
TelCo Phone:	207-435-6482
Comments:	Police: 207-435-6626; Ambulance, Fire Dept: 207-435-2200; Nearest Medical Facility Ashland, ME 207-435-6341; Presque Isle 207-768-4900. Telephone repairs 207-555-1515. Call 911 for Emergency. AT&T Raven 678-602-1522, I.P. [redacted] Heather's email brooklynnsma@yahoo.com, address P.O. Box 374, Ashland, ME 04732, phone 207-435-2906, physical address 131 Oak Street, Ashland, ME 04735. Alternate email for Pamela: folkarttree@gmail.com.

CASTNET Site Contact List

Site Number: **601** (**BAS601**) Site Name: **Basin, WY** Updated: **8/17/2015**

Shelter Telephone:

Latitude:	44.28	Longitude:	-108.0411
Magnetic Declination:		Elevation:	1242 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	11/6/2012	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Cassie Archuleta
Air Resource Specialists, Inc.
1901 Sharp Point Drive
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: carchuleta@air-resource.com

Site Operator: Jared Dalebout
Worland Field Office
101 S. 23rd Street
Worland, WY 82401
Home: 307-347-4687 Work: 307-347-5117 Fax: e-mail: jdalebou@blm.gov
Other:

Backup Site Operator: Jim Wolf
Worland Field Office
,
Home: Work: 307-347-5136 Fax: e-mail: jwolf@blm.gov

Shipping Information

Federal Express: Jared Dalebout
101 S. @3rd St.
Worland, WY 82401

CASTNET Site Contact List

Directions to Site:

Hazards:

Emergency Contact:

Emergency Phone:

Emergency
Directions to
Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments: Brian Bibeau, Technical Lead (1), Work # 970-484-7941, bbibeau@air-resource.com
Nick Dummer, Technical Lead (2), Work # 970-484-7941, ndummer@air-resource.com

CASTNET Site Contact List

Site Number: **401** (**BBE401**) Site Name: **Big Bend NP, TX** Updated: **8/12/2015**

Shelter Telephone: **432-477-2258**

Latitude:	29.3027	Longitude:	-103.1778
Magnetic Declination:		Elevation:	1052 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	7/18/1995	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Lydia Smith
Big Bend National Park
Science and Resource Management
Big Bend National Park, TX 79834
Home: Work: 432-477-1150 Fax: e-mail: lydia_smith@nps.gov

Other: See comment section

Backup Site Operator: Steve Wick, Jeff Bennett

,
Home: Work: Fax: e-mail: steven_wick@nps.gov

Shipping Information

Federal Express: Big Bend National Park
Science and Resource Management
Big Bend National Park, TX 79834

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Provided by NPS
TelCo Phone:	N/A

Comments: Jeffery Bennetts contact info: M, TH, F - 432.837.9964, T, W - 432-477-1141. Email: jeffery_bennett@nps.gov

CASTNET Site Contact List

Site Number: **116** **(BEL116)** Site Name: **Beltsville, MD** Updated: **6/29/2015**

Shelter Telephone: **301-474-3019**

Latitude:	39.0282	Longitude:	-76.8171
Magnetic Declination:	10 97	Elevation:	47 meters
USGS Quadrangle:	Laurel, MD	Site Deactivated:	
Site Installed:	11/1/1988	Polling ID Number:	
Calibration Group:	E1	Site Type:	Dry,Ozone,Met,Precursor
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Xinrong Ren
Dept. of Atmospheric & Oceanic Science
5830 University Research Court, RM4259
College Park, MD 20740
Home: 240-252-8378 Work: 301-683-1391 Fax: e-mail: xinrong.ren@noaa.gov

Site Operator: Allison Ring
University of Maryland
10203 Baltimore Ave, Apt. 6205
College Park, MD 20740
Home: Work: Fax: e-mail: aring@atmos.umd.edu

Other: Allison Cell: 908-875-1304

Backup Site Operator: Gina Mazzuca

10203 Baltimore Ave., Apt. 6205
College Park, MD 20740
Home: Work: 570-573-9925 Fax: e-mail: ginamazz1@gmail.com

Shipping Information

Federal Express: Allison Ring, University of Maryland
3417 CSS Building
College Park, MD 20742-2425

CASTNET Site Contact List

Directions to Site:	NOTE: ARRANGE FOR KEY from Washington, D.C. Take Baltimore/Washington Turnpike north to Powder Mill Road. Head east (toward the Museum). Pass entrance to NASA and take a right on Springfield Road. Approx. 0.7 miles you will come to a chainlink fence gate. Turn left through the gate and continue for about 3/4 of a mile and site will be visible on the right. The gate is usually open from 6 a.m. until 6:30 p.m. If gate is locked call BARC Security. Call same if you are at the site after hours and get locked inside gates. Emergency after hours 301-504-8000
Hazards:	N/A
Emergency Contact:	Doctors Community Hospital; 301.552.8118
Emergency Phone:	911
Emergency Directions to Medical Facility:	See map.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	BARC - We don't pay
Utility Phone:	301-504-6228
Telephone Company:	Verizon 00001591033244Y
TelCo Phone:	800-315-4477
Comments:	AT&T Raven IP Address [redacted] - #4047751363 Verizon #304.474.3019 is the land line in the shelter. BARC security: if gate locked: 301.504.8131; emergency/after hrs: 301.504.8000. Shipping address: 3417 CSS Building, Dept. of Atmospheric & Oceanic Science, University of Maryland, College Park, MD 20742.

CASTNET Site Contact List

Site Number: **142** **(BFT142)** Site Name: **Beaufort, NC** Updated: **6/29/2015**

Shelter Telephone: **252-728-1504**

Latitude:	34.8847	Longitude:	-76.6207
Magnetic Declination:		Elevation:	5 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	12/28/1993	Polling ID Number:	
Calibration Group:	SE4	Site Type:	Dry,Ozone,Met,Nadp
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Dr. Hans Paerl
UNC-IMS
3431 Arendell Street
Morehead City, NC 28557
Home: Work: 252-726-6841 Fax: 252-726-2426 e-mail: hpaerl@email.unc.edu

Site Operator: Nathan Hall
UNC-IMS
3431 Arendell Street
Morehead City, NC 28557
Home: 252-726-7353 Work: 252-726-6841 Fax: 252-726-2426 e-mail: nshall@email.unc.edu
Other: 252-808-5366 Cell

Backup Site Operator: Jeremy Braddy
UNC-IMS
3431 Arendell Street
Morehead City, NC 28557
Home: 252-342-2402 Work: 252-726-6841 Fax: e-mail: jbraddy@unc.edu

Shipping Information

Federal Express: Dr. Hans Pearl/Dave Whittle, UNC-IMS
3431 Arendell St.
Morehead City, NC 28557

CASTNET Site Contact List

Directions to Site:	From Durham/Raleigh, NC take I-40 East to exit 306 (Hwy 70). Take Hwy 70 East to Beaufort, continue through town. About 5 miles outside of town at the intersection of Carteret High School and 70 East, go straight through the light (Marrimon Road) and do not follow Hwy 70. After approx 6 miles you will come to the entrance of Open Grounds Farm on right. Check in with guard at gate and continue 1 mile to 1st dirt road on left. Take another left; site is visible in far corner of field.
Hazards:	Area subject to lightning strikes in summer
Emergency Contact:	Carteret General Hospital, 3500 Arendell St (Hwy 70)
Emergency Phone:	252-247-1616, 911
Emergency Directions to Medical Facility:	Hospital is in Morehead City. From site take dirt road to Merrimon Road, then Merrimon Road approx 7 miles to Hwy 70. Take Hwy 70 approx 10 more miles to Morehead City. (Hospital is approx 22 miles from site). Carteret General Hospital, 3500 Arendell Street (Hwy 70), Morehead City, NC 28557. Phone: 252.247.1616.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	E27-325
Electric Utility:	Carteret Craven Electric Coop 90148860-001 Vendor Code 28816
Utility Phone:	800-682-2217
Telephone Company:	Century Link 423003236 / Vendor Code 27943
TelCo Phone:	252-728-1504
Comments:	Verizon Raven 770.843.4106, I.P. [redacted] Jeremy Braddy's home phone is a cell phone 252.342.2402

CASTNET Site Contact List

Site Number: **603** (**BUF603**) Site Name: **Buffalo, WY** Updated: **6/29/2015**

Shelter Telephone:

Latitude:	44.1442	Longitude:	-106.1089
Magnetic Declination:		Elevation:	1324 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	11/6/2012	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Met
Equipment Type:		Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Cassie Archuleta
Air Resource Specialists, Inc.
1901 Sharp Point Drive
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: carchuleta@air-resource.com

Site Operator: Dominic Jandrain
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834
Home: 307-217-0755 Work: 307-684-1056 Fax: 307-684-1051 e-mail: Dominic_Jandrain@blm.gov
Other:

Backup Site Operator: David Croft
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834
Home: 307-684-1151 Work: 307-217-0760 Fax: e-mail: David_Croft@blm.gov

Shipping Information

Federal Express:

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CASTNET Site Contact List

Directions to Site:

Hazards:

Emergency Contact:

Emergency Phone:

Emergency
Directions to
Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments: Brian Bibeau, Technical Lead (1), Work # 970-484-7941, bbibeau@air-resource.com
Nick Dummer, Technical Lead (2), Work # 970-484-7941, ndummer@air-resource.com

CASTNET Site Contact List

Site Number: **130** **(BVL130)** Site Name: **Bondville, IL** Updated: **6/12/2015**

Shelter Telephone: **217-863-2602**

Latitude:	40.052	Longitude:	-88.3725
Magnetic Declination:	2 89	Elevation:	213 meters
USGS Quadrangle:	Bondville, IL	Site Deactivated:	
Site Installed:	2/9/1988	Polling ID Number:	
Calibration Group:	MW7	Site Type:	Dry,Ozone,Met,Precursor
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Dr. Christopher Lehmann
NADP; University of Illinois at Urbana-Champaign
2204 Griffith Dr.
Champaign, IL 61820
Home: Work: 217-265-8512 Fax: 217-333-0249 e-mail: clehmann@illinois.edu

Site Operator: Mike Snider
Illinois State Water Survey
2204 Griffith Drive
Champaign, IL 61820
Home: 217-863-2615 Work: 217-244-8716 Fax: 217-333-0249 e-mail: mcsnider@illinois.edu

Other: IL State Water Survey: 217-333-2210, Mike Cell #: 217-493-9780

Backup Site Operator: Wyatt Sherlock
University of Illinois; Agricultural Engineering

,
Home: Work: Fax: e-mail: wjsherl2@illinois.edu

Shipping Information

Federal Express: Illinois State Water Survey
2204 Griffith Drive, Dock A
Champaign, IL 61820

CASTNET Site Contact List

Directions to Site:	Take Hwy 10 West out of Champaign, IL to the town of Bondville. In the center of Bondville, 10 will intersect with Market Street. There will be a church on the right. Turn left onto Market Street. In 50 yards you will see some grain silos which will confirm you are on the correct road. Continue for approx 5 miles. You will be passing a large agricultural field. The site is on the right about 100 yards off the road. Snider pager is 217-265-3371 and cell is 217-493-9780
Hazards:	N/A
Emergency Contact:	Carle Hospital; 217.383.3311
Emergency Phone:	911
Emergency Directions to Medical Facility:	See map.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Illinois Power Co.
Utility Phone:	800-755-5000
Telephone Company:	Verizon
TelCo Phone:	800-483-5600
Comments:	(Joyce Changnon BEARS 217.333.0448 changnon@uiuc.edu AT&T Raven 678-906-8105, I.P.

CASTNET Site Contact List

Site Number: **139** **(BWR139)** Site Name: **Blackwater NWR, MD** Updated: **9/19/2014**

Shelter Telephone: **410-221-8624**

Latitude:	38.445	Longitude:	-76.1113
Magnetic Declination:		Elevation:	1 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	7/4/1995	Polling ID Number:	
Calibration Group:	E1	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Larry McGowen (Refuge Asst. Manager)
Blackwater Natl. Wildlife Refuge Office
2145 Key Wallace Drive
Cambridge, MD 21613
Home: Work: 410-228-2692 Fax: e-mail:

Site Operator: Bonnie Abey

6016 Shiloh Camp Road
Hurlock, MD 21643
Home: 410-943-8381 Work: Fax: e-mail: babey2@verizon.net

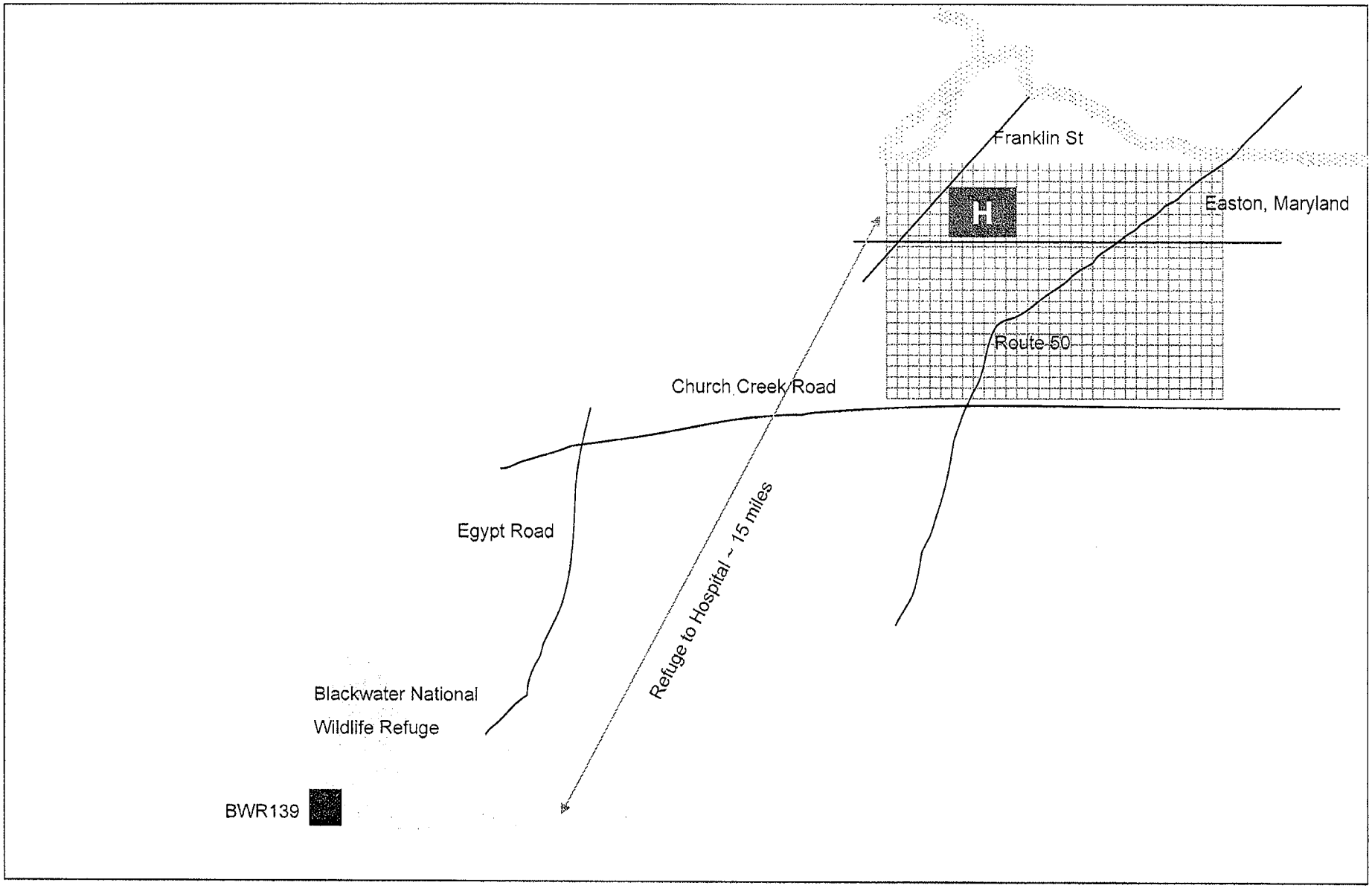
Other: 443-521-9161 Cell

Backup Site Operator: Aubrey Messick

5921 Creamery Road
East New Market, MD 21631
Home: 443-521-7335 Work: 443-521-7335 Fax: e-mail: messickaa@yahoo.com

Shipping Information

Federal Express: Blackwater NWR Office
2145 Key Wallace Drive
Cambridge, MD 21613



Nearest medical facility to Site BWR139, MD

Blackwater, MD

U.S. Environmental Protection Agency (EPA)

Clean Air Status and Trends Network (CASTNET)

CASTNET Site Contact List

Directions to Site:	Take Hwy 50 east to Cambridge, MD. Turn right on Woods Road, located at mile marker 81. There is a Hardees on the corner. (if you are on the correct road, you will pass the town water tower). Go approx 1 mile to a stop sign. Turn right onto SR 16 West. Go 1.7 miles and turn left on Egypt Road. There will be a white building marked D.D.U.-S.T. Store on the corner. Go 7.1 miles to stop sign at T intersection. Turn right (towards the visitors center). Go 0.8 mile to gated drive on left. The site will be visible from the gate.
Hazards:	Ticks, propane cannon
Emergency Contact:	Dorchester General Hospital, 300 Byrn St, Cambridge, MD
Emergency Phone:	410-228-5511, 911
Emergency Directions to Medical Facility:	Go back to route 50 and turn west toward Cambridge. Follow the blue hospital signs. SEE MAP.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Choptank 153602 Vendor Code 27310
Utility Phone:	877-892-0001
Telephone Company:	Verizon 00001115217860Y
TelCo Phone:	800-315-4477
Comments:	Verizon Raven 770.823.2612, I.P. [redacted]

CASTNET Site Contact List

Site Number: **150** **(CAD150)** Site Name: **Caddo Valley, AR** Updated: **6/29/2015**

Shelter Telephone: **870-246-0030**

Latitude:	34.1793	Longitude:	-93.0988
Magnetic Declination:		Elevation:	78 meters
USGS Quadrangle:	Caddo Valley, AR	Site Deactivated:	
Site Installed:	10/4/1988	Polling ID Number:	
Calibration Group:	SE5	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Dr. Joe Jeffers
Ouachita Baptist University Department of Chemistry
P.O. Box 3786
Arkadelphia, AR 71923
Home: 870-246-8909 Work: 870-245-5216 Fax: 870-245-5241 e-mail: jeffers@obu.edu

Site Operator: Harell Beckwith
Ouachita Baptist University
410 Ouachita OBU Box 3786
Arkadelphia, AR 71998-0001
Home: 870-245-5239 Work: 870-245-5239 Fax: 870-245-5241 e-mail: beckwithh@obu.edu
Other:

Backup Site Operator: Clark Kuyper
Ouachita Baptist University Department of Chemistry
410 Ouachita, OBU Box 3786
Arkadelphia, AR 71998-0001
Home: Work: 870-245-5080 Fax: e-mail: kuyperc@obu.edu

Shipping Information

Federal Express: Harrell Beckwith
410 Ouachita, OBU Box 3747
Arkadelphia, AR 71998-0001

CASTNET Site Contact List

Directions to Site:	Out of Little Rock, AK take I-30 West. Go approx 70 mi and take exit 78 marked Caddo Valley, Hwy 7. Turn north, make an immediate turn West on Hwy 390 (located next to I-30 East on ramp) follow for 0.9 mi to site.

Hazards:	N/A
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	From site 150 take Hwy 390 back to Caddo Valley. Get on I-30 West and go to Exit 73 (approx 4 mi). Turn left and go over Interstate then take the first left. Go to the first stop sign and you are there.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Entergy 8752982
Utility Phone:	800-368-3749
Telephone Company:	AT&T 87024600307660 Vendor Code 29105
TelCo Phone:	870-246-0030
Comments:	Police: 870.246.4545; Fire Dept: 870.246.8822; Ambulance, Nearest Medical Facility 870.245.1000 Baptist Medical Center of Arkadelphia. Tracy Lamb does mowing for the site. AT&T Raven 770-653-5014, I.P. [redacted]

CASTNET Site Contact List

Site Number: **407** **(CAN407)** Site Name: **Canyonlands NP, UT** Updated: **4/21/2015**

Shelter Telephone: **435-259-4141**

Latitude:	38.4583	Longitude:	-109.8213
Magnetic Declination:		Elevation:	1809 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	1/24/1995	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Clay Allred
Island in the Sky District, Canyonlands National Park
2282 SW Resource Blvd
Moab, UT 84532
Home: Work: 435-719-2143 Fax: 435-259-3038 e-mail: edwin_allred@nps.gov

Other: See comment section

Backup Site Operator: Lofton Wiley, Joe Carlson

,
Home: Work: 435-259-4712 Fax: e-mail: lofton_wiley@nps.gov

Shipping Information

Federal Express: Island in the Sky District, Canyonlands National Park
Utah 313
Moab, UT 84532

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Provided by NPS
TelCo Phone:	N/A

Comments: Joe Carlson is the administrative contact - email joe_carlson@nps.gov, phone - 435.259.4712 ext. 12

CASTNET Site Contact List

Site Number: **175** **(CAT175)** Site Name: **Claryville, NY** Updated: **7/21/2015**

Shelter Telephone: **TBD/In Process**

Latitude:	41.9423	Longitude:	-74.552
Magnetic Declination:		Elevation:	754 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	5/10/1994	Polling ID Number:	
Calibration Group:	E2	Site Type:	Dry,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Ms. Florence Cucchi
Landowner
47 Southern Way
Princeton, NJ 08540
Home: 609-921-7852 Work: Fax: e-mail: fcucchiemail.com

Site Operator: Anthony Kordziel

2000 Frost Valley Road, Natural Resources & Environment
Claryville, NY 12725
Home: 845-985-2291 Work: Fax: e-mail: akordziel@frostvalley.org

Other:

Backup Site Operator: William Vitagliano
STI

,
Home: Work: 845-985-2291 Fax: e-mail: wvitagliano@frostvalley.org

Shipping Information

Federal Express:

2000 Frost Valley Road
Claryville, NY 12725

CASTNET Site Contact List

Directions to Site:	From Newburgh, NY take 84 West to 17 West. Take 17 West to Exit 100 in Liberty (Route 52). At stop sign, go left to 52 about 1/4 mile to light. Turn left onto West 52. From light, go about 0.9 mi into Liberty until the junction at 55 East. Turn on 55 East toward Grahamsville. Turn left onto County Road 19 to Claryville. Stay on 19 through Claryville. Take an immediate left just over the 10 TON steel bridge at the edge of town. Follow the semi-paved road about 0.7 mi to fork. Take right fork. The first house on left (red) is the property where the site is. Follow mud road along the right side of the house about 3/4 mi.
Hazards:	Recreational hunting during season
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	Leave site on Wildcat Mountain Road. Turn right onto Route 19. Follow 19 until you come to the intersection of 19 & 55. Turn right and proceed to Liberty. At the intersection of 55 & 52 you will see the signs for Community General Hospital. Follow signs to hospital entrance.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Solar
Utility Phone:	N/A
Telephone Company:	
TelCo Phone:	
Comments:	Police: 845.292.6600; Fire/Ambulance 845.292.4121; Medical Facility, Community General Hospital, Harris (Liberty), NY: 845.794.3300.

CASTNET Site Contact List

Site Number: **119** **(CDR119)** Site Name: **Cedar Creek, WV** Updated: **6/29/2015**

Shelter Telephone: **304-462-5375**

Latitude:	38.8795	Longitude:	-80.8477
Magnetic Declination:		Elevation:	240 meters
USGS Quadrangle:	Glenville, WV	Site Deactivated:	
Site Installed:	11/10/1987	Polling ID Number:	
Calibration Group:	E3	Site Type:	Dry,Ozone,Met,Nadp
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Heidi Lindsay
STI
310 Cedar Creek Rd.
Glenville, WV 26351
Home: 304-462-4368 Work: 304-462-8020 Fax: 304-462-4064 e-mail: heidilindsay1@gmail.com

Site Operator: Heidi Lindsay

310 Cedar Creek Road
Glenville, WV 26351
Home: 304-462-4368 Work: 304-462-8020 Fax: e-mail: heidilindsay1@gmail.com

Other:

Backup Site Operator:

,
Home: Work: Fax: e-mail:

Shipping Information

Federal Express: 310 Cedar Creek Rd.

Glenville, WV 26351

CASTNET Site Contact List

Directions to Site:	From Charleston, WV take I79 North to Exit 79, Route 5. Go West on Route 5 to Glenville, WV. Take a left (South) on Hwy 33/119 at T intersection. Proceed through Glenville, straight through the light and 3.5 miles to Cedar Creek State Park Sign (on right). Turn left on #17, Cedar Creek Road. Proceed 4.4 miles to Park entrance. Do not enter park, go around to the left on main road. Site is 1/2 mile from the Park entrance, on right, and visible from road.
Hazards:	If wet or snowing, 4x4 needed to get to site
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	Take Cedar Creek Rd. to park entrance, take 33/119 Northeast to Glenville, go right on Mineral Road to Gilmer County Health Center.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	293960
Electric Utility:	Allegheny Power 37210640081751
Utility Phone:	800-255-3443
Telephone Company:	Verizon 00001481643797Y
TelCo Phone:	800-837-4966
Comments:	ark Address: RT1, Box 9, Glenville, WV 26351; Police, Fire, Ambulance: 304. 462.7306; Gilmer County Health Center 304.462.7351; Stonewall Jackson Memorial Hospital 304.269.8073 Repair services: Jerry Edwards, 19 Edwards LN., Copen, WV 26615. 1-304.853.2205 (t), 1-304.462.8826 (Bldg. Supply). Site operator address can be used as alternate FedEx address (parents address) 911 address: 4582 Cedar Creek Road, Glenville, WV 26351

CASTNET Site Contact List

Site Number: **171** **(CDZ171)** Site Name: **Cadiz, KY** Updated: **4/27/2015**

Shelter Telephone: **270-522-9373**

Latitude:	36.7841	Longitude:	-87.8502
Magnetic Declination:		Elevation:	190 meters
USGS Quadrangle:	7.5 min. Topo Cadiz, KY	Site Deactivated:	
Site Installed:	1/5/1999	Polling ID Number:	
Calibration Group:	MW6	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: David Chesnut
(Betty Thomas, Landowner) PO Box 729, Cadiz, KY 42211-6521
91 Dewpoint LN
Cadiz, KY 42211
Home: 270-522-3895 Work: 270-522-8002 Fax: 2nd e-mail:

Site Operator: Mike Bridges

1325 Old Dover Road
Cadiz, KY 42211
Home: 270-350-1260 Work: Fax: e-mail: mike@gophm.com

Other: Direct: 270-522-6819; Emergency: 270-522-8002; Mobile: 270-350-1260

Backup Site Operator: David Chestnut

91 Dewpoint LN
Cadiz, KY 42211
Home: 270-522-3695 Work: Fax: 270-522-0614 e-mail: david@gophm.com

Shipping Information

Federal Express: Pennyrile Home Medical (UPS)
307 E. Main Street
Cadiz, KY 42211

CASTNET Site Contact List

Directions to Site:	From Hopskinville, KY take 68 West to Cadiz, KY. At the edge of Cadiz, pick up Alt. 68 West and take it through town. Cross the river. Take a left at the top of the hill (at the caution light), onto 1175 South. Go 4.75 miles and turn right on a gravel drive. The drive is just past D. Thomas Road which is on the left. Follow the drive to the end (approx 250 yds), it dead ends at the site compound. The site operators home is just north of the site on D. Thomas Road.
Hazards:	Recreational hunting during season
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	Out of shelter driveway, turn left on Old Dover Highway (Hwy 1175). Proceed 4.7 miles. Take US 68 left. Proceed 1.5 miles to Trigg Co. Hospital, located on east side of US 68.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Pennyrile Rural Electric 27926601
Utility Phone:	800-297-4710
Telephone Company:	AT&T 27052293731650489 Vendor Code 28975
TelCo Phone:	270-522-9373
Comments:	Police/Fire: (270) 522-8888; Ambulance/Medical (270) 522-3215, Trigg County Hospital, Hwy 68, E. Main Street, Cadiz, KY 42211. Verizon Raven 678-372-1546, I.P. [redacted] Contact # for ATT repairs - 800.247.2020, pin # 2143

CASTNET Site Contact List

Site Number: **171** **(CDZ171)** Site Name: **Cadiz, KY** Updated: **4/27/2015**

Shelter Telephone: **270-522-9373**

Latitude:	36.7841	Longitude:	-87.8502
Magnetic Declination:		Elevation:	190 meters
USGS Quadrangle:	7.5 min. Topo Cadiz, KY	Site Deactivated:	11/28/1995
Site Installed:	9/28/1993	Polling ID Number:	
Calibration Group:	MW6	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: David Chesnut
(Betty Thomas, Landowner) PO Box 729, Cadiz, KY 42211-6521
91 Dewpoint LN
Cadiz, KY 42211
Home: 270-522-3895 Work: 270-522-8002 Fax: 2nd e-mail:

Site Operator: Mike Bridges

1325 Old Dover Road
Cadiz, KY 42211
Home: 270-350-1260 Work: Fax: e-mail: mike@gophm.com

Other: Direct: 270-522-6819; Emergency: 270-522-8002; Mobile: 270-350-1260

Backup Site Operator: David Chestnut

91 Dewpoint LN
Cadiz, KY 42211
Home: 270-522-3695 Work: Fax: 270-522-0614 e-mail: david@gophm.com

Shipping Information

Federal Express: Pennyrile Home Medical (UPS)
307 E. Main Street
Cadiz, KY 42211

CASTNET Site Contact List

Directions to Site:	From Hopskinville, KY take 68 West to Cadiz, KY. At the edge of Cadiz, pick up Alt. 68 West and take it through town. Cross the river. Take a left at the top of the hill (at the caution light), onto 1175 South. Go 4.75 miles and turn right on a gravel drive. The drive is just past D. Thomas Road which is on the left. Follow the drive to the end (approx 250 yds), it dead ends at the site compound. The site operators home is just north of the site on D. Thomas Road.
Hazards:	Recreational hunting during season
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	Out of shelter driveway, turn left on Old Dover Highway (Hwy 1175). Proceed 4.7 miles. Take US 68 left. Proceed 1.5 miles to Trigg Co. Hospital, located on east side of US 68.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Pennyrile Rural Electric 27926601
Utility Phone:	800-297-4710
Telephone Company:	AT&T 27052293731650489 Vendor Code 28975
TelCo Phone:	270-522-9373
Comments:	Police/Fire: (270) 522-8888; Ambulance/Medical (270) 522-3215, Trigg County Hospital, Hwy 68, E. Main Street, Cadiz, KY 42211. Verizon Raven 678-372-1546, I.P. [redacted] Contact # for ATT repairs - 800.247.2020, pin # 2143

CASTNET Site Contact List

Site Number: **467** **(CHA467)** Site Name: **Chiricahua NM, AZ** Updated: **10/7/2015**

Shelter Telephone: **520-824-3660**

Latitude:	32.0094	Longitude:	-109.3891
Magnetic Declination:		Elevation:	1570 meters
USGS Quadrangle:	Bowie Mountain South, AZ	Site Deactivated:	
Site Installed:	4/25/1989	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met,Nadp
Equipment Type:		Time Zone:	Mountain time zone, No Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Tina Thompson
Chiricahua National Monument, Div Chief for Resources Mgmt
13063 E. Bonita Canyon Road
Willcox, AZ 85643
Home: 520-824-3625 Work: 520-824-3560 Fax: 520-824-3421 e-mail: eatbeef2night@yahoo.com
Other: See comment section

Backup Site Operator: Amanda Selnick

,
Home: Work: 520-824-3560 Fax: e-mail: amanda_selnick@nps.gov

Shipping Information

Federal Express: Chiracahua Nat. Monument
9500 S. Highway 186
Willcox, AZ 85643

CASTNET Site Contact List

Directions to Site:	From Tucson, AZ; take I-10 to Exit 344 (Willcox, AZ). Take any street to downtown Willcox and pick up Hwy 186. Continue on 186 for approx. 28 to 30 miles (rough road). Chiricahua National Monument sign for left turn. (Also where Hwy 181 and 186 meet). Turn left and follow road to the Park entrance and fee booth. Stop about 50 yards before the booth, next to high voltage metal boxes on left. Remove large log from fence on left and follow road to site.
Hazards:	Sandspurs, other sticky plants, huggie bushes
Emergency Contact:	Willcox Hospital
Emergency Phone:	911
Emergency Directions to Medical Facility:	From site 467 take 186 to Willcox (approx 28 miles). Hospital is located on Rex Allen Drive.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	744684
Electric Utility:	Sulfur Springs Valley Electric Coop
Utility Phone:	602-384-2221
Telephone Company:	Valley Telephone Coop.
TelCo Phone:	602-384-2231
Comments:	Wear protective clothing and shoes. Site has sandspurs, other sticky plants and huggie bushes.

CASTNET Site Contact List

Site Number: **185** **(CHE185)** Site Name: **Cherokee Nation, OK** Updated: **6/29/2015**

Shelter Telephone: **918-696-5604**

Latitude:	35.7508	Longitude:	-94.6698
Magnetic Declination:	2 15	Elevation:	305 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	4/2/2002	Polling ID Number:	
Calibration Group:	W9	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: April Hathcoat
Cherokee Nation, Environmental Programs
208 East Allen Rd.
Tahlequah, OK 74464
Home: 918-453-5098 Work: 918-453-5093 Fax: 918-458-5499 e-mail: april-hathcoat@cherokee.org

Site Operator: Jacque Adam
Cherokee Nation, Environmental Programs
208 East Allen Road
Tahlequah, OK 74464
Home: 918-696-9726 Work: 918-207-3876 Fax: 918-458-5499 e-mail: jacque-adam@cherokee.org

Other: Jacque Cell # 918-207-5284, April Hathcoat 918-453-5098

Backup Site Operator: April Hathcoat, Dani Keese, Larry Scrapper
Dani Keese 918-453-5086

Larry Scrapper 919-453-5092,
Home: Work: Fax: 918-458-5499 e-mail: april-hathcoat@cherokee.org

Shipping Information

Federal Express: April Hathcoat; Cherokee Nation, Environmental Programs
208 East Allen Rd.
Tahlequah, OK 74464

CASTNET Site Contact List

Directions to Site: From Stilwell, OK go south on route 59 for about 5 miles. Turn right at the sign for Dahlonegah School. The road is not named. There will also be the second sign for Cherrytree Baptist church. Continue about two miles bearing left. The elementary school will be on the left. The site is across the street on the far side of the athletic field. You may need to obtain a key for the gate at the school office.

Hazards: Road to site is muddy during rainy season

Emergency Contact: Ryan Callison or Jaque Adam

Emergency Phone: at their homes

Emergency Directions to Medical Facility: From the site go east on the road in front of the school. At the stop sign at the junction of route 59, turn left (north) and go about five miles into Stilwel. Turn left (west) at the intersection of route 100. The hospital is less than one mile on the right.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments: password datalogger C4

CASTNET Site Contact List

Site Number: **136** **(CKT136)** Site Name: **Crockett, KY** Updated: **6/17/2015**

Shelter Telephone: **606-522-3560**

Latitude:	37.9215	Longitude:	-83.0663
Magnetic Declination:		Elevation:	376 meters
USGS Quadrangle:	Dingus, KY	Site Deactivated:	
Site Installed:	8/24/1993	Polling ID Number:	
Calibration Group:	MW6	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Emogene Ferguson
Landowner
Rt. 1, Box 277-C
Hazel Green, KY 41332
Home: 606-662-4068 Work: Fax: e-mail:

Site Operator: Linnie Montgomery

554 Bill Smith Road
Hazel Green, KY 41332
Home: 606-662-9540 Work: Fax: e-mail: linnie@mrtc.com

Other: 606-359-4470 Cell

Backup Site Operator: Carolyn Montgomery

7687 Hwy 437
West Liberty, KY 41472
Home: 606-522-4318 Work: Fax: e-mail:

Shipping Information

Federal Express: 7687 Hwy 437

West Liberty, KY 41472

CASTNET Site Contact List

Directions to Site:	From Huntington, WV take I-64 west, approximately 2 miles, to exit 191 in Kentucky. Then take route 23 south to Paintsville, approx 55 miles. At the first traffic light in Paintsville (junction of 23 and 460/40) turn right, go for about 1/2 mile and then take Route 40 to the right. Follow route 40 for about 1-1/2 miles and then turn right onto Route 172. Stay on Route 172 for about 15 miles. Just past Paintsville Lake, turn left onto Route 437. Stay on Route 437 for 4 miles. Old (closed) Grocery will be on the left. After old Grocery take the first dirt road to the right (about 0.1 mi.) Stay right past the barn (about 0.3 mi) then take the first left. Site is at the top of the hill.
Hazards:	Recreational hunting
Emergency Contact:	see comments
Emergency Phone:	911
Emergency Directions to Medical Facility:	Leave the site and turn right onto 437. Take 437 to I-72 and turn left. Take I-72 to 460 and turn right. Go through the city of W. Liberty to Morgan County Appalachian Regional Hospital. The hospital is on the right.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Licking Valley RECC 1105600501 Vendor Code 26198
Utility Phone:	800-596-6530
Telephone Company:	Mountain Rural Telephone 24900
TelCo Phone:	606-743-3121
Comments:	Nearest Medical Facility 606.743.3186; Morgan County Appalachian Hospital, Wells Hill Road, West Liberty, KY 41472. Possible Service provider - Brown Mechanical Inc. Ron Brown 606-683-2264 voice 606.683.2357 fax and 606-462-0592 cell Added 10-2-07 Verizon Raven 770.315.6074, I.P. [redacted]

CASTNET Site Contact List

Site Number: **125** **(CND125)** Site Name: **Candor, NC** Updated: **9/19/2014**

Shelter Telephone: **910-572-4580**

Latitude:	35.2633	Longitude:	-79.8375
Magnetic Declination:		Elevation:	172 meters
USGS Quadrangle:	Biscoe, NC	Site Deactivated:	
Site Installed:	9/25/1990	Polling ID Number:	
Calibration Group:	SE4	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Hazel Perry (Land Owner)

136 Perry Drive
Candor, NC 27229
Home: 910-572-1423 Work: Fax: e-mail:

Site Operator: Hazel Perry

136 Perry Drive
Candor, NC 27229
Home: 910-572-1423 Work: Fax: e-mail: use BSO's email

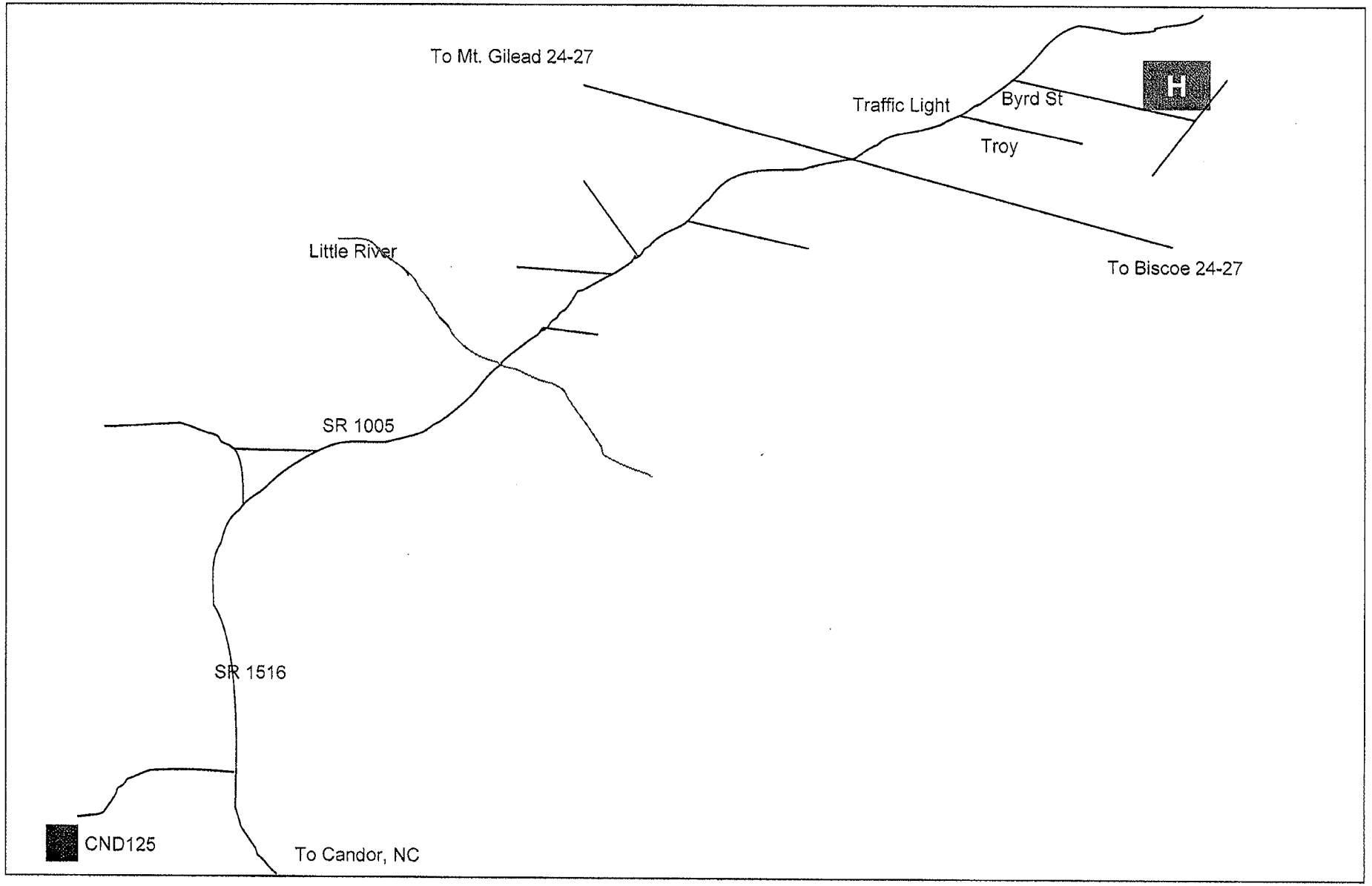
Other:

Backup Site Operator: Patricia Perry, Michelle Richardson
Hazel Perry's daughter in law, grandaughter
136 Perry Drive
Candor, NC 27229
Home: 910-572-1423 Work: 910-572-3784 Fax: e-mail: nanny9perry@yahoo.com

Shipping Information

Federal Express: 136 Perry Drive

Candor, NC 27229



Nearest medical facility to Site CND125, NC

Candor, North Carolina

U.S. Environmental Protection Agency (EPA)

Clean Air Status and Trends Network (CASTNET)

CASTNET Site Contact List

Directions to Site:	From Greensboro take Highway 220 South toward Candor. Exit at 211 and head west into Candor. Take a left onto Alt 220 South. 731 West begins almost immediately and the road bears both names. Follow for 1.3 miles until the routes split. Take 731 West which veers right. Take an immediate right on McCallum Road (it has a sign for E-KU-SUMEE at this junction). Go 5.4 miles to Perry Drive, which goes left only. There are approximately six mailboxes at the end of the road. Follow the drive approximately 3/4 mile to end. Site is behind the house.
Hazards:	Recreational hunting Oct-Dec.
Emergency Contact:	First Health of The Carolinas; 910.576.0606
Emergency Phone:	911
Emergency Directions to Medical Facility:	See map. 911 site address is 136 Perry Drive, per emergency coord.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Pee Dee Electric 606394901
Utility Phone:	800-992-1626
Telephone Company:	Century Link 422936185 Vendor Code 27384
TelCo Phone:	
Comments:	Utility Rockingham Office is 800.228.7322 Cell ph #: 910.220.1549 for Patricia Perry Email: nanny9perry@yahoo.com Additional backup Michelle Richardson, 5279 Woodrun Tillery, MT. Gilead, NC27306. Phone 910.975.4244.

CASTNET Site Contact List

Site Number: **169** **(CNT169)** Site Name: **Centennial, WY** Updated: **1/20/2015**

Shelter Telephone: **307-742-7229**

Latitude:	41.3645	Longitude:	-106.24
Magnetic Declination:		Elevation:	3175 meters
USGS Quadrangle:	Centennial, WY	Site Deactivated:	
Site Installed:	5/9/1989	Polling ID Number:	
Calibration Group:	W10	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Kathleen Dwire
Rocky Mountain Forest & Range Exp. Station
240 West Prospect Road
Fort Collins, CO 80526
Home: Work: 970-498-1016 Fax: e-mail: kadwire@fs.fed.us

Site Operator: John Korfmacher
USFS RMRS 240
240 West Prospect Road
Ft. Collins, CO 80526
Home: Work: 970-498-1052 Fax: e-mail: jkorfmacher@fs.fed.us
Other: 970-420-9890 Cell

Backup Site Operator: John Frank
USFS RMRS 240
240 West Prospect Road
Ft. Collins, CO 80526
Home: 970-407-0759 Work: 970-498-1319 Fax: 956-735-1782 e-mail: jfrank@fs.fed.us

Shipping Information

Federal Express: John Korfmacher
USFS RMRS, 240 West Prospect Road
Ft. Collins, CO 80526

CASTNET Site Contact List

Directions to Site:	From Laramie, WY get on Hwy 130/230 at I-80 exit. Head south for 1/2 mile, take 130 to Centennial, WY (28 miles). Continue through Centennial, up hill and past the information center, continue for a total of about 6 miles, until you see the Mt. Meadows Cabins sign. A sign with Nash Fork will also be seen. Turn right (Rt. 317), continue straight through the intersection and bear to the right at the Y intersection. Brooklyn Lake will be on your left and a Mountain Chapel on the right. Park at the Chapel and go uphill to the left of the chapel to the site. ***Also ask Field Site Operator for site conditions prior to visit. May need snow shoes and or the FSO may have a Snow Cat to help get you to the site. Or road to site may be closed.
Hazards:	N/A
Emergency Contact:	Ivinson Memorial Hospital, 255 N. 30 St., Laramie , WY
Emergency Phone:	307-742-2141
Emergency Directions to Medical Facility:	From the site go back through the town of Centennial to Highway 130. Go to Laramie and take I-80 east to 287 Exit. Take 287 north to 30. Go east on 30 to 30th St. Follow Blue Hospital signs.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Carbon Power and Light 7153000 Vendor Code 26306
Utility Phone:	307-326-5206
Telephone Company:	Century Link 3077427229(810B) Vendor Code 28157
TelCo Phone:	307-742-7229
Comments:	Site Address: 96 Brooklyn Lake Road AT&T Raven 770.331.3084, I.P. [redacted]

CASTNET Site Contact List

Site Number: **005** **(COW005)** Site Name: **Coweeta Screwdriver Knob, NC** Updated: **6/29/2015**

Shelter Telephone:

Latitude:	35.0469	Longitude:	-83.4531
Magnetic Declination:		Elevation:	960 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	11/18/2014	Polling ID Number:	
Calibration Group:	SE4	Site Type:	Dry,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Chelsea Minniat
Southern Research Station Coweeta Hydrologic Lab
3160 Coweeta Lab Road
Otto, NC 28763
Home: Work: 828-524-2128 Fax: e-mail:

Site Operator: Charles Marshall
Southern Research Station Coweeta Hydrologic Lab
3160 Coweeta Lab Road
Otto, NC 28763
Home: Work: 828-524-2128 Fax: 828-369-6768 e-mail: cmarshall01@fs.fed/us

Other:

Backup Site Operator:

,
Home: Work: Fax: e-mail:

Shipping Information

Federal Express: Charles Marshall
3160 Coweeta Lab Road
Otto, NC 28763

CASTNET Site Contact List

Directions to Site: Leave Atlanta on I-85. Exit the interstate on US-23 to Gainesville, GA. Stay on US-23 to the GA-NC border, it will become US23/441 about halfway there. Drive through Dillard, GA, cross the NC state line, then about 3.8 miles into NC turn left at the brown and white Coweeta Hydrologic Lab sign. Follow the signs to the experiment station; it is about 3 miles from the highway.

Hazards:

Emergency Contact: Angel Community Hospital; 828.369.4211

Emergency Phone: 911

Emergency Directions to Medical Facility: From Coweeta Lab go 3 miles to US 441 North, go approximately 11 miles into downtown Franklin, NC. Turn right on Palmer St. Go 1 mile and turn left on Riverview St., go 1/4 mile, hospital is on the left.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility: Dule Energy 1342677064 Vendor Code 27454

Utility Phone: 800-653-5307

Telephone Company: Verizon

TelCo Phone:

Comments: Alternate phone company phone 800.483.5300
Verizon Raven 770-820-9881, I.P. [redacted]

CASTNET Site Contact List

Site Number: **137** **(COW137)** Site Name: **Coweeta, NC** Updated: **8/6/2015**

Shelter Telephone: **828-369-7919**

Latitude:	35.0605	Longitude:	-83.4303
Magnetic Declination:	5 81	Elevation:	683 meters
USGS Quadrangle:	Prentiss, NC	Site Deactivated:	
Site Installed:	11/4/1987	Polling ID Number:	
Calibration Group:	SE4	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Chelsea Minniat
Southern Research Station Coweeta Hydrologic Lab
3160 Coweeta Lab Road
Otto, NC 28763
Home: Work: 828-524-2128 Fax: e-mail:

Site Operator: Charles Marshall
Southern Research Station Coweeta Hydrologic Lab
3160 Coweeta Lab Road
Otto, NC 28763
Home: Work: 828-524-2128 Fax: 828-369-6768 e-mail: cmarshall01@fs.fed.us
Other:

Backup Site Operator: Patsy Clinton
3160 Coweeta Lab Road
Otto, NC 28763
Home: Work: Fax: e-mail:

Shipping Information

Federal Express: Southern Research Station, Charles Marshall
3160 Coweeta Lab Road
Otto, NC 28763

CASTNET Site Contact List

Directions to Site:	Leave Atlanta on I-85. Exit the interstate on US-23 to Gainesville, GA. Stay on US-23 to the GA-NC border, it will become US23/441 about halfway there. Drive through Dillard, GA, cross the NC state line, then about 3.8 miles into NC turn left at the brown & white Coweeta Hydrologic Lab sign. Follow the signs to the experiment station; it is about 3 miles from the highway.

Hazards:	Lightning strikes, rec hunting year round, rattlers & copperheads
Emergency Contact:	Angel Community Hospital; 828.369.4211
Emergency Phone:	911
Emergency Directions to Medical Facility:	From Coweeta Lab go 3 miles to US 441 north, go approx 11 miles into downtown Franklin, NC. Turn right on Palmer St. Go 1 mile and turn left on Riverview Street, go 1/4 mile, hospital is on left.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Duke Energy 1342677064 Vendor Code 27454
Utility Phone:	800-653-5307
Telephone Company:	Verizon
TelCo Phone:	800-483-6000
Comments:	Alternate phone company phone (800) 483-5300. Verizon Raven 770-820-9884, I.P. [redacted]

CASTNET Site Contact List

Site Number: **110** **(CTH110)** Site Name: **Connecticut Hill, NY** Updated: **6/29/2015**

Shelter Telephone: **607-564-7622**

Latitude:	42.4009	Longitude:	-76.6535
Magnetic Declination:		Elevation:	511 meters
USGS Quadrangle:	Mecklenberg, NY	Site Deactivated:	
Site Installed:	9/29/1987	Polling ID Number:	
Calibration Group:	E1	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Dr. Gene E. Likens
Cary Institute for Ecosystem Studies
2801 Sharon Turnpike, Box AB
Millbrook, NY 12545
Home: 845-266-8845 Work: 845-677-5343 Fax: 845-677-5976 e-mail: likensg@caryinstitute.org

Site Operator: Thomas J. Butler
Ecology & Evolutionary Biology, Cornell University
211 Rice Hall
Ithaca, NY 14853
Home: 607-533-4048 Work: 607-255-3580 Fax: 607-255-0238 e-mail: tjb2@cornell.edu

Other: 607-351-9926 Cell

Backup Site Operator: Dave Hubbel
607-592-9239 Cell
23 south Van Dorn Road
Ithica, NY 14850
Home: 607-277-4177 Work: 607-273-4646 Fax: 607-273-4692 e-mail:

Shipping Information

Federal Express: 211 Rice Hall
Cornell University
Ithaca, NY 14853

CASTNET Site Contact List

Directions to Site:	From Ithaca, NY take Route 13 South (locally called Elmira Road). Outside of town, Hwy 327 will veer off to the right. Take 327. There is a sign for Robert Treman State Park at this intersection. Follow 327 past both the lower and upper park entrances. Take the 2nd left past the upper park entrance, which is Trumbell Corners Road. Follow this road approximately one mile until you come to a T. Go right at the T on Connecticut Hill Road. Follow that road for approximately 1/4 mi and it will make a 90 degree turn to the right. The site drive is the next drive on the left. The site is located back and up the hill, so you have to look over your shoulder to see it from the road. If you come to a pond with a red house across the street, you have gone too far.
Hazards:	N/A
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	From site, take Trumbull Road to Rt. 327, take a left on 327, it will turn into Halseyville Road, take Halseyville Rd to Hoyt Rd, go right on Hoyt road to Cayuga Medical Center.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	NYSEG 1001-3741-219
Utility Phone:	800-572-1111
Telephone Company:	Verizon 6075647622607252
TelCo Phone:	800-890-6886
Comments:	Police 607.272.3245; State Police 607.273.4671; County Sheriff 607.272.2444; Fire Department 607.273.8000; Ambulance 607.273.8000; Nearest Medical Facility, Tompkins Community Hospital 607.274.4011. (likensg@ecostudies.org)(tjb2@cornell.edu) Verizon Raven 770-362-0803, IP [redacted]

CASTNET Site Contact List

Site Number: **151** **(CVL151)** Site Name: **Coffeeville, MS** Updated: **9/19/2014**

Shelter Telephone: **662-623-7334**

Latitude:	34.0027	Longitude:	-89.7992
Magnetic Declination:		Elevation:	138 meters
USGS Quadrangle:	Coker Lake, MS	Site Deactivated:	
Site Installed:	12/27/1988	Polling ID Number:	
Calibration Group:	SE5	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Jamie L. Whitten Plant Materials Center
USDA NRCS
2533 County Road 65
Coffeeville,, MS 38922-2652
Home: Work: 662-675-2588 Fax: 662-675-2369 e-mail:

Site Operator: Gail P. Thompson

1632 CR 92
Walter Valley, MS 38965
Home: 662-473-3576 Work: 662-701-8228 Fax: e-mail: delightinme@live.com
Other:

Backup Site Operator: Leonard Brown

1632 CR 92
Water Valley, MS 38965
Home: 662-473-3576 Work: 662-701-8283 Fax: e-mail:

Shipping Information

Federal Express: 1632 CR 92

Walter Valley, MS 38965

CASTNET Site Contact List

Directions to Site:	Take I-55 North out of Grenada, MS. Just out of town, take exit 220 for Hwy 330. Go east 5.1 mi, on the left you will see a USDA sign for Yalobusha Work Center (Forest Service) and Jamie L. Whitter Plant Materials Center (Soil Conservation Service). Enter the complex, proceed just past the wood fence and turn left on Forestry Road 802. Follow it 1.5 mi, turn left at Forestry Road 809 an drive 0.3 mi. Site is visible to the left.
Hazards:	Recreational hunting late November through January
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	From site 151 go to Hwy 330 go East (Hwy 330 will become Depot Street at the corporate limits) to Coffeeville. Turn North on Okahoma Street, turn right on (Main Street), Coffeeville Medical Clinic is on right (14430 Main Street) Between Methodist Church and Courthouse.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Tallahatchie Valley 2137001
Utility Phone:	662-563-4742
Telephone Company:	AT&T 66262373342300594 Vendor Code 29009
TelCo Phone:	662-623-7334
Comments:	Police: 662.675.2411; Fire Dept: 662.675.2642; Ambulance: 662.675.2288; Nearest Medical Facility is Coffeeville Medical Clinic 662.675.2500; Yalobusha county Sheriff: 662.675.2444 / 662.473.2722; Emergency 911 is also available. The work phone # for Gail is a cell phone. Verizon Raven 770.362.5998, I.P. [redacted] Leonard Brown email: leonardbrown1632@yahoo.com

CASTNET Site Contact List

Site Number: **114** **(DCP114)** Site Name: **Deer Creek, OH** Updated: **6/29/2015**

Shelter Telephone: **740-869-4722**

Latitude:	39.6359	Longitude:	-83.2606
Magnetic Declination:		Elevation:	264 meters
USGS Quadrangle:	Mount Sterling, OH	Site Deactivated:	
Site Installed:	9/28/1988	Polling ID Number:	
Calibration Group:	MW7	Site Type:	Dry,Ozone,Met,Nadp
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Zach Woodrow
Manager Deer Creek State Park Office
20635 State Park Rd 20
Mt. Sterling, OH 43143
Home: 740-513-5613 Work: 740-869-3124 Fax: e-mail: zachary.woodrow@dnr.state.oh.

Site Operator: Sally Hammond

25375 Plummer Road
Williamsport, OH 43164
Home: 740-207-7082 Work: Fax: 775-860-7684 e-mail: hammondtrucks@yahoo.com

Other: 740-207-7082 Cell

Backup Site Operator:

,
Home: Work: Fax: e-mail:

Shipping Information

Federal Express: 25375 Plummer Road

Williamsport, OH 43164

CASTNET Site Contact List

Directions to Site:	Take South I-71 out of Columbus, OH. Go approx 22 mi. Take exit 84, the Mount Sterling exit, Hwy 56. Go east to Mount Sterling. Go right at 2nd light (Hwy 207). After 2/10 mi SR 207 bears left, continue on 207 (IGA on left) 3.8 miles to 1st crossroads (Yankeetown Pike), which has a Deer Creek Wildlife Area sign, and go left. Then take the 3rd right at park entrance. Go 1.1 mi and take a right (which is 1st right after golf course entrance, marked NR28). Go 0.5 mile and take left just before barricade. Site is 100 feet down road to left.
Hazards:	Natural gas sub-station 50 yards from site; rec hunting
Emergency Contact:	Fayette Memorial Hospital; 740.335.1210
Emergency Phone:	911
Emergency Directions to Medical Facility:	From the site, go left on Yankeetown Pike, across State Road 207, go to State Road 62, turn left. Hospital is just inside town on the right.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	491486
Electric Utility:	Dayton P&L Acct #13293960834 Emergency 877.468.8243 Vendor
Utility Phone:	800-433-8500
Telephone Company:	Century Link 423127860 Vendor Code 27648
TelCo Phone:	740-869-4722
Comments:	Must tell power company it is where? AT&T Raven 770-653-4968, I.D. [redacted]

CASTNET Site Contact List

Site Number: **417** **(DEN417)** Site Name: **Denali NP, AK** Updated: **3/13/2015**

Shelter Telephone: **907-683-9638**

Latitude:	63.7232	Longitude:	-148.9676
Magnetic Declination:		Elevation:	661 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	10/6/1998	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Alaska time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Andrea Blakesley
Denali National Park
Mile 238 Parks Hwy
McKinley Park, AK 99755
Home: Work: 907-683-9545 Fax: 907-683-9639 e-mail: andrea_blakesley@nps.gov

Other: See comment section

Backup Site Operator: Birgetta Jansen, Stacie Oaks

,
Home: Work: 907-683-6243 Fax: e-mail: stacie_oaks@nps.gov

Shipping Information

Federal Express: Denali National Park US POSTAL SERVICE ONLY -
P.O. Box 9
Denali Park, AK 99755

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Provided by NPS
TelCo Phone:	N/A

Comments: Dave Schirokauer is also a backup for DEN417

CASTNET Site Contact List

Site Number: **431** (**DIN431**) Site Name: **Dinosaur NM, UT** Updated: **5/15/2015**

Shelter Telephone:

Latitude:	40.4373	Longitude:	-109.3046
Magnetic Declination:		Elevation:	1463 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	6/10/2014	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point D., Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: e-mail: mtigges@air-resource.com

Site Operator: Dan Chure
Dinosaur National Monument
11626 East 1500 South
Jensen, UT 84035
Home: Work: 435-781-7703 Fax: e-mail: dan_chure@nps.gov
Other:

Backup Site Operator:

,
Home: Work: Fax: e-mail:

Shipping Information

Federal Express: Daniel J. Chure / Quarry Visitor Center
11625 East 1500 South
Jensen, UT 84035

CASTNET Site Contact List

Directions to Site: Not Available

Hazards:

Emergency Contact:

Emergency Phone:

Emergency
Directions to
Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Provided by NPS
TelCo Phone:	N/A

Comments:

CASTNET Site Contact List

Site Number: **181** **(EGB181)** Site Name: **Egbert, ON** Updated: **4/30/2015**

Shelter Telephone: **705-458-3309**

Latitude:	44.2311	Longitude:	-79.7831
Magnetic Declination:		Elevation:	227 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	12/27/1994	Polling ID Number:	
Calibration Group:	E2	Site Type:	Dry,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Dave Mac Tavish
Environment Canada - CAPMoN www.msc.ec.gc.ca/capmon/
4905 Dufferin St.
Toronto, ON M3H 5T4
Home: Work: 416-739-4450 Fax: e-mail: dave.mactavish@ec.gc.ca

Site Operator: Adrienne Richards
Environment Canada - CAPMoN
6248 Eight Line
Egbert, ON L0L 1N0
Home: Work: 705-715-2322 Fax: 416-739-4606 e-mail: adriennejrichards@gmail.com

Other: See comment section

Backup Site Operator: Renata Braga, Kenny Yan
Environment Canada, CAPMoN
4905 Dufferin Street
Toronto, ON M3H 5T4
Home: Work: 416-739-4871 Fax: 416-739-4606 e-mail: renata.braga@ec.gc.ca

Shipping Information

Federal Express: Environment Canada - CARE, Attn CASTNET
6248 Eighth Line
Egbert, Ontario, CAN L0L 1N0

CASTNET Site Contact List

Directions to Site:	From Toronto, Canada take 403 to 401. Pick up 400 North toward Berre. Take the Highway 89 exit to Cookstown. Turn left, West to Cookstown. Turn right at light (Hwy 27 North). Go North about 3 miles. Turn left on side road 10. See sign: EGBERT 3. Go 3.2 miles. Turn right on Concession 8. See gate on left. Center for Atmospheric Research. Park in a visitor spot and go inside main lab to check in. Get a cart to take equipment out to site behind lab.*** Receptionist is Chris Green**** *** When shipping anything other than filters, please ship to Renata Braga/ARQM address listed under site operator, per Dave MacTavish request.***
Hazards:	Surrounding fields occasionally used by hunters in the fall
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	From site drive west on SR10 to County Road 56. Drive south on Country Road 56 to Hwy 89. Drive west on Hwy 89 into Alliston (past BM High School) to Church Street. Drive north on Church Street (past beer store, over bridge). Turn north onto Fletcher Crescent. Hospital is on right. ETA from site approx 15 minutes.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by Centre for Atmospheric Research Experiments
Utility Phone:	N/A
Telephone Company:	Provided by Centre for Atmospheric Research Experiments
TelCo Phone:	N/A
Comments:	Police: 800.461.4455; Fire: 722.3112; Ambulance: 435.4311; Closest Medical Facility 705.435.6281, Stevenson Memorial Hospital, 200 Fletcher Crescent, Alliston, Ontario. CAPMoM Emergency Hotline is monitored 07:00 to 19:00 Eastern Time #647.222.1649 Renata's cell # 416.739.4871 / phone # for Kenny - 416.739.4954/email: kenny.yan@ec.gc.ca. EM hotline - 647.222.1649.

CASTNET Site Contact List

Site Number: **127** **(ESP127)** Site Name: **Edgar Evins, TN** Updated: **6/29/2015**

Shelter Telephone: **615-597-6556**

Latitude:	36.0389	Longitude:	-85.7331
Magnetic Declination:		Elevation:	302 meters
USGS Quadrangle:	Silver Point, TN	Site Deactivated:	
Site Installed:	3/22/1988	Polling ID Number:	
Calibration Group:	MW6	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Rachel Blackwell

1520 Parker Road
Pall Mall, TN 38577
Home: 931-265-8773 Work: Fax: e-mail: rdcales21@tntech.edu

Site Operator: Jeff Cales

1520 Parker Road
Pall Mall, TN 38577
Home: 931-864-9744 Work: Fax: e-mail: jeff.cales@tn.gov
Other: 931-397-9743 Cell

Backup Site Operator: Daniel Scott Cales

1520 Parker Road
Pall Mall, TN 38577
Home: 931-319-3053 Work: 931-397-8668 Fax: e-mail: dscales2014@gmail.com

Shipping Information

Federal Express: Jeff Cales
1520 Parker Road
Pall Mall, TN 38577

CASTNET Site Contact List

Directions to Site:	Leave Knoxville on I-40 West. Pass Cookeville and take State Road 56 south at exit 273. Follow the sign to the Appalachian Center for Crafts. Just after crossing the Caney Fork River (before getting off the bridge in fact) take a hard left at the Center for Crafts sign. About 1 mile after leaving the highway, there is a driveway with a yellow gate on the right. The driveway is going uphill and the gate is above the main road. The site is at the end of the driveway.

Hazards:	lightning strikes, lake at bottom of hill, rec hunting Aug-May
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	From site go to Hwy 56, head North, go to Hwy 70, turn right and go east for about 8 miles to Cookeville. Turn North on route 135, go about 0.25 miles. Cookevile General Hospital will be on right.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Caney Fork Electric Co. 227-9923-1
Utility Phone:	888-505-3030
Telephone Company:	Dekalb (DTC) 14683 Vendor Code 26918
TelCo Phone:	615-597-6556
Comments:	Police, Fire Dept: 615.597.4935; Ambulance: 615.597.6767; Nearest Medical Facility: 615.597.5715.

CASTNET Site Contact List

Site Number: **419** **(EVE419)** Site Name: **Everglades NP, FL** Updated: **2/10/2015**

Shelter Telephone: **305-242-7838**

Latitude:	25.3912	Longitude:	-80.6808
Magnetic Declination:		Elevation:	2 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	10/6/1998	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Met
Equipment Type:		Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Phil Navarro
Everglades National Park
40001 State Road 9336
Homestead, FL 33034-6733
Home: Work: 305-242-7822 Fax: e-mail: louis_navarro@partner.nps.gov
Other:

Backup Site Operator: Marcy Cruz, Felipe Navarrete, Fabian Kahn

,
Home: Work: 305-242-7863 Fax: e-mail: See comment section

Shipping Information

Federal Express: Everglades National Park
40001 State Road 9336
Homestead, FL 33034-6733

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Provided by NPS
TelCo Phone:	N/A

Comments: George Schardt is A/C, george_schardt@nps.gov, 305.242.7816
felipe_navarrete@partner.nps.gov, fabian_kahn@nps.gov
Marcy Cruz email: marcella_cruz@nps.gov

CASTNET Site Contact List

Site Number:	**605** **(FOR605)**	Site Name:	**Fortification Creek, WY**	Updated: **6/29/2015**

Shelter Telephone:

Latitude:	44.3395	Longitude:	-105.9198
Magnetic Declination:		Elevation:	1408 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	5/21/2013	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Met
Equipment Type:		Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Cassie Archuleta
Air Resource Specialists, Inc.
1901 Sharp Point Dr., Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: carchuleta@air-resource.com

Site Operator: Dominic Jandrain

1425 Fort Street
Buffalo, WY 82834
Home: 307.217.0755 Work: 307-684-1056 Fax: e-mail: dominic_jandrain@blm.gov

Other:

Backup Site Operator: David Croft

1425 Fort Street
Buffalo, WY 82834
Home: Work: 307-684-1151 Fax: e-mail: David_Croft@blm.gov

Shipping Information

Federal Express:

,

CASTNET Site Contact List

Directions to Site:

Hazards:

Emergency Contact:

Emergency Phone:

Emergency
Directions to
Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments: Brian Bibeau, Technical Lead (1), Work # 970-484-7941, bbibeau@air-resource.com
Nick Dummer, Technical Lead (2), Work # 970-484-7941, ndummer@air-resource.com

CASTNET Site Contact List

Site Number: **153** **(GAS153)** Site Name: **Georgia Station, GA** Updated: **6/29/2015**

Shelter Telephone: **770-229-8542**

Latitude:	33.1812	Longitude:	-84.4101
Magnetic Declination:		Elevation:	265 meters
USGS Quadrangle:	Hollonville, GA	Site Deactivated:	
Site Installed:	6/28/1988	Polling ID Number:	
Calibration Group:	SE4	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Ian Flitcroft
Crop & Soil Services
1109 Experiment Street
Griffin, GA 03023
Home: 404-394-4435 Work: 770-228-7322 Fax: e-mail: ian@griffin.uga.edu

Site Operator: Samuel Wright
Bio & Ag Engineering Dept.
1109 Experiment Street
Griffin, GA 30223
Home: Work: 770-229-3440 Fax: e-mail: sw021683@uga.edu
Other:

Backup Site Operator: Eddie Edenfield, Mathew Evans
Ag Engineering Dept.
,
Home: Work: 770-229-3440 Fax: e-mail: edenfiel@uga.edu

Shipping Information

Federal Express: Univ. of GA, Georgia Station, Matthew Evans
Department of Biology & Ag Engineering
Griffin, GA 30223-1797

CASTNET Site Contact List

Directions to Site:	Take I-75 to the south side of Atlanta, GA. Pick up 19/41 South. Continue approx 30 mi through Griffin (PASS EXIT MARKED GEORGIA STATION). Take Williamson Road exit, turn right on Hwy 362 West. Go 7.2 mi on 362 (road jogs right in front of BP station) and then veer right on a dirt road marked Blanton Mill Road. Go 0.9 mi to the Roswell P. Bledsoe Experimental Farm. Enter the complex and take the right fork in the road. Turn left on road across field to site.
Hazards:	frequent lightning strikes
Emergency Contact:	Spalding Regional Hospital 770.229.8059
Emergency Phone:	911
Emergency Directions to Medical Facility:	From site follow Hwy 362 to Griffin. Spalding Regional Hospital.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Southern Rivers Energy 4719001
Utility Phone:	877-358-1383
Telephone Company:	AT&T 77022985423500621 Vendor Code 29103
TelCo Phone:	770-229-8542
Comments:	AT&T Raven 770.595.0814, I.P. [redacted]

CASTNET Site Contact List

Site Number: **468** **(GLR468)** Site Name: **Glacier NP, MT** Updated: **10/28/2015**

Shelter Telephone: **406-888-7983**

Latitude:	48.5103	Longitude:	-113.9968
Magnetic Declination:		Elevation:	976 meters
USGS Quadrangle:	Lake McDonald West, MT	Site Deactivated:	
Site Installed:	12/27/1988	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Ed Eberhardy
Glacier National Park
Science Center
West Glacier, MT 59936
Home: Work: 681-285-5829 Fax: 406-888-7917 e-mail: ed_eberhardy@nps.gov
Other:

Backup Site Operator: Terry Peterson, Mark Biel, Chris Downs
Glacier National Park
Science Center
West Glacier, MT 59936
Home: Work: Fax: e-mail: See comment section

Shipping Information

Federal Express: Glacier National Park
Science Center
West Glacier, MT 59936

CASTNET Site Contact List

Directions to Site:	Out of Glacier Intl airport, (8 mi E of Kalispall, MT) go left on Hwy 2 East. Follow it for 24 mi until you are in West Glacier. Make a left on Going to the Sun Highway follow that for 0.8 mi through park entrance and go 0.3 mi and go right. Go another 0.2 mi; site is on the left through trees (past stables and through gate, approx 100 yds.)

Hazards:	grizzly bears, mountain lions, cars and foul weather
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	From site 468 go to park entrance. Take hwy toward Columbia Falls (approx 15 mi.) There are a couple of clinics in Columbia Falls. If hospital services are required to through Columbia Falls on Hwy 40 until you get to Hwy 93. Take Hwy 93 toward Whitefish. Hospital is approx 2 miles. Just past Mountain Mall.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Flathead Electric Co-op Inc.
Utility Phone:	406-752-4483
Telephone Company:	US West Communications
TelCo Phone:	406-449-4464 Sue
Comments:	Police, Fire, Ambulance: 406.888.5441 Park Dispatch; Nearest Medical Facility: 406.862.2501 North Valley Hospital. Terry Peterson email - terry_peterson@nps.gov, ChrisDowns email - chris_downs@nps.gov.

CASTNET Site Contact List

Site Number: **411** **(GRB411)** Site Name: **Great Basin NP, NV** Updated: **10/5/2015**

Shelter Telephone: **775-234-7104**

Latitude:	39.0051	Longitude:	-114.2159
Magnetic Declination:		Elevation:	2060 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	5/16/1995	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Pacific time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Jonathan Reynolds
Great Basin National Park
Hwy 488
Baker, NV 89311
Home: Work: 775-234-7564 Fax: 775-234-7210 e-mail: jonathan_reynolds@nps.gov
Other:

Backup Site Operator: Meg Horner, Ben Roberts

,
Home: Work: 775-234-7566 Fax: 775-234-7210 e-mail:

Shipping Information

Federal Express:
Hwy 488, Great Basin National Park
Baker, NV 89311

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Provided by NPS
TelCo Phone:	N/A

Comments: Meg Horner email - margaret_horner@nps.gov

CASTNET Site Contact List

Site Number: **474** **(GRC474)** Site Name: **Grand Canyon NP, AZ** Updated: **10/13/2015**

Shelter Telephone: **928-638-2031**

Latitude:	36.0586	Longitude:	-112.1836
Magnetic Declination:		Elevation:	2073 meters
USGS Quadrangle:	Grand Canyon	Site Deactivated:	
Site Installed:	5/16/1989	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Mountain time zone, No Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Theresa DeBoer
Grand Canyon National Park
1 Clinic Road, P.O. Box 129 Resource Management Clinic Bldg
Grand Canyon, AZ 86023-0129
Home: Work: 928-638-7817 Fax: 928-638-7755 e-mail: edward_schenk@nps.gov

Other: See comment section

Backup Site Operator: Ben Tobin, Michele Gandee, Theresa DeBoer, Noah Hoffman,

,
Home: Work: Fax: see comments e-mail:

Shipping Information

Federal Express: Edward Schenk, Grand Nat'l Park Science Center
17 South Rim
Grand Canyon, AZ 86023

CASTNET Site Contact List

Directions to Site: NOTE: ARRANGE FOR KEY From Flagstaff, AZ take I-40 to 64N to 180 to Grand Canyon, Western Rim. Follow road through Grand Canyon to Western Rim Road. Continue on Rim Road to the 1st left past the Abyss. A yellow barrier will be on the left. Unlock gate and follow road to dead end and site.

Hazards: icy roads in winter, deep mud during late winter, and canyon rim

Emergency Contact:

Emergency Phone: 911

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number: N/A

Electric Utility: Arizona Public Service

Utility Phone: 602-638-2282

Telephone Company: US West Communications

TelCo Phone: 602-438-5440

Comments: Theresa DeBoer cell: 928.707.1974. Ed Schenk is the administrative contact- phone - 928.638.7817

CASTNET Site Contact List

Site Number: **420** **(GRS420)** Site Name: **Great Smoky NP - Look Rock, TN** Updated: **3/13/2015**

Shelter Telephone: **865-977-1485**

Latitude:	35.6335	Longitude:	-83.9416
Magnetic Declination:		Elevation:	793 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	10/16/1998	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Jim Renfro
Great Smoky Mtns. Nat'l Park
1316 Cherokee Orchard Road
Gatlinburg, TN 37738
Home: Work: 865-436-1708 Fax: 865-436-1728 e-mail: jim_renfro@nps.gov

Other: see comment section

Backup Site Operator: Ethan McClure
Great Smoky Mountains National Park
1316 Cherokee Orchard Road
Gatlinburg, TN 37738
Home: Work: 865-436-1709 Fax: e-mail: ethan_mcclure@nps.gov

Shipping Information

Federal Express: Great Smoky Mtns Natl Park
1314 Cherokee Orchard Road
Gatlinburg, TN 37738

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Provided by NPS
TelCo Phone:	N/A

Comments: Jim Renfro cell phone: 865.850.1425

CASTNET Site Contact List

Site Number: **161** **(GTH161)** Site Name: **Gothic, CO** Updated: **10/20/2015**

Shelter Telephone: **970-349-5691**

Latitude:	38.9563	Longitude:	-106.9859
Magnetic Declination:		Elevation:	2915 meters
USGS Quadrangle:	Gothic, CO	Site Deactivated:	
Site Installed:	5/16/1989	Polling ID Number:	
Calibration Group:	W10	Site Type:	Dry,Ozone,Met,Nadp
Equipment Type:	RMY	Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Ian Billick
Rocky Mountain Biological Lab
8000 County Road 317
Crested Butte, CO 81224-0519
Home: Work: 970-349-6669 Fax: e-mail: director@rmbl.org

Site Operator: Mike Fabbre

8000 County Road 317, PO Box 519
Crested Butte, CO 81224-0519
Home: Work: 970-349-7770 Fax: e-mail: mike@rmbl.org

Other:

Backup Site Operator: Gary Dotzler, Peter Innes, Sage Smith, Shannon Sprott
RMBL

,
Home: Work: Fax: e-mail: See comment section

Shipping Information

Federal Express: RMBL
8000 County Road 317
Crested Butte, CO 81224

CASTNET Site Contact List

Directions to Site:	From Gunnison, Co, take Hwy 135 north to the town of Crested Butte (28 miles). You will arrive at a 4-way stop sign in town. Proceed straight ahead (137). This road will wind and pass through the village of Mt. Crested Butte. Stay on Gothic Road (137). You will pass the Ranger/Police Station and road will turn into a dirt road. Continue on the dirt road, you will cross two cattle gates and 1 small bridge. Upon approaching the second small bridge (15 feet) pull over to the right and park in visitors parking area. The site is located at the top of the hill on the right and a visible foot path can be used to get there.
Hazards:	N/A
Emergency Contact:	Crested Butte Mountain Clinic (970) 349-2677
Emergency Phone:	970-349-2525, 911
Emergency Directions to Medical Facility:	From site go south on the dirt road back to Mount Crested Butte. The medical facility is marked with a red cross on your left.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Gunnison County Electric Associates
Utility Phone:	970-641-3520
Telephone Company:	Qwest
TelCo Phone:	970-244-4800
Comments:	Gary Dotzler is a back up during the winter months only. Gary email: kikngar@yahoo.com, phone # 970.642.3733. Peter Innes email ptrinnes@gmail.com

CASTNET Site Contact List

Site Number: **191** **(HOW191)** Site Name: **Howland Ameriflux, ME** Updated: **10/18/2013**

Shelter Telephone: **352-213-2475**

Latitude:	45.204	Longitude:	-68.74
Magnetic Declination:		Elevation:	68 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	9/27/2011	Polling ID Number:	
Calibration Group:	E2	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: John Lee

21 Boom Rockway, Rt. 116
Argyle, ME 04468
Home: 207-394-3943 Work: 207-581-2930 Fax: 207-949-4090 e-mail: jtlee@maine.edu

Site Operator: John Lee

21 Boom Rockway, Rt. 116
Argyle, ME 04468
Home: 207-394-3943 Work: 207-581-2930 Fax: e-mail: jtlee@maine.edu

Other: 207-949-4090 Cell

Backup Site Operator:

,
Home: Work: Fax: e-mail:

Shipping Information

Federal Express: John Lee
21 Boom Rockway
Argyle TWP, ME 04468

CASTNET Site Contact List

Directions to Site: From Bangor, ME take I-95 North to Howland exit (Route 6/155). Take route 6 west 1.8 miles, pass the dirt road to the landfill on your right, take the next dirt road on the left. Go through the locked metal gate at the wooden bridge (LOCK-3061). The site is 1 mile past the bridge, behind a farm equipment storage building.

Hazards: Hunters and trappers during open season.

Emergency Contact: see comments

Emergency Phone: see comments

Emergency Directions to Medical Facility: Take I-95 north to next exit (Lincoln-Exit 55). Proceed east off exit approximately 5 miles, take left at 4 corners. Proceed to Lincoln. About 15 miles total from site 132.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number: N/A

Electric Utility: Bangor Hydro Electric CO. 000139438-0064177-3

Utility Phone: 800-499-6600

Telephone Company: AT&T

TelCo Phone:

Comments:

CASTNET Site Contact List

Site Number: **148** **(HOX148)** Site Name: **Hoxeyville, MI** Updated: **10/17/2013**

Shelter Telephone: **231-862-3750**

Latitude:	44.1809	Longitude:	-85.739
Magnetic Declination:		Elevation:	297 meters
USGS Quadrangle:	Wellston, MI	Site Deactivated:	
Site Installed:	10/31/2000	Polling ID Number:	
Calibration Group:	MW8	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Allen Long (Landowner)

10637 S. 9 Rd
Cadillac, MI 49601
Home: 231-862-3452 Work: Fax: e-mail:

Site Operator: Michael Reilly

306 Henderson Ct.
Cadillac, MI 49601
Home: 231-862-3388 Work: Fax: e-mail: mreilly@acegroup.cc
Other:

Backup Site Operator:

,
Home: Work: Fax: e-mail:

Shipping Information

Federal Express: 306 Henderson Ct.

Cadillac, MI 49601

CASTNET Site Contact List

Directions to Site:	From Cadillac, proceed west on route 55 approx 12.5 miles. The entrance to Caberfae Ski Resort should be visible on the right (north) side of the road. Turn left, heading south on Hoxeyville Rd (S13). Go approx 2 miles to the first stop sign. There is a Church at the intersection. Turn right, heading west. The road is not marked. Go approx 2 miles to 9 road. Turn left, heading south. This is a dirt road. If you come to a curve to the north back to route 55, you went too far and missed 9 road. Go approx 1 mile on 9 road, before reaching any intersections. The site is in a field on the left.
Hazards:	recreational hunting 11/15 to 11/30
Emergency Contact:	Mercy Hospital,400 Hobart St., Cadillac, MI
Emergency Phone:	231-876-7200, 911
Emergency Directions to Medical Facility:	From site, go north on dirt road 9. Turn right and go east about 2 miles to Hoxeyville Road (S13) turn left. Follow S13 2 mile to route 55 (east) into Cadillac and follow the blue Hospital signs to Mercy Hospital (approx. 15 miles from site). SEE MAP.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Great Lakes Energy 712012065-001
Utility Phone:	888-485-2537
Telephone Company:	Ace Communications Telephone Co. 0000014037001
TelCo Phone:	231-862-3750
Comments:	Vendor Code 26347

CASTNET Site Contact List

Site Number: **187** **(HWF187)** Site Name: **Huntington Wildlife Forest, NY** Updated: **9/22/2015**

Shelter Telephone: **518-582-4800**

Latitude:	43.973	Longitude:	-74.2233
Magnetic Declination:		Elevation:	497 meters
USGS Quadrangle:	Newcomb	Site Deactivated:	
Site Installed:	5/28/2002	Polling ID Number:	
Calibration Group:	E2	Site Type:	Dry,Ozone,Met,Precursor
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Dr. Myron Mitchell
State University of New York SUNY, College of Environmental
Science and Forestry (ESF)
Syracuse, NY 13210
Home: Work: 315-470-6765 Fax: e-mail: mitchell@syr.edu

Site Operator: Charlotte Demers
SUNY-ESF Adirondack Ecological Center
6312 State Route 28N
Newcomb, NY 12852
Home: Work: 518-582-4551 Fax: 518-582-2181 e-mail: cdemers@esf.edu
Other:

Backup Site Operator: Natasha Karniski, Patrick McHale
SUNY-ESF Adirondack Ecological Center
SUNY-ESF, 246 Illick Hall, 1 Forestry Drive
Syracuse, NY 13210
Home: Work: 518-582-4551 Fax: e-mail: nlkarnisk@esf.edu

Shipping Information

Federal Express: Charlotte Demers, Adirondack Ecological Center
Huntington Wildlife Forest, 6312 state route 28N
Newcomb, NY 12852

CASTNET Site Contact List

Directions to Site: From I-87 from north or south: Take exit 29 to Newcomb. Go through the hamlet about 6 miles, turn right at Adirondack Ecological Center sign, continue on driveway behind building to end. (Note no gas at exit 29 or in Newcomb.)

Hazards:

Emergency Contact: no 911service. fire/amulance number below

Emergency Phone: 518-582-4000

Emergency Directions to Medical Facility: no 911service. fire/amulance number below

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company: Frontier

TelCo Phone: 800-921-8102

Comments: Charlotte's work # 518-582-4551 ext. 103

CASTNET Site Contact List

Site Number: **141** **(IRL141)** Site Name: **Indian River Lagoon, FL** Updated: **2/26/2015**

Shelter Telephone:

Latitude:	27.8492	Longitude:	-80.4556
Magnetic Declination:	6 63	Elevation:	2 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	7/9/2001	Polling ID Number:	
Calibration Group:	SE5	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Charles Vogt
Indian River County Health Dept
1900 27th Street, 2nd Floor
Vero Beach, FL 32960
Home: Work: 772-794-7440 Fax: 772-794-7447 e-mail: Charles.Vogt@flhealth.gov

Site Operator: Charles Vogt
Indian River County Health Dept
1900 27th Street 2nd Floor
Vero Beach, FL 32960
Home: 321-676-5622 Work: 772-794-7440 Fax: 772-794-7447 e-mail: Charles.Vogt@flhealth.gov
Other: 772.473.1499 Cell

Backup Site Operator: Reid Hawkins
Indian River County Health Dept
1900 27th Street 2nd Floor
Vero Beach, FL 32960
Home: Work: 772-794-7440 Fax: 772-794-7447 e-mail: Reid.Hawkins@flhealth.gov

Shipping Information

Federal Express: Indian River County Health Dept
1900 27th St 2nd Floor
Vero Beach, FL 32960

CASTNET Site Contact List

Directions to Site:	From I-95 take exit #71, 192 east. Proceed to A1A and go approx 20 miles south. Cross the Sebastian Inlet Bridge, turn right (west) into the recreation area . After passing the welcome booth, follow the road as far west as possible, the site is on Coconut Point. Park Manager, Ron Johns 1-321.984.4853 Asst Manager, Ed McKenzie 1-321.508.0407
Hazards:	N/A
Emergency Contact:	Indian River Memorial Hospital, 1000 36 St., Vero Beach, FL
Emergency Phone:	561-567-4311, 911
Emergency Directions to Medical Facility:	SEE MAP.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Florida Power & Light 1814677561 Vendor Code 26123
Utility Phone:	800-375-2434
Telephone Company:	No phone at site
TelCo Phone:	
Comments:	AT&T Raven 404.769.4299, I.P. [redacted]

CASTNET Site Contact List

Site Number:	**403** **(JOT403)**	Site Name:	**Joshua Tree NP, CA**	Updated: **11/8/2013**
Shelter Telephone:	**760-228-1927**			

Latitude:	34.0696	Longitude:	-116.3889
Magnetic Declination:		Elevation:	1244 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	2/16/1995	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Pacific time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: jfaust@air-resource.com

Site Operator: Luke Sabala
Joshua Tree National Monument
74485 National Monument Drive
29 Palms, CA 92277
Home: 310-528-5117 Work: 760-367-5563 Fax: e-mail: luke_sabala@nps.gov
Other:

Backup Site Operator: Stacy Manson, Barry Mayron
,
Home: 760-490-8069 Work: 760-367-5578 Fax: e-mail: stacy_manson@nps.gov

Shipping Information

Federal Express: Joshua Tree National Monument
74485 National Monument Drive
29 Palms, CA 92277

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Provided by NPS
TelCo Phone:	N/A

Comments: Stacy's cell phone #: 760.490.8069, email: stacy_manson@nps.gov

CASTNET Site Contact List

Site Number: **112** **(KEF112)** Site Name: **Kane Exp. Forest, PA** Updated: **6/29/2015**

Shelter Telephone: **814-837-8069**

Latitude:	41.5981	Longitude:	-78.7679
Magnetic Declination:		Elevation:	618 meters
USGS Quadrangle:	James City, PA	Site Deactivated:	
Site Installed:	1/3/1989	Polling ID Number:	
Calibration Group:	E3	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Susan Stout
Forestry Science Laboratory (Supervisor)
office is 500' from shelter
, PA 16329
Home: 814-945-6362 Work: 814-563-1040 Fax: 814-945-6390 e-mail:

Site Operator: Bob Ishman

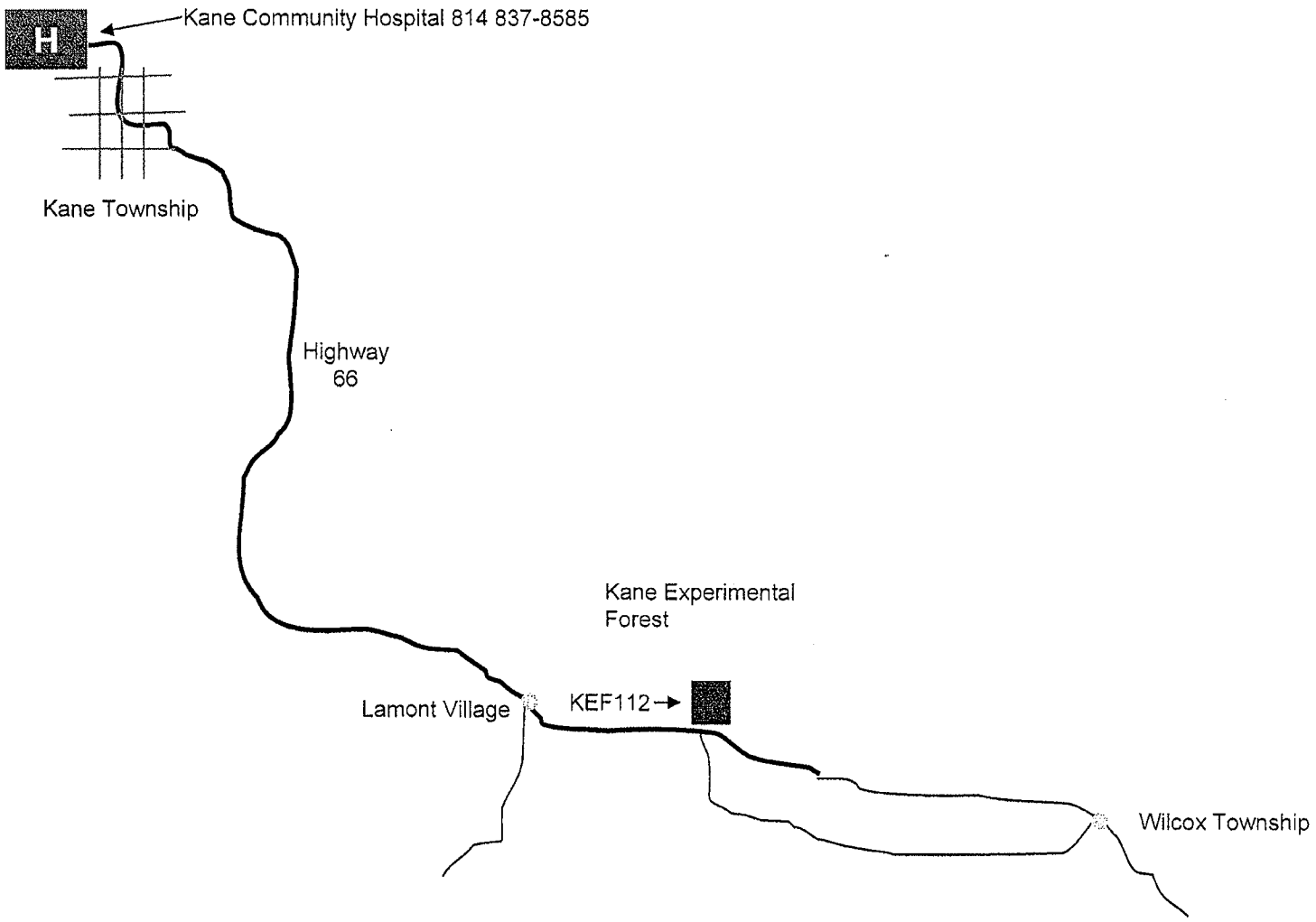
P.O. Box 222, 24 East Main Street
Ludlow, PA 16333
Home: 814-945-6362 Work: 814-945-6512 Fax: 814-945-6390 e-mail: rishman@westpa.net

Other:

Backup Site Operator: Jody Larson
Jody cell 814-598-4924
16 Water Street
Ludlow, PA 16333-0232
Home: 814-945-6272 Work: 814-945-6512 Fax: 814-945-6390 e-mail: jody@olmstedmanor.org

Shipping Information

Federal Express: Olmsted Manor
3 Overbrook Road
Ludlow, PA 16333



Nearest medical facility to Site KEF112, PA

Kane Experimental Forest

U.S. Environmental Protection Agency (EPA)

Clean Air Status and Trends Network (CASTNET)

CASTNET Site Contact List

Directions to Site:	From Pittsburg, PA take I-79 N to I-80 E to Dubois and 219 to 321 to Kane. Take 66 south out of Kane. Go 1 mi. then turn left (just past 2nd cemetery). Continue 0.7 mi to T. Go right. Continue thru village of Lamont (approx 3.2 mi). 1/2 mile past Lamont there is a gravel road to the left with a sign marked Kane NE Forest Experimental Station. Follow road approx 2 mi., always bearing left. You will see the Exp. Station on left (green buildings), veer left, the site is in the field behind cabins on left. (no 911 address,sr) Jodi Larson is the contact @ Olmstead Manor
Hazards:	recreational hunting Sep-Jan
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	See map.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Allegheny Power 13718420038501
Utility Phone:	800-255-3443
Telephone Company:	Verizon 8148378069838714
TelCo Phone:	800-479-1919
Comments:	Police/Fire Department/Ambulance 814.837.1000; State Police 814.778.5555; Nearest Medical Facility, Kane Community Hospital 814.837.8585. Telephone also 800.906.7792. Verizon Raven 770-846-5579, IP [redacted]

CASTNET Site Contact List

Site Number: **003** **(KIC003)** Site Name: **Kickapoo Tribe, KS** Updated: **6/29/2015**

Shelter Telephone:

Latitude:	39.8539	Longitude:	-95.6578
Magnetic Declination:		Elevation:	367 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	2/18/2014	Polling ID Number:	
Calibration Group:	W9	Site Type:	Dry,Met
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Christopher (Sonny) Fee
Kickapoo Environment
1107 Goldfinch Road
Horton, KS 66439
Home: Work: 785-486-2601 Fax: e-mail: christopher.fee@ktik-nsn.gov

Site Operator: Christopher Fee
Kickapoo Tribe
1107 Goldfinch Road
Horton, KS 66439
Home: Work: 785-486-2601 Fax: e-mail: christopher.fee@ktik-nsn.gov

Other: See comment section

Backup Site Operator: Mike Kelley
Kickapoo Tribe
1107 Goldfinch Road
Horton, KS 66439
Home: Work: 785-486-2601 Fax: e-mail: mike.kelley@ktik-nsn.gov

Shipping Information

Federal Express: 1107 Goldfinch Road

Horton, KS 66439

CASTNET Site Contact List

Directions to Site: Leave KTIK Administrative Complex and drive north on Goldfinch Road to Powhattan. Turn right on Main Street, then turn right on West Street, drive south on West Street to shelter on left.

Hazards: Extreme weather, Lightening strikes, large hail, high winds

Emergency Contact: Hiawatha Community Hospital; 785.742.2131

Emergency Phone: 911

Emergency Directions to Medical Facility: From Powhattan, drive north on Goldfinch Road to US Hwy 36. Turn right on US 36, and drive to curve in highway at edge of Hiawatha. Turn left onto Oregon Street at curve. Stay on Oregon Street to 4th Street; hospital is on right.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments: Tej Attili email - viswatej.attili@ktik-nsn.gov, phone 785.486.2601 ext. 7.
Luke R. Terry Environmental Directer, email luke.terry@kitk-nsn.gov, phone 785.486.2601 ext. 1

CASTNET Site Contact List

Site Number: **184** **(KNZ184)** Site Name: **Konza Prairie, KS** Updated: **10/21/2013**

Shelter Telephone: **785-770-8426**

Latitude:	39.1022	Longitude:	-96.6096
Magnetic Declination:		Elevation:	346 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	3/26/2002	Polling ID Number:	
Calibration Group:	W9	Site Type:	Dry,Met
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: John Blair
Kansas State University, Division of Biology
116 Ackert Hall
Manhattan, KS 66506-4901
Home: 785-539-2486 Work: 785-532-7065 Fax: 785-532-6653 e-mail: jblair@ksu.edu

Site Operator: Rosemary Ramundo
Kansas State University, Division Of Biology
116 Ackert Hall
Manhattan, KS 66506-4901
Home: 785-776-1423 Work: 785-532-7997 Fax: 785-532-6653 e-mail: ramundo@ksu.edu

Other: See comment section

Backup Site Operator: Jeff Taylor, Amanda Kuhl
Kansas State University, Division of Biology
116 Ackert Hall
Manhattan, KS 66506-4901
Home: Work: 785-532-7762 Fax: 785-532-6653 e-mail: jht@k-state.edu

Shipping Information

Federal Express: 116 Ackert Hall
Kansas State University, Division of Biology
Manhattan, KS 66506-4901

CASTNET Site Contact List

Directions to Site: From Manhattan, KS take K-177 south. At the east edge of town, immediately after crossing the Kansas River, turn right on county road 901S McDowell Creek Road. Continue approximately 6.2 miles to Konza Prairie Biological Station, which is a dirt road on the left. Continue about 1/2 mile to a security gate, then about another 1/2 mile past the gate. The site is at the top of the hill to the west of the main house.

Hazards:

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility: From the site take the dirt road back to McDowell Creek Road. Turn right heading north to Manhattan. When you arrive at the stop sign for the junction of route K-177, turn left into Manhattan. After crossing the Kansas River, turn north on route US 24. Continue about 2 miles, then turn left on Kimball. Mercy hospital is at the intersection of College and Kimball, about two miles west on Kimball Avenue.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility: Bluestem Elec Coop

Utility Phone: 785-456-2212

Telephone Company: KSU Telecomunications

TelCo Phone: 785-532-7001

Comments: Any difficulties with phone or utilities should be directed to and repairs arranged by the Konza Prairie Site Manager, Tom Van Slyke, 785.539.1961
AT&T Raven 678.447.6125, I.P. [redacted]
Teritary backup: Amanda Kuhl, email: akuhl@ksu.edu, phone: 785-532-7627, cell # 785-564-0137, Jeff Taylor - email: jht@k-atate.edu, phone: cell 785.640.0934, office: 785.532.7762.

CASTNET Site Contact List

Site Number: **410** **(LAV410)** Site Name: **Lassen Volcanic NP, CA** Updated: **8/21/2015**

Shelter Telephone: **530-335-7214**

Latitude:	40.54	Longitude:	-121.5765
Magnetic Declination:		Elevation:	1756 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	7/25/1995	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Pacific time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Elizabeth Hale
Lassen Volcanic National Park
38050 Hwy 36E
Mineral, CA 96063
Home: Work: 530-595-6183 Fax: 530-335-7040 e-mail: elizabeth_hale@nps.gov
Other:

Backup Site Operator: Mike Magnuson

,
Home: Work: 530-595-6187 Fax: e-mail: michael_magnuson@nps.gov

Shipping Information

Federal Express:
42301 Big Springs Ct.
Old Station, CA 96071

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency
Directions to
Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility: Provided by NPS

Utility Phone: N/A

Telephone Company: Provided by NPS

TelCo Phone: N/A

Comments: Fire station 595-5158
Elizabeth Palmer email elizabeth_palmer@nps.gov, phone 530-595-6163.

CASTNET Site Contact List

Site Number: **117** **(LRL117)** Site Name: **Laurel Hill, PA** Updated: **10/16/2015**

Shelter Telephone: **814-352-8177**

Latitude:	39.9883	Longitude:	-79.2516
Magnetic Declination:		Elevation:	609 meters
USGS Quadrangle:	Rockwood, PA	Site Deactivated:	
Site Installed:	12/15/1987	Polling ID Number:	
Calibration Group:	E3	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mike Mamau
Bureau of State Parks
1454 Laurel Hill Park Road
Somerset, PA 15501-5629
Home: Work: 717-787-6640 Fax: e-mail: mmumau@pa.gov

Site Operator: Linda Henry

271 Covered Bridge Road
Rockwood, PA 15557
Home: 814-926-2458 Work: 814-445-4368 Fax: e-mail: lhenry@rockwoodschools.org

Other: 814-442-0466 Cell

Backup Site Operator: Shanna Breegle

,
Home: 440-781-0056 Work: 412-476-2000 Fax: e-mail: s.breegle@gaiconsultants.com

Shipping Information

Federal Express: Linda Henry
271 Covered Bridge Road
Rockwood, PA 15557

CASTNET Site Contact List

Directions to Site:	NOTE: ARRANGE TO GET KEY FROM SITE OPERATOR. From Pittsburg, PA take PA Turnpike (70/76) to Exit 9, take 31 east toward Laurel Hill State Park. Just past Bakersville, look for park sign for Laurel Hill on right. Follow that road 3.8 miles past the park entrance and you will arrive at a stop sign and a T in the road. Go right on CR 653. Follow that road approx 1.3 miles until you pass the South Entrance of the park. Take the 1st left after that. There is a small sign for picnic area #1. Go about 1/4 mile and turn right on Sewer Plant Road. It is a gated road with a special key. About 100 ft past gate, take the right fork. That road dead ends at the site.
Hazards:	Recreational hunting
Emergency Contact:	Somerset Hospital; 814.443.5000
Emergency Phone:	911
Emergency Directions to Medical Facility:	From site exit park through park entrance. Take highway 31 to Somerset. Somerset Hospital is nearest medical facility. SEE MAP.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Somerset Rural Electric Coop. Inc 2085000
Utility Phone:	800-443-4255
Telephone Company:	Verizon Telephone 814352817755516Y
TelCo Phone:	800-700-8297
Comments:	Telephone number repair (800) 275-2355

CASTNET Site Contact List

Site Number: **426** **(MAC426)** Site Name: **Mammoth Cave NP, KY** Updated: **5/27/2015**

Shelter Telephone: **270-597-9613 x9300**

Latitude:	37.1318	Longitude:	-86.143
Magnetic Declination:		Elevation:	243 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	7/24/2002	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Johnathan Jernigan
Mammoth Cave National Park
61 Maintenance Road Warehouse Facility
Mammoth Cave, KY 42259
Home: Work: 270-758-2146 Fax: 270-758-2663 e-mail: Johnathan_jernigan@nps.gov

Other: See comment section

Backup Site Operator: Tyler Binkley, Bobby Carson

,
Home: Work: 270-758-2136 Fax: e-mail: bob_carson@nps.gov

Shipping Information

Federal Express: Johnathan Jernigan / CASTNET FSO
NPS Warehouse, 61 Maitenance Road
Mammoth Cave, KY 42259

CASTNET Site Contact List

Directions to Site:

Hazards:

Emergency Contact:

Emergency Phone:

Emergency
Directions to
Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments: Johnathan Jernigan cell phone # 270-590-3572, Bobby Carson phone #: 270.758.2136.
tyler.binkley567@topper.wku.edu

CASTNET Site Contact List

Site Number: **131** **(MCK131)** Site Name: **Mackville, KY** Updated: **3/18/2015**

Shelter Telephone: **859-262-5181**

Latitude:	37.7047	Longitude:	-85.0487
Magnetic Declination:		Elevation:	293 meters
USGS Quadrangle:	Mackville, KY	Site Deactivated:	
Site Installed:	7/31/1990	Polling ID Number:	
Calibration Group:	MW6	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Belinda Ann Warden
Land Owner
1180 Wesley Miller Lane
Harrodsburg, KY 40330
Home: 859-262-0386 Work: Fax: e-mail: wardenbelinda@hotmail.com

Site Operator: Belinda Ann Warden

1180 Wesley Miller Lane
Harrodsburg, KY 40330
Home: 859-262-0386 Work: Fax: e-mail: wardenbelinda@hotmail.com

Other:

Backup Site Operator:

,
Home: Work: Fax: e-mail:

Shipping Information

Federal Express: 1180 Wesley Miller Lane

Harrodsburg, KY 40330

CASTNET Site Contact List

Directions to Site:	From Danville, KY take US-150 West, following the signs to the Perryville Battlefield. Outside of town keep to the left to stay on Highway 52/150 west. After passing through the town of Perryville and crossing a small bridge take a quick right on County Road 1920 (there should be a Perryville Battlefield sign). After 6 miles on County Road 1920 cross a small bridge and bear right. About 1.6 miles past the bridge, turn left onto Wesley Miller Road. The pavement will end. After 1 mile on the gravel, the site is in the field on the left. The gate is on the left at the top of the hill.
Hazards:	Recreational hunting
Emergency Contact:	James B. Haggin Memorial Hospital; 859.734.5441
Emergency Phone:	911
Emergency Directions to Medical Facility:	From site take 422 North to 152. Go east 12 miles to Harrodsburg. James B. Haggin Memorial Hospital will be on the right just after the junction of route 68.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Inter County Rural 5315101 Vendor Code 26609
Utility Phone:	800-266-7322
Telephone Company:	AT&T 85926251812003174 Vendor Code 30252
TelCo Phone:	859-262-5181
Comments:	AT&T Raven 131=678-736-9435, I.D. [redacted] AT&T Raven 231=678-773-2149, I.P.

CASTNET Site Contact List

Site Number: **231** **(MCK231)** Site Name: **Mackville Collocated, KY** Updated: **3/13/2013**

Shelter Telephone: **606-262-5181**

Latitude:	37.7047	Longitude:	-85.0487
Magnetic Declination:		Elevation:	293 meters
USGS Quadrangle:	Mackville, KY	Site Deactivated:	
Site Installed:	12/29/1992	Polling ID Number:	
Calibration Group:	MW6	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Belinda Warden
Land Owner
1180 Wesley Miller Lane
Harrodsburg, KY 40330
Home: 859-262-0386 Work: Fax: e-mail: wardenbelinda@hotmail.com

Site Operator: Belinda Ann Warden
Land Owner
1180 Wesley Miller Lane
Harrodsburg, KY 40330
Home: 859-262-0386 Work: Fax: e-mail: wardenbelinda@hotmail.com
Other:

Backup Site Operator:

,
Home: Work: Fax: e-mail:

Shipping Information

Federal Express: 1180 Wesley Miller Lane

Harrodsburg, KY 40330

CASTNET Site Contact List

Directions to Site:	From Danville, KY take US-150 West, following the sign to the Perryville Battlefield. Outside of town keep to the left to stay on Highway 52/150 West. After passing through the town of Perryville and crossing a small bridge, take a quick right on County Road 1920 (there should be a Perryville Battlefield sign). After 6 miles on County Road 1920, cross a small bridge and bear right. About 1.6 miles past bridge, turn onto Wesley Miller Road. The pavement will end. After 1 mile on the gravel, the site is in the field on the left. The gate is on the left at the top of the hill.
Hazards:	recreational hunting
Emergency Contact:	Harrodsburg
Emergency Phone:	911
Emergency Directions to Medical Facility:	From site take 422 to 152. Go left and 15 miles to Springfield or right and 12 miles to Harrodsburg.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Inter County RECC
Utility Phone:	606-236-4561
Telephone Company:	AT&T
TelCo Phone:	502-339-2141

Comments:

CASTNET Site Contact List

Site Number: **405** **(MEV405)** Site Name: **Mesa Verde NP, CO** Updated: **10/18/2013**

Shelter Telephone: **970-529-5072**

Latitude:	37.1984	Longitude:	-108.4905
Magnetic Declination:		Elevation:	2165 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	1/10/1995	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Paul Bohmann
Mesa Verde National Park
Natural Resources
Mesa Verde National Park, CO 81330
Home: Work: 970-529-5065 Fax: e-mail: paul_bohmann@nps.gov
Other: sylvia_oliva@contractor.nps.gov

Backup Site Operator: George San Miguel
,
Home: Work: 970-529-5065 Fax: e-mail: george_san_miguel@nps.gov

Shipping Information

Federal Express: Mesa Verde National Park
Natural Resources
Mesa Verde National Park, CO 81330

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Provided by NPS
TelCo Phone:	N/A

Comments: George San Miguel email: george_san_miguel@nps.gov

CASTNET Site Contact List

Site Number: **113** **(MKG113)** Site Name: **M.K. Goddard, PA** Updated: **1/12/2015**

Shelter Telephone: **724-253-3685**

Latitude:	41.4268	Longitude:	-80.1452
Magnetic Declination:		Elevation:	377 meters
USGS Quadrangle:	Hadley, PA	Site Deactivated:	
Site Installed:	1/12/1988	Polling ID Number:	
Calibration Group:	E3	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Roger Fickes
Donald Campbell, Park Superintendent
Bureau of State Parks, P.O. Box 8551
Harrisburg, PA 17105
Home: Work: 717-787-6640 Fax: e-mail:

Site Operator: Mark A. Schroth

362 Klein Road
Sandy Lake, PA 16145
Home: 724-376-4285 Work: 724-699-0631 Fax: e-mail: morrowcs@westminster.edu

Other: 724-699-0631 Cell

Backup Site Operator: Richard Kroskey, Alex Schroth

20 Kerrtown School Road
Sandy Lake, PA 16145
Home: 724-376-3308 Work: 724-495-2523 Fax: e-mail:

Shipping Information

Federal Express: 362 Klein Road

Sandy Lake, PA 16145

CASTNET Site Contact List

Directions to Site:	From Pittsburg, PA take I-79 to 358E to Sandy Lake. In town, go left on 173N. Go approx 2.5 mi until you see the 2nd sign for MK Goddard State Park. Turn left (country store on corner). Go approx 4 mi to the park office which is on the left (small sign). The site is located on the grass, behind the office; obtain permission to drive through loading dock area to site.

Hazards:	N/A
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	From park office, go 3 miles to R358, take right on 358, cross over Rt. 19 at traffic light, go 10 miles to Greenville, cross railroad tracks, take second right, then a left to Greenville Hospital.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Penn Power 110004628100
Utility Phone:	800-720-3600
Telephone Company:	Windstream 020-028-315-888
TelCo Phone:	800-843-9214
Comments:	Police 724.662.4200; Fire Department 724.588.1311; Ambulance 724.376.2525; Nearest Medical Facility Greenville Hospital 724.588.2100. Email address is for Mark Schroth is morrowcs@westminster.edu

CASTNET Site Contact List

Site Number: **602** **(NEC602)** Site Name: **Newcastle, WY** Updated: **6/29/2015**

Shelter Telephone:

Latitude:	43.873	Longitude:	-104.1919
Magnetic Declination:		Elevation:	1468 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	11/7/2012	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Cassie Archuleta
Air Resource Specialists, Inc.
1901 Sharp Point Drive
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: carchuleta@air-resource.com

Site Operator: Eric Schnell
Newcastle Field Office
1101 Washington Blvd.
Newcastle, WY 82701
Home: Work: 307-746-6600 Fax: e-mail: eschnell@blm.gov
Other:

Backup Site Operator:

,
Home: Work: Fax: e-mail:

Shipping Information

Federal Express:

,

CASTNET Site Contact List

Directions to Site:

Hazards:

Emergency Contact:

Emergency Phone:

Emergency
Directions to
Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments: Brian Bibeau, Technical Lead (1), Work # 970-484-7941, bbibeau@air-resource.com
Nick Dummer, Technical Lead (2), Work # 970-484-7941, ndummer@air-resource.com

CASTNET Site Contact List

Site Number: **001** **(NIC001)** Site Name: **Nicks Lake, NY** Updated: **6/29/2015**

Shelter Telephone:

Latitude:	43.6805	Longitude:	-74.9891
Magnetic Declination:		Elevation:	525 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	11/20/2012	Polling ID Number:	
Calibration Group:	E2	Site Type:	Dry,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Dirk Felton
NYSDEC, Bureau of Air Quality Surveillance
625 Broadway
Albany, NY 12233-3256
Home: 518-429-7432 Work: 518-402-8502 Fax: 518-402-8507 e-mail: dirk.felton@dec.ny.gov

Site Operator: Ken Eckhardt

110 Marble Mountain Lane
Wilmington, NY 12997
Home: Work: 518-928-6149 Fax: e-mail: kneckhar@gw.dec.state.ny.us

Other:

Backup Site Operator: Erik Cortright

,
Home: Work: Fax: e-mail: efcortri@gw.dec.state.ny.us

Shipping Information

Federal Express: Paul Casson
110 Marble Mountain Lane
Wilmington, NY 12997

CASTNET Site Contact List

Directions to Site:	NYS Thruway to exit 31, turn right onto route 12 north. Stay on route 12 to Alder Creek. Turn right onto route 28. Stay on route 28 into Old Forge. In Old Forge follow signs to Nick's Lake campground. The air monitor is located on Loop "A", on the right side of the road in a storage area. If the gate is locked see the caretaker to get it unlocked.

Hazards:	Stinging insects
Emergency Contact:	Old Forge Fire Dept. and Ambulance Services 315.369.3424
Emergency Phone:	911
Emergency Directions to Medical Facility:	Head north on Nick's Lake road toward Bisby Road. Turn left onto Bisby Road. In 0.7 miles, turn left onto JoyTract Road. Turn left onto NY-28. In 26 miles, take ramp onto NY-12/NY-28 S. Continue onto I-790 W/NY-12 S. Take New York 5A exit toward Whitesboro. Merge onto Oriskany St. W. In 1.2 miles, turn left onto Champlin Ave. St. Luke's Memorial Hospital will be 1.3 miles down on the right. 1656 Champlin Ave., Utica, NY 13502.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	
Electric Utility:	National Grid
Utility Phone:	800-642-4272
Telephone Company:	Frontier Communication
TelCo Phone:	866-761-9972
Comments:	Site is fenced and locked.

CASTNET Site Contact List

Site Number: **122** **(OXF122)** Site Name: **Oxford, OH** Updated: **10/27/2015**

Shelter Telephone: **513-523-6912**

Latitude:	39.5311	Longitude:	-84.7235
Magnetic Declination:		Elevation:	284 meters
USGS Quadrangle:	Oxford, OH	Site Deactivated:	
Site Installed:	8/18/1987	Polling ID Number:	
Calibration Group:	MW7	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Dr. Johnathan Levy
Institute for the Environment & Sustainability
254 Upham Hall
Oxford, OH 45056
Home: Work: 513-529-1947 Fax: e-mail: levyj@miamioh.edu

Site Operator: Keara Pringle
Institute for the Environment & Sustainability
254 Upham Hall
Oxford, OH 45056
Home: Work: 314-660-4740 Fax: e-mail: pringlkl@miamioh.edu
Other:

Backup Site Operator: Taylor Myatt
Institute for the Environment & Sustainability
254 Upham Hall
Oxford, OH 45056
Home: Work: 740-504-6453 Fax: e-mail: myattts@miamioh.edu

Shipping Information

Federal Express: IES - Miami University,Keara Pringle
100 Bishop Circle, Upham Hall
Oxford, OH 45056

CASTNET Site Contact List

Directions to Site:	(North of Cincinnati) Out of Oxford, Ohio go North on 732, which is locally named Main St. Outside of the town the roads name changes to Morning Sun. Continue past the athletic field and cross the river (approx 1 mi from the Days Inn) and turn right on Sommerville Road. Watch for the Ecological Research Center on the right at the top of the 2nd rise in the road (approx 1/4 mi); the sign sits back from the road and is difficult to see. Please do not drive on the grass at the Research Center - in the spring and fall it gets very muddy and cars have gotten stuck.
Hazards:	N/A
Emergency Contact:	McCoulough-Hyde Memorial Hospital; 513.523.2111
Emergency Phone:	911
Emergency Directions to Medical Facility:	Take Somerville Rd. to Rt. 732, turn left into Oxford, turn left on Withrow Street and right into the Emergency Drive. Total distance is approximately 1.5 miles.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	
Electric Utility:	Butler Rural Electric Coop, Inc.
Utility Phone:	800-255-2732
Telephone Company:	General Telephone
TelCo Phone:	800-621-2712
Comments:	Campus Address is Institute of Environmental Science, Upham Hall, 100 Bishop Circle A key is now required for entry to site.

CASTNET Site Contact List

Site Number: **190** **(PAL190)** Site Name: **Palo Duro, TX** Updated: **10/15/2014**

Shelter Telephone: **806-488-2587**

Latitude:	34.8806	Longitude:	-101.6647
Magnetic Declination:	6 4	Elevation:	1053 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	4/24/2007	Polling ID Number:	
Calibration Group:	W10	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Brent Auvermann
Texas A&M Agricultural Experiment Station (TAES)
6500 Amarillo BLVD West
Amarillo, TX 79106
Home: 806-670-8081 Work: 806-677-5610 Fax: e-mail: B-auvermann@tamu.edu

Site Operator: Brent Auvermann

6500 Amarillo BLVD West
Amarillo, TX 79106
Home: Work: 806-677-5610 Fax: 806-677-5644 e-mail: B-auvermann@tamu.edu

Other:

Backup Site Operator: Jack Bush, Kevin Heflin
TAES
6500 Amarillo Blvd West
Amarillo, TX 79106
Home: see comments Work: 806-654-4489 Fax: 806-677-5644 e-mail: kjbush@ag.tamu.edu

Shipping Information

Federal Express: 6500 Amarillo Blvd West

Amarillo, TX 79106

CASTNET Site Contact List

Directions to Site:	From Rich Husband International Airport, Amarillo, TX. Travel west on I-40 until you reach Interstate Highway 27. Head south on 27 until you pass the town of Canyon. Get off 27 onto Hungate Road exit. Head East on Hungate (~4m) until you reach S. Eastern. Take a right (South) S. Eastern is a dirt road. Travel ~2 miles. Take a left onto E. Lawrence (1/2 dirt, 1/2 paved) Travel ~4 m until you come to a gate. Gate may be locked. Call ahead to the site to make sure it is open. Travel thru the open gate to your right on paved road. Site is on the left ~ 1 mile.
Hazards:	
Emergency Contact:	Brent Auvermann or Jerri Hamer
Emergency Phone:	806-677-5600
Emergency Directions to Medical Facility:	

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	FEDX INFO
Electric Utility:	Swisher County Electric 530900000
Utility Phone:	800-530-4344
Telephone Company:	Mid Plains Rural Telephone Co 11049
TelCo Phone:	806-628-3959
Comments:	Dr. Brent Auvermann contact info: phone: (806)677-5600, fax: (806)677-5644 / e-mail: bauverma@ag.tamu.edu AT&T Raven 678-446-7589, I.P. Backups -Jack Bush email: kjbush@ag.tamu.edu, Brad Wilhite, email: wbwilhite@ag.tamu.edu. Kevin Heflin, phone 806.683.5544

CASTNET Site Contact List

Site Number: **107** **(PAR107)** Site Name: **Parsons, WV** Updated: **6/29/2015**

Shelter Telephone: **304-478-8647**

Latitude:	39.0904	Longitude:	-79.6617
Magnetic Declination:		Elevation:	510 meters
USGS Quadrangle:	Parsons, WV	Site Deactivated:	
Site Installed:	1/19/1988	Polling ID Number:	
Calibration Group:	E3	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Chris Cassidy
USDA Forest Service Northern Research Station
P.O. Box 404
Parsons, WV 26287
Home: 304-678-4344 Work: 304-478-2000 Fax: e-mail: cscassidy@fs.fed.us

Site Operator: Chris Cassidy
USDA Forest Service Northern Research Station
P.O. Box 404
Parsons, WV 26287
Home: 304-678-4344 Work: 304-478-2000 Fax: e-mail: cscassidy@fs.fed.us
Other: 304-678-4344 Cell

Backup Site Operator: Pamela Edwards, Frederica Wood

Parsons, WV 26287
Home: Work: Fax: e-mail:

Shipping Information

Federal Express: 459 Nursery Bottom Rd

Parsons, WV 26287

CASTNET Site Contact List

Directions to Site: Take Highway 33W to Elkins. Pick up 19 N to Parsons. Continue through town to the Nursery Bottom Reservoir. The site entrance is on the right next to the visitors center.

Hazards: N/A

Emergency Contact: Tucker County Ambulatory Center; (304) 478-2511

Emergency Phone: 911

Emergency Directions to Medical Facility: See map.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number: N/A

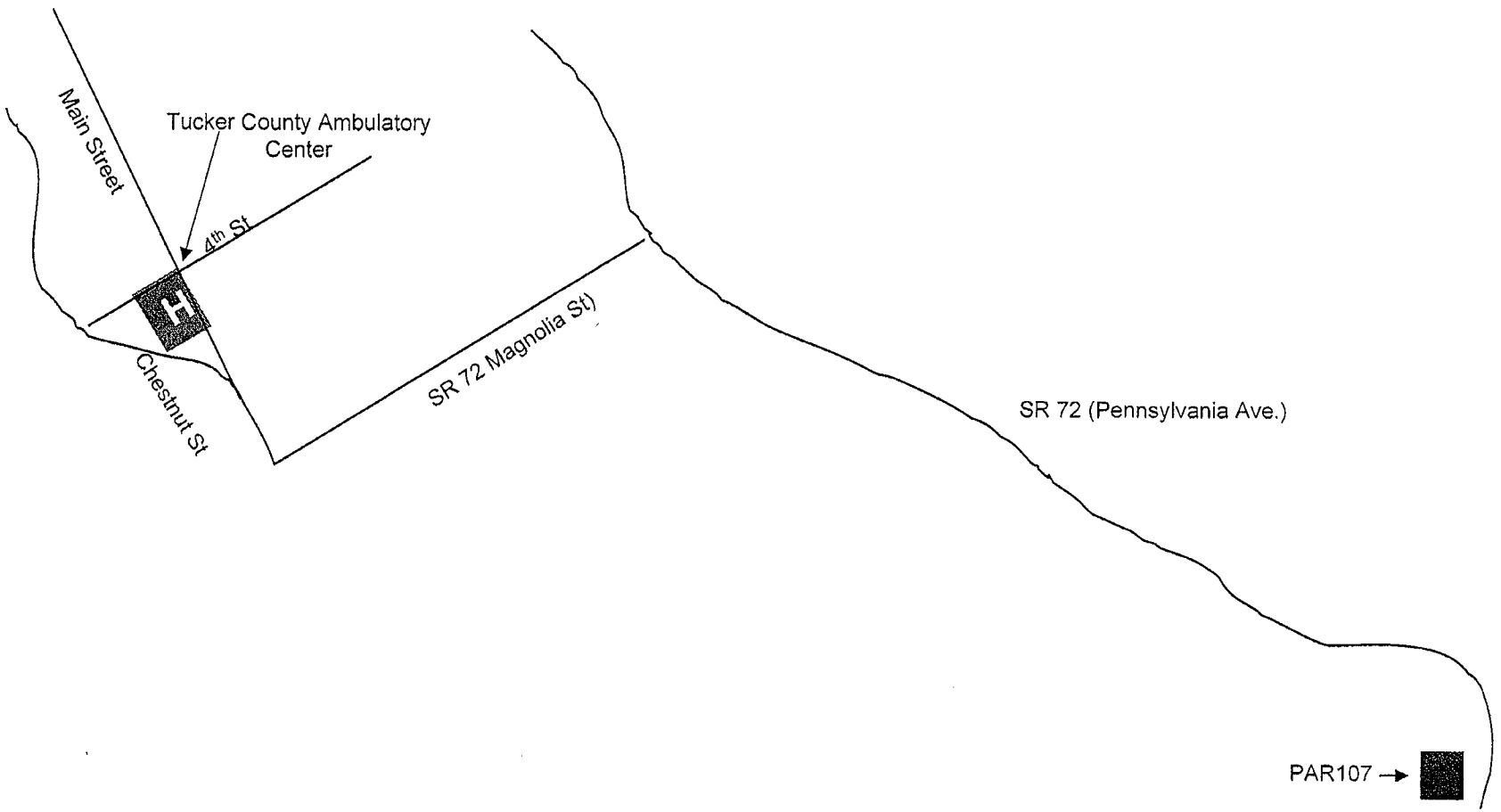
Electric Utility: Alleghney Power - acct.# 323 12 722 080901

Utility Phone: 800-255-3443

Telephone Company: Frontier Communications 30447886470316044

TelCo Phone: 800-921-8102

Comments: Pamela Edwards, 304-478-2000 ext. 129
Frederica Wood, 304-478-2000 ext. 128



Nearest medical facility to Site PAR107, WV Parsons, WV

U.S. Environmental Protection Agency (EPA)

Clean Air Status and Trends Network (CASTNET)

CASTNET Site Contact List

Site Number:	**108** **(PED108)**	Site Name:	**Prince Edward, VA**	Updated: **9/19/2014**
Shelter Telephone:	**434-392-9506**			

Latitude:	37.1652	Longitude:	-78.3071
Magnetic Declination:		Elevation:	149 meters
USGS Quadrangle:	Green Bay, VA	Site Deactivated:	
Site Installed:	11/3/1987	Polling ID Number:	
Calibration Group:	E1	Site Type:	Dry,Ozone,Met,Nadp
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Gary Heiser
Cumberland State Forest
751 Oak Hill Road
Cumberland, VA 23040
Home: Work: 804-492-4121 Fax: e-mail:

Site Operator: Gene Brooks

49 Stone Drive (SR 705)
Cumberland, VA 23040
Home: 804-492-9232 Work: Fax: e-mail: cgenebrooks@verizon.net

Other: 434-390-8935 Cell

Backup Site Operator: Bill Overstreet, Ralph Harris

1015 Osborn Road
Farmville, VA 23901
Home: 804-392-8079 Work: 434-607-9507 Fax: e-mail: rharris@hotmail.com

Shipping Information

Federal Express: 49 Stone Drive (SR 705)

Cumberland, VA 23040

CASTNET Site Contact List

Directions to Site:	From Petersburg, VA take 460 West. About 1 mile from Farmville turn left South on 696. There will be a brown sign for Twin Lakes State Park at the turnoff. After traveling 5 miles there will be another sign for the state park. At the Y (Hwy612) go straight (going left will take you to the park). After approximately 8.4 miles you will come to the sign for Prince Edward Gallion State Forest. Approximately 8.6 miles from Hwy 460 you will come to Hwy 629; turn left. Go approx 1.3 miles (top of hill) and you will come to a dirt/gravel road on the right. Take a right onto that road. The road splits, go right again. There will be a wooden gate; open wooden gate and proceed to site. Site is not visible from the main road.
Hazards:	Recreational hunting
Emergency Contact:	Burkeville Medical (434)767-5511
Emergency Phone:	911
Emergency Directions to Medical Facility:	Upon leaving site, take a right onto Rt. 629, when you reach Rt. 613 take a right, go to Rt. 360, take a left (go east) to Burkeville Medical Bldg. (approx 7 miles).

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	X23261
Electric Utility:	Southside Electric Coop 930-027-001-01 68344.001
Utility Phone:	800-552-2118
Telephone Company:	Century Link 309979711 / 423054602 / Vendor Code 27940
TelCo Phone:	434-392-9506
Comments:	Verizon Raven 404-520-410, IP Ralph Harris address P.O. Box 235, Farmville, VA 23901, home phone434-392-9825, cell # 434-547-8929

CASTNET Site Contact List

Site Number: **427** **(PET427)** Site Name: **Petrified Forest, AZ** Updated: **7/8/2015**

Shelter Telephone: **928-524-6668**

Latitude:	34.8225	Longitude:	-109.8925
Magnetic Declination:		Elevation:	1723 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	9/12/2002	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Mountain time zone, No Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, Co 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Cathy Lash
Petrified Forest National Park
1 Park Road
Petrified Forest National Park, AZ 86028
Home: Work: 928-524-6228 Fax: e-mail: cathy_lash@nps.gov

Other: See comment section

Backup Site Operator: Kyle Lehmkuhl, Nick Poulos, Andy Bridges, Matt Smith

,
Home: Work: 928-524-6228 Fax: e-mail: See comment section

Shipping Information

Federal Express: Matt Smith, Petrified Forest national Park
1 Park Road
Petrified Forest Nat'l Park, AZ 86028

CASTNET Site Contact List

Directions to Site:

Hazards:

Emergency Contact:

Emergency Phone:

Emergency
Directions to
Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments: Bill Parker email: william_parker@nps.gov, ph: 928.524.6628x262, Cathy Lash email . Andy Bridges email: andrew_bridges@nps.gov

CASTNET Site Contact List

Site Number: **414** **(PIN414)** Site Name: **Pinnacles NM, CA** Updated: **10/18/2013**

Shelter Telephone: **831-389-4586**

Latitude:	36.4832	Longitude:	-121.1569
Magnetic Declination:		Elevation:	335 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	5/16/1995	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Pacific time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Valerie Nuttman
Pinnacles National Monument
5000 Hwy 146
Paicines, CA 95043
Home: Work: 831-389-4486 Fax: 831-389-4489 e-mail: valerie_nuttman@nps.gov
Other:

Backup Site Operator: Lucy Chen, Alacia Welch

,
Home: Work: 831-389-4486 Fax: e-mail: alacia_welch@nps.gov

Shipping Information

Federal Express: Pinnacles National Monument
5000 Hwy 146
Paicines, CA 95043

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Provided by NPS
TelCo Phone:	N/A

Comments: Vlaerie Nuttman phone 831.389.4486 ext. 272, Alacia Welch phone 831.389.4486 ext. 260

CASTNET Site Contact List

Site Number: **165** **(PND165)** Site Name: **Pinedale, WY** Updated: **6/29/2015**

Shelter Telephone: **307-367-6584**

Latitude:	42.929	Longitude:	-109.7878
Magnetic Declination:	11 18	Elevation:	2386 meters
USGS Quadrangle:	Freemont Lake South, WY	Site Deactivated:	
Site Installed:	12/27/1988	Polling ID Number:	
Calibration Group:	W10	Site Type:	Dry,Ozone,Met,Precursor
Equipment Type:	RMY	Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Janet Bellis
BLM Pinedale Field Office
1625 West Pine Street, P.O. Box 768
Pinedale, WY 82941
Home: Work: 307-367-5316 Fax: 307-367-5329 e-mail: jbellis@blm.gov

Site Operator: Ted Porwoll

P.O. Box 513
Pinedale, WY 82941
Home: Work: 307-367-5722 Fax: e-mail: tporwoll@fs.fed.us

Other: 307-360-3366 Cell

Backup Site Operator: STI

,
Home: Work: Fax: e-mail:

Shipping Information

Federal Express: 21 Riverside Subdivision RD.

Pinedale, WY 82941

CASTNET Site Contact List

Directions to Site:	Off 191 in Pinedale (locally called Pine) turn on Lake Road (between general store and Z-tire). Go Northeast (road only goes one direction off 191). Site is at top of ridge on right of road 6.2 mi from turnoff. Small dirt road leads to site, but you may need a 4x4 vehicle due to large rocks in the road.

Hazards:	Large Rocks in road
Emergency Contact:	Pinedale Medical Clinic, 619 E. Hennic St., Pinedale, WY
Emergency Phone:	307-367-4133, 911
Emergency Directions to Medical Facility:	From site go back toward Pinedale, about 5 miles. The medical facility is on the left just past the ball field.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Pacific Power / Rocky Mountain 69875016-0013
Utility Phone:	800-221-7070
Telephone Company:	CenturyLink 423005932 Vendor Code 27840
TelCo Phone:	800-786-6272
Comments:	Repairs: Gene - ALL-Tech Heating Specialiti,3 Longbow Lane, Suite 105, Pinedale, WY 82941 AT&T Raven 678-602-1164, i. p. Karen cell # 307-231-2345, Meghan home # 307-200-1926, Meghans physical address: 229 South Sublette, Pinedale WY 82941, mailing address: PO Box 1714

CASTNET Site Contact List

Site Number: **126** **(PNF126)** Site Name: **Cranberry, NC** Updated: **10/22/2015**

Shelter Telephone: **828-733-1643**

Latitude:	36.1054	Longitude:	-82.045
Magnetic Declination:		Elevation:	1216 meters
USGS Quadrangle:	Carber's Gap, NC	Site Deactivated:	
Site Installed:	12/27/1988	Polling ID Number:	
Calibration Group:	SE4	Site Type:	Dry,Ozone,Met,Precursor
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: TBA
U.S. Forest Service, Toecane Dist.
P.O. Box 128
Burnsville, NC 28714
Home: 828-682-7660 Work: Fax: e-mail:

Site Operator: Phillip Ray Hughes

70 David Clay Lane
Newland, NC 28657
Home: 828-592-1243 Work: Cell # is work # Fax: e-mail: prayhughes@outlook.com

Other:

Backup Site Operator: Elisa Dawn Daniels
(Phillip's daughter)
403 Little Plumtree Creek Road
Newland, NC 28657
Home: 828-733-9119 Work: 828-387-1651 Fax: e-mail:

Shipping Information

Federal Express: 70 David Clay Lane

Newland, NC 28657

CASTNET Site Contact List

Directions to Site:	Leave Asheville, NC on US-19/23 driving north. Follow signs to US-19 then US-19E. On US-19E pass through Plumb Tree, NC then cross the North Toe River. After crossing the river drive about 3.1 miles and turn left on Roaring Creek Road, just past a white church called McCourys Rock Baptist Church. After driving about 3.7 miles on Roaring Creek Road, bearing right at each of the two forks, the pavement ends. After the pavement ends, drive about 1/4 mile up a hill and turn right up into a driveway. The site is in a field and visible from the main road. (If you get to the town of Minneapolis, you have missed the turn for Roaring Creek Road.)
Hazards:	recreational hunting
Emergency Contact:	Cannon Memorial Hospital; 828.737.7000
Emergency Phone:	911
Emergency Directions to Medical Facility:	4 miles from site to the mouth of Roaring Creek Rd. Take a left at the stop sign and go about 1.5-2 miles to Russells Antiques, turn right. Go about 6 miles, the road sorta forks - bear to the left, about 1/4 of mile bear to the right -(Spanish Oak Road) when you come to a stop sign, you will turn right. Come to a red light you will turn left. Come to another stop sign and turn right, the hospital entrance will be on the right about 1 1/2 -2 miles from the last stop sign.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	NC-X28086
Electric Utility:	Mt. Electric Coop 4801401
Utility Phone:	423-727-1800
Telephone Company:	AT&T 82873316439583190 Vendor Code29010
TelCo Phone:	828-733-1643

Comments:

CASTNET Site Contact List

Site Number: **134** **(PRK134)** Site Name: **Perkinstown, WI** Updated: **3/17/2015**

Shelter Telephone: **715-785-7989**

Latitude:	45.2065	Longitude:	-90.5972
Magnetic Declination:		Elevation:	462 meters
USGS Quadrangle:	Perkinstown, WI	Site Deactivated:	
Site Installed:	9/27/1988	Polling ID Number:	
Calibration Group:	MW7	Site Type:	Dry,Ozone,Met,Nadp
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Fred Emstrom
Land owner
W 10746 CTH M
Medford, WI 54451
Home: 715-785-7943 Work: 715-748-2963 Fax: e-mail: fredandkelly@tds.net

Site Operator: Fred E. Emstrom

W 10746 CTH M
Medford, WI 54451
Home: 715-785-7943 Work: 715-748-2963 Fax: e-mail: fredandkelly@tds.net

Other: 715-965-7128 Cell

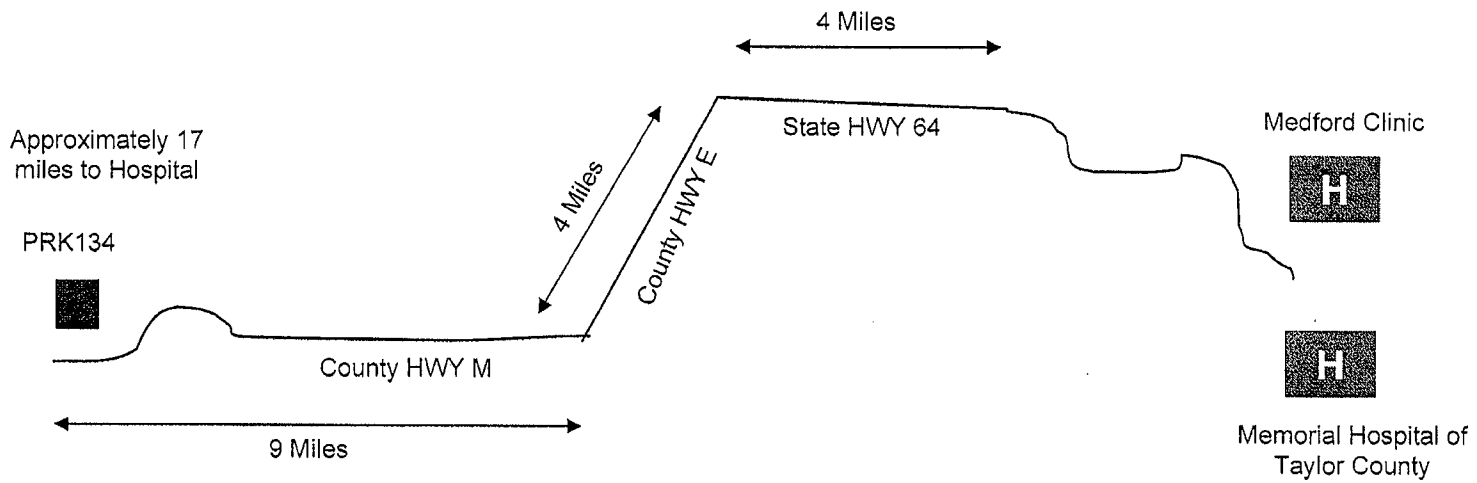
Backup Site Operator: Jan Armstrong

W9157 State Road 64
Medford, WI 54451
Home: 715-785-7590 Work: Fax: e-mail:

Shipping Information

Federal Express: W 10746 CTH M

Medford, WI 54451



Nearest medical facility to Site PRK134, WI

Perkinstown, Wisconsin

U.S. Environmental Protection Agency (EPA)

Clean Air Status and Trends Network (CASTNET)

CASTNET Site Contact List

Directions to Site:	Go West on 29 from Wausaw, WI to Abbotsford, WI. Go North on 13 approximately 4.5 miles past Medford, WI. Go West (left) on County M approximately 13 miles, just past 2 small bridges. Site operators house is on right (has 3 car garage); site is behind house on hill. In summer use driveway to East of site ops house. In winter use site ops driveway to site.

Hazards:	N/A
Emergency Contact:	Medford Clinic & Memorial Hospital of Taylor County
Emergency Phone:	911
Emergency Directions to Medical Facility:	See map. Memorial Hospital of Taylor County is approximately 17 miles from the site.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	5-6893
Electric Utility:	Clark Electric Coop. 3043 Vendor Code 884721
Utility Phone:	800-272-6188
Telephone Company:	TDS Telecom
TelCo Phone:	888-837-3050
Comments:	HOSPITAL NUMBERS: Medford Clinic 715.7482121; and Memorial Hospital of Taylor County 715.748.8100. You can also reach the Utility Co @ 800.272.6188 or after hours @ 800.927.5707

CASTNET Site Contact List

Site Number: **106** **(PSU106)** Site Name: **Penn State, PA** Updated: **6/29/2015**

Shelter Telephone: **814-237-5778**

Latitude:	40.7209	Longitude:	-77.9318
Magnetic Declination:		Elevation:	364 meters
USGS Quadrangle:	Pine Grove Mills, PA	Site Deactivated:	
Site Installed:	1/6/1987	Polling ID Number:	
Calibration Group:	E1	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Dr. Alfred Moyle
Dept. of Meteorology, Penn State University
503 Walker Bldg.
University Park, PA 16802
Home: 814-342-3496 Work: 814-863-4526 Fax: 814-865-3663 e-mail: amm14@psu.edu

Site Operator: Bob Ziegler
Penn State University
423 Walker Bldg.
University Park, PA 16802
Home: 717-667-3637 Work: 814-863-4526 Fax: e-mail: rfz1@psu.edu
Other: 717-994-2651 Cell

Backup Site Operator: Dick Thompson

,
Home: Work: Fax: e-mail:

Shipping Information

Federal Express: 423 Walker Bldg.
Penn State University
University Park, PA 16802

CASTNET Site Contact List

Directions to Site:	NOTE: ARRANGE FOR KEY From Harrisburg, PA take Hwy 322 to State College. Take Hwy 26 south (downtown) to Hwy 45; 26 meets w/45. Continue to Rock Springs on Hwy 45 west. About 2 miles out of town a green hwy info and brown historical sign will appear just after a white house. This is Tadpole Road. Take a right onto Tadpole Road. Site will be visible in field on left. Look for trail about 1/4 mile on left; it will take you to the site.
Hazards:	N/A
Emergency Contact:	Centre Community Hospital; (814) 231-7000
Emergency Phone:	911
Emergency Directions to Medical Facility:	From Site take Route 45 toward State College; turn left onto Route 26, turn left again onto route 322 then right onto Park Ave. Follow the hospital signs.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Somerset Rural Electric
Utility Phone:	814-445-4106
Telephone Company:	Bell of PA
TelCo Phone:	717-327-7954
Comments:	Verizon Raven - 404-357-4663, IP [redacted]

CASTNET Site Contact List

Site Number: **172** **(QAK172)** Site Name: **Quaker City, OH** Updated: **6/29/2015**

Shelter Telephone: **740-679-3345**

Latitude:	39.9427	Longitude:	-81.3379
Magnetic Declination:		Elevation:	371 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	1/5/1999	Polling ID Number:	
Calibration Group:	MW7	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mary Lou Trainer
Landowner
58163 St. Johns Road
Quaker City, OH 43773
Home: 740-679-2605 Work: same Fax: e-mail:

Site Operator: Mary Lou Trainer

58163 Street Johns Road
Quaker City, OH 43773
Home: 740-679-2605 Work: same Fax: e-mail: Use BSO's email

Other:

Backup Site Operator: George Muffett

26125 Thompson Road
Quaker City, OH 43773
Home: Work: 740-679-3119 Fax: e-mail: gmuffet1@gmail.com

Shipping Information

Federal Express: 58163 St. Johns Road

Quaker City, OH 43773

CASTNET Site Contact List

Directions to Site:	Out of Columbus, OH take I-70 E for approx 90 miles. Take Exit 193 for Quaker City/Hwy 513. Take Hwy 513 South approx 6 miles to Quaker City. At the stop sign in the center of town, take a right on Hwy 265. Go approx 0.75 mi and turn left on Yoker Valley Road (this is the first paved road to the left). Go approx 2.1 miles until you come to the top of a long hill. Veer right on the dirt road marked Noble County 34 (this is St. Johns Road). Follow this road until you see the 2ND house on the right which has a big red workshop behind it. The house is several miles from the junction of Yoker Valley Road. You are now at the site operators house. The site is in the hay field at the top of the hill across the road from the site operators house. The access road is just beyond the house, around the curve to the left. It cannot be driven when it is wet without 4-wheel drive.
Hazards:	Recreational hunting during season
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	From site take St. Johns Road (County Road 34) to Yoker Valley Road. Take Yoker Valley Road to State Route 265 East through Quaker City to Barnesville. Turn left at first intersection. Second stoplight, turn left.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	4E4-828
Electric Utility:	Gurnsey-Muskingum Elec Coop 6804213502 Vendor Code 26895
Utility Phone:	800-521-9879
Telephone Company:	Windstream 001485530999
TelCo Phone:	800-43-9214
Comments:	Police: 740.732.4158 Noble Cty. Sheriff; Fire/Ambulance: 740.679.2211 Quaker City; Nearest Medical: 740.425.3941, Barnesville Hospital, 639 West Main Street, Barnesville, OH 43713.

CASTNET Site Contact List

Site Number:	**172** **(QAK172)**	Site Name: **Quaker City, OH**		Updated: **6/29/2015**
Shelter Telephone:	**740-679-3345**			

Latitude:	39.9427	Longitude:	-81.3379
Magnetic Declination:		Elevation:	371 meters
USGS Quadrangle:		Site Deactivated:	12/5/1995
Site Installed:	9/28/1993	Polling ID Number:	
Calibration Group:	MW7	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mary Lou Trainer
Landowner
58163 St. Johns Road
Quaker City, OH 43773
Home: 740-679-2605 Work: same Fax: e-mail:

Site Operator: Mary Lou Trainer

58163 Street Johns Road
Quaker City, OH 43773
Home: 740-679-2605 Work: same Fax: e-mail: Use BSO's email

Other:

Backup Site Operator: George Muffett

26125 Thompson Road
Quaker City, OH 43773
Home: Work: 740-679-3119 Fax: e-mail: gmuffet1@gmail.com

Shipping Information

Federal Express: 58163 St. Johns Road

Quaker City, OH 43773

CASTNET Site Contact List

Directions to Site:	Out of Columbus, OH take I-70 E for approx 90 miles. Take Exit 193 for Quaker City/Hwy 513. Take Hwy 513 South approx 6 miles to Quaker City. At the stop sign in the center of town, take a right on Hwy 265. Go approx 0.75 mi and turn left on Yoker Valley Road (this is the first paved road to the left). Go approx 2.1 miles until you come to the top of a long hill. Veer right on the dirt road marked Noble County 34 (this is St. Johns Road). Follow this road until you see the 2ND house on the right which has a big red workshop behind it. The house is several miles from the junction of Yoker Valley Road. You are now at the site operators house. The site is in the hay field at the top of the hill across the road from the site operators house. The access road is just beyond the house, around the curve to the left. It cannot be driven when it is wet without 4-wheel drive.
Hazards:	Recreational hunting during season
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	From site take St. Johns Road (County Road 34) to Yoker Valley Road. Take Yoker Valley Road to State Route 265 East through Quaker City to Barnesville. Turn left at first intersection. Second stoplight, turn left.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	4E4-828
Electric Utility:	Gurnsey-Muskingum Elec Coop 6804213502 Vendor Code 26895
Utility Phone:	800-521-9879
Telephone Company:	Windstream 001485530999
TelCo Phone:	800-43-9214
Comments:	Police: 740.732.4158 Noble Cty. Sheriff; Fire/Ambulance: 740.679.2211 Quaker City; Nearest Medical: 740.425.3941, Barnesville Hospital, 639 West Main Street, Barnesville, OH 43713.

CASTNET Site Contact List

Site Number: **004** **(RED004)** Site Name: **Red Lake Nation, MN** Updated: **9/12/2014**

Shelter Telephone:

Latitude:	47.8638	Longitude:	-94.8352
Magnetic Declination:		Elevation:	372 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	8/26/2014	Polling ID Number:	
Calibration Group:	MW7	Site Type:	Dry,Met
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Jennifer Malinski
Red Lake Nation
15761 High School Drive
Red Lake, MN 56671
Home: Work: 218-679-1618 Fax: 218-679-2830 e-mail: jmalinski@redlakenation.org

Site Operator: Jennifer Malinski
Red Lake Nation
15761 High School Drive
Red Lake, MN 56671
Home: Work: 218-679-1618 Fax: 218-679-2830 e-mail: jmalinski@redlakenation.org
Other: 218-556-8389 Cell

Backup Site Operator: Willow LeBlanc
Red Lake Nation
15761 High School Drive
Red Lake, MN 56671
Home: Work: 218-649-1643 Fax: e-mail: wleblanc@redlakenation.org

Shipping Information

Federal Express: 15761 High School Drive

Red Lake, MN 56671

CASTNET Site Contact List

Directions to Site: From Red Lake go east on Hwy 1 for approximately 9 miles, this will take you through Redby. Turn onto a path heading south off of Hwy 1 just before the sign indicating 'Bridge 424'. This path will lead directly to the site.

Hazards: Deep muddy ruts after a lot of rain.

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility: Head west on Hwy 1 for 9.4 miles. Turn right onto Holstein Avenue and then turn left into parking lot. Red Lake IHS Hospital, 24760 Hospital Drive.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments:

CASTNET Site Contact List

Site Number: **206** **(ROM206)** Site Name: **Rocky Mtn NP Collocated, CO** Updated: **6/29/2015**

Shelter Telephone: **970-586-2598**

Latitude:	40.2781	Longitude:	-105.5456
Magnetic Declination:		Elevation:	2742 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	7/3/2001	Polling ID Number:	
Calibration Group:	W10	Site Type:	Dry,Ozone,Met,Precursor
Equipment Type:	RMY	Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Ronca

P.O. Box 162
Drake, CO 80515
Home: 970-231-2662 Work: Fax: e-mail: mcronca@hotmail.com

Site Operator: James Detterline

66 Bunce School Road
Lyons, CO 80540
Home: 970-231-2662 Work: Fax: e-mail: jim.detterline@gmail.com
Other:

Backup Site Operator: Bill Karam

64 Bunce School Road
Lyons, CO 80540
Home: 303-747-2438 Work: Fax: e-mail: billkaram@me.com

Shipping Information

Federal Express: Jim Detterline
66 Bunce School Road
Lyons, CO 80540

CASTNET Site Contact List

Directions to Site:	From the east side of Estes Park, take highway 7 south about 8.5 miles. Turn right on the first dirt road past Longs Peak Inn. There is a sign that reads High Peak Camp. The site is about 100 meters down the dirt road on the left, and 100 meters from the dirt road.

Hazards:	N/A
Emergency Contact:	Estes Park Medical Center
Emergency Phone:	970-586-2317, 911
Emergency Directions to Medical Facility:	From the site take the dirt road east to highway 7. Turn left (north) on highway 7 to Estes Park. When approaching town, just before the junction of Hwy 7 and route 36, turn left on Stanley Avenue. Follow the blue Hospital signs about 0.5 miles to Estes Park Hospital.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	T54745820
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Century Link 9705862598687B Vendor Code 28211
TelCo Phone:	970-586-2598
Comments:	Additional backup operators: Laura Wheatley, RNMP Utility area. Cell 970-232-5112, work 970-586-1252 AT&T Raven 678.735.9507, I.P. [redacted] Special instructions: gate combo 1346, items can be left under barn roof. Summer gate combo = 6526 Carlie Ronca contact info, same as Mark's.

CASTNET Site Contact List

Site Number: **406** (**ROM406**) Site Name: **Rocky Mtn NP, CO** Updated: **10/28/2015**

Shelter Telephone: **970-586-8520**

Latitude:	40.2781	Longitude:	-105.5456
Magnetic Declination:		Elevation:	2743 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	12/20/1994	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Brian Kolokowsky
Rocky Mountain National Park
1000 West Highway 36
Estes Park, CO 80517
Home: Work: 970-586-1252 Fax: 970-586-1310 e-mail: Brian_kolokowsky@nps.gov

Other: See comment section

Backup Site Operator: Stacy Nigon, Kevin Gaalaas, Michelle Gibbons
Rocky Mountain National Park
1000 West Highway 36
Estes Park, CO 80517
Home: Work: Fax: e-mail: See comment section

Shipping Information

Federal Express: Rocky Mountain National Park, Brian Kolokowsky
1000 West Highway 36
Estes Park, CO 80517

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Provided by NPS
TelCo Phone:	N/A

Comments: Kevin Gaalaas email - kevin_gaalaas@nps.gov, Stacy Nigon email - stacia_nigon@nps.gov, Michelle Gibbons email - michelle_gibbons@nps.gov

CASTNET Site Contact List

Site Number: **133** **(SAL133)** Site Name: **Salamonie Reservoir, IN** Updated: **6/29/2015**

Shelter Telephone: **260-782-2428**

Latitude:	40.816	Longitude:	-85.6614
Magnetic Declination:		Elevation:	250 meters
USGS Quadrangle:	Lagro, IN	Site Deactivated:	
Site Installed:	6/28/1988	Polling ID Number:	
Calibration Group:	MW8	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, No Daylight Savings Time

Contacts/Operators

Primary Contact: John Scheiber
Salamonie Project Manager
1004 South Salamonie Dam Road
Largo, IN 46941
Home: 260-450-5340 Work: 260-782-2358 Fax: e-mail: john.d.scheiber@uface.army.mil

Site Operator: Karey Davis

2832 N. 600 E.
Warsaw, IN 46582
Home: Work: Fax: e-mail: davis.karey@gmail.com

Other: 765-506-6229 Cell

Backup Site Operator: Shelley Marchetti
STI
6693 South Old S Road 15
Wabash, IN 46992
Home: 765-981-2282 Work: Fax: e-mail:

Shipping Information

Federal Express: 2832 N. 600 E.

Warsaw, IN 46582

CASTNET Site Contact List

Directions to Site:	From Fort Wayne, In take I69 and Hwy 24 (exit 102). Proceed on Hwy 24 West through Huntington and Andrews. Close to Lagro you will come to Hwy 524 South. Turn left on Hwy 524, cross river and the road turns left. Take the road that is on the left when 524 turns back to the right. This is Hanging Rock Road. Turn on Division Road, turn onto 600 E. Road, turn left on 50 S., Turn right on 725E, this road turns into gravel and goes right by the site.
Hazards:	N/A
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	From site go out driveway, take a right on 50 South, take a left on 750 East, take a right onto Division Road, cross over State Road 105 and Rangeline Road, take a left onto State Road 9, St Rd. 9 merges with HWY 24 Huntington. Stay on 9/24, go through Huntington, at east edge of town an right (south) side of HWY is Huntington Memorial Hospital.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Wabash, Co. REMC 517002
Utility Phone:	800-563-2146
Telephone Company:	AT&T 26078224281343 Vendor Code 28932
TelCo Phone:	260-782-2428
Comments:	Police: 260.358.2308; Fire Dept: 260.782.2011; Ambulance: 260.356.1122; Nearest Medical Facility: Huntington Memorial Hospital. Shelly Marchetti is Karey's sister

CASTNET Site Contact List

Site Number: **189** **(SAN189)** Site Name: **Santee Sioux, NE** Updated: **10/7/2015**

Shelter Telephone: **402-857-2546 x2539**

Latitude:	42.8292	Longitude:	-97.8541
Magnetic Declination:		Elevation:	434 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	7/5/2006	Polling ID Number:	
Calibration Group:	W9	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Alisha Bartling
Santee Sioux
52948 HWY 12
Niobrara, NE 68760
Home: Work: 402-857-3347 Fax: 402-857-3339 e-mail: santeeenvirodept@gmail.com

Site Operator: Matthew Laughlin

52948 HWY 12
Niobrara, NE 68760
Home: Work: 402-857-3347 Fax: 402-857-3339 e-mail: matthew.laughlin@santeeoep.c

Other: See comment section

Backup Site Operator: Jennifer Straub, Redina Redwing

52948 HWY 12
Niobrara, NE 68760
Home: Work: 402-857-3347 Fax: 402-857-3339 e-mail: See comment section

Shipping Information

Federal Express: 425 Frazier N. Suite 2, Matthew Laughlin

Niobrara, NE 68760

CASTNET Site Contact List

Directions to Site:	From Eppley Airport, Omaha NE. Travel North on I-29 until you reach Sioux City, Iowa. Take US Hwy 20 West before you enter Sioux City. Look for State Road 12 on the right. Approximately 10 miles from Hwy 20. Head North on State Road 12. You eventually will travel North-Northwest on State Road 12 until you come to State Road 54D. (If you reach Niobrara on Hwy 12, you've gone to far) Travel North onto State Road 54D for ~9 miles. You will see town of Santee. The site is located on the left before you reach the town, There is a Blue Water pump station next to the site on the left.
Hazards:	
Emergency Contact:	Santee Health Center & Wellness
Emergency Phone:	404-857-2300
Emergency Directions to Medical Facility:	From CASNET shelter go back to Spur 54D take a left toward Santee. Turn left onto Dwellers Ave, follow to Visiting Eagle Street. Clinic is on Left (about two blocks). For the Police and Fire you will need to call 911 and Knox County will contact the Santee Police or Fire personnel.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	
Electric Utility:	North Central Public Power District
Utility Phone:	402-358-5112
Telephone Company:	Great Plains Communications
TelCo Phone:	888-343-8014
Comments:	Verizon Raven 770.570.8330, I.P. [redacted] Jennifer Straub, is Deputy Director, email: jennifer.straub@santeeoep.com, Redina Redwing is Tribal Responde Coordinator, email: redina.redwing@santeeoep.com All can be reached at 401.857.3347

CASTNET Site Contact List

Site Number: **430** **(SEK430)** Site Name: **Sequoia NP - Ash Mountain, CA** Updated: **3/16/2015**

Shelter Telephone: **559-565-4216 x3490**

Latitude:	36.4895	Longitude:	-118.8292
Magnetic Declination:		Elevation:	510 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	4/7/2005	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Pacific time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Erik Meyer

,
Home: Work: 559-565-3127 Fax: 559-565-4253 e-mail: erik_meyerr@nps.gov
Other:

Backup Site Operator: Frank Klein, Mike Turner, Brianne Permar

,
Home: Work: 559-565-3768 Fax: see comments e-mail: mike_turner@nps.gov

Shipping Information

Federal Express: Erik Meyer, Sequoia & Kings Canyon Nat'l Parks
47050 Generals Hwy.
Three Rivers, CA 93271

CASTNET Site Contact List

Directions to Site:

Hazards:

Emergency Contact:

Emergency Phone:

Emergency
Directions to
Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments: Frank Klein email frank_klein@nps.gov, phone 559.565.3777. Annie Esperanza is the Administrative Contact for SEK430, e-mail annie_esperanza@nps.gov, phone - 559.564.4211

CASTNET Site Contact List

Site Number: **604** **(SHE604)** Site Name: **Sheridan, WY** Updated: **6/29/2015**

Shelter Telephone:

Latitude:	44.93	Longitude:	-106.85
Magnetic Declination:		Elevation:	1115 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	11/6/2012	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Met
Equipment Type:		Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Cassie Archuleta
Air Resource specialists, Inc.
1901 Sharp Point Drive
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: carchuleta@air-resource.com

Site Operator: Dominic Jandrain
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834
Home: 307-217-0755 Work: 307-684-1056 Fax: 307-684-1051 e-mail: Dominic_Jandrain@blm.gov
Other:

Backup Site Operator: David Croft
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834
Home: 307-684-1151 Work: 307-217-0760 Fax: e-mail: David_Croft@blm.gov

Shipping Information

Federal Express:

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CASTNET Site Contact List

Directions to Site:

Hazards:

Emergency Contact:

Emergency Phone:

Emergency
Directions to
Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments: Brian Bibeau, Technical Lead (1), Work # 970-484-7941, bbibeau@air-resource.com
Nick Dummer, Technical Lead (2), Work # 970-484-7941, ndummer@air-resource.com

CASTNET Site Contact List

Site Number: **418** **(SHN418)** Site Name: **Shenandoah NP - Big Meadows, VA** Updated: **3/13/2015**

Shelter Telephone: **540-999-3698**

Latitude:	38.5231	Longitude:	-78.4347
Magnetic Declination:		Elevation:	1073 meters
USGS Quadrangle:	Big Meadows, VA	Site Deactivated:	
Site Installed:	6/28/1988	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtiggest@air-resource.com

Site Operator: Liz Garcia
Shenandoah National Park
3655 US Hwy 211 East
Luray, VA 22835
Home: Work: 540-999-3500 Fax: 540-999-3693 e-mail: liz_garcia@nps.gov
Other:

Backup Site Operator: Jalyn Cummings, Jim Schalbert

,
Home: Work: 540-999-3500 Fax: e-mail: jim_schaberl@nps.gov

Shipping Information

Federal Express: Shenandoah National Park
3655 US Hwy 211 East
Luray, VA 22835

CASTNET Site Contact List

Directions to Site:	NOTE: Telephone 3 or 4 days in advance for an EB Submaster key to be left at Big Meadows Station. From D.C. take 460 West to 29 N to 33 W to Skyline Drive N (left). Exit into Big Meadows visitors center to pick up key. Exit visitors center by filling station and go right (toward Lodge). Take the 1st right. On the left there is a parking lot and a dirt and gravel road. Take that road to the left; it will curve right (take right fork) and go directly to site...about 100 yards.

Hazards:	N/A
Emergency Contact:	Page Memorial Hospital
Emergency Phone:	911
Emergency Directions to Medical Facility:	From site, go north to US 211, go right on 211, take 211 business loop into Luray, take Memorial Drive (on right) to Page Memorial Hospital.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	C & P Telephone
TelCo Phone:	540- 899-2958
Comments:	Jim Schaberl phone #: 540.999.3500x3491, Liz extion 3499

CASTNET Site Contact List

Site Number: **152** **(SND152)** Site Name: **Sand Mountain, AL** Updated: **10/17/2013**

Shelter Telephone: **256-528-7175**

Latitude:	34.289	Longitude:	-85.9701
Magnetic Declination:		Elevation:	349 meters
USGS Quadrangle:	Crossville, AL	Site Deactivated:	
Site Installed:	12/27/1988	Polling ID Number:	
Calibration Group:	SE4	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: James Bannon
Auburn University

Auburn, AL 35660
Home: Work: 334-844-5611 Fax: e-mail:

Site Operator: Mack Smith

4328 Egypt Road
Boaz, AL 35956
Home: 256-593-7884 Work: Fax: e-mail: macksmith2004@yahoo.com

Other: 256-738-3130 Cell

Backup Site Operator: Rebecca Driskill
(Mack's daughter)
408 George Street
Crossville, AL 35962
Home: 256-528-5480 Work: 256-293-9181 Fax: e-mail: ckdrisk@tds.net

Shipping Information

Federal Express: 4328 Egypt Road

BOAZ, AL 35956

CASTNET Site Contact List

Directions to Site:	From Gadsden, AL take I-59 North approx 20 mi. Take exit 205 for Hwy 68 & Crossville. Go west arppox 15 mi, just inside the city limits of Crossville. Site is on the right behind houses in the Sand Mountain Experimental Station.

Hazards:	N/A
Emergency Contact:	see comments
Emergency Phone:	911
Emergency Directions to Medical Facility:	From site 152 turn right on Hwy 68, go past the bank and the school, there will be a Doctors Office on your left approx 1.5 miles from site. To get to B+A Hospital, go past the Dr.s Office until you get to Hwy 168, take a left, go to Hwy 431, take a right, hospital is approx 12 miles from site.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Marshall Dekalb Electric 200204100201 Vendor Code 26755
Utility Phone:	800-239-3692
Telephone Company:	TDS Telecom 256.528.7175
TelCo Phone:	888-837-3050
Comments:	Doctors Office: 256.528.7173; B+A Hospital: 256.528.7131. Other primary contact: John Eason 256.528.7133 Verizon Raven 770.820.9860, I.P. [redacted]

CASTNET Site Contact List

Site Number: **111** **(SPD111)** Site Name: **Speedwell, TN** Updated: **6/29/2015**

Shelter Telephone: **423-869-8159**

Latitude:	36.4698	Longitude:	-83.8265
Magnetic Declination:		Elevation:	361 meters
USGS Quadrangle:	Ausmus, TN	Site Deactivated:	
Site Installed:	6/12/1989	Polling ID Number:	
Calibration Group:	MW6	Site Type:	Dry,Ozone,Met,Nadp
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: William Roger Russell
Landowner
718 Russell Hill Road
Speedwell, TN 37870
Home: 423-869-8445 Work: 865-604-7949 Fax: e-mail: grrenee@bellsouth.net

Site Operator: Roger Russell

718 Russell Hill Road
Speedwell, TN 37870
Home: 423-869-4413 Work: 423-869-8445 Fax: 423-869-7906 e-mail: grrenee@bellsouth.net

Other: 865-604-7949 Cell

Backup Site Operator: Franklin G. Russell
(Roger's uncle)
3005 Back Valley Road
Speedwell, TN 37870
Home: 423-869-4504 Work: Fax: 423-869-7906 e-mail:

Shipping Information

Federal Express: 718 Russell Hill Road

Speedwell, TN 37870

CASTNET Site Contact List

Directions to Site:	Leave Knoxville on I-75 North. Get off the interstate onto US-25W at Caryville, exit 134, then on state road 63 (heading northeast) at La Follette. After about 15 miles highway 63 will cross the county line into Claiborne County and the mile markers will restart at zero. Just past the mile marker 6 in Clairborne County, turn right (southeast). As of August 95 there is a B&B Texaco on the other side of the highway at this point. Turning off the highway, drive about 200 yards and turn left at the T. After 100 yards, turn right, it should be the first right, near an old filling station. This is known as Russell Road and look for the shelter near a silo in a field to the right. Entrance is a barbed wire fence gate just past the silo. Bear left at 1st fork in driveway.
Hazards:	N/A
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	Take Russell Lane 1 mile to service station, go left Old Hwy. 63, take Hwy 63 to a brick house on right (approx 1/8 mile), take a right, go 1/8 mile, turn left onto Highway 63, go approx 20 miles to La Follette Medical Center.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	LaFollette Electric Co. 3284-001 Vendor Code 27057
Utility Phone:	800-352-1340
Telephone Company:	AT&T Club Service 404R19-4187187*865M14-5216216
TelCo Phone:	888-401-4336
Comments:	Police 423.626.2820; Fire Department 423.869.8275 (day) 865.2358 (night); Ambulance 423.562.2211; Nearest Medical Facility, LaFollette Medical Center 423.562.2211. Verizon Raven 678.372.417, IP [redacted]

CASTNET Site Contact List

Site Number: **138** **(STK138)** Site Name: **Stockton, IL** Updated: **10/17/2013**

Shelter Telephone: **815-947-9003**

Latitude:	42.2872	Longitude:	-90
Magnetic Declination:		Elevation:	281 meters
USGS Quadrangle:	Stockton, IL	Site Deactivated:	
Site Installed:	12/28/1993	Polling ID Number:	
Calibration Group:	MW7	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Steve Evans
Landowner
10952 E. Parker Road
Stockton, IL 61085
Home: 815-947-9914 Work: 815-541-8884 Fax: e-mail: sevans@jisp.net

Site Operator: Steve Evans

10952 E. Parker Road
Stockton, IL 61085
Home: 815-947-9914 Work: Fax: e-mail: sevans@jisp.net

Other: 815-541-8884 Cell

Backup Site Operator:

,
Home: Work: Fax: e-mail:

Shipping Information

Federal Express: 10952 E. Parker Road

Stockton, IL 61085

CASTNET Site Contact List

Directions to Site:	From Chicago take RT 90 West to Rockford. From Rockford, take RT 20 West to Stockton. At the light in Stockton (Main Street) turn left (South) on RT 78. About 2.7 miles south of Stockton, RT 78 curves to the right and Ridge Road (which is dirt) continuing straight. Take the dirt road. There will be a stop sign at about 100 ft. Continue straight for about 1.1 miles. Go AROUND THE HILL with the mobile home on top. On the other side of the hill, Ridge Road turns right, but go straight on the DEAD END dirt road. Site operators live in the farm house 1/4 mile on the right. The site is further up the road past the house, barn, and shed on the left.
Hazards:	N/A
Emergency Contact:	Stockton Family Health Center; 109 N. Main, 815.947.2155
Emergency Phone:	911
Emergency Directions to Medical Facility:	From site go west on E. Parker Road 1.5 miles to Hwy 78. Take a right on Hwy 78 North to Stockton, approx 3.5 miles. Go 1 mile through Stockton and the Health Center will be on your right. Stockton Family Health Center, 109 N. Main, Stockton, IL 61085. Phone: 815.947.2155.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Commonwealth Edison (ComEd) 3456162014 Vendor Code 27185
Utility Phone:	877-462-4008
Telephone Company:	Verizon 401494338604261910
TelCo Phone:	800-483-6000

Comments:

CASTNET Site Contact List

Site Number: **156** **(SUM156)** Site Name: **Sumatra, FL** Updated: **5/22/2015**

Shelter Telephone: **850-670-8376**

Latitude:	30.1102	Longitude:	-84.9904
Magnetic Declination:		Elevation:	16 meters
USGS Quadrangle:	Sumatra, FL	Site Deactivated:	
Site Installed:	12/27/1988	Polling ID Number:	
Calibration Group:	SE5	Site Type:	Dry,Ozone,Met,Nadp
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Ronald C. Smith
USDA Forest Service
Rt. 6, Box 7860
Crawfordville, FL 32327-9307
Home: 850-643-2283 Work: Fax: e-mail:

Site Operator: Jimmy Bishop

19157 N.E. Elijahmooris Road
Blountstown, FL 32424
Home: 850-674-4854 Work: Fax: e-mail:
Other:

Backup Site Operator: Tara Tillman
STI
5339 Fork Road
Greenwood, FL 32443
Home: 850-594-7528 Work: Fax: e-mail:

Shipping Information

Federal Express: Jimmy Bishop
19157 N.E. Elijahmooris Rd.
Blountstown, FL 32424

CASTNET Site Contact List

Directions to Site:	Out of Tallahassee, FL take Hwy 20 West to town of Hosford (approx 25 mi). At the flashing light make a left (South) onto Hwy 65. Go 22.8 miles and make a right onto an unmarked dirt road/trail. Turn left at "T" (fork is approx 100 yards in). The site can be seen approx 1/4 mi on the right. *** There are multiple dead end access points between miles 21 - 23.***

Hazards:	recreational hunting and frequent lightning strikes
Emergency Contact:	Calhoun Liberty Hospital, 424 Burns Avenue, Blountstown, FL
Emergency Phone:	850-674-5411
Emergency Directions to Medical Facility:	From site take State Road 65 north to Highway 12. Continue north to Bristol. Go west on Hwy 20 to Blountstown. Take Hwy 71 north to Charlie E. Johns Street, turn east on Burns Avenue, where hospital is located.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	FL1028
Electric Utility:	Talquin Electric 2114407071
Utility Phone:	850-627-7651
Telephone Company:	Fairpoint New England - Verizon 0010025297 Vendor Code 27130
TelCo Phone:	850-670-8376
Comments:	Ambulance/Police: 850.643.2235; Fire Dept: 850.643.2400. AT&T Raven 678.654.1067, I.P. [redacted]

CASTNET Site Contact List

Site Number: **422** **(THR422)** Site Name: **Theodore Roosevelt NP, ND** Updated: **3/16/2015**

Shelter Telephone: **701-575-4203**

Latitude:	46.8948	Longitude:	-103.3777
Magnetic Declination:		Elevation:	850 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	10/6/1998	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Cory Andvik
Theodore Roosevelt National Park

Medora, ND 58645
Home: Work: Fax: 701-623-4840 e-mail: cory_andvik@nps.gov
Other:

Backup Site Operator: Amy McCann, Bill Whitworth

,
Home: Work: 701-623-4730 Fax: 701-623-4840 e-mail: bill_whitworth@nps.gov

Shipping Information

Federal Express: Theodore Roosevelt National Park
315 2nd Avenue
Medora, ND 58645

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Provided by NPS
TelCo Phone:	N/A

Comments: Bill Whitworth phone #: 701.623.4730x3407

CASTNET Site Contact List

Site Number: **002** **(UND002)** Site Name: **Underhill, VT** Updated: **6/9/2015**

Shelter Telephone:

Latitude:	44.5283	Longitude:	-72.8688
Magnetic Declination:		Elevation:	399 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	11/13/2012	Polling ID Number:	
Calibration Group:	E2	Site Type:	Dry,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Benjamin Whitney
State of Vermont Air Pollution Control Division
Building 3 South, 103 South Main Street
Waterbury, VT 05671
Home: Work: 802-241-3861 Fax: 802-241-2590 e-mail: ben.whitney@state.vt.us

Site Operator: Miriam Pendleton
Proctor Maple Research Center
58 Harvey Road
Underhill Center, VT 05489
Home: Work: 802-899-9926 Fax: e-mail: mpendlet@uvm.edu
Other:

Backup Site Operator: Judy Rosovsky, Jim Duncan
337 College Hill Road
Johnson, VT 05656
Home: 802-434-4252 Work: 802-656-2975 Fax: e-mail: judy.rosovsky@uvm.edu

Shipping Information

Federal Express: UVM Proctor Research Center
58 Harvey Road
Underhill, VT 05489

CASTNET Site Contact List

Directions to Site:

Hazards: Seasonal bow/rifle hunting, moose, blackbear, coyote, hypothermia

Emergency Contact:

Emergency Phone: 911

Emergency Directions to Medical Facility:

1. Start out going northwest on Harvey Rd toward Pleasant Valley Rd. 0.7 mi
2. Turn left onto Pleasant Valley Rd. 2.0 mi
3. Turn very slight right onto River Rd. River Rd is just past Krug Rd United States Postal Service is on the corner 2.7 mi; you are really staying on the same track, the name just changes here.
4. Turn left onto VT Route 15/VT-15. Continue to follow VT-15. JOLLEY RIVER SIDE MOBIL is on the corner 6.0 mi
5. Turn left onto Center Rd/VT-15. Continue to follow VT-15. VT-15 is 0.1 miles past Alder Ln Essex Free Library is on the corner If you are on Towers Rd and reach Clover Dr you've gone about 0.1 miles too far 3.1 mi
6. Turn slight right onto Pearl St/VT-15. Continue to follow VT-15. VT-15 is just past Lincoln St Mobil is on the corner 4.3 mi
7. Turn slight left onto VT-15/E Allen St. McKee's Pub is on the corner 0.02 mi
8. Enter next roundabout and take the 3rd exit onto US-7 S/US-2 E. 0.2 mi
9. Stay straight to go onto Colchester Ave. 0.8 mi
10. 111 COLCHESTER AVE is on the left. Fletcher Allen Hospital -- (802) 847-0000

Your destination is just past Fletcher Pl If you reach Univ of Vermont you've gone a little too far.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

Electric Utility:

Utility Phone Number:

Telephone Company:

TelCo Phone:

Comments: Judy Rosovsky cell phone # 802.324.3473

CASTNET Site Contact List

Site Number: **124** **(UVL124)** Site Name: **Unionville, MI** Updated: **7/2/2015**

Shelter Telephone: **989-673-5901**

Latitude:	43.6136	Longitude:	-83.3599
Magnetic Declination:		Elevation:	202 meters
USGS Quadrangle:	Ellington, MI	Site Deactivated:	
Site Installed:	6/28/1988	Polling ID Number:	
Calibration Group:	MW8	Site Type:	Dry,Ozone,Met,Nadp
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Jay Matt
(Fred Matt, Landowner) 1821 E. Dickerson Rd. Unionville, MI 48767
5450 Remington Road
Unionville, MI 48767
Home: 989-980-0124 Work: Fax: e-mail:

Site Operator: Denise Dickson

5450 Remington Road
Unionville, MI 48767
Home: 989-670-4291 Work: 989-872-3870 Fax: e-mail: keshaandcasey@yahoo.com

Other: Jay Matt serves as a technical resource for equipment and site maintenance and repair.

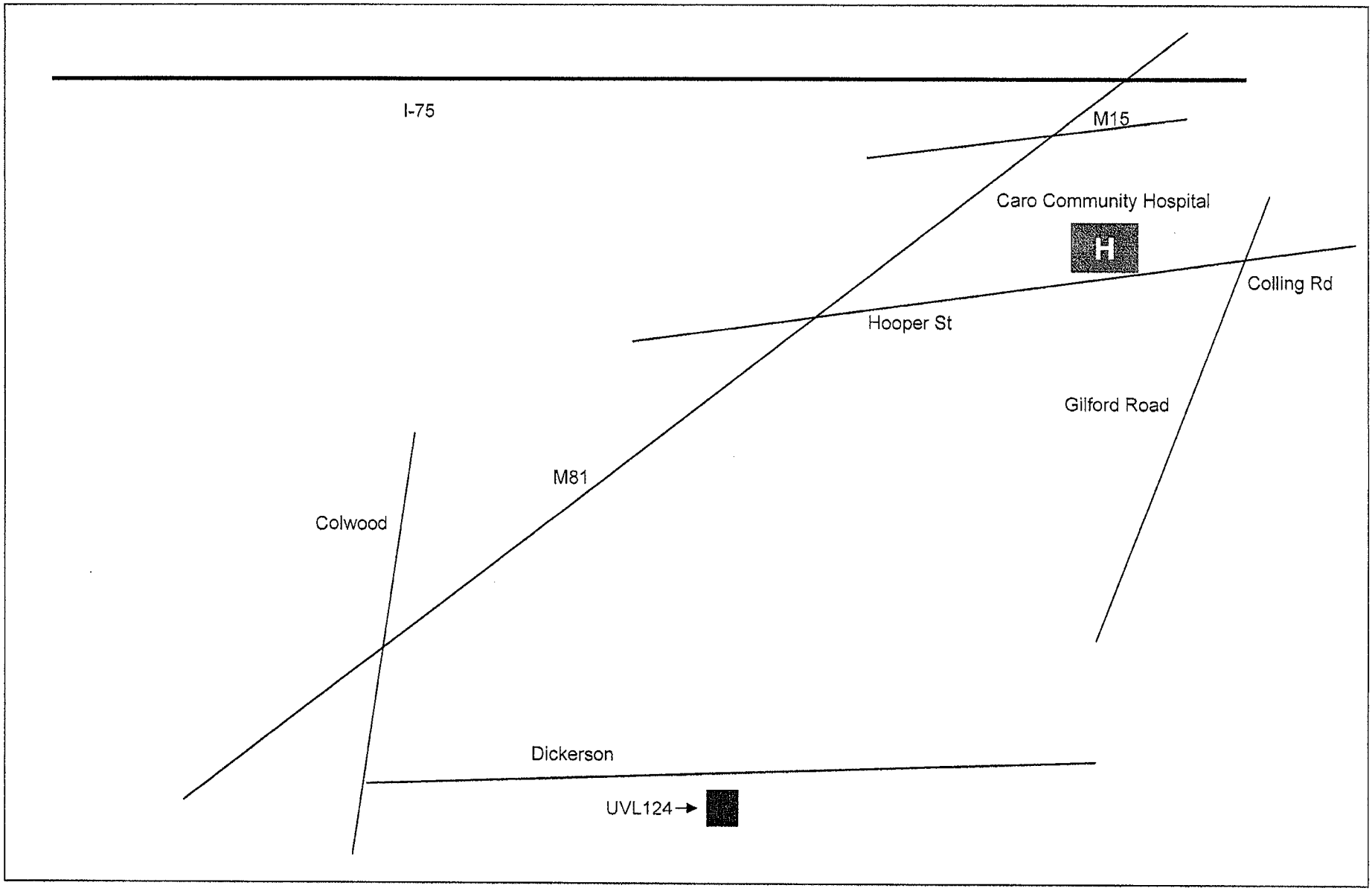
Backup Site Operator: Jay Matt

5450 Remington Road
Unionville, MI 48767
Home: Work: Fax: e-mail:

Shipping Information

Federal Express: 5450 Remington Road

Unionville, MI 48767



Nearest medical facility to Site UVL124, MI

Unionville, MI

U.S. Environmental Protection Agency (EPA)

Clean Air Status and Trends Network (CASTNET)

CASTNET Site Contact List

Directions to Site:	Take 81 East from Saginaw, MI to Caro. From junction of SR 24 & 81, continue 2.9 miles East on 81. Turn left on Colwood (Church on left, Luckys on right). Go 6 miles on Colwood to Dickerson Rd. (stop sign). Turn left, see site on right behind first farmhouse on right. (911address is Fred Matts home, 1821 E. Dickerson Rd. Unionville, MI 48767 Fred phone # 989-673-3277

Hazards:	N/A
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	See map.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	7X1473
Electric Utility:	Detroit Edison Company 100574800015 Vendor Code 26120
Utility Phone:	800-477-4747
Telephone Company:	Century Link 422900956 Vendor Code 27657
TelCo Phone:	800-201-4102
Comments:	Telephone repairs 800.824.2877; Police: 989.673.2156; Fire Dept: 989.674.8661; Ambulance: 989.674.8661 & 691.5511; Nearest Medical Facility Caro Community Hospital 989.673.3141. Jay Matt serves as a technical resource for equipment and site maintenance and repair. He does not perform sampling.

CASTNET Site Contact List

Site Number: **140** **(VIN140)** Site Name: **Vincennes, IN** Updated: **12/9/2014**

Shelter Telephone: **812-886-0177**

Latitude:	38.7408	Longitude:	-87.4849
Magnetic Declination:		Elevation:	136 meters
USGS Quadrangle:	Fritchton, IN	Site Deactivated:	
Site Installed:	8/4/1987	Polling ID Number:	
Calibration Group:	MW7	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, No Daylight Savings Time

Contacts/Operators

Primary Contact: Dr. Rich Grant
Purdue University Department of Agronomy
Lilly Hall of Life Sciences
West Lafayette, IN 47097
Home: 765-497-0854 Work: 765-494-8048 Fax: 765-496-2926 e-mail:

Site Operator: Bill Davis
Southwest Purdue Agricultural Center
4669 N. Purdue Road
Vincennes, IN 47591
Home: 812-887-6781 Work: 812-886-9661 Fax: e-mail: davisw@purdue.edu
Other:

Backup Site Operator: Dennis Nowaskie
Purdue U, 812-887-0757 Cell
4669 N. Purdue Road
Vincennes, IN 47591
Home: 812-886-9661 Work: 812-886-9661 Fax: 812-886-9997 e-mail: nowaskie@purdue.edu

Shipping Information

Federal Express: SW Purdue Agricultural Center
4669 N. Purdue Rd.
Vincennes, IN 47591

CASTNET Site Contact List

Directions to Site:	Take Hwy 50 to Vincennes, IN. Take Hwy 41 North approx 2 to 3 miles until you see the sign for the Purdue Agricultural Center. Turn left. The drive to the center veers left, the road to the site continues straight.

Hazards:	Farm spray shed & summer thunderstorms
Emergency Contact:	Medical Center of Vincennes; (812) 882-1106
Emergency Phone:	911
Emergency Directions to Medical Facility:	From SW Purdue Agricultural Center go West on U.S. 41, take the U.S. 50/41 By-Pass south. Take the SR 441 exit north into Vincennes. Exit onto south 6th St. Distance from farm to hospital is approx 10 miles.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	REMC
Utility Phone:	812-882-5140
Telephone Company:	Indiana Bell
TelCo Phone:	812-556-3200

Comments:

CASTNET Site Contact List

Site Number: **413** **(VOY413)** Site Name: **Voyageurs NP, MN** Updated: **10/8/2015**

Shelter Telephone: **218-286-3113 Cell**

Latitude:	48.4125	Longitude:	-92.8292
Magnetic Declination:		Elevation:	429 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	6/13/1996	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Central time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Bryce Olson
Voyageurs National Park
360 Highway 11 East
International Falls, MN 56649-8904
Home: Work: 218-283-6944 Fax: 218-283-7407 e-mail: bryce_olson@nps.gov

Other: Bryce Cell: 218-324-2984

Backup Site Operator: Sean Johnson-Bice, Tom Gable, Lisa Maass, Andrew LaBounty,

,
Home: Work: 218-283-6692 Fax: e-mail: See Comment section

Shipping Information

Federal Express: Voyageurs National Park
360 Hghway 11 East
International Falls, MN 56649

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Provided by NPS
TelCo Phone:	N/A

Comments: Contact Bryce Olson with any problems, by email, or phone call.

CASTNET Site Contact List

Site Number: **120** **(VPI120)** Site Name: **Horton Station, VA** Updated: **6/29/2015**

Shelter Telephone: **540-626-7003**

Latitude:	37.3298	Longitude:	-80.5575
Magnetic Declination:		Elevation:	920 meters
USGS Quadrangle:	Eggleston, VA	Site Deactivated:	
Site Installed:	6/2/1987	Polling ID Number:	
Calibration Group:	E1	Site Type:	Dry,Ozone,Met,Nadp
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Diane Reaver

199 Leffel Lane
Newport, VA 24128
Home: 540-544-7358 Work: Fax: e-mail: dianer@vt.edu

Site Operator: Diane Reaver
Virginia Polytechnic Institute
199 Leffel Lane
Newport, VA 24128
Home: 540-544-7358 Work: Fax: e-mail: dianer@vt.edu
Other:

Backup Site Operator: Erica Jones

1171 Happy Hollow Road
Newport, VA 24128
Home: 540-544-7359 Work: Fax: e-mail: emjones@vt.edu

Shipping Information

Federal Express: Diane Reaver
199 Leffel Lane
Newport, VA 24128

CASTNET Site Contact List

Directions to Site:	From Blacksburg, VA take 460 West approx. 10 mi. Turn right on 700 north; there is a sign for Mountain Lake and Horton Station. Go six miles and the station is on the right, there is no sign, but there are 2 black mailboxes in a fieldstone stand, one of which is marked Horton. Proceed through the gate and the site will be visible.

Hazards:	Recreational hunting in Nov & Dec
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	From Horton Center take Mountain Lake Road to 460. Take 460 East toward Christiansburg for Montgomery Co. Hospital. Take 460 West through Pembroke across the New River to Pearisburg Hospital. There is a First Aid Station in Newport, to get there take 460 East from Mt. Lake Road, turn right onto 42.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Appalachian Power 02541770018 Vendor Code 28093
Utility Phone:	800-956-4237
Telephone Company:	Pembroke Telephone 0000002650
TelCo Phone:	336-463-1897
Comments:	Police: 702.921.3842; Fire Department 702.626.3800; Ambulance 702.921.3842 or 544.7695; Nearest Medical Facility Pearisburg or Montgomery County Hospital (18 miles). Verizon Raven - 404.520.1152, IP [redacted]

CASTNET Site Contact List

Site Number: **007** **(WFM007)** Site Name: **Whiteface Mountain Summit, NY** Updated: **8/14/2015**

Shelter Telephone:

Latitude:	44.36608	Longitude:	-73.90312
Magnetic Declination:		Elevation:	1415 meters
USGS Quadrangle:	Wilmington, NY	Site Deactivated:	
Site Installed:	6/4/2015	Polling ID Number:	
Calibration Group:	E2	Site Type:	Dry,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Dirk Felton
NYSDEC, Bureau of Air Quality Surveillance
625 Broadway
Albany, NY 12233-3256
Home: 518-429-7432 Work: 518-402-8502 Fax: 518-402-85.7 e-mail: hdfelton@gw.dec.state.ny.us

Site Operator: Paul Casson

110 Marble Mountain Lane
Wilmington, NY 12997
Home: Work: 518-946-2142 Fax: e-mail: pcasson@albany.edu

Other: 518-524-9965 Cell

Backup Site Operator: Shari Kent

,
Home: Work: 518-946-2142 Fax: e-mail: skent@albany.edu

Shipping Information

Federal Express: Paul Casson
110 Marble Mountain Lane
Wilmington, NY 12997

CASTNET Site Contact List

Directions to Site: The WFM007 site is located at 110 Marble Mountain Lane, Wilmington, NY. From Lake Placid, NY, take NYS route 86 to Wilmington. At the intersection of route 86 and route 431, go approximately 6 miles past the toll house to summit parking lot. Take the elevator to the summit observatory.

Hazards: Use a climbing harness to prevent falling, avoid exposure during

Emergency Contact: Paul Casson. Work phone# 518-946-2142. Home phone# 518-891-7455

Emergency Phone:

Emergency Directions to Medical Facility: The nearest medical facility is AMC Lake Placid. Take route 431 (Whiteface Veterans Memorial Highway) down the Mointain to the junction of route 86. Go right on route 86 to Lake Placid. Go left on route 73. Go approximately 2 miles and trun right on Newton Way. Turn left on Church Street. The hospital is on the right.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments:

CASTNET Site Contact List

Site Number: **105** **(WFM105)** Site Name: **Whiteface Mountain, NY** Updated: **8/14/2015**

Shelter Telephone:

Latitude:	44.39	Longitude:	-73.86
Magnetic Declination:		Elevation:	570 meters
USGS Quadrangle:	Wilmington, NY	Site Deactivated:	
Site Installed:	11/20/2012	Polling ID Number:	
Calibration Group:	E2	Site Type:	Dry,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Dirk Felton
NYSDEC, Bureau of Air Quality Surveillance
625 Broadway
Albany, NY 12233-3256
Home: 518-429-7432 Work: 518-402-8502 Fax: 518-402-8507 e-mail: dirk.felton@dec.ny.gov

Site Operator: Paul Casson

110 Marble Mountain Lane
Wilmington, NY 12997
Home: Work: 518-946-2142 Fax: e-mail: pcasson@albany.edu

Other: 518-524-9965 Cell

Backup Site Operator: Shari Kent

,
Home: Work: 518-946-2142 Fax: e-mail: skent@albany.edu

Shipping Information

Federal Express: Paul Casson
110 Marble Mountain Lane
Wilmington, NY 12997

CASTNET Site Contact List

Directions to Site: The WFM105 site is located at 110 Marble Mountain Lane, Wilmington, NY. From Lake Placid, NY. take NYS Rt. 86 to Wilmington. At the intersection of Rt. 86 and Rt. 431 go left on Rt. 431 for approximately 3 miles to Marble Mountain Lane on the left. Proceed to the end of Marble Mountain Lane. The site is located about 100yards above the Marble Mountain Lodge.

Hazards: There are no known hazards at the site.

Emergency Contact: Paul Casson. Work phone# 518-946-2142. Home phone# 518-891-7455

Emergency Phone:

Emergency Directions to Medical Facility: The nearest medical facility is AMC Lake Placid. Follow Rt.86 to Lake Placid. Go left on Rt.73. Go approximately 2 miles and take a right on Newton Way, then go left on Church Street. The hospital is on your right.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments:

CASTNET Site Contact List

Site Number: **105** **(WFM105)** Site Name: **Whiteface Mountain, NY** Updated: **8/14/2015**

Shelter Telephone:

Latitude:	44.39	Longitude:	-73.86
Magnetic Declination:		Elevation:	570 meters
USGS Quadrangle:	Wilmington, NY	Site Deactivated:	4/1/1993
Site Installed:	1/6/1987	Polling ID Number:	
Calibration Group:	E2	Site Type:	Dry,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Dirk Felton
NYSDEC, Bureau of Air Quality Surveillance
625 Broadway
Albany, NY 12233-3256
Home: 518-429-7432 Work: 518-402-8502 Fax: 518-402-8507 e-mail: dirk.felton@dec.ny.gov

Site Operator: Paul Casson

110 Marble Mountain Lane
Wilmington, NY 12997
Home: Work: 518-946-2142 Fax: e-mail: pcasson@albany.edu

Other: 518-524-9965 Cell

Backup Site Operator: Shari Kent

,
Home: Work: 518-946-2142 Fax: e-mail: skent@albany.edu

Shipping Information

Federal Express: Paul Casson
110 Marble Mountain Lane
Wilmington, NY 12997

CASTNET Site Contact List

Directions to Site: The WFM105 site is located at 110 Marble Mountain Lane, Wilmington, NY. From Lake Placid, NY. take NYS Rt. 86 to Wilmington. At the intersection of Rt. 86 and Rt. 431 go left on Rt. 431 for approximately 3 miles to Marble Mountain Lane on the left. Proceed to the end of Marble Mountain Lane. The site is located about 100yards above the Marble Mountain Lodge.

Hazards: There are no known hazards at the site.

Emergency Contact: Paul Casson. Work phone# 518-946-2142. Home phone# 518-891-7455

Emergency Phone:

Emergency Directions to Medical Facility: The nearest medical facility is AMC Lake Placid. Follow Rt.86 to Lake Placid. Go left on Rt.73. Go approximately 2 miles and take a right on Newton Way, then go left on Church Street. The hospital is on your right.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments:

CASTNET Site Contact List

Site Number: **429** **(WNC429)** Site Name: **Wind Cave NP, SD** Updated: **10/6/2015**

Shelter Telephone: **605-745-4103**

Latitude:	43.5576	Longitude:	-103.4839
Magnetic Declination:		Elevation:	1292 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	11/20/2003	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Marc Ohms
Wind Cave National Park
RR 1, Box 190
Hot Springs, SD 57747
Home: Work: 605-745-1182 Fax: e-mail: marc_ohms@nps.gov
Other:

Backup Site Operator: Blase LaSala, Sarah Myers

,
Home: Work: 605-745-1179 Fax: e-mail: email: blase_lasala@nps.gov

Shipping Information

Federal Express: Marc Ohms - Physical Science Tech., Wind Cave National
26611 US Highway 385
Hot Springs, SD 57745

CASTNET Site Contact List

Directions to Site:

Hazards:

Emergency Contact:

Emergency Phone:

Emergency
Directions to
Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility:

Utility Phone:

Telephone Company:

TelCo Phone:

Comments: Rick Boddicker (state) rick.boddicker@state.sd.us, 605.773.6706

CASTNET Site Contact List

Site Number: **144** **(WSP144)** Site Name: **Wash. Crossing, NJ** Updated: **10/17/2013**

Shelter Telephone: **609-737-3271**

Latitude:	40.3123	Longitude:	-74.8727
Magnetic Declination:		Elevation:	59 meters
USGS Quadrangle:	Pennington, NJ	Site Deactivated:	
Site Installed:	12/27/1988	Polling ID Number:	
Calibration Group:	E1	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Bhavna Shah/Kathy McCullough
New Jersey Dept of Environmental Protection
380 Scotch Road
West Trenton, NJ 08628
Home: 609-530-4058 Work: 609-280-8918 Fax: e-mail:

Site Operator: John Kukon

14 Brandon Road West
Pennington, NJ 08534-1126
Home: 609-737-3522 Work: Fax: e-mail: jpkukon@verizon.net

Other: 856-834-8928 Cell

Backup Site Operator: Nicholas Maggio

,
Home: Work: 215-493-9087 Fax: e-mail: namaggio@verizon.net

Shipping Information

Federal Express: John Kukon
14 Brandon Road West
Pennington, NJ 08534-1126

CASTNET Site Contact List

Directions to Site:	Lock Combinations: Top lock=1903 W.C. lock=key. Out of Philadelphia take 95 North to 29 North (Lamberton/Trenton exit) the last exit in PA. Go 2.7 mi and make a right on CR 546-there is a BP Station and a sign indicating that this is the turn for the main park entrance. Go 1.4 mi and make a left on Bear Tavern Road (green park office on the corner). Go 0.6 mi and make a left on Church Road. Go 0.8 mi and look for a wooden gate across a gravel drive. You will pass the intersection of Fiddlers Creek Road and see a yellow diamond shaped warning sign, go around a curve, past a house on the left, followed by a short stretch of woods, a short stretch of clearing and another short stretch of woods. The gate is marked WCRC-FA and sits back about 10 feet from the road. Closest hotels are in Ewing. Out of site go right at wooden gate to Church Rd. Go to end of road and go right. Go to first light (by park office), go left, go to first light (just past police station), and go right. Go approx 1/2 mi and follow signs to 95-295. Take 95 North; turns into 295 South. Go approx 6 or 7 exits and take Route 1 North (Lawrenceville Exit). Red Roof, Howard Johnson, and McIntosh Inns are available...HoJo and McIntosh are on 1 South. To get back to site from hotels, take Scotch Road exit.
Hazards:	N/A
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	From site 144 turn left onto Church Rd. At traffic light turn left onto Rt. 29. Follow signs to Trenton. At light (at Upper Fery Rd.) turn left, then right onto River Rd. At light (at Lower Ferry Road) turn left. Go past next light.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

Electric Utility:	Jersey Central Power & Light 100089331985 Vendor Code 26040
Utility Phone:	800-662-3115
Telephone Company:	Verizon
TelCo Phone:	800-440-8000
Comments:	Police: (609) 737-3100; Ambulance, Fire Dept: (609) 466-1616; Nearest Medical Facility Mercer Medical Center (609) 394-4000. Verizon Raven 770-843-3245, I.P. [redacted]

CASTNET Site Contact List

Site Number: **109** **(WST109)** Site Name: **Woodstock, NH** Updated: **6/29/2015**

Shelter Telephone: **603-726-4935**

Latitude:	43.9445	Longitude:	-71.7008
Magnetic Declination:		Elevation:	255 meters
USGS Quadrangle:	Woodstock, NH	Site Deactivated:	
Site Installed:	12/27/1988	Polling ID Number:	
Calibration Group:	E2	Site Type:	Dry,Ozone,Met
Equipment Type:	RMY	Time Zone:	Eastern time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Ian Halm
USFS Hubbard Brook Exp. Forest
234 Mirror Lake Road
North Woodstock, NH 03262
Home: 603-397-7966 Work: 603-726-8902 Fax: 603-726-4851 e-mail: ihalm@fs.fed.us

Site Operator: Brenda Minicucci
IES (Institute of Ecosytem Studies)
234 Mirror Lake Road
North Woodstock, NH 03223
Home: 603-536-6386 Work: 603-726-4204 Fax: 603-726-4851 e-mail: bminicucci70703@roadrunner.c

Other: Research station (next door) # 603-726-4204, try here if you need site op

Backup Site Operator: IES

,
Home: Work: Fax: e-mail:

Shipping Information

Federal Express: Brenda Minicucci, IES
234 Mirror Lake Rd
North Woodstock, NH 03223

CASTNET Site Contact List

Directions to Site:	From junction of SR 112 & US 3 in Woodstock, proceed South on US 3 for 7.3 miles. Turn right on Mirror Lake Road. Follow road 1.2 miles to end of road, site is on right across from Hubbard Brook Experimental Station Office. Or, from I-93 take Thornton Exit (#30). Go 2.0 miles south, turn right on Mirror Lake Road, site is 1.2 miles on the right.

Hazards:	Recreational hunting, mountainous area, lake nearby, moose
Emergency Contact:	see comments
Emergency Phone:	see comments
Emergency Directions to Medical Facility:	Take Mirror Lake Road 1.8 miles to Route 3, take a right, go 3 miles to Route 93, take another right, go 10 miles, take exit 25 (Tonny Mtn. Hwy), get back on Rt. 3, go 2 miles to Downtown Plymouth, go past PSC College on Hospital Road. Speare Memorial Hospital is about 0.5 miles further west.

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	N.H. Electric Coop., Inc. - Acct. # 520723210
Utility Phone:	800-698-2007
Telephone Company:	Verizon / Fairpoint 6037264935230 Vendor Code 26263
TelCo Phone:	603-726-4935
Comments:	Telephone repairs: 603.555.1515. Utility customer service accepts calls only from 7am-6pm. Call 800.343.6432 to report power outages. Police: 603.726.4222; Fire Department & Ambulance 603.524.1545; Medical Facility: 603.536.1120.

CASTNET Site Contact List

Site Number:	**408**	Site Name: **Yellowstone NP, WY**		Updated: **9/26/2014**
	(YEL408)			
Shelter Telephone:	**307-242-2410**			

Latitude:	44.5654	Longitude:	-110.4003
Magnetic Declination:		Elevation:	2400 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	6/26/1996	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Mountain time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: John Klaptosky
Yellowstone National Park
Lake Ranger Station
Yellowstone National Park, WY 82190
Home: Work: 307-344-2022 Fax: e-mail: John_klaptosky@nps.gov
Other:

Backup Site Operator: Michael Mustafaga, Zackary Wilson

,
Home: Work: 307-344-2161 Fax: e-mail: michael_mustafaga@nps.gov

Shipping Information

Federal Express: Yellowstone National Park
Lake AQ Rangesr Station
Yellowstone National Park, WY 82190

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:	N/A
Electric Utility:	Provided by NPS
Utility Phone:	N/A
Telephone Company:	Provided by NPS
TelCo Phone:	N/A

Comments: JK. cell # 724.496.9894.

CASTNET Site Contact List

Site Number:	**404 (YOS404)**	Site Name:	**Yosemite NP - Turtleback Dome, CA**	Updated:	**10/6/2015**
Shelter Telephone:	**209-372-4411**				

Latitude:	37.7133	Longitude:	-119.7062
Magnetic Declination:		Elevation:	1605 meters
USGS Quadrangle:		Site Deactivated:	
Site Installed:	9/25/1995	Polling ID Number:	
Calibration Group:		Site Type:	Dry,Ozone,Met
Equipment Type:		Time Zone:	Pacific time zone, with Daylight Savings Time

Contacts/Operators

Primary Contact: Mark Tigges
Air Resource Specialists, Inc.
1901 Sharp Point Dr. Suite E
Fort Collins, CO 80525
Home: Work: 970-484-7941 Fax: 970-484-3423 e-mail: mtigges@air-resource.com

Site Operator: Katy Warner
Yosemite National Park
Resources Management, P.O. Box 577
Yosemite National Park, CA 95389
Home: Work: 209-379-1421 Fax: 209-379-1452 e-mail: katy_warner@nps.gov
Other:

Backup Site Operator: Keenan Takahashi, Eric Lynch

,
Home: Work: 209-379-1422 Fax: e-mail: See comment section

Shipping Information

Federal Express: Katy Warner
Yosemite RMS, 5083 Foresta Rd
El Portal, CA 95318

CASTNET Site Contact List

Directions to Site: Not Available

Hazards: N/A

Emergency Contact:

Emergency Phone:

Emergency Directions to Medical Facility:

In cases of emergency at EPA-sponsored sites, please notify Amec Foster Wheeler (Newberry, FL office) as soon as possible: 352-332-3318. For NPS- or BLM-sponsored sites please notify Air Resource Specialists (ARS): 970-484-7941.

UPS Account Number:

Electric Utility: Provided by NPS

Utility Phone: N/A

Telephone Company: Provided by NPS

TelCo Phone: N/A

Comments: UPS ONLY! DO NOT USE FED EX! Lee Tarnay email: leland_tarnay@nps.gov, phone: 209.379.1422, johnathan_byers@nps.gov, phone: 209.769.3470, rebecca_rising@nps.gov, phone: 209.379.1419

Appendix B

OSHA Regulations (Standards – 29 CFR)

The control of hazardous energy (lockout/tagout) – 1910.147

ELECTRONIC CODE OF FEDERAL REGULATIONS

e-CFR data is current as of October 26, 2015

Title 29 → Subtitle B → Chapter XVII → Part 1910 → Subpart J → §1910.147

Title 29: Labor
PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS Subpart J—General Environmental Controls

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§1910.147 The control of hazardous energy (lockout/tagout).

(a) Scope, application, and purpose—(1) Scope. (i) This standard covers the servicing and maintenance of machines and equipment in which the unexpected energization or start up of the machines or equipment, or release of stored energy could cause injury to employees. This standard establishes minimum performance requirements for the control of such hazardous energy.

(ii) This standard does not cover the

following: (A) Construction and agriculture

employment;

(B) Employment covered by parts 1915, 1917, and 1918 of this title;

(C) Installations under the exclusive control of electric utilities for the purpose of power generation, transmission and distribution, including related equipment for communication or metering;

(D) Exposure to electrical hazards from work on, near, or with conductors or equipment in electric-utilization installations, which is covered by subpart S of this part; and

(E) Oil and gas well drilling and servicing.

(2) Application. (i) This standard applies to the control of energy during servicing and/or maintenance of machines and equipment.

(ii) Normal production operations are not covered by this standard (See subpart 0 of this part). Servicing and/or maintenance which takes place during normal production operations is covered by this standard only if;:

(A) An employee is required to remove or bypass a guard or other safety device; or

(B) An employee is required to place any part of his or her body into an area on a machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.

NOTE: Exception to paragraph (a)(2)(ii): Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, are not covered by this standard if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures which provide effective protection (See subpart 0 of this part).

(iii) This standard does not apply to the following.

(A) Work on cord and plug connected electric equipment for which exposure to the hazards of unexpected energization or start up of the equipment is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the employee performing the servicing or maintenance.

(B) Hot tap operations involving transmission and distribution systems for substances such as gas, steam, water or petroleum products when they are performed on pressurized pipelines, provided that the employer demonstrates that (1) continuity of service is essential; (2) shutdown of the system is impractical; and (3) documented procedures are followed, and special equipment is used which will provide proven effective protection for employees.

(3) Purpose. (i) This section requires employers to establish a program and utilize procedures for affixing appropriate lockout devices or tagout devices to energy isolating devices, and to otherwise disable machines or

equipment to prevent unexpected energization, start-up or release of stored energy in order to prevent injury to employees.(ii) When other standards in this part require the use of lockout or tagout, they shall be used and supplemented by the procedural and training requirements of this section.

(b) Definitions applicable to this section.

Affected employee. An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Authorized employee. A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this section.

Capable of being locked out. An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

Energized. Connected to an energy source or containing residual or stored energy.

Energy isolating device. A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: 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. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

Energy source. Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Hot tap. A procedure used in the repair, maintenance and services activities which involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

Lockout. The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout device. A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in a safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

Normal production operations. The utilization of a machine or equipment to perform its intended production function.

Servicing and/or maintenance. Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.

Setting up. Any work performed to prepare a machine or equipment to perform its normal production operation.

Tagout. The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout device. A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

(c) General—(1) Energy control program. The employer shall establish a program consisting of energy control procedures, employee training and periodic inspections to ensure that before any employee performs any servicing or maintenance on a machine or equipment where the unexpected energizing, start up or release of stored energy could occur and cause injury, the machine or equipment shall be isolated from the energy source, and rendered inoperative.

(2) Lockout/tagout. (i) If an energy isolating device is not capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize a tagout system.

(ii) If an energy isolating device is capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize lockout, unless the employer can demonstrate that the utilization of a tagout system will provide full employee protection as set forth in paragraph (c)(3) of this section. (iii) After January 2, 1990, whenever replacement or major repair, renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machine or equipment shall be designed to accept a lockout device.

(3) Full employee protection. (i) When a tagout device is used on an energy isolating device which is capable of being locked out, the tagout device shall be attached at the same location that the lockout device would have been attached,
and the employer shall demonstrate that the tagout program will provide a level of safety equivalent to that obtained by using a lockout program.

(ii) In demonstrating that a level of safety is achieved in the tagout program which is equivalent to the level of safety obtained by using a lockout program, the employer shall demonstrate full compliance with all tagout-related provisions of this standard together with such additional elements as are necessary to provide the equivalent safety available from the use of a lockout device. Additional means to be considered as part of the demonstration of full employee protection shall include the implementation of additional safety measures such as the removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device, or the removal of a valve handle to reduce the likelihood of inadvertent energization.

(4) Energy control procedure. (i) Procedures shall be developed, documented and utilized for the control of potentially hazardous energy when employees are engaged in the activities covered by this section.

NOTE: Exception: The employer need not document the required procedure for a particular machine or equipment, when all of the following elements exist: (1) The machine or equipment has no potential for stored or residual energy or reaccumulation of stored energy after shut down which could endanger employees; (2) the machine or equipment has a single energy source which can be readily identified and isolated; (3) the isolation and locking out of that energy source will completely deenergize and deactivate the machine or equipment; (4) the machine or equipment is isolated from that energy source and locked out during servicing or maintenance; (5) a single lockout device will achieve a locked-out condition; (6) the lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance; (7) the servicing or maintenance does not create hazards for
other employees; and (8) the employer, in utilizing this exception, has had no accidents involving the unexpected activation or reenergization of the machine or equipment during servicing or maintenance.

(ii) The procedures shall clearly and specifically outline the scope, purpose, authorization, rules, and techniques to be utilized for the control of hazardous energy, and the means to enforce compliance including, but not limited to, the following:

(A) A specific statement of the intended use of the procedure;

(B) Specific procedural steps for shutting down, isolating, blocking and securing machines or equipment to control hazardous energy;

(C) Specific procedural steps for the placement, removal and transfer of lockout devices or tagout devices and the responsibility for them; and

(D) Specific requirements for testing a machine or equipment to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures.

(5) Protective materials and hardware. (i) Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be provided by the employer for isolating, securing or blocking of machines or equipment from energy sources.

(ii) Lockout devices and tagout devices shall be singularly identified; shall be the only devices(s) used for controlling energy; shall not be used for other purposes; and shall meet the following requirements:

(A) Durable. (1) Lockout and tagout devices shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.

(2) Tagout devices shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.

(3) Tags shall not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled and stored.

(B) Standardized. Lockout and tagout devices shall be standardized within the facility in at least one of the following criteria: Color; shape; or size; and additionally, in the case of tagout devices, print and format shall be standardized.

(C) Substantial—(1) Lockout devices. Lockout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.

(2) Tagout devices. Tagout devices, including and their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all-environment-tolerant nylon cable tie.

(D) Identifiable. Lockout devices and tagout devices shall indicate the identity of the employee applying the

device(s). (iii) Tagout devices shall warn against hazardous conditions if the machine or equipment is energized and

shall
include a legend such as the following: Do Not Start, Do Not Open, Do Not Close, Do Not Energize, Do Not Operate.

(6) Periodic inspection. (i) The employer shall conduct a periodic inspection of the energy control procedure at least annually to ensure that the procedure and the requirements of this standard are being followed.

(A) The periodic inspection shall be perfomed by an authorized employee other than the ones(s) utilizing the energy control procedure being inspected.

(B) The periodic inspection shall be conducted to correct any deviations or inadequacies identified.

(C) Where lockout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected.

(D) Where tagout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized and affected employee, of that employee's responsibilities under the energy control procedure being inspected, and the elements set forth in paragraph (c)(7)(ii) of this section.

(ii) The employer shall certify that the periodic inspections have been performed. The certification shall identify the machine or equipment on which the energy control procedure was being utilized, the date of the inspection, the employees included in the inspection, and the person performing the inspection.

(7) Training and communication. (i) The employer shall provide training to ensure that the purpose and function of the energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees. The training shall include the following:

(A) Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.

(B) Each affected employee shall be instructed in the purpose and use of the energy control procedure.

(C) All other employees whose work operations are or may be in an area where energy control procedures may be utilized, shall be instructed about the procedure, and about the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.

(ii) When tagout systems are used, employees shall also be trained in the following limitations of tags:

(A) Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.

(B) When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.

(C) Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.

(D) Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.

(E) Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.

(F) Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.

(iii) Employee retraining.

(A) Retraining shall be provided for all authorized and affected employees whenever there is a change in their job assignments, a change in machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures. (B) Additional retraining shall also be conducted whenever a periodic inspection under paragraph (c)(6) of this section reveals, or whenever the employer has reason to believe, that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.

(C) The retraining shall reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary.

(iv) The employer shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training.

(8) Energy isolation. Lockout or tagout shall be performed only bythe authorized employees who are performing the servicing or maintenance.

(9) Notification of employees. Affected employees shall be notified by the employer or authorized employee of the application and removal of lockout devices or tagout devices. Notification shall be given before the controls are applied, and after they are removed from the machine or equipment.

(d) Application of control. The established procedures for the application of energy control (the lockout or tagout procedures) shall cover the following elements and actions and shall be done in the following sequence:

(1) Preparation for shutdown. Before an authorized or affected employee turns off a machine or equipment, the authorized employee shall have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy.

(2) Machine or equipment shutdown. The machine or equipment shall be turned off or shut down using the procedures established for the machine or equipment. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.

(3) Machine or equipment isolation. All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated in such a manner as to isolate the machine or equipment from the energy source(s).

(4) Lockout or tagout device application. (i) Lockout or tagout devices shall be affixed to each energy isolating device by authorized employees.

(ii) Lockout devices, where used, shall be affixed in a manner to that will hold the energy isolating devices in a “safe” or “off” position.

(iii) Tagout devices, where used, shall be affixed in such a manner as will clearly indicate that the operation or movement of energy isolating devices from the “safe” or “off” position is prohibited.

(A) Where tagout devices are used with energy isolating devices designed with the capability of being locked, the tag attachment shall be fastened at the same point at which the lock would have been attached.

(B) Where a tag cannot be affixed directly to the energy isolating device, the 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 device.

(5) Stored energy. (i) Following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved, disconnected, restrained, and otherwise rendered safe.

(ii) If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.

(6) Verification of isolation. Prior to starting work on machines or equipment that have been locked out or tagged

out, the authorized employee shall verify that isolation and deenergization of the machine or equipment have been accomplished.

(e) Release from lockout or tagout. Before lockout or tagout devices are removed and energy is restored to the machine or equipment, procedures shall be followed and actions taken by the authorized employee(s) to ensure the following:

(1) The machine or equipment. The work area shall be inspected to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

(2) Employees. (i) The work area shall be checked to ensure that all employees have been safely positioned or removed.

(ii) After lockout or tagout devices have been removed and before a machine or equipment is started, affected employees shall be notified that the lockout or tagout device(s) have been removed. (3) Lockout or tagout devices removal. Each lockout or tagout device shall be removed from each energy isolating device by the employee who applied the device. Exception to paragraph (e)(3): When the authorized employee who applied the lockout or tagout device is not available to remove it, that device may be removed under the direction of the employer, provided that specific procedures and training for such removal have been developed, documented and incorporated into the employer's energy control program. The employer shall demonstrate that the specific procedure provides equivalent safety to the removal of the device by the authorized employee who applied it. The specific procedure shall include at least the following elements:

(i) Verfication by the employer that the authorized employee who applied the device is not at the facility;

(ii) Making all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed; and

(iii) Ensuring that the authorized employee has this knowledge before he/she resumes work at that facility.

(f) Additional requirements—(1) Testing or positioning of machines, equipment or components thereof. In situations in which lockout or tagout devices must be temporarily removed from the energy isolating device and the machine or equipment energized to test or position the machine, equipment or component thereof, the following sequence of actions shall be followed:

(i) Clear the machine or equipment of tools and materials in accordance with paragraph (e)(1) of this section;

(ii) Remove employees from the machine or equipment area in accordance with paragraph (e)(2) of this

section; (iii) Remove the lockout or tagout devices as specified in paragraph (e)(3) of this section;

(iv) Energize and proceed with testing or positioning;

(v) Deenergize all systems and reapply energy control measures in accordance with paragraph (d) of this section to continue the servicing and/or maintenance.

(2) Outside personnel (contractors, etc.). (i) Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this standard, the on-site employer and the outside employer shall inform each other of their respective lockout or tagout procedures.

(ii) The on-site employer shall ensure that his/her employees understand and comply with the restrictions and prohibitions of the outside employer's energy control program.

(3) Group lockout or tagout. (i) When servicing and/or maintenance is performed by a crew, craft, department or other group, they shall utilize a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device.

(ii) Group lockout or tagout devices shall be used in accordance with the procedures required by paragraph (c)(4) of this section including, but not necessarily limited to, the following specific requirements:

(A) Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device (such as an operations lock);

(B) Provision for the authorized employee to ascertain the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment and

(C) When more than one crew, craft, department, etc. is involved, assignment of overall job-associated lockout

or tagout control responsibility to an authorized employee designated to coordinate affected work forces and ensure continuity of protection; and

(D) Each authorized employee shall affix a personal lockout or tagout device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work, and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

(4) Shift or personnel changes. Specific procedures shall be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection, including provision for the orderly transfer of lockout or tagout device protection between off-going and oncoming employees, to minimize exposure to hazards from the unexpected energization or start- up of the machine or equipment, or the release of stored energy.

NOTE: The following appendix to §1910.147 services as a non-mandatory guideline to assist employers and employees in complying with the requirements of this section, as well as to provide other helpful information. Nothing in the appendix adds to or detracts from any of the requirements of this section.

APPENDIX A TO §1910.147—TYPICAL MINIMAL LOCKOUT PROCEDURE

General

The following simple lockout procedure is provided to assist employers in developing their procedures so they meet the requirements of this standard. When the energy isolating devices are not lockable, tagout may be used, provided the employer complies with the provisions of the standard which require additional training and more rigorous periodic inspections. When tagout is used and the energy isolating devices are lockable, the employer must provide full employee protection (see paragraph (c)(3)) and additional training and more rigorous periodic inspections are required. For more complex systems, more comprehensive procedures may need to be developed, documented and utilized.

Lockout Procedure

Lockout procedure for

_____

(Name of Company for single procedure or identification of equipment if multiple procedures are used)

Purpose

This procedure establishes the minimum requirements for the lockout of energy isolating devices whenever maintenance or servicing is done on machines or equipment. It shall be used to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources and locked out before employees perform any servicing or maintenance where the unexpected energization or start-up of the machine or equipment or release of stored energy could cause injury.

Compliance With This Program

All employees are required to comply with the restrictions and limitations imposed upon them during the use of lockout. The authorized employees are required to perform the lockout in accordance with this procedure. All employees, upon observing a machine or piece of equipment which is locked out to perform servicing or maintenance shall not attempt to start, energize or use that machine or equipment.

_____

Type of compliance enforcement to be taken for violation of the above.

Sequence of Lockout

(1) Notify all affected employees that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance.

_____

Name(s)/Job Title(s) of affected employees and how to notify.

(2) The authorized employee shall refer to the company procedure to identify the type and magnitude of the energy that the machine or equipment utilizes, shall understand the hazards of the energy, and shall know the methods to control the energy.

_____

Type(s) and magnitude(s) of energy, its hazards and the methods to control the energy.

(3) If the machine or equipment is operating, shut it down by the normal stopping procedure (depress stop button, open switch, close valve, etc.).

Type(s) and location(s) of machine or equipment operating controls.

(4) De-activate the energy isolating device(s) so that the machine or equipment is isolated from the energy source(s).

Type(s) and location(s) of energy isolating devices.

(5) Lock out the energy isolating device(s) with assigned individual lock(s).

(6) Stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.

Type(s) of stored energy—methods to dissipate or restrain.

(7) Ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate. CAUTION: Return operating control(s) to neutral or “off” position after verifying the isolation of the equipment.

Method of verifying the isolation of the equipment.

(8) The machine or equipment is now locked out.

Restoring Equipment to Service. When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps shall be taken.

(1) Check the machine or equipment and the immediate area around the machine or equipment to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.

(2) Check the work area to ensure that all employees have been safely positioned or removed from the area.

(3) Verify that the controls are in neutral.

(4) Remove the lockout devices and reenergize the machine or equipment.

NOTE: The removal of some forms of blocking may require reenergization of the machine before safe removal.

(5) Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

[54 FR 36687, Sept. 1, 1989, as amended at 54 FR 42498, Oct. 17, 1989; 55 FR 38685, 38686, Sept. 20, 1990; 76 FR 24698, May 2, 2011; 76 FR 44265, July 25, 2011]

Appendix C

OSHA Regulations (Standards – 29 CFR)

Personal Fall Arrest System – 1910.66 App C

ELECTRONIC CODE OF FEDERAL REGULATIONS

e-CFR data is current as of October 27, 2015

Title 29 → Subtitle B → Chapter XVII → Part 1910 → Subpart F → §1910.66

Title 29: Labor
PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS
Subpart F—Powered Platforms, Manlifts, and Vehicle-Mounted Work Platforms

§1910.66 Powered platforms for building maintenance.

(a) Scope. This section covers powered platform installations permanently dedicated to interior or exterior building maintenance of a specific structure or group of structures. This section does not apply to suspended scaffolds (swinging scaffolds) used to service buildings on a temporary basis and covered under subpart D of this part, nor to suspended scaffolds used for construction work and covered under subpart L of 29 CFR part 1926. Building maintenance includes, but is not limited to, such tasks as window cleaning, caulking, metal polishing and reglazing.

(b) Application—(1) New installations. This section applies to all permanent installations completed after July 23, 1990. Major modifications to existing installations completed after that date are also considered new installations under this section.

(2) Existing installations. (i) Permanent installations in existence and/or completed before July 23, 1990 shall comply with paragraphs (g), (h), (i), (j) and appendix C of this section.

(ii) In addition, permanent installations completed after August 27, 1971, and in existence and/or completed before July 23, 1990, shall comply with appendix D of this section.

(c) Assurance. (1) Building owners of new installations shall inform the employer before each use in writing that the installation meets the requirements of paragraphs (e)(1) and (f)(1) of this section and the additional design criteria contained in other provisions of paragraphs (e) and (f) of this section relating to: required load sustaining capabilities of platforms, building components, hoisting and supporting equipment; stability factors for carriages, platforms and supporting equipment; maximum horizontal force for movement of carriages and davits; design of carriages, hoisting machines, wire rope and stabilization systems; and design criteria for electrical wiring and equipment.

(2) Building owners shall base the information required in paragraph (c)(1) of this section on the results of a field test of the installation before being placed into service and following any major alteration to an existing installation, as required in paragraph (g)(1) of this section. The assurance shall also be based on all other relevant available information, including, but not limited to, test data, equipment specifications and verification by a registered professional engineer.

(3) Building owners of all installations, new and existing, shall inform the employer in writing that the installation has been inspected, tested and maintained in compliance with the requirements of paragraphs (g) and (h) of this section and that all protection anchorages meet the requirements of paragraph (I)(c)(10) of appendix C.

(4) The employer shall not permit employees to use the installation prior to receiving assurance from the building owner that the installation meets the requirements contained in paragraphs (c)(1) and (c)(3) of this section.

(d) Definitions.

Anemometer means an instrument for measuring wind velocity.

Angulated roping means a suspension method where the upper point of suspension is inboard from the attachments on the suspended unit, thus causing the suspended unit to bear against the face of the building.

Building face roller means a rotating cylindrical member designed to ride on the face of the building wall to prevent the platform from abrading the face of the building and to assist in stabilizing the platform.

Building maintenance means operations such as window cleaning, caulking, metal polishing, reglazing, and general maintenance on building surfaces.

Cable means a conductor, or group of conductors, enclosed in a weatherproof sheath, that may be used to supply

electrical power and/or control current for equipment or to provide voice communication circuits.

Carriage means a wheeled vehicle used for the horizontal movement and support of other equipment.

Certification means a written, signed and dated statement confirming the performance of a requirement of this section.

Combination cable means a cable having both steel structural members capable of supporting the platform, and copper or other electrical conductors insulated from each other and the structural members by nonconductive barriers.

Competent person means a person who, because of training and experience, is capable of identifying hazardous or dangerous conditions in powered platform installations and of training employees to identify such conditions.

Continuous pressure means the need for constant manual actuation for a control to function.

Control means a mechanism used to regulate or guide the operation of the equipment.

Davit means a device, used singly or in pairs, for suspending a powered platform from work, storage and rigging locations on the building being serviced. Unlike outriggers, a davit reacts its operating load into a single roof socket or carriage attachment.

Equivalent means alternative designs, materials or methods which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in the standard.

Ground rigging means a method of suspending a working platform starting from a safe surface to a point of suspension above the safe surface.

Ground rigged davit means a davit which cannot be used to raise a suspended working platform above the building face being serviced.

Guide button means a building face anchor designed to engage a guide track mounted on a platform.

Guide roller means a rotating cylindrical member, operating separately or as part of a guide assembly, designed to provide continuous engagement between the platform and the building guides or guideways.

Guide shoe means a device attached to the platform designed to provide a sliding contact between the platform and the building guides.

Hoisting machine means a device intended to raise and lower a suspended or supported unit.

Hoist rated load means the hoist manufacturer's maximum allowable operating load.

Installation means all the equipment and all affected parts of a building which are associated with the performance of building maintenance using powered platforms.

Interlock means a device designed to ensure that operations or motions occur in proper sequence.

Intermittent stabilization means a method of platform stabilization in which the angulated suspension wire rope(s) are secured to regularly spaced building anchors.

Lanyard means a flexible line of rope, wire rope or strap which is used to secure the body belt or body harness to a deceleration device, lifeline or anchorage.

Lifeline means a component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

Live load means the total static weight of workers, tools, parts, and supplies that the equipment is designed to support.

Obstruction detector means a control that will stop the suspended or supported unit in the direction of travel if an obstruction is encountered, and will allow the unit to move only in a direction away from the obstruction.

Operating control means a mechanism regulating or guiding the operation of equipment that ensures a specific operating mode. Operating device means a device actuated manually to activate a control.

Outrigger means a device, used singly or in pairs, for suspending a working platform from work, storage, and rigging locations on the building being serviced. Unlike davits, an outrigger reacts its operating moment load as at least two opposing vertical components acting into two or more distinct roof points and/or attachments.

Platform rated load means the combined weight of workers, tools, equipment and other material which is permitted to be carried by the working platform at the installation, as stated on the load rating plate.

Poured socket means the method of providing wire rope terminations in which the ends of the rope are held in a tapered socket by means of poured spelter or resins.

Primary brake means a brake designed to be applied automatically whenever power to the prime mover is interrupted or discontinued.

Prime mover means the source of mechanical power for a machine.

Rated load means the manufacturer's recommended maximum load.

Rated strength means the strength of wire rope, as designated by its manufacturer or vendor, based on standard testing procedures or acceptable engineering design practices.

Rated working load means the combined static weight of men, materials, and suspended or supported equipment.

Registered professional engineer means a person who has been duly and currently registered and licensed by an authority within the United States or its territories to practice the profession of engineering.

Roof powered platform means a working platform where the hoist(s) used to raise or lower the platform is located on the roof.

Roof rigged davit means a davit used to raise the suspended working platform above the building face being serviced. This type of davit can also be used to raise a suspended working platform which has been ground-rigged.

Rope means the equipment used to suspend a component of an equipment installation, i.e., wire rope.

Safe surface means a horizontal surface intended to be occupied by personnel, which is so protected by a fall protection system that it can be reasonably assured that said occupants will be protected against falls.

Secondary brake means a brake designed to arrest the descent of the suspended or supported equipment in the event of an overspeed condition.

Self powered platform means a working platform where the hoist(s) used to raise or lower the platform is mounted on the platform.

Speed reducer means a positive type speed reducing machine.

Stability factor means the ratio of the stabilizing moment to the overturning moment.

Stabilizer tie means a flexible line connecting the building anchor and the suspension wire rope supporting the platform.

Supported equipment means building maintenance equipment that is held or moved to its working position by means of attachment directly to the building or extensions of the building being maintained.

Suspended equipment means building maintenance equipment that is suspended and raised or lowered to its working position by means of ropes or combination cables attached to some anchorage above the equipment.

Suspended scaffold (swinging scaffold) means a scaffold supported on wire or other ropes, used for work on, or for providing access to, vertical sides of structures on a temporary basis. Such scaffold is not designed for use on a specific structure or group of structures.

Tail line means the nonsupporting end of the wire rope used to suspend the platform.

Tie-in guides means the portion of a building that provides continuous positive engagement between the building and a suspended or supported unit during its vertical travel on the face of the building. Traction hoist means a type of hoisting machine that does not accumulate the suspension wire rope on the hoisting drum or sheave, and is designed to raise and

lower a suspended load by the application of friction forces between the suspension wire rope and the drum or sheave.

Transportable outriggers means outriggers designed to be moved from one work location to another.

Trolley carriage means a carriage suspended from an overhead track structure.

Verified means accepted by design, evaluation, or inspection by a registered professional engineer.

Weatherproof means so constructed that exposure to adverse weather conditions will not affect or interfere with the proper use or functions of the equipment or component.

Winding drum hoist means a type of hoisting machine that accumulates the suspension wire rope on the hoisting drum.

Working platform means suspended or supported equipment intended to provide access to the face of a building and manned by persons engaged in building maintenance.

Wrap means one complete turn of the suspension wire rope around the surface of a hoist drum.

(e) Powered platform installations—Affected parts of buildings—(1) General requirements. The following requirements apply to affected parts of buildings which utilize working platforms for building maintenance.

(i) Structural supports, tie-downs, tie-in guides, anchoring devices and any affected parts of the building included in the installation shall be designed by or under the direction of a registered professional engineer experienced in such design;

(ii) Exterior installations shall be capable of withstanding prevailing climatic conditions;

(iii) The building installation shall provide safe access to, and egress from, the equipment and sufficient space to conduct necessary maintenance of the equipment; and, (iv) The affected parts of the building shall have the capability of sustaining all the loads imposed by the equipment;

(v) The affected parts of the building shall be designed so as to allow the equipment to be used without exposing employees to a hazardous condition.

(2) Tie-in guides. (i) The exterior of each building shall be provided with tie-in guides unless the conditions in paragraph (e)(2)(ii) or (e)(2)(iii) of this section are met.

NOTE: See figure 1 in appendix B of this section for a description of a typical continuous stabilization system utilizing tie-in guides.

(ii) If angulated roping is employed, tie-in guides required in paragraph (e)(2)(i) of this section may be eliminated for not more than 75 feet (22.9 m) of the uppermost elevation of the building, if infeasible due to exterior building design, provided an angulation force of at least 10 pounds (44.4 n) is maintained under all conditions of loading.

(iii) Tie-in guides required in paragraph (e)(2)(i) of this section may be eliminated if one of the guide systems in paragraph (e)(2)(iii)(A), (e)(2)(iii)(B) or (e)(2)(iii)(C) of this section is provided, or an equivalent.

(A) Intermittent stabilization system. The system shall keep the equipment in continuous contact with the building facade, and shall prevent sudden horizontal movement of the platform. The system may be used together with continuous positive building guide systems using tie-in guides on the same building, provided the requirements for each system are met.

(1) The maximum vertical interval between building anchors shall be three floors or 50 feet (15.3 m), whichever is less.

(2) Building anchors shall be located vertically so that attachment of the stabilizer ties will not cause the platform suspension ropes to angulate the platform horizontally across the face of the building. The anchors shall be positioned horizontally on the building face so as to be symmetrical about the platform suspension ropes.

(3) Building anchors shall be easily visible to employees and shall allow a stabilizer tie attachment for each of the platform suspension ropes at each vertical interval. If more than two suspension ropes are used on a platform, only the

two building-side suspension ropes at the platform ends shall require a stabilizer attachment.

(4) Building anchors which extend beyond the face of the building shall be free of sharp edges or points.

Where cables, suspension wire ropes and lifelines may be in contact with the building face, external building anchors shall not interfere with their handling or operation.

(5) The intermittent stabilization system building anchors and components shall be capable of sustaining without failure at least four times the maximum anticipated load applied or transmitted to the components and anchors. The minimum design wind load for each anchor shall be 300 (1334 n) pounds, if two anchors share the wind load.

(6) The building anchors and stabilizer ties shall be capable of sustaining anticipated horizontal and vertical loads from winds specified for roof storage design which may act on the platform and wire ropes if the platform is stranded on a building face. If the building anchors have different spacing than the suspension wire rope or if the building requires different suspension spacings on one platform, one building anchor and stabilizer tie shall be capable of sustaining the wind loads.

NOTE: See figure 2 in appendix B of this section for a description of a typical intermittent stabilization system.

(B) Button guide stabilization system.

(1) Guide buttons shall be coordinated with platform mounted equipment of paragraph (f)(5)(vi) of this section.

(2) Guide buttons shall be located horizontally on the building face so as to allow engagement of each of the guide tracks mounted on the platform.

(3) Guide buttons shall be located in vertical rows on the building face for proper engagement of the guide tracks mounted on the platform.

(4) Two guide buttons shall engage each guide track at all times except for the initial engagement.

(5) Guide buttons which extend beyond the face of the building shall be free of sharp edges or points. Where cables, ropes and lifelines may be in contact with the building face, guide buttons shall not interfere with their handling or operation.

(6) Guide buttons, connections and seals shall be capable of sustaining without damage at least the weight of the platform, or provision shall be made in the guide tracks or guide track connectors to prevent the platform and its attachments from transmitting the weight of the platform to the guide buttons, connections and seals. In either case, the minimum design load shall be 300 pounds (1334 n) per building anchor.

NOTE: See paragraph (f)(5)(vi) of this section for relevant equipment provisions.

NOTE: See figure 3 in appendix B of this section for a description of a typical button guide stabilization system.

(C) System utilizing angulated roping and building face rollers. The system shall keep the equipment in continuous contact with the building facade, and shall prevent sudden horizontal movement of the platform. This system is acceptable only where the suspended portion of the equipment in use does not exceed 130 feet (39.6 m) above a safe surface or ground level, and where the platform maintains no less than 10 pounds (44.4 n) angulation force on the building facade.

(iv) Tie-in guides for building interiors (atriums) may be eliminated when a registered professional engineer determines that an alternative stabilization system, including systems in paragraphs (e)(2)(iii) (A), (B) and (C), or a platform tie-off at each work station will provide equivalent safety.

(3) Roof guarding. (i) Employees working on roofs while performing building maintenance shall be protected by a perimeter guarding system which meets the requirements of paragraph (c)(1) of §1910.23 of this part.

(ii) The perimeter guard shall not be more than six inches (152 mm) inboard of the inside face of a barrier, i.e. the parapet wall, or roof edge curb of the building being serviced; however, the perimeter guard location shall not exceed an
18 inch (457 mm) setback from the exterior building face.

(4) Equipment stops. Operational areas for trackless type equipment shall be provided with structural stops, such as

curbs, to prevent equipment from traveling outside its intended travel areas and to prevent a crushing or shearing hazard.

(5) Maintenance access. Means shall be provided to traverse all carriages and their suspended equipment to a safe area for maintenance and storage.

(6) Elevated track. (i) An elevated track system which is located four feet (1.2 m) or more above a safe surface, and traversed by carriage supported equipment, shall be provided with a walkway and guardrail system; or

(ii) The working platform shall be capable of being lowered, as part of its normal operation, to the lower safe surface for access and egress of the personnel and shall be provided with a safe means of access and egress to the lower safe surface.

(7) Tie-down anchors. Imbedded tie-down anchors, fasteners, and affected structures shall be resistant to

corrosion. (8) Cable stabilization. (i) Hanging lifelines and all cables not in tension shall be stabilized at each 200

foot (61 m)
interval of vertical travel of the working platform beyond an initial 200 foot (61 m) distance.

(ii) Hanging cables, other than suspended wire ropes, which are in constant tension shall be stabilized when the vertical travel exceeds an initial 600 foot (183 m) distance, and at further intervals of 600 feet (183 m) or less.

(9) Emergency planning. A written emergency action plan shall be developed and implemented for each kind of working platform operation. This plan shall explain the emergency procedures which are to be followed in the event of a power failure, equipment failure or other emergencies which may be encountered. The plan shall also explain that employees inform themselves about the building emergency escape routes, procedures and alarm systems before operating a platform. Upon initial assignment and whenever the plan is changed the employer shall review with each employee those parts of the plan which the employee must know to protect himself or herself in the event of an emergency.

(10) Building maintenance. Repairs or major maintenance of those building portions that provide primary support for the suspended equipment shall not affect the capability of the building to meet the requirements of this standard.

(11) Electrical requirements. The following electrical requirements apply to buildings which utilize working platforms for building maintenance.

(i) General building electrical installations shall comply with §§1910.302 through 1910.308 of this part, unless otherwise specified in this section;

(ii) Building electrical wiring shall be of such capacity that when full load is applied to the equipment power circuit not more than a five percent drop from building service-vault voltage shall occur at any power circuit outlet used by equipment regulated by this section;

(iii) The equipment power circuit shall be an independent electrical circuit that shall remain separate from all other equipment within or on the building, other than power circuits used for hand tools that will be used in conjunction with the equipment. If the building is provided with an emergency power system, the equipment power circuit may also be connected to this system;

(iv) The power circuit shall be provided with a disconnect switch that can be locked in the “OFF” and “ON” positions. The switch shall be conveniently located with respect to the primary operating area of the equipment to allow the operators of the equipment access to the switch;

(v) The disconnect switch for the power circuit shall be locked in the “ON” position when the equipment is in use; and

(vi) An effective two-way voice communication system shall be provided between the equipment operators and persons stationed within the building being serviced. The communications facility shall be operable and shall be manned at all times by persons stationed within the building whenever the platform is being used.

(f) Powered platform installations—Equipment—(1) General requirements. The following requirements apply to equipment which are part of a powered platform installation, such as platforms, stabilizing components, carriages, outriggers, davits, hoisting machines, wire ropes and electrical components.

(i) Equipment installations shall be designed by or under the direction of a registered professional engineer experienced in such design;

(ii) The design shall provide for a minimum live load of 250 pounds (113.6 kg) for each occupant of a suspended or supported platform;

(iii) Equipment that is exposed to wind when not in service shall be designed to withstand forces generated by winds of at least 100 miles per hour (44.7 m/s) at 30 feet (9.2 m) above grade; and

(iv) Equipment that is exposed to wind when in service shall be designed to withstand forces generated by winds of at least 50 miles per hour (22.4 m/s) for all elevations. (2) Construction requirements. Bolted connections shall be self-locking or shall otherwise be secured to prevent loss of the connections by vibration.

(3) Suspension methods. Elevated building maintenance equipment shall be suspended by a carriage, outriggers, davits or an equivalent method.

(i) Carriages. Carriages used for suspension of elevated building maintenance equipment shall comply with the following:

(A) The horizontal movement of a carriage shall be controlled so as to ensure its safe movement and allow accurate positioning of the platform for vertical travel or storage;

(B) Powered carriages shall not exceed a traversing speed of 50 feet per minute (0.3 m/s);

(C) The initiation of a traversing movement for a manually propelled carriage on a smooth level surface shall not require a person to exert a horizontal force greater than 40 pounds (444.8 n);

(D) Structural stops and curbs shall be provided to prevent the traversing of the carriage beyond its designed limits of travel;

(E) Traversing controls for a powered carriage shall be of a continuous pressure weatherproof type. Multiple controls when provided shall be arranged to permit operation from only one control station at a time. An emergency stop device shall be provided on each end of a powered carriage for interrupting power to the carriage drive motors;

(F) The operating controls(s) shall be so connected that in the case of suspended equipment, traversing of a carriage is not possible until the suspended portion of the equipment is located at its uppermost designed position for traversing; and is free of contact with the face of the building or building guides. In addition, all protective devices and interlocks are to be in the proper position to allow traversing of the carriage;

(G) Stability for underfoot supported carriages shall be obtained by gravity, by an attachment to a structural support, or by a combination of gravity and a structural support. The use of flowing counterweights to achieve stability is prohibited.

(1) The stability factor against overturning shall not be less than two for horizontal traversing of the carriage, including the effects of impact and wind.

(2) The carriages and their anchorages shall be capable of resisting accidental over-tensioning of the wire ropes suspending the working platform, and this calculated value shall include the effect of one and one-half times the stall capacity of the hoist motor. All parts of the installation shall be capable of withstanding without damage to any part of the installation the forces resulting from the stall load of the hoist and one half the wind load.

(3) Roof carriages which rely on having tie-down devices secured to the building to develop the required stability against overturning shall be provided with an interlock which will prevent vertical platform movement unless the tie-down is engaged;

(H) An automatically applied braking or locking system, or equivalent, shall be provided that will prevent unintentional traversing of power traversed or power assisted carriages;

(I) A manual or automatic braking or locking system or equivalent, shall be provided that will prevent unintentional traversing of manually propelled carriages;

(J) A means to lock out the power supply for the carriage shall be provided;

(K) Safe access to and egress from the carriage shall be provided from a safe surface. If the carriage traverses an elevated area, any operating area on the carriage shall be protected by a guardrail system in compliance with the provisions of paragraph (f)(5)(i)(F) of this section. Any access gate shall be self-closing and self-latching, or provided with an interlock;

(L) Each carriage work station position shall be identified by location markings and/or position indicators; and

(M) The motors shall stall if the load on the hoist motors is at any time in excess of three times that necessary for lifting the working platform with its rated load.

(ii) Transportable outriggers. (A) Transportable outriggers may be used as a method of suspension for ground rigged working platforms where the point of suspension does not exceed 300 feet (91.5 m) above a safe surface. Tie-in guide system(s) shall be provided which meet the requirements of paragraph (e)(2) of this section. (B) Transportable outriggers shall be used only with self-powered, ground rigged working platforms.

(C) Each transportable outrigger shall be secured with a tie-down to a verified anchorage on the building during the entire period of its use. The anchorage shall be designed to have a stability factor of not less than four against overturning or upsetting of the outrigger.

(D) Access to and egress from the working platform shall be from and to a safe surface below the point of

suspension. (E) Each transportable outrigger shall be designed for lateral stability to prevent roll-over in the event an

accidental
lateral load is applied to the outrigger. The accidental lateral load to be considered in this design shall be not less than 70 percent of the rated load of the hoist.

(F) Each transportable outrigger shall be designed to support an ultimate load of not less than four times the rated load of the hoist.

(G) Each transportable outrigger shall be so located that the suspension wire ropes for two point suspended working platforms are hung parallel.

(H) A transportable outrigger shall be tied-back to a verified anchorage on the building with a rope equivalent in strength to the suspension rope.

(I) The tie-back rope shall be installed parallel to the centerline of the outrigger.

(iii) Davits. (A) Every davit installation, fixed or transportable, rotatable or non-rotatable shall be designed and installed to insure that it has a stability factor against overturning of not less than four.

(B) The following requirements apply to roof rigged davit systems:

(1) Access to and egress from the working platform shall be from a safe surface. Access or egress shall not require persons to climb over a building's parapet or guard railing; and

(2) The working platform shall be provided with wheels, casters or a carriage for traversing

horizontally. (C) The following requirements apply to ground rigged davit systems:

(1) The point of suspension shall not exceed 300 feet (91.5 m) above a safe surface. Guide system(s) shall be provided which meet the requirements of paragraph (e)(2) of this section;

(2) Access and egress to and from the working platform shall only be from a safe surface below the point of suspension.

(D) A rotating davit shall not require a horizontal force in excess of 40 pounds (177.9 n) per person to initiate a rotating movement.

(E) The following requirements shall apply to transportable davits:

(1) A davit or part of a davit weighing more than 80 pounds (36 kg) shall be provided with a means for its transport, which shall keep the center of gravity of the davit at or below 36 inches (914 mm) above the safe surface during transport;

(2) A davit shall be provided with a pivoting socket or with a base that will allow the insertion or removal of a davit at a position of not more than 35 degrees above the horizontal, with the complete davit inboard of the building face being serviced; and

(3) Means shall be provided to lock the davit to its socket or base before it is used to suspend the platform.

(4) Hoisting machines. (i) Raising and lowering of suspended or supported equipment shall be performed only by a hoisting machine.

(ii) Each hoisting machine shall be capable of arresting any overspeed descent of the

load. (iii) Each hoisting machine shall be powered only by air, electric or hydraulic

sources.

(iv) Flammable liquids shall not be carried on the working platform.

(v) Each hoisting machine shall be capable of raising or lowering 125 percent of the rated load of the hoist. (vi) Moving parts of a hoisting machine shall be enclosed or guarded in compliance with paragraphs (a)(1) and (2) of §1910.212 of this part.

(vii) Winding drums, traction drums and sheaves and directional sheaves used in conjunction with hoisting machines shall be compatible with, and sized for, the wire rope used.

(viii) Each winding drum shall be provided with a positive means of attaching the wire rope to the drum. The attachment shall be capable of developing at least four times the rated load of the hoist.

(ix) Each hoisting machine shall be provided with a primary brake and at least one independent secondary brake, each capable of stopping and holding not less than 125 percent of the lifting capacity of the hoist.

(A) The primary brake shall be directly connected to the drive train of the hoisting machine, and shall not be connected through belts, chains, clutches, or set screw type devices. The brake shall automatically set when power to the prime mover is interrupted.

(B)(1) The secondary brake shall be an automatic emergency type of brake that, if actuated during each stopping cycle, shall not engage before the hoist is stopped by the primary brake.

(2) When a secondary brake is actuated, it shall stop and hold the platform within a vertical distance of 24 inches (609.6 mm).

(x) Any component of a hoisting machine which requires lubrication for its protection and proper functioning shall be provided with a means for that lubrication to be applied.

(5) Suspended equipment—(i) General requirements. (A) Each suspended unit component, except suspension ropes and guardrail systems, shall be capable of supporting, without failure, at least four times the maximum intended live load applied or transmitted to that component.

(B) Each suspended unit component shall be constructed of materials that will withstand anticipated weather conditions.

(C) Each suspended unit shall be provided with a load rating plate, conspicuously located, stating the unit weight and rated load of the suspended unit.

(D) When the suspension points on a suspended unit are not at the unit ends, the unit shall be capable of remaining continuously stable under all conditions of use and position of the live load, and shall maintain at least a 1.5 to 1 stability factor against unit upset.

(E) Guide rollers, guide shoes or building face rollers shall be provided, and shall compensate for variations in building dimensions and for minor horizontal out-of-level variations of each suspended unit.

(F) Each working platform of a suspended unit shall be secured to the building facade by one or more of the following methods, or by an equivalent method:

(1) Continuous engagement to building anchors as provided in paragraph (e)(2)(i) of this section;

(2) Intermittent engagement to building anchors as provided in paragraph (e)(2)(iii)(A) of this

section; (3) Button guide engagement as provided in paragraph (e)(2)(iii)(B) of this section; or

(4) Angulated roping and building face rollers as provided in paragraph (e)(2)(iii)(C) of this section.

(G) Each working platform of a suspended unit shall be provided with a guardrail system on all sides which shall meet the following requirements:

(1) The system shall consist of a top guardrail, midrail, and a toeboard;

(2) The top guardrail shall not be less than 36 inches (914 mm) high and shall be able to withstand at least a 100- pound (444 n) force in any downward or outward direction;

(3) The midrail shall be able to withstand at least a 75-pound (333 n) force in any downward or outward direction; and

(4) The areas between the guardrail and toeboard on the ends and outboard side, and the area between the midrail and toeboard on the inboard side, shall be closed with a material that is capable of withstanding a load of 100 pounds (45.4 KG.) applied horizontally over any area of one square foot (.09 m^2). The material shall have all openings small enough to reject passage of life lines and potential falling objects which may be hazardous to persons below.

(5) Toeboards shall be capable of withstanding, without failure, a force of at least 50 pounds (222 n) applied in any downward or horizontal direction at any point along the toeboard.

(6) Toeboards shall be three and one-half inches (9 cm) minimum in length from their top edge to the level of the platform floor.

(7) Toeboards shall be securely fastened in place at the outermost edge of the platform and have no more than one- half inch (1.3 cm) clearance above the platform floor.

(8) Toeboards shall be solid or with an opening not over one inch (2.5 cm) in the greatest dimension.

(ii) Two and four-point suspended working platforms. (A) The working platform shall be not less than 24 inches (610 mm) wide and shall be provided with a minimum of a 12 inch (305 mm) wide passage at or past any obstruction on the platform.

(B) The flooring shall be of a slip-resistant type and shall contain no opening that would allow the passage of life lines, cables and other potential falling objects. If a larger opening is provided, it shall be protected by placing a material under the opening which shall prevent the passage of life lines, cables and potential falling objects.

(C) The working platfrom shall be provided with a means of suspension that will restrict the platform's inboard to outboard roll about its longitudinal axis to a maximum of 15 degrees from a horizontal plane when moving the live load from the inboard to the outboard side of the platform.

(D) Any cable suspended from above the platform shall be provided with a means for storage to prevent accumulation of the cable on the floor of the platform.

(E) All operating controls for the vertical travel of the platform shall be of the continuous-pressure type, and shall be located on the platform.

(F) Each operating station of every working platform shall be provided with a means of interrupting the power supply to all hoist motors to stop any further powered ascent or descent of the platform.

(G) The maximum rated speed of the platform shall not exceed 50 feet per minute (0.3 ms) with single speed hoists, nor 75 feet per minute (0.4 ms) with multi-speed hoists.

(H) Provisions shall be made for securing all tools, water tanks, and other accessories to prevent their movement or accumulation on the floor of the platform.

(I) Portable fire extinguishers conforming to the provisions of §§1910.155 and 1910.157 of this part shall be provided and securely attached on all working platforms.

(J) Access to and egress from a working platfrom, except for those that land directly on a safe surface, shall be provided by stairs, ladders, platforms and runways conforming to the provisions of subpart D of this part. Access gates shall be self-closing and self-latching.

(K) Means of access to or egress from a working platform which is 48 inches (1.2 m) or more above a safe surface shall be provided with a guardrail system or ladder handrails that conform to the provisions of subpart D of this part.

(L) The platform shall be provided with a secondary wire rope suspension system if the platform contains overhead structures which restrict the emergency egress of employees. A horizontal lifeline or a direct connection anchorage shall be provided, as part of a fall arrest system which meets the requirements of appendix C, for each employee on such a platform.

(M) A vertical lifeline shall be provided as part of a fall arrest system which meets the requirements of appendix C, for each employee on a working platform suspended by two or more wire ropes, if the failure of one wire rope or suspension attachment will cause the platform to upset. If a secondary wire rope suspension is used, vertical lifelines are not required for the fall arrest system, provided that each employee is attached to a horizontal lifeline anchored to the platform.

(N) An emergency electric operating device shall be provided on roof powered platforms near the hoisting machine for use in the event of failure of the normal operating device located on the working platform, or failure of the cable connected to the platform. The emergency electric operating device shall be mounted in a secured compartment, and the compartment shall be labeled with instructions for use. A means for opening the compartment shall be mounted in a break-glass receptable located near the emergency electric operating device or in an equivalent secure and accessible location. (iii) Single point suspended working platforms. (A) The requirements of paragraphs (f)(5)(ii) (A) through (K) of this section shall also apply to a single point working platform.

(B) Each single point suspended working platform shall be provided with a secondary wire rope suspension system, which will prevent the working platform from falling should there be a failure of the primary means of support, or if the platform contains overhead structures which restrict the egress of the employees. A horizontal life line or a direct connection anchorage shall be provided, as part of a fall arrest system which meets the requirements of appendix C, for each employee on the platform.

(iv) Ground-rigged working platforms. (A) Groundrigged working platforms shall comply with all the requirements of paragraphs (f)(5)(ii) (A) through (M) of this section.

(B) After each day's use, the power supply within the building shall be disconnected from a ground-rigged working platform, and the platform shall be either disengaged from its suspension points or secured and stored at grade.

(v) Intermittently stabilized platforms. (A) The platform shall comply with paragraphs (F)(5)(ii) (A) through (M) of this section.

(B) Each stabilizer tie shall be equipped with a “quick connect-quick disconnect” device which cannot be accidently disengaged, for attachment to the building anchor, and shall be resistant to adverse environmental conditions.

(C) The platform shall be provided with a stopping device that will interrupt the hoist power supply in the event the platform contacts a stabilizer tie during its ascent.

(D) Building face rollers shall not be placed at the anchor setting if exterior anchors are used on the building face.

(E) Stabilizer ties used on intermittently stabilized platforms shall allow for the specific attachment length needed

to effect the predetermined angulation of the suspended wire rope. The specific attachment length shall be

maintained at all
building anchor locations.

(F) The platform shall be in continuous contact with the face of the building during ascent and descent.

(G) The attachment and removal of stabilizer ties shall not require the horizontal movement of the platform.

(H) The platform-mounted equipment and its suspension wire ropes shall not be physically damaged by the loads from the stabilizer tie or its building anchor. The platform, platform mounted equipment and wire ropes shall be able to withstand a load that is at least twice the ultimate strength of the stabilizer tie.

NOTE: See figure II in appendix B of this section for a description of a typical intermittent stabilization system.

(vi) Button-guide stabilized platforms. (A) The platform shall comply with paragraphs (f)(5)(ii) (A) through (M) of this section.

(B) Each guide track on the platform shall engage a minimum of two guide buttons during any vertical travel of the platform following the initial button engagement.

(C) Each guide track on a platform that is part of a roof rigged system shall be provided with a storage position on the platform.

(D) Each guide track on the platform shall be sufficiently maneuverable by platform occupants to permit easy engagement of the guide buttons, and easy movement into and out of its storage position on the platform.

(E) Two guide tracks shall be mounted on the platform and shall provide continuous contact with the building

face. (F) The load carrying components of the button guide stabilization system which transmit the load into the

platform
shall be capable of supporting the weight of the platform, or provision shall be made in the guide track connectors or platform attachments to prevent the weight of the platform from being transmitted to the platform attachments.

NOTE: See figure III in appendix B of this section for a description of a typical button guide stabilization system.

(6) Supported equipment. (i) Supported equipment shall maintain a vertical position in respect to the face of the building by means other than friction.

(ii) Cog wheels or equivalent means shall be incorporated to provide climbing traction between the supported equipment and the building guides. Additional guide wheels or shoes shall be incorporated as may be necessary to ensure that the drive wheels are continuously held in positive engagement with the building guides. (iii) Launch guide mullions indexed to the building guides and retained in alignment with the building guides shall be used to align drive wheels entering the building guides.

(iv) Manned platforms used on supported equipment shall comply with the requirements of paragraphs (f)(5)(ii)(A), (f) (5)(ii)(B), and (f)(5)(ii) (D) through (K) of this section covering suspended equipment.

(7) Suspension wire ropes and rope connections. (i) Each specific installation shall use suspension wire ropes or combination cable and connections meeting the specification recommended by the manufacturer of the hoisting machine used. Connections shall be capable of developing at least 80 percent of the rated breaking strength of the wire rope.

(ii) Each suspension rope shall have a “Design Factor” of at least 10. The “Design Factor” is the ratio of the rated strength of the suspension wire rope to the rated working load, and shall be calculated using the following formula:

$$F = \frac{S(N)}{W}$$

Where:

F = Design factor

S = Manufacturer's rated strength of one suspension rope

N = Number of suspension ropes under load

W = Rated working load on all ropes at any point of travel

(iii) Suspension wire rope grade shall be at least improved plow steel or equivalent.

(iv) Suspension wire ropes shall be sized to conform with the required design factor, but shall not be less than $^{5}/_{16}$ Inch (7.94 mm) in diameter.

(v) No more than one reverse bend in six wire rope lays shall be permitted.

(vi) A corrosion-resistant tag shall be securely attached to one of the wire rope fastenings when a suspension wire rope is to be used at a specific location and will remain in that location. This tag shall bear the following wire rope data:

(A) The diameter (inches and/or

mm); (B) Construction classification;

(C) Whether non-preformed or

preformed; (D) The grade of material;

(E) The manufacturer's rated

strength; (F) The manufacturer's

name;

(G) The month and year the ropes were installed; and

(H) The name of the person or company which installed the

ropes. (vii) A new tag shall be installed at each rope renewal.

(viii) The original tag shall be stamped with the date of the resocketing, or the original tag shall be retained and a supplemental tag shall be provided when ropes are resocketed. The supplemental tag shall show the date of resocketing and the name of the person or company that resocketed the rope.

(ix) Winding drum type hoists shall contain at least three wraps of the suspension wire rope on the drum when the suspended unit has reached the lowest possible point of its vertical travel.

(x) Traction drum and sheave type hoists shall be provided with a wire rope of sufficient length to reach the lowest possible point of vertical travel of the suspended unit, and an additional length of the wire rope of at least four feet (1.2 m).

(xi) The lengthening or repairing of suspension wire ropes is prohibited. (xii) Babbitted fastenings for suspension wire rope are prohibited.

(8) Control circuits, power circuits and their components. (i) Electrical wiring and equipment shall comply with subpart S of this part, except as otherwise required by this section.

(ii) Electrical runway conductor systems shall be of a type designed for use in exterior locations, and shall be located so that they do not come into contact with accumulated snow or water.

(iii) Cables shall be protected against damage resulting from overtensioning or from other causes.

(iv) Devices shall be included in the control system for the equipment which will provide protection against electrical overloads, three phase reversal and phase failure. The control system shall have a separate method, independent of the direction control circuit, for breaking the power circuit in case of an emergency or malfunction.

(v) Suspended or supported equipment shall have a control system which will require the operator of the equipment to follow predetermined procedures.

(vi) The following requirements shall apply to electrical protection devices:

(A) On installations where the carriage does not have a stability factor of at least four against overturning, electrical contact(s) shall be provided and so connected that the operating devices for the suspended or supported equipment shall be operative only when the carriage is located and mechanically retained at an established operating point.

(B) Overload protection shall be provided in the hoisting or suspension system to protect against the equipment operating in the “up” direction with a load in excess of 125 percent of the rated load of the platform; and

(C) An automatic detector shall be provided for each suspension point that will interrupt power to all hoisting motors for travel in the “down” direction, and apply the primary brakes if any suspension wire rope becomes slack. A continuous- pressure rigging-bypass switch designed for use during rigging is permitted. This switch shall only be used during rigging.

(vii) Upper and lower directional switches designed to prevent the travel of suspended units beyond safe upward and downward levels shall be provided.

(viii) Emergency stop switches shall be provided on remote controlled, roof-powered manned platforms adjacent

to each control station on the platform.

(ix) Cables which are in constant tension shall have overload devices which will prevent the tension in the cable from interfering with the load limiting device required in paragraph (f)(8)(vi)(B) of this section, or with the platform roll limiting device required in paragraph (f)(5)(ii)(C) of this section. The setting of these devices shall be coordinated with other overload settings at the time of design of the system, and shall be clearly indicated on or near the device. The device shall interrupt the equipment travel in the "down" direction.

(g) Inspection and tests—(1) Installations and alterations. All completed building maintenance equipment installations shall be inspected and tested in the field before being placed in initial service to determine that all parts of the installation conform to applicable requirements of this standard, and that all safety and operating equipment is functioning as required. A similar inspection and test shall be made following any major alteration to an existing installation. No hoist in an installation shall be subjected to a load in excess of 125 percent of its rated load.

(2) Periodic inspections and tests. (i) Related building supporting structures shall undergo periodic inspection by a competent person at intervals not exceeding 12 months.

(ii) All parts of the equipment including control systems shall be inspected, and, where necessary, tested by a competent person at intervals specified by the manufacturer/supplier, but not to exceed 12 months, to determine that they are in safe operating condition. Parts subject to wear, such as wire ropes, bearings, gears, and governors shall be inspected and/or tested to determine that they have not worn to such an extent as to affect the safe operation of the installation.

(iii) The building owner shall keep a certification record of each inspection and test required under paragraphs (g)(2)(i) and (ii) of this section. The certification record shall include the date of the inspection, the signature of the person who performed the inspection, and the number, or other identifier, of the building support structure and equipment which was inspected. This certification record shall be kept readily available for review by the Assistant Secretary of Labor or the Assistant Secretary's representative and by the employer.

(iv) Working platforms and their components shall be inspected by the employer for visible defects before every use and after each occurrence which could affect the platform's structural integrity. (3) Maintenance inspections and tests. (i) A maintenance inspection and, where necessary, a test shall be made of each platform installation every 30 days, or where the work cycle is less than 30 days such inspection and/or test shall be made prior to each work cycle. This inspection and test shall follow procedures recommended by the manufacturer, and shall be made by a competent person.

(ii) The building owner shall keep a certification record of each inspection and test performed under paragraph (g)(3)(i) of this section. The certification record shall include the date of the inspection and test, the signature of the person who performed the inspection and/or test, and an identifier for the platform installation which was inspected. The certification record shall be kept readily available for review by the Assistant Secretary of Labor or the Assistant Secretary's representative and by the employer.

(4) Special inspection of governors and secondary brakes. (i) Governors and secondary brakes shall be inspected and tested at intervals specified by the manufacturer/supplier but not to exceed every 12 months.

(ii) The results of the inspection and test shall confirm that the initiating device for the secondary braking system operates at the proper overspeed.

(iii) The results of the inspection and test shall confirm that the secondary brake is functioning properly.

(iv) If any hoisting machine or initiating device for the secondary brake system is removed from the equipment for testing, all reinstalled and directly related components shall be reinspected prior to returning the equipment installation to service.

(v) Inspection of governors and secondary brakes shall be performed by a competent person.

(vi) The secondary brake governor and actuation device shall be tested before each day's use. Where testing is not feasible, a visual inspection of the brake shall be made instead to ensure that it is free to operate.

(5) Suspension wire rope maintenance, inspection and replacement. (i) Suspension wire rope shall be maintained and used in accordance with procedures recommended by the wire rope manufacturer.

(ii) Suspension wire rope shall be inspected by a competent person for visible defects and gross damage to the rope before every use and after each occurrence which might affect the wire rope's integrity.

(iii) A thorough inspection of suspension wire ropes in service shall be made once a month. Suspension wire ropes that have been inactive for 30 days or longer shall have a thorough inspection before they are placed into service. These thorough inspections of suspension wire ropes shall be performed by a competent person.

(iv) The need for replacement of a suspension wire rope shall be determined by inspection and shall be based on the condition of the wire rope. Any of the following conditions or combination of conditions will be cause for removal of the wire rope:

(A) Broken wires exceeding three wires in one strand or six wires in one rope

lay; (B) Distortion of rope structure such as would result from crushing or

kinking;

(C) Evidence of heat damage;

(D) Evidence of rope deterioration from corrosion;

(E) A broken wire within 18 inches (460.8 mm) of the end

attachments; (F) Noticeable rusting and pitting;

(G) Evidence of core failure (a lengthening of rope lay, protrusion of the rope core and a reduction in rope diameter suggests core failure); or

(H) More than one valley break (broken wire).

(I) Outer wire wear exceeds one-third of the original outer wire diameter.

(J) Any other condition which the competent person determines has significantly affected the integrity of the

rope. (v) The building owner shall keep a certification record of each monthly inspection of a suspension wire

rope as
required in paragraph (g)(5)(iii) of this section. The record shall include the date of the inspection, the signature of the person who performed the inspection, and a number, or other identifier, of the wire rope which was inspected. This record of inspection shall be made available for review by the Assistant Secretary of Labor or the Assistant Secretary's representative and by the employer.

(6) Hoist inspection. Before lowering personnel below the top elevation of the building, the hoist shall be tested each day in the lifting direction with the intended load to make certain it has sufficient capacity to raise the personnel back to the boarding level.

(h) Maintenance—(1) General maintenance. All parts of the equipment affecting safe operation shall be maintained in proper working order so that they may perform the functions for which they were intended. The equipment shall be taken out of service when it is not in proper working order.

(2) Cleaning. (i) Control or power contactors and relays shall be kept clean.

(ii) All other parts shall be kept clean if their proper functioning would be affected by the presence of dirt or other contaminants.

(3) Periodic resocketing of wire rope fastenings. (i) Hoisting ropes utilizing poured socket fastenings shall be resocketed at the non-drum ends at intervals not exceeding 24 months. In resocketing the ropes, a sufficient length shall be cut from the end of the rope to remove damaged or fatigued portions.

(ii) Resocketed ropes shall conform to the requirements of paragraph (f)(7) of this

section. (iii) Limit switches affected by the resocketed ropes shall be reset, if necessary.

(4) Periodic reshackling of suspension wire ropes. The hoisting ropes shall be reshackled at the nondrum ends at intervals not exceeding 24 months. When reshackling the ropes, a sufficient length shall be cut from the end of the rope to remove damaged or fatigued portions.

(5) Roof systems. Roof track systems, tie-downs, or similar equipment shall be maintained in proper working order so that they perform the function for which they were intended.

(6) Building face guiding members. T-rails, indented mullions, or equivalent guides located in the face of a building shall be maintained in proper working order so that they perform the functions for which they were intended. Brackets for cable stabilizers shall similarly be maintained in proper working order.

(7) Inoperative safety devices. No person shall render a required safety device or electrical protective device inoperative, except as necessary for tests, inspections, and maintenance. Immediately upon completion of such tests, inspections and maintenance, the device shall be restored to its normal operating condition.

(i) Operations—(1) Training. (i) Working platforms shall be operated only by persons who are proficient in the operation, safe use and inspection of the particular working platform to be operated.

(ii) All employees who operate working platforms shall be trained in the following:

(A) Recognition of, and preventive measures for, the safety hazards associated with their individual work tasks.

(B) General recognition and prevention of safety hazards associated with the use of working platforms, including the provisions in the section relating to the particular working platform to be operated.

(C) Emergency action plan procedures required in paragraph (e)(9) of this

section. (D) Work procedures required in paragraph (i)(1)(iv) of this section.

(E) Personal fall arrest system inspection, care, use and system performance.

(iii) Training of employees in the operation and inspection of working platforms shall be done by a competent

person. (iv) Written work procedures for the operation, safe use and inspection of working platforms shall be

provided for
employee training. Pictorial methods of instruction, may be used, in lieu of written work procedures, if employee communication is improved using this method. The operating manuals supplied by manufacturers for platform system components can serve as the basis for these procedures.

(v) The employer shall certify that employees have been trained in operating and inspecting a working platform by preparing a certification record which includes the identity of the person trained, the signature of the employer or the person who conducted the training and the date that training was completed. The certification record shall be prepared at
the completion of the training required in paragraph (i)(1)(ii) of this section, and shall be maintained in a file for the duration of the employee's employment. The certification record shall be kept readily available for review by the Assistant Secretary of Labor or the Assistant Secretary's representative.

(2) Use. (i) Working platforms shall not be loaded in excess of the rated load, as stated on the platform load rating plate.

(ii) Employees shall be prohibited from working on snow, ice, or other slippery material covering platforms, except for the removal of such materials.

(iii) Adequate precautions shall be taken to protect the platform, wire ropes and life lines from damage due to acids or other corrosive substances, in accordance with the recommendations of the corrosive substance producer, supplier, platform manufacturer or other equivalent information sources. Platform members which have been exposed to acids or other corrosive substances shall be washed down with a neutralizing solution, at a frequency recommended by the corrosive substance producer or supplier.

(iv) Platform members, wire ropes and life lines shall be protected when using a heat producing process. Wire ropes and life lines which have been contacted by the heat producing process shall be considered to be permanently damaged and shall not be used.

(v) The platform shall not be operated in winds in excess of 25 miles per hour (40.2 km/hr) except to move it from an operating to a storage position. Wind speed shall be determined based on the best available information, which includes on-site anemometer readings and local weather forecasts which predict wind velocities for the area.

(vi) On exterior installations, an anemometer shall be mounted on the platform to provide information of on-site

wind velocities prior to and during the use of the platform. The anemometer may be a portable (hand held) unit which is temporarily mounted during platform use.

(vii) Tools, materials and debris not related to the work in progress shall not be allowed to accumulate on platforms. Stabilizer ties shall be located so as to allow unencumbered passage along the full length of the platform and shall be of such length so as not to become entangled in rollers, hoists or other machinery.

(j) Personal fall protection. Employees on working platforms shall be protected by a personal fall arrest system meeting the requirements of appendix C, section I, of this standard, and as otherwise provided by this standard.

APPENDIX A TO §1910.66, GUIDELINES
(ADVISORY)

1. Use of the Appendix. Appendix A provides examples of equipment and methods to assist the employer in meeting the requirements of the indicated provision of the standard. Employers may use other equipment or procedures which conform to the requirements of the standard. This appendix neither adds to nor detracts from the mandatory requirements set forth in §1910.66.

2. Assurance. Paragraph (c) of the standard requires the building owner to inform the employer in writing that the powered platform installation complies with certain requirements of the standard, since the employer may not have the necessary information to make these determinations. The employer, however, remains responsible for meeting these requirements which have not been set off in paragraph (c)(1).

3. Design Requirements. The design requirements for each installation should be based on the limitations (stresses, deflections, etc.), established by nationally recognized standards as promulgated by the following organizations, or to equivalent standards:

AA—The Aluminum Association, 818 Connecticut Avenue, NW., Washington, DC, 20006

Aluminum Construction Manual

Specifications For Aluminum

Structures Aluminum Standards and

Data

AGMA—American Gear Manufacturers Association, 101 North Fort Meyer Dr., Suite 1000, Arlington, VA 22209

AISC—American Institute of Steel Construction, 400 North Michigan Avenue, Chicago, IL 60611

ANSI—American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018

ASCE—American Society of Civil Engineers, 345 East 47th Street, New York, NY 10017

ASME—American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017

ASTM—American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103

AWS—American Welding Society, Inc., Box 351040, 550 NW. LeJeunne Road, Miami, FL 33126 JIC—Joint Industrial Council, 2139 Wisconsin Avenue NW., Washington, DC 20007

NEMA—National Electric Manufacturers Association, 2101 L Street, NW., Washington, DC 20037

4. Tie-in-guides. Indented mullions, T-rails or other equivalent guides are acceptable as tie-in guides in a building face for a continuous stabilization system. Internal guides are embedded in other building members with only the opening exposed (see Figure
1 of appendix B). External guides, however, are installed external to the other building members and so are fully exposed. The minimum opening for tie-in guides is three-quarters of an inch (19 mm), and the minimum inside dimensions are one-inch (25 mm) deep and two inches (50 mm) wide.

Employers should be aware of the hazards associated with tie-in guides in a continuous stabilization system which was not designed properly. For example, joints in these track systems may become extended or discontinuous due to installation or building settlement. If this alignment problem is not corrected, the system could jam when a guide roller or guide shoe strikes a joint and this would cause a hazardous situation for employees. In another instance, faulty design will result in guide rollers being mounted in a line so they will jam in the track at the slightest misalignment.

5. Building anchors (intermittent stabilization system). In the selection of the vertical distance between building anchors, certain factors should be given consideration. These factors include building height and architectural design, platform length and

weight,
wire rope angulation, and the wind velocities in the building area. Another factor to consider is the material of the building face, since this material may be adversely affected by the building rollers.

External or indented type building anchors are acceptable. Receptacles in the building facade used for the indented type should be kept clear of extraneous materials which will hinder their use. During the inspection of the platform installation, evidence of a failure or abuse of the anchors should be brought to the attention of the employer.

6. Stabilizer tie length. A stabilizer tie should be long enough to provide for the planned angulation of the suspension cables. However, the length of the tie should not be excessive and become a problem by possibly becoming entangled in the building face rollers or parts of the platform machinery.

The attachment length may vary due to material elongation and this should be considered when selecting the material to be used. Consideration should also be given to the use of ties which are easily installed by employees, since this will encourage their use.

7. Intermittent stabilization system. Intermittent stabilization systems may use different equipment, tie-in devices and methods to restrict the horizontal movement of a powered platform with respect to the face of the building. One acceptable method employs corrosion-resistant building anchors secured in the face of the building in vertical rows every third floor or 50 feet (15.3 m), whichever is less. The anchors are spaced horizontally to allow a stabilization attachment (stabilizer tie) for each of the two platform suspension wire ropes. The stabilizer tie consists of two parts. One part is a quick connect-quick disconnect device which utilizes a corrosion- resistant yoke and retainer spring that is designed to fit over the building anchors. The second part of the stabilizer tie is a lanyard which is used to maintain a fixed distance between the suspension wire rope and the face of the building.

In this method, as the suspended powered platform descends past the elevation of each anchor, the descent is halted and each of the platform occupants secures a stabilizer tie between a suspension wire rope and a building anchor. The procedure is repeated as each elevation of a building anchor is reached during the descent of the powered platform.

As the platform ascends, the procedure is reversed; that is, the stabilizer ties are removed as each elevation of a building anchor is reached. The removal of each stabilizer tie is assured since the platform is provided with stopping devices which will interrupt power to its hoist(s) in the event either stopping device contacts a stabilizer during the ascent of the platform.

Figure 2 of appendix B illustrates another type of acceptable intermittent stabilization system which utilizes retaining pins as the quick connect-quick disconnect device in the stabilizer tie.

8. Wire Rope Inspection. The inspection of the suspension wire rope is important since the rope gradually loses strength during its useful life. The purpose of the inspection is to determine whether the wire rope has sufficient integrity to support a platform with the required design factor.

If there is any doubt concerning the condition of a wire rope or its ability to perform the required work, the rope should be replaced. The cost of wire rope replacement is quite small if compared to the cost in terms of human injuries, equipment down time and replacement.

No listing of critical inspection factors, which serve as a basis for wire rope replacement in the standard, can be a substitute for an experienced inspector of wire rope. The listing serves as a user's guide to the accepted standards by which ropes must be judged.

Rope life can be prolonged if preventive maintenance is performed regularly. Cutting off an appropriate length of rope at the end termination before the core degrades and valley breaks appear minimizes degradation at these sections.

9. General Maintenance. In meeting the general maintenance requirement in paragraph (h)(1) of the standard, the employer should undertake the prompt replacement of broken, worn and damaged parts, switch contacts, brushes, and short flexible conductors of electrical devices. The components of the electrical service system and traveling cables should be replaced when damaged or significantly abraded. In addition, gears, shafts, bearings, brakes and hoisting drums should be kept in proper
alignment.

10. Training. In meeting the training requirement of paragraph (i)(1) of the standard, employers should use both on the job training and formal classroom training. The written work procedures used for this training should be obtained from the manufacturer, if possible, or prepared as necessary for the employee's information and use.

Employees who will operate powered platforms with intermittent stabilization systems should receive instruction in the specific ascent and descent procedures involving the assembly and disassembly of the stabilizer ties.

An acceptable training program should also include employee instruction in basic inspection procedures for the purpose of determining the need for repair and replacement of platform equipment. In addition, the program should cover the inspection, care and use of the personal fall protection equipment required in paragraph (j)(1) of the standard.

In addition, the training program should also include emergency action plan elements. OSHA brochure #1B3088 (Rev.) 1985, "How to Prepare for Workplace Emergencies," details the basic steps needed to prepare to handle emergencies in the workplace.

Following the completion of a training program, the employee should be required to demonstrate competency in operating the equipment safely. Supplemental training of the employee should be provided by the employer, as necessary, if the equipment used or other working conditions should change.

An employee who is required to work with chemical products on a platform should receive training in proper cleaning procedures, and in the hazards, care and handling of these products. In addition, the employee should be supplied with the appropriate personal protective equipment, such as gloves and eye and face protection.

11. Suspension and Securing of Powered Platforms (Equivalency). One acceptable method of demonstrating the equivalency of a method of suspending or securing a powered platform, as required in paragraphs (e)(2)(iii), (f)(3) and (f)(5)(i)(F), is to provide an engineering analysis by a registered professional engineer. The analysis should demonstrate that the proposed method will provide an equal or greater degree of safety for employees than any one of the methods specified in the standard.

APPENDIX B TO §1910.66—EXHIBITS (ADVISORY)

The three drawings in appendix B illustrate typical platform stabilization systems which are addressed in the standard. The drawings are to be used for reference purposes only, and do not illustrate all the mandatory requirements for each system.

Figure 1. Typical Self-Powered Platform—Continuous External or Indented Mullion Guide System

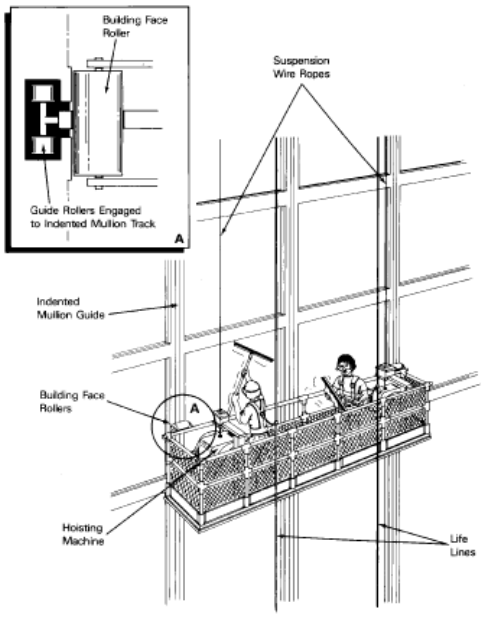
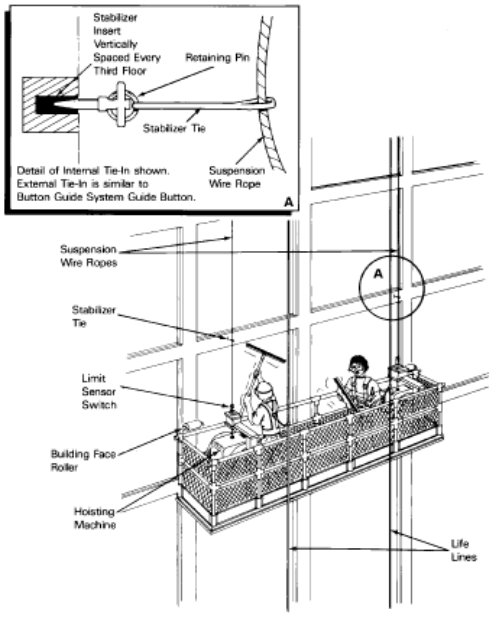
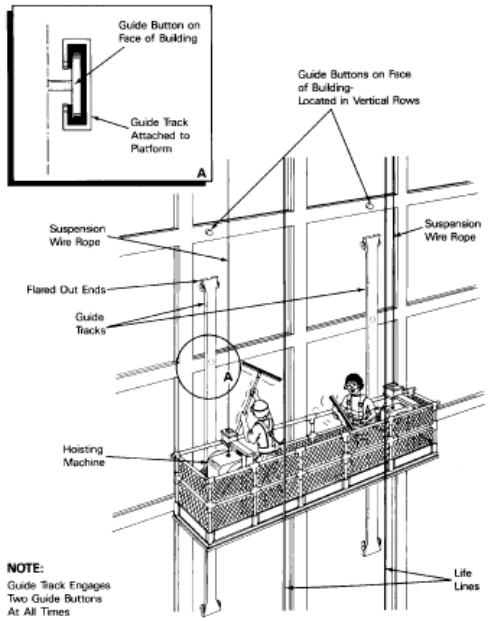


Figure 2. Typical Self-Powered Platform--Intermittent Tie-In System



View or download PDF

Figure 3. Typical Self-Powered Platform--Button Guide System



APPENDIX C TO §1910.66—PERSONAL FALL ARREST SYSTEM (SECTION I—MANDATORY; SECTIONS II AND III—NON-MANDATORY)

Use of the Appendix

Section I of appendix C sets out the mandatory criteria for personal fall arrest systems used by all employees using powered platforms, as required by paragraph (j)(1) of this standard. Section II sets out nonmandatory test procedures which may be used to determine compliance with applicable requirements contained in section I of this appendix. Section III provides nonmandatory guidelines which are intended to assist employers in complying with these provisions.

I. Personal fall arrest systems—(a) Scope and application. This section establishes the application of and performance criteria

(j).for personal fall arrest systems which are required for use by all employees using powered platforms under paragraph 1910.66

(b) Definitions. Anchorage means a secure point of attachment for lifelines, lanyards or deceleration devices, and which is independent of the means of supporting or suspending the employee.

Body belt means a strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.

Body harness means a design of straps which may be secured about the employee in a manner to distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.

Buckle means any device for holding the body belt or body harness closed around the employee's body.

Competent person means a person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as in their application and use with related equipment.

Connector means a device which is used to couple (connect) parts of the system together. It may be an independent component of the system (such as a carabiner), or an integral component of part of the system (such as a buckle or dee-ring sewn into a body belt or body harness, or a snap-hook spliced or sewn to a lanyard or self-retracting lanyard).

Deceleration device means any mechanism, such as a rope grab, ripstitch lanyard, specially woven lanyard, tearing or deforming lanyard, or automatic self retracting-lifeline/lanyard, which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limits the energy imposed on an employee during fall arrest.

Deceleration distance means the additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee's body belt or body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.

Equivalent means alternative designs, materials or methods which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in the standard.

Free fall means the act of falling before the personal fall arrest system begins to apply force to arrest the fall.

Free fall distance means the vertical displacement of the fall arrest attachment point on the employee's body belt or body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, lifeline and lanyard elongation but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.

Lanyard means a flexible line of rope, wire rope, or strap which is used to secure the body belt or body harness to a deceleration device, lifeline, or anchorage.

Lifeline means a component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

Personal fall arrest system means a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

Qualified person means one with a recognized degree or professional certificate and extensive knowledge and experience in the subject field who is capable of design, analysis, evaluation and specifications in the subject work, project, or product.

Rope grab means a deceleration device which travels on a lifeline and automatically frictionally engages the lifeline and locks so as to arrest the fall of an employee. A rope grab usually employs the principle of inertial locking, cam/lever locking, or both.

Self-retracting lifeline/lanyard means a deceleration device which contains a drum-wound line which may be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

Snap-hook means a connector comprised of a hookshaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. Snap-hooks are generally one of two types:

1. The locking type with a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection, or

2. The non-locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection. Tie-off means the act of an employee, wearing personal fall protection equipment, connecting directly or indirectly to an anchorage. It also means the condition of an employee being connected to an anchorage.

(c) Design for system components. (1) Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials.

(2) Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.
kN).

(3) Lanyards and vertical lifelines which tie-off one employee shall have a minimum breaking strength of 5,000 pounds (22.2

(4) Self-retracting lifelines and lanyards which automatically limit free fall distance to two feet (0.61 m) or less shall have components capable of sustaining a minimum static tensile load of 3,000 pounds (13.3 kN) applied to the device with the lifeline or lanyard in the fully extended position.

(5) Self-retracting lifelines and lanyards which do not limit free fall distance to two feet (0.61 m) or less, ripstitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds (22.2 kN) applied to the device with the lifeline or lanyard in the fully extended position.

(6) Dee-rings and snap-hooks shall be capable of sustaining a minimum tensile load of 5,000 pounds (22.2 kN).

(7) Dee-rings and snap-hooks shall be 100 percent proof-tested to a minimum tensile load of 3,600 pounds (16 kN) without cracking, breaking, or taking permanent deformation.

(8) Snap-hooks shall be sized to be compatible with the member to which they are connected so as to prevent unintentional disengagement of the snap-hook by depression of the snap-hook keeper by the connected member, or shall be a locking type snap-hook designed and used to prevent disengagement of the snap-hook by the contact of the snaphook keeper by the connected member.

(9) Horizontal lifelines, where used, shall be designed, and installed as part of a complete personal fall arrest system, which maintains a safety factor of at least two, under the supervision of a qualified person.

(10) Anchorages to which personal fall arrest equipment is attached shall be capable of supporting at least 5,000 pounds (22.2 kN) per employee attached, or shall be designed, installed, and used as part of a complete personal fall arrest system which maintains a safety factor of at least two, under the supervision of a qualified person.

(11) Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body belts and body harnesses, shall be made from synthetic fibers or wire rope.

(d) System performance criteria. (1) Personal fall arrest systems shall, when stopping a fall:

(i) Limit maximum arresting force on an employee to 900 pounds (4 kN) when used with a body belt;

(ii) Limit maximum arresting force on an employee to 1,800 pounds (8 kN) when used with a body harness;
and (iii) Bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet (1.07 m);

(iv) Shall have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of six feet (1.8 m), or the free fall distance permitted by the system, whichever is less.

(2)(i) When used by employees having a combined person and tool weight of less than 310 pounds (140 kg), personal fall arrest systems which meet the criteria and protocols contained in paragraphs (b), (c) and (d) in section II of this appendix shall be considered as complying with the provisions of paragraphs (d)(1)(i) through (d)(1)(iv) above.

(ii) When used by employees having a combined tool and body weight of 310 pounds (140 kg) or more, personal fall arrest systems which meet the criteria and protocols contained in paragraphs (b), (c) and (d) in section II may be considered as complying with the provisions of paragraphs (d)(1)(i) through (d)(1)(iv) provided that the criteria and protocols are modified appropriately to provide proper protection for such heavier weights.

(e) Care and use. (1) Snap-hooks, unless of a locking type designed and used to prevent disengagement from the following connections, shall not be engaged:

(i) Directly to webbing, rope or wire rope;

(ii) To each other;

(iii) To a dee-ring to which another snap-hook or other connector is attached; (iv) To a horizontal lifeline; or

(v) To any object which is incompatibly shaped or dimensioned in relation to the snap-hook such that the connected object could depress the snap-hook keeper a sufficient amount to release itself.

(2) Devices used to connect to a horizontal lifeline which may become a vertical lifeline shall be capable of locking in either direction on the lifeline.

(3) Personal fall arrest systems shall be rigged such that an employee can neither free fall more than six feet (1.8 m), nor contact any lower level.

(4) The attachment point of the body belt shall be located in the center of the wearer's back. The attachment point of the body harness shall be located in the center of the wearer's back near shoulder level, or above the wearer's head.

(5) When vertical lifelines are used, each employee shall be provided with a separate lifeline.

(6) Personal fall arrest systems or components shall be used only for employee fall protection.

(7) Personal fall arrest systems or components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection unless inspected and determined by a competent person to be undamaged and suitable for reuse.

(8) The employer shall provide for prompt rescue of employees in the event of a fall or shall assure the self-rescue capability of employees.

(9) Before using a personal fall arrest system, and after any component or system is changed, employees shall be trained in accordance with the requirements of paragraph 1910.66(i)(1), in the safe use of the system.

(f) Inspections. Personal fall arrest systems shall be inspected prior to each use for mildew, wear, damage and other deterioration, and defective components shall be removed from service if their strength or function may be adversely affected.

II. Test methods for personal fall arrest systems (non-mandatory)—(a) General. Paragraphs (b), (c), (d) and (e), of this section II set forth test procedures which may be used to determine compliance with the requirements in paragraph (d)(1)(i) through (d)(1)(iv) of section I of this appendix.

(b) General conditions for all tests in section II. (1) Lifelines, lanyards and deceleration devices should be attached to an anchorage and connected to the body-belt or body harness in the same manner as they would be when used to protect employees.

(2) The anchorage should be rigid, and should not have a deflection greater than .04 inches (1 mm) when a force of 2,250 pounds (10 kN) is applied.

(3) The frequency response of the load measuring instrumentation should be 120 Hz.

(4) The test weight used in the strength and force tests should be a rigid, metal, cylindrical or torso-shaped object with a girth of 38 inches plus or minus four inches (96 cm plus or minus 10 cm).

(5) The lanyard or lifeline used to create the free fall distance should be supplied with the system, or in its absence, the least elastic lanyard or lifeline available to be used with the system.

(6) The test weight for each test should be hoisted to the required level and should be quickly released without having any appreciable motion imparted to it.

(7) The system's performance should be evaluated taking into account the range of environmental conditions for which it is designed to be used.

(8) Following the test, the system need not be capable of further operation.

(c) Strength test. (1) During the testing of all systems, a test weight of 300 pounds plus or minus five pounds (135 kg plus or minus 2.5 kg) should be used. (See paragraph (b)(4), above.)

(2) The test consists of dropping the test weight once. A new unused system should be used for each test.

(3) For lanyard systems, the lanyard length should be six feet plus or minus two inches (1.83 m plus or minus 5 cm) as measured from the fixed anchorage to the attachment on the body belt or body harness.

(4) For rope-grab-type deceleration systems, the length of the lifeline above the centerline of the grabbing mechanism to the lifeline's anchorage point should not exceed two feet (0.61 m).

(5) For lanyard systems, for systems with deceleration devices which do not automatically limit free fall distance to two feet (0.61

m) or less, and for systems with deceleration devices which have a connection distance in excess of one foot (0.3 m) (measured between the centerline of the lifeline and the attachment point to the body belt or harness), the test weight should be rigged to free fall a distance of 7.5 feet (2.3 m) from a point that is 1.5 feet (46 cm) above the anchorage point, to its hanging location (six feet below the anchorage). The test weight should fall without interference, obstruction, or hitting the floor or ground during the test. In some cases a non-elastic wire lanyard of sufficient length may need to be added to the system (for test purposes) to create the necessary free fall distance.

(6) For deceleration device systems with integral lifelines or lanyards which automatically limit free fall distance to two feet (0.61 m) or less, the test weight should be rigged to free fall a distance of four feet (1.22 m).

(7) Any weight which detaches from the belt or harness should constitute failure for the strength test.

(d) Force test—(1) General. The test consists of dropping the respective test weight specified in (d)(2)(i) or (d)(3)(i) once. A new, unused system should be used for each test.

(2) For lanyard systems. (i) A test weight of 220 pounds plus or minus three pounds (100 kg plus or minus 1.6 kg) should be used. (See paragraph (b)(4), above.)

(ii) Lanyard length should be six feet plus or minus two inches (1.83 m plus or minus 5 cm) as measured from the fixed anchorage to the attachment on the body belt or body harness.

(iii) The test weight should fall free from the anchorage level to its hanging location (a total of six feet (1.83 m) free fall distance) without interference, obstruction, or hitting the floor or ground during the test.

(3) For all other systems. (i) A test weight of 220 pounds plus or minus three pounds (100 kg plus or minus 1.6 kg) should be used. (See paragraph (b)(4), above.)

(ii) The free fall distance to be used in the test should be the maximum fall distance physically permitted by the system during normal use conditions, up to a maximum free fall distance for the test weight of six feet (1.83 m), except as follows:

(A) For deceleration systems which have a connection link or lanyard, the test weight should free fall a distance equal to the connection distance (measured between the centerline of the lifeline and the attachment point to the body belt or harness).

(B) For deceleration device systems with integral lifelines or lanyards which automatically limit free fall distance to two feet (0.61 m) or less, the test weight should free fall a distance equal to that permitted by the system in normal use. (For example, to test a system with a self-retracting lifeline or lanyard, the test weight should be supported and the system allowed to retract the lifeline or lanyard as it would in normal use. The test weight would then be released and the force and deceleration distance measured).

(4) A system fails the force test if the recorded maximum arresting force exceeds 1,260 pounds (15.6 kN) when using a body belt, and/or exceeds 2,520 pounds (11.2 kN) when using a body harness.

(5) The maximum elongation and deceleration distance should be recorded during the force test.

(e) Deceleration device tests—(1) General. The device should be evaluated or tested under the environmental conditions, (such as rain, ice, grease, dirt, type of lifeline, etc.), for which the device is designed.

(2) Rope-grab-type deceleration devices. (i) Devices should be moved on a lifeline 1,000 times over the same length of line a distance of not less than one foot (30.5 cm), and the mechanism should lock each time.

(ii) Unless the device is permanently marked to indicate the type(s) of lifeline which must be used, several types (different diameters and different materials), of lifelines should be used to test the device.

(3) Other self-activatinq-type deceleration devices. The locking mechanisms of other self-activating-type deceleration devices designed for more than one arrest should lock each of 1,000 times as they would in normal service.

III. Additional non-mandatory guidelines for personal fall arrest systems. The following information constitutes additional guidelines for use in complying with requirements for a personal fall arrest system.

(a) Selection and use considerations. The kind of personal fall arrest system selected should match the particular work situation, and any possible free fall distance should be kept to a minimum. Consideration should be given to the particular work environment. For example, the presence of acids, dirt, moisture, oil, grease, etc., and their effect on the system, should be evaluated. Hot or cold environments may also have an adverse affect on the system. Wire rope should not be used where an electrical hazard is anticipated. As required by the standard, the employer must plan to have means available to promptly rescue an employee should a fall occur, since the suspended employee may not be able to reach a work level independently.

Where lanyards, connectors, and lifelines are subject to damage by work operations such as welding, chemical cleaning, and sandblasting, the component should be protected, or other securing systems should be used. The employer should fully evaluate the work conditions and environment (including seasonal weather changes) before selecting the appropriate personal fall protection

system. Once in use, the system's effectiveness should be monitored. In some cases, a program for cleaning and maintenance of the system may be necessary. (b) Testing considerations. Before purchasing or putting into use a personal fall arrest system, an employer should obtain from the supplier information about the system based on its performance during testing so that the employer can know if the system meets this standard. Testing should be done using recognized test methods. Section II of this appendix C contains test methods
recognized for evaluating the performance of fall arrest systems. Not all systems may need to be individually tested; the performance of some systems may be based on data and calculations derived from testing of similar systems, provided that enough information is available to demonstrate similarity of function and design.

(c) Component compatibility considerations. Ideally, a personal fall arrest system is designed, tested, and supplied as a complete system. However, it is common practice for lanyards, connectors, lifelines, deceleration devices, body belts and body harnesses to be interchanged since some components wear out before others. The employer and employee should realize that not all components are interchangeable. For instance, a lanyard should not be connected between a body belt (or harness) and a deceleration device of the self-retracting type since this can result in additional free fall for which the system was not designed. Any substitution or change to a personal fall arrest system should be fully evaluated or tested by a competent person to determine that it meets the standard, before the modified system is put in use.

(d) Employee training considerations. Thorough employee training in the selection and use of personal fall arrest systems is imperative. As stated in the standard, before the equipment is used, employees must be trained in the safe use of the system. This should include the following: Application limits; proper anchoring and tie-off techniques; estimation of free fall distance, including determination of deceleration distance, and total fall distance to prevent striking a lower level; methods of use; and inspection and storage of the system. Careless or improper use of the equipment can result in serious injury or death. Employers and employees should become familiar with the material in this appendix, as well as manufacturer's recommendations, before a system is used. Of uppermost importance is the reduction in strength caused by certain tie-offs (such as using knots, tying around sharp edges, etc.) and maximum permitted free fall distance. Also, to be stressed are the importance of inspections prior to use, the limitations of the equipment, and unique conditions at the worksite which may be important in determining the type of system to use.

(e) Instruction considerations. Employers should obtain comprehensive instructions from the supplier as to the system's proper use and application, including, where applicable:

(1) The force measured during the sample force test;

(2) The maximum elongation measured for lanyards during the force test;

(3) The deceleration distance measured for deceleration devices during the force test;

(4) Caution statements on critical use limitations;

(5) Application limits;

(6) Proper hook-up, anchoring and tie-off techniques, including the proper dee-ring or other attachment point to use on the body belt and harness for fall arrest;

(7) Proper climbing techniques;

(8) Methods of inspection, use, cleaning, and storage; and

(9) Specific lifelines which may be used. This information should be provided to employees during training.

(f) Inspection considerations. As stated in the standard (section I, Paragraph (f)), personal fall arrest systems must be regularly inspected. Any component with any significant defect, such as cuts, tears, abrasions, mold, or undue stretching; alterations or additions which might affect its efficiency; damage due to deterioration; contact with fire, acids, or other corrosives; distorted hooks or faulty hook springs; tongues unfitted to the shoulder of buckles; loose or damaged mountings; non-functioning parts; or wearing or internal deterioration in the ropes must be withdrawn from service immediately, and should be tagged or marked as unusable, or destroyed.

(g) Rescue considerations. As required by the standard (section I, Paragraph (e)(8)), when personal fall arrest systems are used, the employer must assure that employees can be promptly rescued or can rescue themselves should a fall occur. The availability of rescue personnel, ladders or other rescue equipment should be evaluated. In some situations, equipment which allows employees to rescue themselves after the fall has been arrested may be desirable, such as devices which have descent capability.

(h) Tie-off considerations. (1) One of the most important aspects of personal fall protection systems is fully planning the system before it is put into use. Probably the most overlooked component is planning for suitable anchorage points. Such planning should ideally be done before the structure or building is constructed so that anchorage points can be incorporated during construction for use later for window cleaning or other building maintenance. If properly planned, these anchorage points may be used during construction, as well as afterwards.

(2) Employers and employees should at all times be aware that the strength of a personal fall arrest system is based on its being

attached to an anchoring system which does not significantly reduce the strength of the system (such as a properly dimensioned eye-bolt/snap-hook anchorage). Therefore, if a means of attachment is used that will reduce the strength of the system, that component should be replaced by a stronger one, but one that will also maintain the appropriate maximum arrest force characteristics. (3) Tie-off using a knot in a rope lanyard or lifeline (at any location) can reduce the lifeline or lanyard strength by 50 percent or more. Therefore, a stronger lanyard or lifeline should be used to compensate for the weakening effect of the knot, or the lanyard length should be reduced (or the tie-off location raised) to minimize free fall distance, or the lanyard or lifeline should be replaced by one which has an appropriately incorporated connector to eliminate the need for a knot.

(4) Tie-off of a rope lanyard or lifeline around an “H” or “I” beam or similar support can reduce its strength as much as 70 percent due to the cutting action of the beam edges. Therefore, use should be made of a webbing lanyard or wire core lifeline around the beam; or the lanyard or lifeline should be protected from the edge; or free fall distance should be greatly minimized.

(5) Tie-off where the line passes over or around rough or sharp surfaces reduces strength drastically. Such a tie-off should be avoided or an alternative tie-off rigging should be used. Such alternatives may include use of a snap-hook/dee ring connection, wire rope tie-off, an effective padding of the surfaces, or an abrasion-resistance strap around or over the problem surface.

(6) Horizontal lifelines may, depending on their geometry and angle of sag, be subjected to greater loads than the impact load imposed by an attached component. When the angle of horizontal lifeline sag is less than 30 degrees, the impact force imparted to the lifeline by an attached lanyard is greatly amplified. For example, with a sag angle of 15 degrees, the force amplification is about 2:1 and at 5 degrees sag, it is about 6:1. Depending on the angle of sag, and the line's elasticity, the strength of the horizontal lifeline and the anchorages to which it is attached should be increased a number of times over that of the lanyard. Extreme care should be taken in considering a horizontal lifeline for multiple tie-offs. The reason for this is that in multiple tie-offs to a horizontal lifeline, if one employee falls, the movement of the falling employee and the horizontal lifeline during arrest of the fall may cause other employees to also fall. Horizontal lifeline and anchorage strength should be increased for each additional employee to be tied-off. For these and other reasons, the design of systems using horizontal lifelines must only be done by qualified persons. Testing of installed lifelines and anchors prior to use is recommended.

(7) The strength of an eye-bolt is rated along the axis of the bolt and its strength is greatly reduced if the force is applied at an angle to this axis (in the direction of shear). Also, care should be exercised in selecting the proper diameter of the eye to avoid accidental disengagement of snap-hooks not designed to be compatible for the connection.

(8) Due to the significant reduction in the strength of the lifeline/lanyard (in some cases, as much as a 70 percent reduction), the sliding hitch knot should not be used for lifeline/lanyard connections except in emergency situations where no other available system is practical. The “one-and-one” sliding hitch knot should never be used because it is unreliable in stopping a fall. The “two-and-two,” or “three-and-three” knot (preferable), may be used in emergency situations; however, care should be taken to limit free fall distance to a minimum because of reduced lifeline/lanyard strength.

(i) Vertical lifeline considerations. As required by the standard, each employee must have a separate lifeline when the lifeline is vertical. The reason for this is that in multiple tie-offs to a single lifeline, if one employee falls, the movement of the lifeline during the arrest of the fall may pull other employees' lanyards, causing them to fall as well.

(j) Snap-hook considerations. Although not required by this standard for all connections, locking snap-hooks designed for connection to suitable objects (of sufficient strength) are highly recommended in lieu of the non-locking type. Locking snap-hooks incorporate a positive locking mechanism in addition to the spring loaded keeper, which will not allow the keeper to open under moderate pressure without someone first releasing the mechanism. Such a feature, properly designed, effectively prevents roll-out from occurring.

As required by the standard (section I, paragraph (e)(1)) the following connections must be avoided (unless properly designed locking snap-hooks are used) because they are conditions which can result in roll-out when a nonlocking snap-hook is used:

- Direct connection of a snap-hook to a horizontal lifeline.
- Two (or more) snap-hooks connected to one dee-ring.
- Two snap-hooks connected to each other.
- A snap-hook connected back on its integral lanyard.
- A snap-hook connected to a webbing loop or webbing lanyard.
- Improper dimensions of the dee-ring, rebar, or other connection point in relation to the snap-hook dimensions which would allow the snap-hook keeper to be depressed by a turning motion of the snap-hook.

(k) Free fall considerations. The employer and employee should at all times be aware that a system's maximum arresting force is evaluated under normal use conditions established by the manufacturer, and in no case using a free fall distance in excess of six feet (1.8 m). A few extra feet of free fall can significantly increase the arresting force on the employee, possibly to the point of causing injury. Because of this, the free fall distance should be kept at a minimum, and, as required by the standard, in no case

greater than six feet (1.8 m). To help assure this, the tie-off attachment point to the lifeline or anchor should be located at or above the connection point of the fall arrest equipment to belt or harness. (Since otherwise additional free fall distance is added to the length of the connecting means (i.e. lanyard)). Attaching to the working surface will often result in a free fall greater than six feet (1.8 m). For instance, if a six foot (1.8 m) lanyard is used, the total free fall distance will be the distance from the working level to the body belt (or harness) attachment point plus the six feet (1.8 m) of lanyard length. Another important consideration is that the arresting force which the fall system must withstand also goes up with greater distances of free fall, possibly exceeding the strength of the system.

(l) Elongation and deceleration distance considerations. Other factors involved in a proper tie-off are elongation and deceleration distance. During the arresting of a fall, a lanyard will experience a length of stretching or elongation, whereas activation of a deceleration device will result in a certain stopping distance. These distances should be available with the lanyard or device's instructions and must be added to the free fall distance to arrive at the total fall distance before an employee is fully stopped. The additional stopping distance may be very significant if the lanyard or deceleration device is attached near or at the end of a long lifeline, which may itself add considerable distance due to its own elongation. As required by the standard, sufficient distance to allow for all of these factors must also be maintained between the employee and obstructions below, to prevent an injury due to impact before the system fully arrests the fall. In addition, a minimum of 12 feet (3.7 m) of lifeline should be allowed below the securing point of a rope grab type deceleration device, and the end terminated to prevent the device from sliding off the lifeline. Alternatively, the lifeline should extend to the ground or the next working level below. These measures are suggested to prevent the worker from inadvertently moving past the end of the lifeline and having the rope grab become disengaged from the lifeline.

(m) Obstruction considerations. The location of the tie-off should also consider the hazard of obstructions in the potential fall path of the employee. Tie-offs which minimize the possibilities of exaggerated swinging should be considered. In addition, when a body belt is used, the employee's body will go through a horizontal position to a jack-knifed position during the arrest of all falls. Thus, obstructions which might interfere with this motion should be avoided or a severe injury could occur.

(n) Other considerations. Because of the design of some personal fall arrest systems, additional considerations may be required for proper tie-off. For example, heavy deceleration devices of the self-retracting type should be secured overhead in order to avoid the weight of the device having to be supported by the employee. Also, if selfretracting equipment is connected to a horizontal lifeline, the sag in the lifeline should be minimized to prevent the device from sliding down the lifeline to a position which creates a swing hazard during fall arrest. In all cases, manufacturer's instructions should be followed.

APPENDIX D TO §1910.66—EXISTING INSTALLATIONS (MANDATORY)

Use of the Appendix

Appendix D sets out the mandatory building and equipment requirements for applicable permanent installations completed after August 27, 1971, and no later than July 23, 1990 which are exempt from the paragraphs (a), (b)(1), (b)(2), (c), (d), (e), and (f) of this standard. The requirements in appendix D are essentially the same as unrevised building and equipment provisions which previously were designated as 29 CFR 1910.66 (a), (b), (c) and (d) and which were effective on August 27, 1971.

NOTE: All existing installations subject to this appendix shall also comply with paragraphs (g), (h), (i), (j) and appendix C of the standard 29 CFR 1910.66.

(a) Definitions applicable to this appendix—(1) Angulated roping. A system of platform suspension in which the upper wire rope sheaves or suspension points are closer to the plane of the building face than the corresponding attachment points on the platform, thus causing the platform to press against the face of the building during its vertical travel.

(2) ANSI. American National Standards Institute.

(3) Babbitted fastenings. The method of providing wire rope attachments in which the ends of the wire strands are bent back and are held in a tapered socket by means of poured molten babbitt metal.

(4) Brake—disc type. A brake in which the holding effect is obtained by frictional resistance between one or more faces of discs keyed to the rotating member to be held and fixed discs keyed to the stationary or housing member (pressure between the discs being applied axially).

(5) Brake—self-energizing band type. An essentially undirectional brake in which the holding effect is obtained by the snubbing action of a flexible band wrapped about a cylindrical wheel or drum affixed to the rotating member to be held, the connections and linkages being so arranged that the motion of the brake wheel or drum will act to increase the tension or holding force of the band.

(6) Brake—shoe type. A brake in which the holding effect is obtained by applying the direct pressure of two or more segmental friction elements held to a stationary member against a cylindrical wheel or drum affixed to the rotating member to be held.

(7) Building face rollers. A specialized form of guide roller designed to contact a portion of the outer face or wall structure of the building, and to assist in stabilizing the operators' platform during vertical travel.

(8) Continuous pressure. Operation by means of buttons or switches, any one of which may be used to control the movement of the working platform or roof car, only as long as the button or switch is manually maintained in the actuating position.

(9) Control. A system governing starting, stopping, direction, acceleration, speed, and retardation of moving members.

(10) Controller. A device or group of devices, usually contained in a single enclosure, which serves to control in some predetermined manner the apparatus to which it is connected.

(11) Electrical ground. A conducting connection between an electrical circuit or equipment and the earth, or some conducting body which serves in place of the earth.

(12) Guide roller. A rotating, bearing-mounted, generally cylindrical member, operating separately or as part of a guide shoe assembly, attached to the platform, and providing rolling contact with building guideways, or other building contact members.

(13) Guide shoe. An assembly of rollers, slide members, or the equivalent, attached as a unit to the operators' platform, and designed to engage with the building members provided for the vertical guidance of the operators' platform.

(14) Interlock. A device actuated by the operation of some other device with which it is directly associated, to govern succeeding operations of the same or allied devices.

(15) Operating device. A pushbutton, lever, or other manual device used to actuate a control.

(16) Powered platform. Equipment to provide access to the exterior of a building for maintenance, consisting of a suspended power-operated working platform, a roof car, or other suspension means, and the requisite operating and control devices.

(17) Rated load. The combined weight of employees, tools, equipment, and other material which the working platform is designed and installed to lift.

(18) Relay, direction. An electrically energized contactor responsive to an initiating control circuit, which in turn causes a moving member to travel in a particular direction.

(19) Relay, potential for vertical travel. An electrically energized contactor responsive to initiating control circuit, which in turn controls the operation of a moving member in both directions. This relay usually operates in conjunction with direction relays, as covered under the definition, “relay, direction.”

(20) Roof car. A structure for the suspension of a working platform, providing for its horizontal movement to working positions.

(21) Roof-powered platform. A powered platform having the raising and lowering mechanism located on a roof car.

(22) Self-powered platform. A powered platform having the raising and lowering mechanism located on the working platform.

(23) Traveling cable. A cable made up of electrical or communication conductors or both, and providing electrical connection between the working platform and the roof car or other fixed point.

(24) Weatherproof. Equipment so constructed or protected that exposure to the weather will not interfere with its proper operation.

(25) Working platform. The suspended structure arranged for vertical travel which provides access to the exterior of the building or structure.

(26) Yield point. The stress at which the material exhibits a permanent set of 0.2 percent.

(27) Zinced fastenings. The method of providing wire rope attachments in which the splayed or fanned wire ends are held in a tapered socket by means of poured molten zinc.

(b) General requirements. (1) Design requirements. All powered platform installations for exterior building maintenance completed as of August 27, 1971, but no later than [insert date, 180 days after the effective date], shall meet all of the design, construction and installation requirements of part II and III of the “American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance ANSI A120.1-1970” and of this appendix. References shall be made to appropriate parts of ANSI A120.1-1970 for detail specifications for equipment and special installations.

(2) Limitation. The requirements of this appendix apply only to electric powered platforms. It is not the intent of this appendix to prohibit the use of other types of power. Installation of powered platforms using other types of power is permitted, provided such platforms have adequate protective devices for the type of power used, and otherwise provide for reasonable safety of life and limb to users of equipment and to others who may be exposed.

(3) Types of powered platforms. (i) For the purpose of applying this appendix, powered platforms are divided into two basic types, Type F and Type T.

(ii) Powered platforms designated as Type F shall meet all the requirements in part II of ANSI A 120.1-1970, American National

Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance. A basic requirement of Type F equipment is that the work platform is suspended by at least four wire ropes and designed so that failure of any one wire rope will not substantially alter the normal position of the working platform. Another basic requirement of Type F equipment is that only one layer of hoisting rope is permitted on winding drums. Type F powered platforms may be either roof-powered or self-powered.

(iii) Powered platforms designated as Type T shall meet all the requirements in part III of ANSI A120.1-1970 American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance, except for section 28, Safety Belts and Life Lines. A basic requirement of Type T equipment is that the working platform is suspended by at least two wire ropes. Failure of one wire rope would not permit the working platform to fall to the ground, but would upset its normal position. Type T powered platforms may be either roof-powered or self-powered.

(iv) The requirements of this section apply to powered platforms with winding drum type hoisting machines. It is not the intent of this section to prohibit powered platforms using other types of hoisting machines such as, but not limited to, traction drum hoisting machines, air powered machines, hydraulic powered machines, and internal combustion machines. Installation of powered platforms with other types of hoisting machines is permitted, provided adequate protective devices are used, and provided reasonable safety of life and limb to users of the equipment and to others who may be exposed is assured.

(v) Both Type F and Type T powered platforms shall comply with the requirements of appendix C of this standard.

(c) Type F powered platforms—(1) Roof car, general. (i) A roof car shall be provided whenever it is necessary to move the working platform horizontally to working or storage positions.

(ii) The maximum rated speed at which a power traversed roof car may be moved in a horizontal direction shall be 50 feet per minute.

(2) Movement and positioning of roof car. (i) Provision shall be made to protect against having the roof car leave the roof or enter roof areas not designed for travel.

(ii) The horizontal motion of the roof cars shall be positively controlled so as to insure proper movement and positioning of the roof car.

(iii) Roof car positioning devices shall be provided to insure that the working platform is placed and retained in proper position for vertical travel and during storage.

(iv) Mechanical stops shall be provided to prevent the traversing of the roof car beyond its normal limits of travel. Such stops shall be capable of withstanding a force equal to 100 percent of the inertial effect of the roof car in motion with traversing power applied.

(v)(a) The operating device of a power-operated roof car for traversing shall be located on the roof car, the working platform, or both, and shall be of the continuous pressure weather-proof electric type. If more than one operating device is provided, they shall be so arranged that traversing is possible only from one operating device at a time.

(b) The operating device shall be so connected that it is not operable until:

(1) The working platform is located at its uppermost position of travel and is not in contact with the building face or fixed vertical guides in the face of the building; and

(2) All protective devices and interlocks are in a position for traversing.

(3) Roof car stability. Roof car stability shall be determined by either paragraph (c)(3) (i) or (ii) of this appendix, whichever is greater.

(i) The roof car shall be continuously stable, considering overturning moment as determined by 125 percent rated load, plus maximum dead load and the prescribed wind loading.

(ii) The roof car and its anchorages shall be capable of resisting accidental over-tensioning of the wire ropes suspending the working platform and this calculated value shall include the effect of one and one-half times the value. For this calculation, the simultaneous effect of one-half wind load shall be included, and the design stresses shall not exceed those referred to in paragraph (b)(1) of this appendix.

(iii) If the load on the motors is at any time in excess of three times that required for lifting the working platform with its rated load the motor shall stall.

(4) Access to the roof car. Safe access to the roof car and from the roof car to the working platform shall be provided. If the access to the roof car at any point of its travel is not over the roof area or where otherwise necessary for safety, self-closing, self-locking gates shall be provided. Applicable provisions of the American National Standard Safety Requirements for Floor and Wall Openings, Railings and Toeboard, A12.1-1967, shall apply.

(5) Means for maintenance, repair, and storage. Means shall be provided to run the roof car away from the roof perimeter, where necessary, and to provide a safe area for maintenance, repairs, and storage. Provisions shall be made to secure the machine in the stored position. For stored machines subject to wind forces, see special design and anchorage requirements for "wind forces" in part II, section 10.5.1.1 of ANSI A120.1-1970 American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance.

(6) General requirements for working platforms. The working platform shall be of girder or truss construction and shall be adequate to support its rated load under any position of loading, and comply with the provisions set forth in section 10 of ANSI A120.1-1970, American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance.

(7) Load rating plate. Each working platform shall bear a manufacturer's load rating plate, conspicuously posted; stating the maximum permissible rated load. Load rating plates shall be made of noncorrosive material and shall have letters and figures stamped, etched, or cast on the surface. The minimum height of the letters and figures shall be one-fourth inch.

(8) Minimum size. The working platform shall have a minimum net width of 24 inches.

(9) Guardrails. Working platforms shall be furnished with permanent guard rails not less than 36 inches high, and not more than 42 inches high at the front (building side). At the rear, and on the sides, the rail shall not be less than 42 inches high. An intermediate guardrail shall be provided around the entire platform between the top guardrail and the toeboard.

(10) Toeboards. A four-inch toeboard shall be provided along all sides of the working platform.

(11) Open spaces between guardrails and toeboards. The spaces between the intermediate guardrail and platform toeboard on the building side of the working platform, and between the top guardrail and the toeboard on other sides of the platform, shall be filled with metalic mesh or similar material that will reject a ball one inch in diameter. The installed mesh shall be capable of withstanding a load of 100 pounds applied horizontally over any area of 144 square inches. If the space between the platform and the building face does not exceed eight inches, and the platform is restrained by guides, the mesh may be omitted on the front side. (12) Flooring. The platform flooring shall be of the nonskid type, and if of open construction, shall reject a 9/16 -inch diameter ball, or be provided with a screen below the floor to reject a 9/16 -inch diameter ball.

(13) Access gates. Where access gates are provided, they shall be self-closing and self-locking.

(14) Operating device for vertical movement of the working platform. (i) The normal operating device for the working platform shall be located on the working platform and shall be of the continuous pressure weatherproof electric type.

(ii) The operating device shall be operable only when all electrical protective devices and interlocks on the working platform are in position for normal service and, the roof car, if provided, is at an established operating point.

(15) Emergency electric operative device. (i) In addition, on roof-powered platforms, an emergency electric operating device shall be provided near the hoisting machine for use in the event of failure of the normal operating device for the working platform, or failure of the traveling cable system. The emergency operating device shall be mounted in a locked compartment and shall have a legend mounted thereon reading: "For Emergency Operation Only. Establish Communication With Personnel on Working Platform Before Use."

(ii) A key for unlocking the compartment housing the emergency operating device shall be mounted in a break-glass receptacle located near the emergency operating device.

(16) Manual cranking for emergency operation. Emergency operation of the main drive machine may be provided to allow manual cranking. This provision for manual operation shall be designed so that not more than two persons will be required to perform this operation. The access to this provision shall include a means to automatically make the machine inoperative electrically while under the emergency manual operation. The design shall be such that the emergency brake is operative at or below governor tripping speed during manual operation.

(17) Arrangement and guarding of hoisting equipment. (i) Hoisting equipment shall consist of a power-driven drum or drum contained in the roof car (roof-powered platforms) or contained on the working platform (self-powered platform).

(ii) The hoisting equipment shall be power-operated in both up and down directions.

(iii) Guard or other protective devices shall be installed wherever rotating shafts or other mechanisms or gears may expose personnel to a hazard.

(iv) Friction devices or clutches shall not be used for connecting the main driving mechanism to the drum or drums. Belt or chain-driven machines are prohibited.

(18) Hoisting motors. (i) Hoisting motors shall be electric and of weather-proof construction.

(ii) Hoisting motors shall be in conformance with applicable provisions of paragraph (c)(22) of this appendix, Electric Wiring and Equipment.

(iii) Hoisting motors shall be directly connected to the hoisting machinery. Motor couplings, if used, shall be of steel construction.

(19) Brakes. The hoisting machine(s) shall have two independent braking means, each designed to stop and hold the working platform with 125 percent of rated load.

(20) Hoisting ropes and rope connections. (i) Working platforms shall be suspended by wire ropes of either 6 × 19 or 6 × 37 classification, preformed or nonpreformed.

(ii) [Reserved] (iii) The minimum factor of safety shall be 10, and shall be calculated by the following formula: F = S × N/W
Where S = Manufacturer's rated breaking strength of one rope. N = Number of ropes under load.
W = Maximum static load on all ropes with the platform and its rated load at any point of its travel.

(iv) Hoisting ropes shall be sized to conform with the required factor of safety, but in no case shall the size be less than $^{5}/_{16}$ inch diameter.

(v) Winding drums shall have at least three turns of rope remaining when the platform has landed at the lowest possible point of its travel.

(vi) The lengthening or repairing of wire rope by the joining of two or more lengths is prohibited.

(vii) The nondrum ends of the hoisting ropes shall be provided with individual shackle rods which will permit individual adjustment of rope lengths, if required.

(viii) More than two reverse bends in each rope is prohibited.

(21) Rope tag data. (i) A metal data tag shall be securely attached to one of the wire rope fastenings. This data tag shall bear the following wire rope data:

(a) The diameter in inches.

(b) Construction classification.

(c) Whether nonpreformed or preformed.

(d) The grade of material used.

(e) The manufacturer's rated breaking strength.

(f) Name of the manufacturer of the rope.

(g) The month and year the ropes were installed.

(22) Electrical wiring and equipment. (i) All electrical equipment and wiring shall conform to the requirements of subpart S of this Part, except as modified by ANSI A120.1—1970 “American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance” (see §1910.6). For detail design specifications for electrical equipment, see part 2, ANSI A120.1-1970.

(ii) All motors and operation and control equipment shall be supplied from a single power source.

(iii) The power supply for the powered platform shall be an independent circuit supplied through a fused disconnect switch.

(iv) Electrical conductor parts of the power supply system shall be protected against accidental contact.

(v) Electrical grounding shall be provided.

(a) Provisions for electrical grounding shall be included with the power-supply system.

(b) Controller cabinets, motor frames, hoisting machines, the working platform, roof car and roof car track system, and noncurrent carrying parts of electrical equipment, where provided, shall be grounded.

(c) The controller, where used, shall be so designed and installed that a single ground or short circuit will not prevent both the normal and final stopping device from stopping the working platform.

(d) Means shall be provided on the roof car and working platform for grounding portable electric tools.

(e) The working platform shall be grounded through a grounding connection in a traveling cable. Electrically powered tools utilized on the working platform shall be grounded.

(vi) Electrical receptacles located on the roof or other exterior location shall be of a weatherproof type and shall be located so as not to be subject to contact with water or accumulated snow. The receptacles shall be grounded and the electric cable shall include a grounding conductor. The receptacle and plug shall be a type designed to avoid hazard to persons inserting or withdrawing the plug. Provision shall be made to prevent application of cable strain directly to the plug and receptacle.

(vii) Electric runway conductor systems shall be of the type designed for use in exterior locations and shall be located so as not to be subject to contact with water or accumulated snow. The conductors, collectors, and disconnecting means shall conform to the same requirements as those for cranes and hoists in subpart S of this Part. A grounded conductor shall parallel the power conductors and be so connected that it cannot be opened by the disconnecting means. The system shall be designed to avoid hazard to persons in the area.

(viii) Electrical protective devices and interlocks of the weatherproof type shall be provided.

(ix) Where the installation includes a roof car, electric contact(s) shall be provided and so connected that the operating devices for the working platform shall be operative only when the roof car is located and mechanically retained at an established operating point.

(x) Where the powered platform includes a powered-operated roof car, the operating device for the roof car shall be inoperative when the roof car is mechanically retained at an established operating point.

(xi) An electric contact shall be provided and so connected that it will cause the down direction relay for vertical travel to open if the tension in the traveling cable exceeds safe limits.

(xii) An automatic overload device shall be provided to cut off the electrical power to the circuit in all hoisting motors for travel in the up direction, should the load applied to the hoisting ropes at either end of the working platform exceed 125 percent of its normal tension with rated load, as shown on the manufacturer's data plate on the working platform.

(xiii) An automatic device shall be provided for each hoisting rope which will cut off the electrical power to the hoisting motor or motors in the down direction and apply the brakes if any hoisting rope becomes slack.

(xiv) Upper and lower directional limit devices shall be provided to prevent the travel of the working platform beyond the normal upper and lower limits of travel.

(xv) Operation of a directional limit device shall prevent further motion in the appropriate direction, if the normal limit of travel has been reached.

(xvi) Directional limit devices, if driven from the hoisting machine by chains, tapes, or cables, shall incorporate a device to disconnect the electric power from the hoisting machine and apply both the primary and secondary brakes in the event of failure of the driving means.

(xvii) Final terminal stopping devices of the working platform:

(a) Final terminal stopping devices for the working platform shall be provided as a secondary means of preventing the working platform from over-traveling at the terminals.

(b) The device shall be set to function as close to each terminal landing as practical, but in such a way that under normal operating conditions it will not function when the working platform is stopped by the normal terminal stopping device.

(c) Operation of the final terminal stopping device shall open the potential relay for vertical travel, thereby disconnecting the electric power from the hoisting machine, and applying both the primary and secondary brakes.

(d) The final terminal stopping device for the upper limit of travel shall be mounted so that it is operated directly by the motion of the working platform itself.

(xviii) Emergency stop switches shall be provided in or adjacent to each operating device.

(xix) Emergency stop switches shall:

(a) Have red operating buttons or handles.

(b) Be conspicuously and permanently marked “Stop.”

(c) Be the manually opened and manually closed type.

(d) Be positively opened with the opening not solely dependent on springs.

(xx) The manual operation of an emergency stop switch associated with an operating device for the working platform shall open

the potential relay for vertical travel, thereby disconnecting the electric power from the hoisting machine and applying both the primary and secondary brakes.

(xxi) The manual operation of the emergency stop switch associated with the operating device for a power-driven roof car shall cause the electrical power to the traverse machine to be interrupted, and the traverse machine brake to apply.

(23) Requirements for emergency communications. (i) Communication equipment shall be provided for each powered platform for use in an emergency.

(ii) Two-way communication shall be established between personnel on the roof and personnel on the stalled working platform before any emergency operation of the working platform is undertaken by personnel on the roof.

(iii) The equipment shall permit two-way voice communication between the working platform and

(a) Designated personnel continuously available while the powered platform is in use; and

(b) Designated personnel on roof-powered platforms, undertaking emergency operation of the working platform by means of the emergency operating device located near the hoisting machine.

(iv) The emergency communication equipment shall be one of the following types:

(a) Telephone connected to the central telephone exchange system; or

(b) Telephones on a limited system or an approved two-way radio system, provided designated personnel are available to receive a message during the time the powered platform is in use.

(d) Type T powered platforms—(1) Roof car. The requirements of paragraphs (c)(1) through (c)(5) of this appendix shall apply to Type T powered platforms.

(2) Working platform. The requirements of paragraphs (c)(6) through (c)(16) of this appendix apply to Type T powered platforms.

(i) The working platform shall be suspended by at least two wire ropes.

(ii) The maximum rated speed at which the working platform of self-powered platforms may be moved in a vertical direction shall not exceed 35 feet per minute.

(3) Hoisting equipment. The requirements of paragraphs (c) (17) and (18) of this appendix shall apply to Type T powered platforms.

(4) Brakes. Brakes requirements of paragraph (c)(19) of this appendix shall apply.

(5) Hoisting ropes and rope connections. (i) Paragraphs (c)(20) (i) through (vi) and (viii) of this appendix shall apply to Type T powered platforms.

(ii) Adjustable shackle rods in subparagraph (c)(20)(vii) of this appendix shall apply to Type T powered platforms, if the working platform is suspended by more than two wire ropes.

(6) Electrical wiring and equipment. (i) The requirements of paragraphs (c)(22) (i) through (vi) of this appendix shall apply to Type T powered platforms. “Circuit protection limitation,” “powered platform electrical service system,” all operating services and control equipment shall comply with the specifications contained in part 2, section 26, ANSI A120.1-1970.

(ii) For electrical protective devices the requirements of paragraphs (c)(22) (i) through (viii) of this appendix shall apply to Type T powered platforms. Requirements for the “circuit potential limitation” shall be in accordance with specifications contained in part 2, section 26, of ANSI A120.1-1970.

(7) Emergency communications. All the requirements of paragraph (c)(23) of this appendix shall apply to Type T powered platforms.

[54 FR 31456, July 28, 1989, as amended at 61 FR 9235, Mar. 7, 1996; 72 FR 7190, Feb. 14, 2007]

Appendix D

OSHA Regulations
Standards – 29 CFR)

Hazard Communication – 1910.1200

ELECTRONIC CODE OF FEDERAL REGULATIONS

e-CFR data is current as of October 27, 2015

Title 29 → Subtitle B → Chapter XVII → Part 1910 → Subpart Z → §1910.1200

Title 29: Labor
PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS (CONTINUED)
Subpart Z—Toxic and Hazardous Substances

§1910.1200 Hazard communication.

(a) *Purpose.* (1) The purpose of this section is to ensure that the hazards of all chemicals produced or imported are classified, and that information concerning the classified hazards is transmitted to employers and employees. The requirements of this section are intended to be consistent with the provisions of the United Nations Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Revision 3. The transmittal of information is to be accomplished by means of comprehensive hazard communication programs, which are to include container labeling and other forms of warning, safety data sheets and employee training.

(2) This occupational safety and health standard is intended to address comprehensively the issue of classifying the potential hazards of chemicals, and communicating information concerning hazards and appropriate protective measures to employees, and to preempt any legislative or regulatory enactments of a state, or political subdivision of a state, pertaining to this subject. Classifying the potential hazards of chemicals and communicating information concerning hazards and appropriate protective measures to employees, may include, for example, but is not limited to, provisions for: developing and maintaining a written hazard communication program for the workplace, including lists of hazardous chemicals present; labeling of containers of chemicals in the workplace, as well as of containers of chemicals being shipped to other workplaces; preparation and distribution of safety data sheets to employees and downstream employers; and development and implementation of employee training programs regarding hazards of chemicals and protective measures. Under section 18 of the Act, no state or political subdivision of a state may adopt or enforce any requirement relating to the issue addressed by this Federal standard, except pursuant to a Federally-approved state plan.

(b) *Scope and application.* (1) This section requires chemical manufacturers or importers to classify the hazards of chemicals which they produce or import, and all employers to provide information to their employees about the hazardous chemicals to which they are exposed, by means of a hazard communication program, labels and other forms of warning, safety data sheets, and information and training. In addition, this section requires distributors to transmit the required information to employers. (Employers who do not produce or import chemicals need only focus on those parts of this rule that deal with establishing a workplace program and communicating information to their workers.)

(2) This section applies to any chemical which is known to be present in the workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency.

(3) This section applies to laboratories only as follows:

(i) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced;

(ii) Employers shall maintain any safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible during each workshift to laboratory employees when they are in their work areas;

(iii) Employers shall ensure that laboratory employees are provided information and training in accordance with paragraph (h) of this section, except for the location and availability of the written hazard communication program under paragraph (h)(2)(iii) of this section; and,

(iv) Laboratory employers that ship hazardous chemicals are considered to be either a chemical manufacturer or a distributor under this rule, and thus must ensure that any containers of hazardous chemicals leaving the laboratory are labeled in accordance with paragraph (f) of this section, and that a safety data sheet is provided to distributors and other employers in accordance with paragraphs (g)(6) and (g)(7) of this section.

(4) In work operations where employees only handle chemicals in sealed containers which are not opened under normal conditions of use (such as are found in marine cargo handling, warehousing, or retail sales), this section applies to

these operations only as follows:

(i) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced;

(ii) Employers shall maintain copies of any safety data sheets that are received with incoming shipments of the sealed containers of hazardous chemicals, shall obtain a safety data sheet as soon as possible for sealed containers of hazardous chemicals received without a safety data sheet if an employee requests the safety data sheet, and shall ensure that the safety data sheets are readily accessible during each work shift to employees when they are in their work area(s); and,

(iii) Employers shall ensure that employees are provided with information and training in accordance with paragraph (h) of this section (except for the location and availability of the written hazard communication program under paragraph (h)(2)(iii) of this section), to the extent necessary to protect them in the event of a spill or leak of a hazardous chemical from a sealed container.

(5) This section does not require labeling of the following chemicals:

(i) Any pesticide as such term is defined in the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136 *et seq.*), when subject to the labeling requirements of that Act and labeling regulations issued under that Act by the Environmental Protection Agency;

(ii) Any chemical substance or mixture as such terms are defined in the Toxic Substances Control Act (15 U.S.C. 2601 *et seq.*), when subject to the labeling requirements of that Act and labeling regulations issued under that Act by the Environmental Protection Agency.

(iii) Any food, food additive, color additive, drug, cosmetic, or medical or veterinary device or product, including materials intended for use as ingredients in such products (*e.g.* flavors and fragrances), as such terms are defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 *et seq.*) or the Virus-Serum-Toxin Act of 1913 (21 U.S.C. 151 *et seq.*), and regulations issued under those Acts, when they are subject to the labeling requirements under those Acts by either the Food and Drug Administration or the Department of Agriculture;

(iv) Any distilled spirits (beverage alcohols), wine, or malt beverage intended for nonindustrial use, as such terms are defined in the Federal Alcohol Administration Act (27 U.S.C. 201 *et seq.*) and regulations issued under that Act, when subject to the labeling requirements of that Act and labeling regulations issued under that Act by the Bureau of Alcohol, Tobacco, Firearms and Explosives;

(v) Any consumer product or hazardous substance as those terms are defined in the Consumer Product Safety Act (15 U.S.C. 2051 *et seq.*) and Federal Hazardous Substances Act (15 U.S.C. 1261 *et seq.*) respectively, when subject to a consumer product safety standard or labeling requirement of those Acts, or regulations issued under those Acts by the Consumer Product Safety Commission; and,

(vi) Agricultural or vegetable seed treated with pesticides and labeled in accordance with the Federal Seed Act (7 U.S.C. 1551 *et seq.*) and the labeling regulations issued under that Act by the Department of Agriculture.

(6) This section does not apply to: (i) Any hazardous waste as such term is defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901 *et seq.*), when subject to regulations issued under that Act by the Environmental Protection Agency;

(ii) Any hazardous substance as such term is defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (42 U.S.C. 9601 *et seq.*) when the hazardous substance is the focus of remedial or removal action being conducted under CERCLA in accordance with Environmental Protection Agency regulations.

(iii) Tobacco or tobacco products;

(iv) Wood or wood products, including lumber which will not be processed, where the chemical manufacturer or importer can establish that the only hazard they pose to employees is the potential for flammability or combustibility (wood or wood products which have been treated with a hazardous chemical covered by this standard, and wood which may be subsequently sawed or cut, generating dust, are not exempted);

(v) Articles (as that term is defined in paragraph (c) of this section);

(vi) Food or alcoholic beverages which are sold, used, or prepared in a retail establishment (such as a grocery store, restaurant, or drinking place), and foods intended for personal consumption by employees while in the workplace;

(vii) Any drug, as that term is defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 *et seq.*), when it is

in solid, final form for direct administration to the patient (*e.g.,* tablets or pills); drugs which are packaged by the chemical manufacturer for sale to consumers in a retail establishment (*e.g.*, over-the-counter drugs); and drugs intended for personal consumption by employees while in the workplace (*e.g.*, first aid supplies);

(viii) Cosmetics which are packaged for sale to consumers in a retail establishment, and cosmetics intended for personal consumption by employees while in the workplace;

(ix) Any consumer product or hazardous substance, as those terms are defined in the Consumer Product Safety Act (15 U.S.C. 2051 *et seq.*) and Federal Hazardous Substances Act (15 U.S.C. 1261 *et seq.*) respectively, where the employer can show that it is used in the workplace for the purpose intended by the chemical manufacturer or importer of the product, and the use results in a duration and frequency of exposure which is not greater than the range of exposures that could reasonably be experienced by consumers when used for the purpose intended;

(x) Nuisance particulates where the chemical manufacturer or importer can establish that they do not pose any physical or health hazard covered under this section;

(xi) Ionizing and nonionizing radiation; and,

(xii) Biological hazards.

(c) *Definitions. Article* means a manufactured item other than a fluid or particle: (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which under normal conditions of use does not release more than very small quantities, *e.g.,* minute or trace amounts of a hazardous chemical (as determined under paragraph (d) of this section), and does not pose a physical hazard or health risk to employees.

Assistant Secretary means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

Chemical means any substance, or mixture of substances.

Chemical manufacturer means an employer with a workplace where chemical(s) are produced for use or distribution.

Chemical name means the scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) rules of nomenclature, or a name that will clearly identify the chemical for the purpose of conducting a hazard classification.

Classification means to identify the relevant data regarding the hazards of a chemical; review those data to ascertain the hazards associated with the chemical; and decide whether the chemical will be classified as hazardous according to the definition of hazardous chemical in this section. In addition, classification for health and physical hazards includes the determination of the degree of hazard, where appropriate, by comparing the data with the criteria for health and physical hazards.

Commercial account means an arrangement whereby a retail distributor sells hazardous chemicals to an employer, generally in large quantities over time and/or at costs that are below the regular retail price.

Common name means any designation or identification such as code name, code number, trade name, brand name or generic name used to identify a chemical other than by its chemical name.

Container means any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. For purposes of this section, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers.

Designated representative means any individual or organization to whom an employee gives written authorization to exercise such employee's rights under this section. A recognized or certified collective bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization.

Director means the Director, National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designee.

Distributor means a business, other than a chemical manufacturer or importer, which supplies hazardous chemicals to other distributors or to employers.

Employee means a worker who may be exposed to hazardous chemicals under normal operating conditions or in foreseeable emergencies. Workers such as office workers or bank tellers who encounter hazardous chemicals only in non-

routine, isolated instances are not covered.

Employer means a person engaged in a business where chemicals are either used, distributed, or are produced for use or distribution, including a contractor or subcontractor.

Exposure or *exposed* means that an employee is subjected in the course of employment to a chemical that is a physical or health hazard, and includes potential (*e.g.* accidental or possible) exposure. "Subjected" in terms of health hazards includes any route of entry (*e.g.* inhalation, ingestion, skin contact or absorption.)

Foreseeable emergency means any potential occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which could result in an uncontrolled release of a hazardous chemical into the workplace.

Hazard category means the division of criteria within each hazard class, e.g., oral acute toxicity and flammable liquids include four hazard categories. These categories compare hazard severity within a hazard class and should not be taken as a comparison of hazard categories more generally.

Hazard class means the nature of the physical or health hazards, e.g., flammable solid, carcinogen, oral acute toxicity.

Hazard not otherwise classified (HNOC) means an adverse physical or health effect identified through evaluation of scientific evidence during the classification process that does not meet the specified criteria for the physical and health hazard classes addressed in this section. This does not extend coverage to adverse physical and health effects for which there is a hazard class addressed in this section, but the effect either falls below the cut-off value/concentration limit of the hazard class or is under a GHS hazard category that has not been adopted by OSHA (e.g., acute toxicity Category 5).

Hazard statement means a statement assigned to a hazard class and category that describes the nature of the hazard(s) of a chemical, including, where appropriate, the degree of hazard.

Hazardous chemical means any chemical which is classified as a physical hazard or a health hazard, a simple asphyxiant, combustible dust, pyrophoric gas, or hazard not otherwise classified.

Health hazard means a chemical which is classified as posing one of the following hazardous effects: acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); or aspiration hazard. The criteria for determining whether a chemical is classified as a health hazard are detailed in Appendix A to §1910.1200—Health Hazard Criteria.

Immediate use means that the hazardous chemical will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

Importer means the first business with employees within the Customs Territory of the United States which receives hazardous chemicals produced in other countries for the purpose of supplying them to distributors or employers within the United States.

Label means an appropriate group of written, printed or graphic information elements concerning a hazardous chemical that is affixed to, printed on, or attached to the immediate container of a hazardous chemical, or to the outside packaging.

Label elements means the specified pictogram, hazard statement, signal word and precautionary statement for each hazard class and category.

Mixture means a combination or a solution composed of two or more substances in which they do not react.

Physical hazard means a chemical that is classified as posing one of the following hazardous effects: explosive; flammable (gases, aerosols, liquids, or solids); oxidizer (liquid, solid or gas); self-reactive; pyrophoric (liquid or solid); self-heating; organic peroxide; corrosive to metal; gas under pressure; or in contact with water emits flammable gas. *See* Appendix B to §1910.1200—Physical Hazard Criteria.

Pictogram means a composition that may include a symbol plus other graphic elements, such as a border, background pattern, or color, that is intended to convey specific information about the hazards of a chemical. Eight pictograms are designated under this standard for application to a hazard category.

Precautionary statement means a phrase that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous chemical, or improper storage or handling.

Produce means to manufacture, process, formulate, blend, extract, generate, emit, or repackage.

Product identifier means the name or number used for a hazardous chemical on a label or in the SDS. It provides a unique means by which the user can identify the chemical. The product identifier used shall permit cross-references to be made among the list of hazardous chemicals required in the written hazard communication program, the label and the SDS.

Pyrophoric gas means a chemical in a gaseous state that will ignite spontaneously in air at a temperature of 130 degrees F (54.4 degrees C) or below.

Responsible party means someone who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary.

Safety data sheet (SDS) means written or printed material concerning a hazardous chemical that is prepared in accordance with paragraph (g) of this section.

Signal word means a word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. The signal words used in this section are “danger” and “warning.” “Danger” is used for the more severe hazards, while “warning” is used for the less severe.

Simple asphyxiant means a substance or mixture that displaces oxygen in the ambient atmosphere, and can thus cause oxygen deprivation in those who are exposed, leading to unconsciousness and death.

Specific chemical identity means the chemical name, Chemical Abstracts Service (CAS) Registry Number, or any other information that reveals the precise chemical designation of the substance.

Substance means chemical elements and their compounds in the natural state or obtained by any production process, including any additive necessary to preserve the stability of the product and any impurities deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition.

Trade secret means any confidential formula, pattern, process, device, information or compilation of information that is used in an employer's business, and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it. Appendix E to §1910.1200—Definition of Trade Secret, sets out the criteria to be used in evaluating trade secrets.

Use means to package, handle, react, emit, extract, generate as a byproduct, or transfer.

Work area means a room or defined space in a workplace where hazardous chemicals are produced or used, and where employees are present.

Workplace means an establishment, job site, or project, at one geographical location containing one or more work areas.

(d) *Hazard classification.* (1) Chemical manufacturers and importers shall evaluate chemicals produced in their workplaces or imported by them to classify the chemicals in accordance with this section. For each chemical, the chemical manufacturer or importer shall determine the hazard classes, and, where appropriate, the category of each class that apply to the chemical being classified. Employers are not required to classify chemicals unless they choose not to rely on the classification performed by the chemical manufacturer or importer for the chemical to satisfy this requirement.

(2) Chemical manufacturers, importers or employers classifying chemicals shall identify and consider the full range of available scientific literature and other evidence concerning the potential hazards. There is no requirement to test the chemical to determine how to classify its hazards. Appendix A to §1910.1200 shall be consulted for classification of health hazards, and Appendix B to §1910.1200 shall be consulted for the classification of physical hazards.

(3) *Mixtures.* (i) Chemical manufacturers, importers, or employers evaluating chemicals shall follow the procedures described in Appendices A and B to §1910.1200 to classify the hazards of the chemicals, including determinations regarding when mixtures of the classified chemicals are covered by this section.

(ii) When classifying mixtures they produce or import, chemical manufacturers and importers of mixtures may rely on the information provided on the current safety data sheets of the individual ingredients, except where the chemical manufacturer or importer knows, or in the exercise of reasonable diligence should know, that the safety data sheet misstates or omits information required by this section.

(e) *Written hazard communication program.* (1) Employers shall develop, implement, and maintain at each workplace, a written hazard communication program which at least describes how the criteria specified in paragraphs (f), (g), and (h)

of this section for labels and other forms of warning, safety data sheets, and employee information and training will be met, and which also includes the following:

(i) A list of the hazardous chemicals known to be present using a product identifier that is referenced on the appropriate safety data sheet (the list may be compiled for the workplace as a whole or for individual work areas); and,

(ii) The methods the employer will use to inform employees of the hazards of non-routine tasks (for example, the cleaning of reactor vessels), and the hazards associated with chemicals contained in unlabeled pipes in their work areas.

(2) *Multi-employer workplaces.* Employers who produce, use, or store hazardous chemicals at a workplace in such a way that the employees of other employer(s) may be exposed (for example, employees of a construction contractor working on-site) shall additionally ensure that the hazard communication programs developed and implemented under this paragraph (e) include the following:

(i) The methods the employer will use to provide the other employer(s) on-site access to safety data sheets for each hazardous chemical the other employer(s)' employees may be exposed to while working;

(ii) The methods the employer will use to inform the other employer(s) of any precautionary measures that need to be taken to protect employees during the workplace's normal operating conditions and in foreseeable emergencies; and,

(iii) The methods the employer will use to inform the other employer(s) of the labeling system used in the workplace.

(3) The employer may rely on an existing hazard communication program to comply with these requirements, provided that it meets the criteria established in this paragraph (e).

(4) The employer shall make the written hazard communication program available, upon request, to employees, their designated representatives, the Assistant Secretary and the Director, in accordance with the requirements of 29 CFR 1910.20 (e).

(5) Where employees must travel between workplaces during a workshift, *i.e.,* their work is carried out at more than one geographical location, the written hazard communication program may be kept at the primary workplace facility.

(f) *Labels and other forms of warning*—(1) *Labels on shipped containers.* The chemical manufacturer, importer, or distributor shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged, or marked. Hazards not otherwise classified do not have to be addressed on the container. Where the chemical manufacturer or importer is required to label, tag or mark the following information shall be provided:

(i) Product identifier;

(ii) Signal word;

(iii) Hazard statement(s);

(iv) Pictogram(s);

(v) Precautionary statement(s); and,

(vi) Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party.

(2) The chemical manufacturer, importer, or distributor shall ensure that the information provided under paragraphs (f)(1)(i) through (v) of this section is in accordance with Appendix C to §1910.1200, for each hazard class and associated hazard category for the hazardous chemical, prominently displayed, and in English (other languages may also be included if appropriate).

(3) The chemical manufacturer, importer, or distributor shall ensure that the information provided under paragraphs (f)(1)(ii) through (iv) of this section is located together on the label, tag, or mark.

(4*) Solid materials.* (i) For solid metal (such as a steel beam or a metal casting), solid wood, or plastic items that are not exempted as articles due to their downstream use, or shipments of whole grain, the required label may be transmitted to the customer at the time of the initial shipment, and need not be included with subsequent shipments to the same employer unless the information on the label changes;

(ii) The label may be transmitted with the initial shipment itself, or with the safety data sheet that is to be provided prior to or at the time of the first shipment; and,

(iii) This exception to requiring labels on every container of hazardous chemicals is only for the solid material itself,

and does not apply to hazardous chemicals used in conjunction with, or known to be present with, the material and to which employees handling the items in transit may be exposed (for example, cutting fluids or pesticides in grains).

(5) Chemical manufacturers, importers, or distributors shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged, or marked in accordance with this section in a manner which does not conflict with the requirements of the Hazardous Materials Transportation Act (49 U.S.C. 1801 *et seq.*) and regulations issued under that Act by the Department of Transportation.

(6) Workplace labeling. Except as provided in paragraphs (f)(7) and (f)(8) of this section, the employer shall ensure that each container of hazardous chemicals in the workplace is labeled, tagged or marked with either:

(i) The information specified under paragraphs (f)(1)(i) through (v) of this section for labels on shipped containers; or,

(ii) Product identifier and words, pictures, symbols, or combination thereof, which provide at least general information regarding the hazards of the chemicals, and which, in conjunction with the other information immediately available to employees under the hazard communication program, will provide employees with the specific information regarding the physical and health hazards of the hazardous chemical.

(7) The employer may use signs, placards, process sheets, batch tickets, operating procedures, or other such written materials in lieu of affixing labels to individual stationary process containers, as long as the alternative method identifies the containers to which it is applicable and conveys the information required by paragraph (f)(6) of this section to be on a label. The employer shall ensure the written materials are readily accessible to the employees in their work area throughout each work shift.

(8) The employer is not required to label portable containers into which hazardous chemicals are transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer. For purposes of this section, drugs which are dispensed by a pharmacy to a health care provider for direct administration to a patient are exempted from labeling.

(9) The employer shall not remove or deface existing labels on incoming containers of hazardous chemicals, unless the container is immediately marked with the required information.

(10) The employer shall ensure that workplace labels or other forms of warning are legible, in English, and prominently displayed on the container, or readily available in the work area throughout each work shift. Employers having employees who speak other languages may add the information in their language to the material presented, as long as the information is presented in English as well.

(11) Chemical manufacturers, importers, distributors, or employers who become newly aware of any significant information regarding the hazards of a chemical shall revise the labels for the chemical within six months of becoming aware of the new information, and shall ensure that labels on containers of hazardous chemicals shipped after that time contain the new information. If the chemical is not currently produced or imported, the chemical manufacturer, importer, distributor, or employer shall add the information to the label before the chemical is shipped or introduced into the workplace again.

(g) *Safety data sheets.* (1) Chemical manufacturers and importers shall obtain or develop a safety data sheet for each hazardous chemical they produce or import. Employers shall have a safety data sheet in the workplace for each hazardous chemical which they use.

(2) The chemical manufacturer or importer preparing the safety data sheet shall ensure that it is in English (although the employer may maintain copies in other languages as well), and includes at least the following section numbers and headings, and associated information under each heading, in the order listed (*See* Appendix D to §1910.1200—Safety Data Sheets, for the specific content of each section of the safety data sheet):

(i) Section 1, Identification;

(ii) Section 2, Hazard(s) identification;

(iii) Section 3, Composition/information on ingredients;

(iv) Section 4, First-aid measures;

(v) Section 5, Fire-fighting measures;

(vi) Section 6, Accidental release measures;

(vii) Section 7, Handling and storage;

(viii) Section 8, Exposure controls/personal protection;

(ix) Section 9, Physical and chemical properties;

(x) Section 10, Stability and reactivity;

(xi) Section 11, Toxicological information;

(xii) Section 12, Ecological information;

(xiii) Section 13, Disposal considerations;

(xiv) Section 14, Transport information;

(xv) Section 15, Regulatory information; and

(xvi) Section 16, Other information, including date of preparation or last revision.

NOTE 1 TO PARAGRAPH (g)(2): To be consistent with the GHS, an SDS must also include the headings in paragraphs (g)(2)(xii) through (g)(2)(xv) in order.

NOTE 2 TO PARAGRAPH (g)(2): OSHA will not be enforcing information requirements in sections 12 through 15, as these areas are not under its jurisdiction.

(3) If no relevant information is found for any sub-heading within a section on the safety data sheet, the chemical manufacturer, importer or employer preparing the safety data sheet shall mark it to indicate that no applicable information was found.

(4) Where complex mixtures have similar hazards and contents (i.e. the chemical ingredients are essentially the same, but the specific composition varies from mixture to mixture), the chemical manufacturer, importer or employer may prepare one safety data sheet to apply to all of these similar mixtures.

(5) The chemical manufacturer, importer or employer preparing the safety data sheet shall ensure that the information provided accurately reflects the scientific evidence used in making the hazard classification. If the chemical manufacturer, importer or employer preparing the safety data sheet becomes newly aware of any significant information regarding the hazards of a chemical, or ways to protect against the hazards, this new information shall be added to the safety data sheet within three months. If the chemical is not currently being produced or imported, the chemical manufacturer or importer shall add the information to the safety data sheet before the chemical is introduced into the workplace again.

(6)(i) Chemical manufacturers or importers shall ensure that distributors and employers are provided an appropriate safety data sheet with their initial shipment, and with the first shipment after a safety data sheet is updated;

(ii) The chemical manufacturer or importer shall either provide safety data sheets with the shipped containers or send them to the distributor or employer prior to or at the time of the shipment;

(iii) If the safety data sheet is not provided with a shipment that has been labeled as a hazardous chemical, the distributor or employer shall obtain one from the chemical manufacturer or importer as soon as possible; and,

(iv) The chemical manufacturer or importer shall also provide distributors or employers with a safety data sheet upon request.

(7)(i) Distributors shall ensure that material data sheets, and updated information, are provided to other distributors and employers with their initial shipment and with the first shipment after a safety data sheet is updated;

(ii) The distributor shall either provide safety data sheets with the shipped containers, or send them to the other distributor or employer prior to or at the time of the shipment;

(iii) Retail distributors selling hazardous chemicals to employers having a commercial account shall provide a safety data sheet to such employers upon request, and shall post a sign or otherwise inform them that a material safety data sheet is available;

(iv) Wholesale distributors selling hazardous chemicals to employers over-the-counter may also provide safety data sheets upon the request of the employer at the time of the over-the-counter purchase, and shall post a sign or otherwise inform such employers that a material safety data sheet is available;

(v) If an employer without a commercial account purchases a hazardous chemical from a retail distributor not required

to have safety data sheets on file (*i.e.,* the retail distributor does not have commercial accounts and does not use the materials), the retail distributor shall provide the employer, upon request, with the name, address, and telephone number of the chemical manufacturer, importer, or distributor from which a safety data sheet can be obtained;

(vi) Wholesale distributors shall also provide safety data sheets to employers or other distributors upon request; and,

(vii) Chemical manufacturers, importers, and distributors need not provide safety data sheets to retail distributors that have informed them that the retail distributor does not sell the product to commercial accounts or open the sealed container to use it in their own workplaces.

(8) The employer shall maintain in the workplace copies of the required safety data sheets for each hazardous chemical, and shall ensure that they are readily accessible during each work shift to employees when they are in their work area(s). (Electronic access and other alternatives to maintaining paper copies of the safety data sheets are permitted as long as no barriers to immediate employee access in each workplace are created by such options.)

(9) Where employees must travel between workplaces during a workshift, *i.e.,* their work is carried out at more than one geographical location, the safety data sheets may be kept at the primary workplace facility. In this situation, the employer shall ensure that employees can immediately obtain the required information in an emergency.

(10) Safety data sheets may be kept in any form, including operating procedures, and may be designed to cover groups of hazardous chemicals in a work area where it may be more appropriate to address the hazards of a process rather than individual hazardous chemicals. However, the employer shall ensure that in all cases the required information is provided for each hazardous chemical, and is readily accessible during each work shift to employees when they are in their work area(s).

(11) Safety data sheets shall also be made readily available, upon request, to designated representatives, the Assistant Secretary, and the Director, in accordance with the requirements of §1910.1020(e).

(h) *Employee information and training.* (1) Employers shall provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new chemical hazard the employees have not previously been trained about is introduced into their work area. Information and training may be designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific chemicals. Chemical-specific information must always be available through labels and safety data sheets.

(2) *Information.* Employees shall be informed of:

(i) The requirements of this section;

(ii) Any operations in their work area where hazardous chemicals are present; and,

(iii) The location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals, and safety data sheets required by this section.

(3) *Training.* Employee training shall include at least:

(i) Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);

(ii) The physical, health, simple asphyxiation, combustible dust, and pyrophoric gas hazards, as well as hazards not otherwise classified, of the chemicals in the work area;

(iii) The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and,

(iv) The details of the hazard communication program developed by the employer, including an explanation of the labels received on shipped containers and the workplace labeling system used by their employer; the safety data sheet, including the order of information and how employees can obtain and use the appropriate hazard information.

(i) *Trade secrets.* (1) The chemical manufacturer, importer, or employer may withhold the specific chemical identity, including the chemical name, other specific identification of a hazardous chemical, or the exact percentage (concentration) of the substance in a mixture, from the safety data sheet, provided that:

(i) The claim that the information withheld is a trade secret can be supported;

(ii) Information contained in the safety data sheet concerning the properties and effects of the hazardous chemical is disclosed;

(iii) The safety data sheet indicates that the specific chemical identity and/or percentage of composition is being withheld as a trade secret; and,

(iv) The specific chemical identity and percentage is made available to health professionals, employees, and designated representatives in accordance with the applicable provisions of this paragraph (i).

(2) Where a treating physician or nurse determines that a medical emergency exists and the specific chemical identity and/or specific percentage of composition of a hazardous chemical is necessary for emergency or first-aid treatment, the chemical manufacturer, importer, or employer shall immediately disclose the specific chemical identity or percentage composition of a trade secret chemical to that treating physician or nurse, regardless of the existence of a written statement of need or a confidentiality agreement. The chemical manufacturer, importer, or employer may require a written statement of need and confidentiality agreement, in accordance with the provisions of paragraphs (i)(3) and (4) of this section, as soon as circumstances permit.

(3) In non-emergency situations, a chemical manufacturer, importer, or employer shall, upon request, disclose a specific chemical identity or percentage composition, otherwise permitted to be withheld under paragraph (i)(1) of this section, to a health professional (i.e. physician, industrial hygienist, toxicologist, epidemiologist, or occupational health nurse) providing medical or other occupational health services to exposed employee(s), and to employees or designated representatives, if:

(i) The request is in writing;

(ii) The request describes with reasonable detail one or more of the following occupational health needs for the information:

(A) To assess the hazards of the chemicals to which employees will be exposed;

(B) To conduct or assess sampling of the workplace atmosphere to determine employee exposure levels;

(C) To conduct pre-assignment or periodic medical surveillance of exposed employees;

(D) To provide medical treatment to exposed employees;

(E) To select or assess appropriate personal protective equipment for exposed employees;

(F) To design or assess engineering controls or other protective measures for exposed employees; and,

(G) To conduct studies to determine the health effects of exposure.

(iii) The request explains in detail why the disclosure of the specific chemical identity or percentage composition is essential and that, in lieu thereof, the disclosure of the following information to the health professional, employee, or designated representative, would not satisfy the purposes described in paragraph (i)(3)(ii) of this section:

(A) The properties and effects of the chemical;

(B) Measures for controlling workers' exposure to the chemical;

(C) Methods of monitoring and analyzing worker exposure to the chemical; and,

(D) Methods of diagnosing and treating harmful exposures to the chemical;

(iv) The request includes a description of the procedures to be used to maintain the confidentiality of the disclosed information; and,

(v) The health professional, and the employer or contractor of the services of the health professional (i.e. downstream employer, labor organization, or individual employee), employee, or designated representative, agree in a written confidentiality agreement that the health professional, employee, or designated representative, will not use the trade secret information for any purpose other than the health need(s) asserted and agree not to release the information under any circumstances other than to OSHA, as provided in paragraph (i)(6) of this section, except as authorized by the terms of the agreement or by the chemical manufacturer, importer, or employer.

(4) The confidentiality agreement authorized by paragraph (i)(3)(iv) of this section:

(i) May restrict the use of the information to the health purposes indicated in the written statement of need;

(ii) May provide for appropriate legal remedies in the event of a breach of the agreement, including stipulation of a reasonable pre-estimate of likely damages; and,

(iii) May not include requirements for the posting of a penalty bond.

(5) Nothing in this standard is meant to preclude the parties from pursuing non-contractual remedies to the extent permitted by law.

(6) If the health professional, employee, or designated representative receiving the trade secret information decides that there is a need to disclose it to OSHA, the chemical manufacturer, importer, or employer who provided the information shall be informed by the health professional, employee, or designated representative prior to, or at the same time as, such disclosure.

(7) If the chemical manufacturer, importer, or employer denies a written request for disclosure of a specific chemical identity or percentage composition, the denial must:

(i) Be provided to the health professional, employee, or designated representative, within thirty days of the request;

(ii) Be in writing;

(iii) Include evidence to support the claim that the specific chemical identity or percent of composition is a trade secret;

(iv) State the specific reasons why the request is being denied; and,

(v) Explain in detail how alternative information may satisfy the specific medical or occupational health need without revealing the trade secret.

(8) The health professional, employee, or designated representative whose request for information is denied under paragraph (i)(3) of this section may refer the request and the written denial of the request to OSHA for consideration.

(9) When a health professional, employee, or designated representative refers the denial to OSHA under paragraph (i)(8) of this section, OSHA shall consider the evidence to determine if:

(i) The chemical manufacturer, importer, or employer has supported the claim that the specific chemical identity or percentage composition is a trade secret;

(ii) The health professional, employee, or designated representative has supported the claim that there is a medical or occupational health need for the information; and,

(iii) The health professional, employee or designated representative has demonstrated adequate means to protect the confidentiality.

(10)(i) If OSHA determines that the specific chemical identity or percentage composition requested under paragraph (i)(3) of this section is not a “bona fide” trade secret, or that it is a trade secret, but the requesting health professional, employee, or designated representative has a legitimate medical or occupational health need for the information, has executed a written confidentiality agreement, and has shown adequate means to protect the confidentiality of the information, the chemical manufacturer, importer, or employer will be subject to citation by OSHA.

(ii) If a chemical manufacturer, importer, or employer demonstrates to OSHA that the execution of a confidentiality agreement would not provide sufficient protection against the potential harm from the unauthorized disclosure of a trade secret, the Assistant Secretary may issue such orders or impose such additional limitations or conditions upon the disclosure of the requested chemical information as may be appropriate to assure that the occupational health services are provided without an undue risk of harm to the chemical manufacturer, importer, or employer.

(11) If a citation for a failure to release trade secret information is contested by the chemical manufacturer, importer, or employer, the matter will be adjudicated before the Occupational Safety and Health Review Commission in accordance with the Act's enforcement scheme and the applicable Commission rules of procedure. In accordance with the Commission rules, when a chemical manufacturer, importer, or employer continues to withhold the information during the contest, the Administrative Law Judge may review the citation and supporting documentation “in camera” or issue appropriate orders to protect the confidentiality of such matters.

(12) Notwithstanding the existence of a trade secret claim, a chemical manufacturer, importer, or employer shall, upon request, disclose to the Assistant Secretary any information which this section requires the chemical manufacturer, importer, or employer to make available. Where there is a trade secret claim, such claim shall be made no later than at the

time the information is provided to the Assistant Secretary so that suitable determinations of trade secret status can be made and the necessary protections can be implemented.

(13) Nothing in this paragraph shall be construed as requiring the disclosure under any circumstances of process information which is a trade secret.

(j) *Effective dates.* (1) Employers shall train employees regarding the new label elements and safety data sheets format by December 1, 2013.

(2) Chemical manufacturers, importers, distributors, and employers shall be in compliance with all modified provisions of this section no later than June 1, 2015, except:

(i) After December 1, 2015, the distributor shall not ship containers labeled by the chemical manufacturer or importer unless the label has been modified to comply with paragraph (f)(1) of this section.

(ii) All employers shall, as necessary, update any alternative workplace labeling used under paragraph (f)(6) of this section, update the hazard communication program required by paragraph (h)(1), and provide any additional employee training in accordance with paragraph (h)(3) for newly identified physical or health hazards no later than June 1, 2016.

(3) Chemical manufacturers, importers, distributors, and employers may comply with either §1910.1200 revised as of October 1, 2011, or the current version of this standard, or both during the transition period.

APPENDIX A TO §1910.1200—HEALTH HAZARD CRITERIA (MANDATORY)

A.0 GENERAL CLASSIFICATION CONSIDERATIONS

A.0.1 CLASSIFICATION

A.0.1.1 The term “hazard classification” is used to indicate that only the intrinsic hazardous properties of chemicals are considered. Hazard classification incorporates three steps:

(a) Identification of relevant data regarding the hazards of a chemical;

(b) Subsequent review of those data to ascertain the hazards associated with the chemical;

(c) Determination of whether the chemical will be classified as hazardous and the degree of hazard.

A.0.1.2 For many hazard classes, the criteria are semi-quantitative or qualitative and expert judgment is required to interpret the data for classification purposes.

A.0.2 AVAILABLE DATA, TEST METHODS AND TEST DATA QUALITY

A.0.2.1 There is no requirement for testing chemicals.

A.0.2.2 The criteria for determining health hazards are test method neutral, i.e., they do not specify particular test methods, as long as the methods are scientifically validated.

A.0.2.3 The term “scientifically validated” refers to the process by which the reliability and the relevance of a procedure are established for a particular purpose. Any test that determines hazardous properties, which is conducted according to recognized scientific principles, can be used for purposes of a hazard determination for health hazards. Test conditions need to be standardized so that the results are reproducible with a given substance, and the standardized test yields “valid” data for defining the hazard class of concern.

A.0.2.4 Existing test data are acceptable for classifying chemicals, although expert judgment also may be needed for classification purposes.

A.0.2.5 The effect of a chemical on biological systems is influenced, by the physico-chemical properties of the substance and/or ingredients of the mixture and the way in which ingredient substances are biologically available. A chemical need not be classified when it can be shown by conclusive experimental data from scientifically validated test methods that the chemical is not biologically available.

A.0.2.6 For classification purposes, epidemiological data and experience on the effects of chemicals on humans (e.g., occupational data, data from accident databases) shall be taken into account in the evaluation of human health hazards of a chemical.

A.0.3 CLASSIFICATION BASED ON WEIGHT OF EVIDENCE

A.0.3.1 For some hazard classes, classification results directly when the data satisfy the criteria. For others, classification of a

chemical shall be determined on the basis of the total weight of evidence using expert judgment. This means that all available information bearing on the classification of hazard shall be considered together, including the results of valid *in vitro* tests, relevant animal data, and human experience such as epidemiological and clinical studies and well-documented case reports and observations.

A.0.3.2 The quality and consistency of the data shall be considered. Information on chemicals related to the material being classified shall be considered as appropriate, as well as site of action and mechanism or mode of action study results. Both positive and negative results shall be considered together in a single weight-of-evidence determination.

A.0.3.3 Positive effects which are consistent with the criteria for classification, whether seen in humans or animals, shall normally justify classification. Where evidence is available from both humans and animals and there is a conflict between the findings, the quality and reliability of the evidence from both sources shall be evaluated in order to resolve the question of classification. Reliable, good quality human data shall generally have precedence over other data. However, even well-designed and conducted epidemiological studies may lack a sufficient number of subjects to detect relatively rare but still significant effects, or to assess potentially confounding factors. Therefore, positive results from well-conducted animal studies are not necessarily negated by the lack of positive human experience but require an assessment of the robustness, quality and statistical power of both the human and animal data.

A.0.3.4 Route of exposure, mechanistic information, and metabolism studies are pertinent to determining the relevance of an effect in humans. When such information raises doubt about relevance in humans, a lower classification may be warranted. When there is scientific evidence demonstrating that the mechanism or mode of action is not relevant to humans, the chemical should not be classified.

A.0.3.5 Both positive and negative results are considered together in the weight of evidence determination. However, a single positive study performed according to good scientific principles and with statistically and biologically significant positive results may justify classification.

A.0.4 Considerations for the Classification of Mixtures

A.0.4.1 For most hazard classes, the recommended process of classification of mixtures is based on the following sequence:

(a) Where test data are available for the complete mixture, the classification of the mixture will always be based on those data;

(b) Where test data are not available for the mixture itself, the bridging principles designated in each health hazard chapter of this appendix shall be considered for classification of the mixture;

(c) If test data are not available for the mixture itself, and the available information is not sufficient to allow application of the above-mentioned bridging principles, then the method(s) described in each chapter for estimating the hazards based on the information known will be applied to classify the mixture (e.g., application of cut-off values/concentration limits).

A.0.4.2 An exception to the above order or precedence is made for Carcinogenicity, Germ Cell Mutagenicity, and Reproductive Toxicity. For these three hazard classes, mixtures shall be classified based upon information on the ingredient substances, unless on a case-by-case basis, justification can be provided for classifying based upon the mixture as a whole. See chapters A.5, A.6, and A.7 for further information on case-by-case bases.

A.0.4.3 Use of cut-off values/concentration limits.

A.0.4.3.1 When classifying an untested mixture based on the hazards of its ingredients, cut-off values/concentration limits for the classified ingredients of the mixture are used for several hazard classes. While the adopted cut-off values/concentration limits adequately identify the hazard for most mixtures, there may be some that contain hazardous ingredients at lower concentrations than the specified cut-off values/concentration limits that still pose an identifiable hazard. There may also be cases where the cut-off value/concentration limit is considerably lower than the established non-hazardous level for an ingredient.

A.0.4.3.2 If the classifier has information that the hazard of an ingredient will be evident (i.e., it presents a health risk) below the specified cut-off value/concentration limit, the mixture containing that ingredient shall be classified accordingly.

A.0.4.3.3 In exceptional cases, conclusive data may demonstrate that the hazard of an ingredient will not be evident (i.e., it does not present a health risk) when present at a level above the specified cut-off value/concentration limit(s). In these cases the mixture may be classified according to those data. The data must exclude the possibility that the ingredient will behave in the mixture in a manner that would increase the hazard over that of the pure substance. Furthermore, the mixture must not contain ingredients that would affect that determination.

A.0.4.4 Synergistic or antagonistic effects.

When performing an assessment in accordance with these requirements, the evaluator must take into account all available information about the potential occurrence of synergistic effects among the ingredients of the mixture. Lowering classification of a mixture to a less hazardous category on the basis of antagonistic effects may be done only if the determination is supported by sufficient data.

A.0.5 Bridging Principles for the Classification of Mixtures Where Test Data Are Not Available for the

COMPLETE MIXTURE

A.0.5.1 Where the mixture itself has not been tested to determine its toxicity, but there are sufficient data on both the individual ingredients and similar tested mixtures to adequately characterize the hazards of the mixture, these data shall be used in accordance with the following bridging principles, subject to any specific provisions for mixtures for each hazard class. These principles ensure that the classification process uses the available data to the greatest extent possible in characterizing the hazards of the mixture.

A.0.5.1.1 Dilution.

For mixtures classified in accordance with A.1 through A.10 of this Appendix, if a tested mixture is diluted with a diluent that has an equivalent or lower toxicity classification than the least toxic original ingredient, and which is not expected to affect the toxicity of other ingredients, then:

(a) The new diluted mixture shall be classified as equivalent to the original tested mixture; or

(b) For classification of acute toxicity in accordance with A.1 of this Appendix, paragraph A.1.3.6 (the additivity formula) shall be applied.

A.0.5.1.2 Batching.

For mixtures classified in accordance with A.1 through A.10 of this Appendix, the toxicity of a tested production batch of a mixture can be assumed to be substantially equivalent to that of another untested production batch of the same mixture, when produced by or under the control of the same *chemical manufacturer,* unless there is reason to believe there is significant variation such that the toxicity of the untested batch has changed. If the latter occurs, a new classification is necessary.

A.0.5.1.3 Concentration of mixtures.

For mixtures classified in accordance with A.1, A.2, A.3, A.8, A.9, or A.10 of this Appendix, if a tested mixture is classified in Category 1, and the concentration of the ingredients of the tested mixture that are in Category 1 is increased, the resulting untested mixture shall be classified in Category 1.

A.0.5.1.4 Interpolation within one toxicity category.

For mixtures classified in accordance with A.1, A.2, A.3, A.8, A.9, or A.10 of this Appendix, for three mixtures (A, B and C) with identical ingredients, where mixtures A and B have been tested and are in the same toxicity category, and where untested mixture C has the same toxicologically active ingredients as mixtures A and B but has concentrations of toxicologically active ingredients intermediate to the concentrations in mixtures A and B, then mixture C is assumed to be in the same toxicity category as A and B.

A.0.5.1.5 Substantially similar mixtures.

For mixtures classified in accordance with A.1 through A.10 of this Appendix, given the following set of conditions:

(a) Where there are two mixtures:

(i) A + B;

(ii) C + B;

(b) The concentration of ingredient B is essentially the same in both mixtures;

(c) The concentration of ingredient A in mixture (i) equals that of ingredient C in mixture (ii);

(d) And data on toxicity for A and C are available and substantially equivalent; i.e., they are in the same hazard category and are not expected to affect the toxicity of B; then

If mixture (i) or (ii) is already classified based on test data, the other mixture can be assigned the same hazard category.

A.0.5.1.6 Aerosols.

For mixtures classified in accordance with A.1, A.2, A.3, A.4, A.8, or A.9 of this Appendix, an aerosol form of a mixture shall be classified in the same hazard category as the tested, non-aerosolized form of the mixture, provided the added propellant does not affect the toxicity of the mixture when spraying.

A.1 ACUTE TOXICITY

A.1.1 DEFINITION

Acute toxicity refers to those adverse effects occurring following oral or dermal administration of a single dose of a substance, or

multiple doses given within 24 hours, or an inhalation exposure of 4 hours.

A.1.2 CLASSIFICATION CRITERIA FOR SUBSTANCES

A.1.2.1 Substances can be allocated to one of four toxicity categories based on acute toxicity by the oral, dermal or inhalation route according to the numeric cut-off criteria as shown in Table A.1.1. Acute toxicity values are expressed as (approximate) LD50 (oral, dermal) or LC50 (inhalation) values or as acute toxicity estimates (ATE). See the footnotes following Table A.1.1 for further explanation on the application of these values.

TABLE A.1.1—ACUTE TOXICITY HAZARD CATEGORIES AND ACUTE TOXICITY ESTIMATE (ATE) VALUES DEFINING THE RESPECTIVE CATEGORIES

Exposure route	Category 1	Category 2	Category 3	Category 4
Oral (mg/kg bodyweight)				
see: Note (a)	≤5	>5 and ≤50	>50 and ≤300	>300 and ≤2000.
Note (b)				
Dermal (mg/kg bodyweight)				
see: Note (a)	≤50	>50 and ≤200	>200 and ≤1000	>1000 and ≤2000.
Note (b)				
Inhalation—Gases (ppmV)				
see: Note (a)	≤100	>100 and ≤500	>500 and ≤2500	>2500 and ≤20000.
Note (b)				
Note (c)				
Inhalation—Vapors (mg/l)				
see: Note (a)	≤0.5	>0.5 and ≤2.0	>2.0 and ≤10.0	>10.0 and ≤20.0.
Note (b)				
Note (c)				
Note (d)				
Inhalation—Dusts and Mists (mg/l)				
see: Note (a)	≤0.05	>0.05 and ≤0.5	>0.5 and ≤1.0	>1.0 and ≤5.0.
Note (b)				
Note (c)				

Note: *Gas concentrations are expressed in parts per million per volume (ppmV).*

Notes to Table A.1.1:

(a) *The acute toxicity estimate (ATE) for the classification of a substance is derived using the LD_{50}/LC_{50} where available;*

(b) *The acute toxicity estimate (ATE) for the classification of a substance or ingredient in a mixture is derived using:*

(i) *the LD_{50}/LC_{50} where available. Otherwise,*

(ii) *the appropriate conversion value from Table 1.2 that relates to the results of a range test, or*

(iii) *the appropriate conversion value from Table 1.2 that relates to a classification category;*

(c) *Inhalation cut-off values in the table are based on 4 hour testing exposures. Conversion of existing inhalation toxicity data which has been generated according to 1 hour exposure is achieved by dividing by a factor of 2 for gases and vapors and 4 for dusts and mists;*

(d) *For some substances the test atmosphere will be a vapor which consists of a combination of liquid and gaseous phases. For other substances the test atmosphere may consist of a vapor which is nearly all the gaseous phase. In these latter cases, classification is based on ppmV as follows: Category 1 (100 ppmV), Category 2 (500 ppmV), Category 3 (2500 ppmV), Category 4 (20000 ppmV).*

The terms "dust", "mist" and "vapor" are defined as follows:

(i) *Dust: solid particles of a substance or mixture suspended in a gas (usually air);*

(ii) *Mist: liquid droplets of a substance or mixture suspended in a gas (usually air);*

(iii) *Vapor: the gaseous form of a substance or mixture released from its liquid or solid state.*

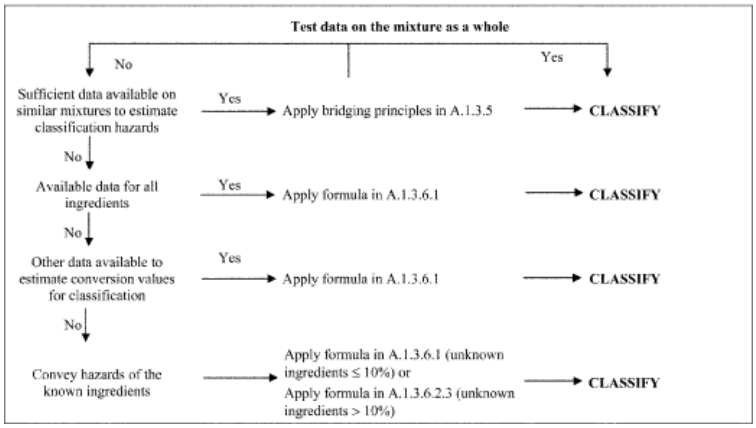
A.1.2.3 The preferred test species for evaluation of acute toxicity by the oral and inhalation routes is the rat, while the rat or rabbit are preferred for evaluation of acute dermal toxicity. Test data already generated for the classification of chemicals under existing systems should be accepted when reclassifying these chemicals under the harmonized system. When experimental data for

acute toxicity are available in several animal species, scientific judgment should be used in selecting the most appropriate LD_{50} value from among scientifically validated tests.

A.1.3 CLASSIFICATION CRITERIA FOR MIXTURES

A.1.3.1 The approach to classification of mixtures for acute toxicity is tiered, and is dependent upon the amount of information available for the mixture itself and for its ingredients. The flow chart of Figure A.1.1 indicates the process that must be followed:

Figure A.1.1: Tiered approach to classification of mixtures for acute toxicity



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A.1.3.2 Classification of mixtures for acute toxicity may be carried out for each route of exposure, but is only required for one route of exposure as long as this route is followed (estimated or tested) for all ingredients and there is no relevant evidence to suggest acute toxicity by multiple routes. When there is relevant evidence of acute toxicity by multiple routes of exposure, classification is to be conducted for all appropriate routes of exposure. All available information shall be considered. The pictogram and signal word used shall reflect the most severe hazard category; and all relevant hazard statements shall be used.

A.1.3.3 For purposes of classifying the hazards of mixtures in the tiered approach:

(a) The “relevant ingredients” of a mixture are those which are present in concentrations ≥1% (weight/weight for solids, liquids, dusts, mists and vapors and volume/volume for gases). If there is reason to suspect that an ingredient present at a concentration <1% will affect classification of the mixture for acute toxicity, that ingredient shall also be considered relevant. Consideration of ingredients present at a concentration <1% is particularly important when classifying untested mixtures which contain ingredients that are classified in Category 1 and Category 2;

(b) Where a classified mixture is used as an ingredient of another mixture, the actual or derived acute toxicity estimate (ATE) for that mixture is used when calculating the classification of the new mixture using the formulas in A.1.3.6.1 and A.1.3.6.2.4.

(c) If the converted acute toxicity point estimates for all ingredients of a mixture are within the same category, then the mixture should be classified in that category.

(d) When only range data (or acute toxicity hazard category information) are available for ingredients in a mixture, they may be converted to point estimates in accordance with Table A.1.2 when calculating the classification of the new mixture using the formulas in A.1.3.6.1 and A.1.3.6.2.4.

A.1.3.4 CLASSIFICATION OF MIXTURES WHERE ACUTE TOXICITY TEST DATA ARE AVAILABLE FOR THE COMPLETE MIXTURE

Where the mixture itself has been tested to determine its acute toxicity, it is classified according to the same criteria as those used for substances, presented in Table A.1.1. If test data for the mixture are not available, the procedures presented below must be followed.

A.1.3.5 CLASSIFICATION OF MIXTURES WHERE ACUTE TOXICITY TEST DATA ARE NOT AVAILABLE FOR THE COMPLETE MIXTURE: BRIDGING PRINCIPLES

A.1.3.5.1 Where the mixture itself has not been tested to determine its acute toxicity, but there are sufficient data on both the individual ingredients and similar tested mixtures to adequately characterize the hazards of the mixture, these data will be used in accordance with the following bridging principles as found in paragraph A.0.5 of this Appendix: Dilution, Batching, Concentration of mixtures, Interpolation within one toxicity category, Substantially similar mixtures, and Aerosols.

A.1.3.6 CLASSIFICATION OF MIXTURES BASED ON INGREDIENTS OF THE MIXTURE (ADDITIVITY FORMULA)

A.1.3.6.1 Data available for all ingredients.

The acute toxicity estimate (ATE) of ingredients is considered as follows:

(a) Include ingredients with a known acute toxicity, which fall into any of the acute toxicity categories, or have an oral or dermal LD_{50} greater than 2000 but less than or equal to 5000 mg/kg body weight (or the equivalent dose for inhalation);

(b) Ignore ingredients that are presumed not acutely toxic (e.g., water, sugar);

(c) Ignore ingredients if the data available are from a limit dose test (at the upper threshold for Category 4 for the appropriate route of exposure as provided in Table A.1.1) and do not show acute toxicity.

Ingredients that fall within the scope of this paragraph are considered to be ingredients with a known acute toxicity estimate (ATE). See note (b) to Table A.1.1 and paragraph A.1.3.3 for appropriate application of available data to the equation below, and paragraph A.1.3.6.2.4.

The ATE of the mixture is determined by calculation from the ATE values for all relevant ingredients according to the following formula below for oral, dermal or inhalation toxicity:

$$\frac{100}{\text{ATEmix}} = \sum_{n} \frac{\text{Ci}}{\text{ATE}_i}$$

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Where:

Ci = concentration of ingredient i

n ingredients and i is running from 1 to n

ATEi = acute toxicity estimate of ingredient i.

A.1.3.6.2 Data are not available for one or more ingredients of the mixture.

A.1.3.6.2.1 Where an ATE is not available for an individual ingredient of the mixture, but available information provides a derived conversion value, the formula in A.1.3.6.1 may be applied. This information may include evaluation of:

(a) Extrapolation between oral, dermal and inhalation acute toxicity estimates. Such an evaluation requires appropriate pharmacodynamic and pharmacokinetic data;

(b) Evidence from human exposure that indicates toxic effects but does not provide lethal dose data;

(c) Evidence from any other toxicity tests/assays available on the substance that indicates toxic acute effects but does not necessarily provide lethal dose data; or

(d) Data from closely analogous substances using structure/activity relationships.

A.1.3.6.2.2 This approach requires substantial supplemental technical information, and a highly trained and experienced expert, to reliably estimate acute toxicity. If sufficient information is not available to reliably estimate acute toxicity, proceed to the provisions of A.1.3.6.2.3.

A.1.3.6.2.3 In the event that an ingredient with unknown acute toxicity is used in a mixture at a concentration ≥1%, and the mixture has not been classified based on testing of the mixture as a whole, the mixture cannot be attributed a definitive acute toxicity estimate. In this situation the mixture is classified based on the known ingredients only. (Note: A statement that × percent of the mixture consists of ingredient(s) of unknown toxicity is required on the label and safety data sheet in such cases; see Appendix C to this section, Allocation of Label Elements and Appendix D to this section, Safety Data Sheets.)

Where an ingredient with unknown acute toxicity is used in a mixture at a concentration ≥1%, and the mixture is not classified based on testing of the mixture as a whole, a statement that X% of the mixture consists of ingredient(s) of unknown acute toxicity is required on the label and safety data sheet in such cases; see Appendix C to this section, Allocation of Label Elements and Appendix D to this section, Safety Data Sheets.)

A.1.3.6.2.4 If the total concentration of the relevant ingredient(s) with unknown acute toxicity is ≤10% then the formula presented in A.1.3.6.1 must be used. If the total concentration of the relevant ingredient(s) with unknown acute toxicity is >10%, the formula presented in A.1.3.6.1 is corrected to adjust for the percentage of the unknown ingredient(s) as follows:

$$\frac{100 - \left(\sum C_{unknown} \text{ if } > 10\%\right)}{ATE_{mix}} = \sum_{n} \frac{Ci}{ATE_i}$$

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TABLE A.1.2—CONVERSION FROM EXPERIMENTALLY OBTAINED ACUTE TOXICITY RANGE VALUES (OR ACUTE TOXICITY HAZARD

CATEGORIES) TO ACUTE TOXICITY POINT ESTIMATES FOR USE IN THE FORMULAS FOR THE CLASSIFICATION OF MIXTURES

Exposure routes	Classification category or experimentally obtained acute toxicity range estimate	Converted acute toxicity point estimate
Oral (mg/kg bodyweight)	0 <Category 1 ≤5	0.5
	5 <Category 2 ≤50	5
	50 <Category 3 ≤300	100
	300 <Category 4 ≤2000	500
Dermal (mg/kg bodyweight)	0 <Category 1 ≤50	5
	50 <Category 2 ≤200	50
	200 <Category 3 ≤1000	300
	1000 <Category 4 ≤2000	1100
Gases (ppmV)	0 <Category 1 ≤100	10
	100 <Category 2 ≤500	100
	500 <Category 3 ≤2500	700
	2500 <Category 4 ≤20000	4500
Vapors (mg/l)	0 <Category 1 ≤0.5	0.05
	0.5 <Category 2 ≤2.0	0.5
	2.0 <Category 3 ≤10.0	3
	10.0 <Category 4 ≤20.0	11
Dust/mist (mg/l)	0 <Category 1 ≤0.05	0.005
	0.05 <Category 2 ≤0.5	0.05
	0.5 <Category 3 ≤1.0	0.5
	1.0 <Category 4 ≤5.0	1.5

Note: Gas concentrations are expressed in parts per million per volume (ppmV).

A.2 SKIN CORROSION/IRRITATION

A.2.1 DEFINITIONS AND GENERAL CONSIDERATIONS

A.2.1.1 *Skin corrosion* is the production of irreversible damage to the skin; namely, visible necrosis through the epidermis and into the dermis, following the application of a test substance for up to 4 hours. Corrosive reactions are typified by ulcers, bleeding, bloody scabs, and, by the end of observation at 14 days, by discoloration due to blanching of the skin, complete areas of alopecia, and scars. Histopathology should be considered to evaluate questionable lesions.

Skin irritation is the production of reversible damage to the skin following the application of a test substance for up to 4 hours.

A.2.1.2 Skin corrosion/irritation shall be classified using a tiered approach as detailed in figure A.2.1. Emphasis shall be placed upon existing human data (See A.0.2.6), followed by other sources of information. Classification results directly when the data satisfy the criteria in this section. In case the criteria cannot be directly applied, classification of a substance or a mixture is made on the basis of the total weight of evidence (See A.0.3.1). This means that all available information bearing on the determination of skin corrosion/irritation is considered together, including the results of appropriate scientifically validated in-vitro tests, relevant animal data, and human data such as epidemiological and clinical studies and well-documented case reports and observations.

A.2.2 CLASSIFICATION CRITERIA FOR SUBSTANCES USING ANIMAL TEST DATA

A.2.2.1 CORROSION

A.2.2.1.1 A corrosive substance is a chemical that produces destruction of skin tissue, namely, visible necrosis through the epidermis and into the dermis, in at least 1 of 3 tested animals after exposure up to a 4-hour duration. Corrosive reactions are typified by ulcers, bleeding, bloody scabs and, by the end of observation at 14 days, by discoloration due to blanching of the skin, complete areas of alopecia and scars. Histopathology should be considered to discern questionable lesions.

A.2.2.1.2 Three sub-categories of Category 1 are provided in Table A.2.1, all of which shall be regulated as Category 1.

TABLE A.2.1—SKIN CORROSION CATEGORY AND SUB-CATEGORIES

Category 1: corrosive	Corrosive sub-categories	Corrosive in ≥1 of 3 animals	
		Exposure	Observation
	1A	≤3 min	≤1 h.
	1B	>3 min ≤1 h	≤14 days.
	1C	>1 h ≤4 h	≤14 days.

A.2.2.2 IRRITATION

A.2.2.2.1 A single irritant category (Category 2) is presented in the Table A.2.2. The major criterion for the irritant category is

that at least 2 tested animals have a mean score of ≥2.3 ≤4.0.

TABLE A.2.2—SKIN IRRITATION CATEGORY

	Criteria
Irritant (Category 2)	(1) Mean value of ≥2.3 ≤4.0 for erythema/eschar or for edema in at least 2 of 3 tested animals from gradings at 24, 48 and 72 hours after patch removal or, if reactions are delayed, from grades on 3 consecutive days after the onset of skin reactions; or
	(2) Inflammation that persists to the end of the observation period normally 14 days in at least 2 animals, particularly taking into account alopecia (limited area), hyperkeratosis, hyperplasia, and scaling; or
	(3) In some cases where there is pronounced variability of response among animals, with very definite positive effects related to chemical exposure in a single animal but less than the criteria above.

A.2.2.2.2 Animal irritant responses within a test can be quite variable, as they are with corrosion. A separate irritant criterion accommodates cases when there is a significant irritant response but less than the mean score criterion for a positive test. For example, a substance might be designated as an irritant if at least 1 of 3 tested animals shows a very elevated mean score throughout the study, including lesions persisting at the end of an observation period of normally 14 days. Other responses could also fulfil this criterion. However, it should be ascertained that the responses are the result of chemical exposure. Addition of this criterion increases the sensitivity of the classification system.

A.2.2.2.3 Reversibility of skin lesions is another consideration in evaluating irritant responses. When inflammation persists to the end of the observation period in 2 or more test animals, taking into consideration alopecia (limited area), hyperkeratosis, hyperplasia and scaling, then a chemical should be considered to be an irritant.

A.2.3 CLASSIFICATION CRITERIA FOR SUBSTANCES USING OTHER DATA ELEMENTS

A.2.3.1 Existing human and animal data including information from single or repeated exposure should be the first line of analysis, as they give information directly relevant to effects on the skin. If a substance is highly toxic by the dermal route, a skin corrosion/irritation study may not be practicable since the amount of test substance to be applied would considerably exceed the toxic dose and, consequently, would result in the death of the animals. When observations are made of skin corrosion/irritation in acute toxicity studies and are observed up through the limit dose, these data may be used for classification provided that the dilutions used and species tested are equivalent. *In vitro* alternatives that have been scientifically validated shall be used to make classification decisions. Solid substances (powders) may become corrosive or irritant when moistened or in contact with moist skin or mucous membranes. Likewise, pH extremes like ≤2 and ≥11.5 may indicate skin effects, especially when associated with significant buffering capacity. Generally, such substances are expected to produce significant effects on the skin. In the absence of any other information, a substance is considered corrosive (Skin Category 1) if it has a pH ≤2 or a pH ≥11.5. However, if consideration of alkali/acid reserve suggests the substance or mixture may not be corrosive despite the low or high pH value, then further evaluation may be necessary. In some cases enough information may be available from structurally related compounds to make classification decisions.

A.2.3.2 A *tiered approach* to the evaluation of initial information shall be used (Figure A.2.1) recognizing that all elements may not be relevant in certain cases.

A.2.3.3 The tiered approach explains how to organize information on a substance and to make a weight-of-evidence decision about hazard assessment and hazard classification.

A.2.3.4 All the above information that is available on a substance shall be evaluated. Although information might be gained from the evaluation of single parameters within a tier, there is merit in considering the totality of existing information and making an overall weight of evidence determination. This is especially true when there is information available on some but not all parameters. Emphasis shall be placed upon existing human experience and data, followed by animal experience and testing data, followed by other sources of information, but case-by-case determinations are necessary.

Figure A.2.1: Tiered evaluation of skin corrosion and irritation potential

Notes to Figure A.2.1:

[1] Evidence of existing human or animal data may be derived from single or repeated exposure(s) in occupational, consumer, transportation, or emergency response scenarios; from ethically-conducted human clinical studies; or from purposely-generated data from animal studies conducted according to scientifically validated test methods (at present, there is no internationally accepted test method for human skin irritation testing).

[2] Classify in the appropriate harmonized category, as shown in Tables A.2.1 and A.2.2.

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[3] Pre-existing animal data (e.g. from an acute dermal toxicity test or a sensitisation test) should be carefully reviewed to determine if sufficient skin corrosion/irritation evidence is available through other, similar information. For example, classification/categorization may be done on the basis of whether a chemical has or has not produced any skin irritation in an acute dermal toxicity test in animals at the limit dose, or produces very toxic effects in an acute dermal toxicity test in animals. In the latter case, the chemical would be classified as being very hazardous by the dermal route for acute toxicity, and it would be moot whether the chemical is also irritating or corrosive on the skin. It should be kept in mind in evaluating acute dermal toxicity information that the reporting of dermal lesions may be incomplete, testing and observations may be made on a species other than the rabbit, and species may differ in sensitivity in their responses.

[4] Evidence from studies using scientifically validated protocols with isolated human/animal tissues or other, non-tissue-based, though scientifically validated, protocols should be assessed. Examples of scientifically validated test methods for skin corrosion include OECD TG 430 (Transcutaneous Electrical Resistance Test (TER)), 431 (Human Skin Model Test), and 435 (Membrane Barrier Test Method). OECD TG 439 (Reconstructed Human Epidermis Test Method) is a scientifically validated in vitro test method for skin irritation.

[5] Measurement of pH alone may be adequate, but assessment of acid or alkali reserve (buffering capacity) would be preferable. Presently, there is no scientifically validated and internationally accepted method for assessing this parameter.

[6] All information that is available on a chemical should be considered and an overall determination made on the total weight of evidence. This is especially true when there is conflict in information available on some parameters. Professional judgment should be exercised in making such a determination.

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A.2.4 Classification Criteria for Mixtures

A.2.4.1 Classification of Mixtures When Data Are Available for the Complete Mixture

A.2.4.1.1 The mixture shall be classified using the criteria for substances (See A.2.3).

A.2.4.2 Classification of Mixtures When Data Are Not Available for the Complete Mixture: Bridging Principles

A.2.4.2.1 Where the mixture itself has not been tested to determine its skin corrosion/irritation, but there are sufficient data on both the individual ingredients and similar tested mixtures to adequately characterize the hazards of the mixture, these data will be used in accordance with the following bridging principles, as found in paragraph A.0.5 of this Appendix: Dilution, Batching, Concentration of mixtures, Interpolation within one toxicity category, Substantially similar mixtures, and Aerosols.

A.2.4.3 Classification of Mixtures When Data Are Available for All Ingredients or Only for Some Ingredients of the Mixture

A.2.4.3.1 For purposes of classifying the skin corrosion/irritation hazards of mixtures in the tiered approach:

The "relevant ingredients" of a mixture are those which are present in concentrations ≥1% (weight/weight for solids, liquids, dusts, mists and vapors and volume/volume for gases.) If the classifier has reason to suspect that an ingredient present at a concentration <1% will affect classification of the mixture for skin corrosion/irritation, that ingredient shall also be considered relevant.

A.2.4.3.2 In general, the approach to classification of mixtures as irritant or corrosive to skin when data are available on the ingredients, but not on the mixture as a whole, is based on the theory of additivity, such that each corrosive or irritant ingredient contributes to the overall irritant or corrosive properties of the mixture in proportion to its potency and concentration. A weighting factor of 10 is used for corrosive ingredients when they are present at a concentration below the concentration limit for classification with Category 1, but are at a concentration that will contribute to the classification of the mixture as an irritant. The mixture is classified as corrosive or irritant when the sum of the concentrations of such ingredients exceeds a cut-off value/concentration limit.

A.2.4.3.3 Table A.2.3 below provides the cut-off value/concentration limits to be used to determine if the mixture is considered to be an irritant or a corrosive to the skin.

A.2.4.3.4 Particular care shall be taken when classifying certain types of chemicals such as acids and bases, inorganic salts, aldehydes, phenols, and surfactants. The approach explained in A.2.4.3.1 and A.2.4.3.2 might not work given that many of such substances are corrosive or irritant at concentrations <1%. For mixtures containing strong acids or bases the pH should be used as classification criteria since pH will be a better indicator of corrosion than the concentration limits of Table A.2.3. A mixture containing corrosive or irritant ingredients that cannot be classified based on the additivity approach shown in Table A.2.3, due to chemical characteristics that make this approach unworkable, should be classified as Skin Category 1 if it contains ≥1% of a corrosive ingredient and as Skin Category 2 when it contains ≥3% of an irritant ingredient. Classification of mixtures with ingredients for which the approach in Table A.2.3 does not apply is summarized in Table A.2.4 below.

A.2.4.3.5 On occasion, reliable data may show that the skin corrosion/irritation of an ingredient will not be evident when present at a level above the generic concentration cut-off values mentioned in Tables A.2.3 and A.2.4. In these cases the mixture could be classified according to those data (See *Use of cut-off values/concentration limits,* paragraph A.0.4.3 of this Appendix).

A.2.4.3.6 If there are data showing that (an) ingredient(s) may be corrosive or irritant at a concentration of <1% (corrosive) or <3% (irritant), the mixture shall be classified accordingly (See *Use of cut-off values/concentration limits,* paragraph A.0.4.3 of this Appendix).

Table A.2.3—Concentration of Ingredients of a Mixture Classified as Skin Category 1 or 2 That Would Trigger Classification of the Mixture as Hazardous to Skin

[Category 1 or 2]

	Concentration triggering classification of a mixture as:	
	Skin corrosive	Skin irritant
Sum of ingredients classified as:	Category 1	Category 2
Skin Category 1	≥5%	≥1% but <5%.
Skin Category 2		≥10%.
(10 × Skin Category 1) + Skin Category 2		≥10%.

Table A.2.4—Concentration of Ingredients of a Mixture for Which the Additivity Approach Does Not Apply, That Would Trigger Classification of the Mixture as Hazardous to Skin

Ingredient:	Concentration:	Mixture classified as: Skin
Acid with pH ≤2	≥1%	Category 1.
Base with pH ≥11.5	≥1%	Category 1.
Other corrosive (Category 1) ingredients for which additivity does not apply	≥1%	Category 1.
Other irritant (Category 2) ingredients for which additivity does not apply, including acids and bases	≥3%	Category 2.

A.3 SERIOUS EYE DAMAGE/EYE IRRITATION

A.3.1 Definitions and General Considerations

A.3.1.1 *Serious eye damage* is the production of tissue damage in the eye, or serious physical decay of vision, following application of a test substance to the anterior surface of the eye, which is not fully reversible within 21 days of application.

Eye irritation is the production of changes in the eye following the application of test substance to the anterior surface of the eye, which are fully reversible within 21 days of application.

A.3.1.2 Serious eye damage/eye irritation shall be classified using a tiered approach as detailed in Figure A.3.1. Emphasis shall be placed upon existing human data (See A.0.2.6), followed by animal data, followed by other sources of information. Classification results directly when the data satisfy the criteria in this section. In case the criteria cannot be directly applied, classification of a substance or a mixture is made on the basis of the total weight of evidence (See A.0.3.1). This means that all available information bearing on the determination of serious eye damage/eye irritation is considered together, including the results of appropriate scientifically validated *in vitro* tests, relevant animal data, and human data such as epidemiological and clinical studies and well-documented case reports and observations.

A.3.2 Classification Criteria for Substances Using Animal Test Data

A.3.2.1 Irreversible effects on the eye/serious damage to eyes (Category 1).

A single hazard category is provided in Table A.3.1, for substances that have the potential to seriously damage the eyes. Category 1, irreversible effects on the eye, includes the criteria listed below. These observations include animals with grade 4 cornea lesions and other severe reactions (e.g. destruction of cornea) observed at any time during the test, as well as persistent corneal opacity, discoloration of the cornea by a dye substance, adhesion, pannus, and interference with the function of the iris or other effects that impair sight. In this context, persistent lesions are considered those which are not fully reversible within an observation period of normally 21 days. Category 1 also contains substances fulfilling the criteria of corneal opacity ≥3 and/or iritis >1.5 detected in a Draize eye test with rabbits, because severe lesions like these usually do not reverse within a 21-day observation period.

TABLE A.3.1—IRREVERSIBLE EYE EFFECTS

A substance is classified as Serious Eye Damage Category 1 (irreversible effects on the eye) when it produces:
(a) at least in one tested animal, effects on the cornea, iris or conjunctiva that are not expected to reverse or have not fully reversed within an observation period of normally 21 days; and/or
(b) at least in 2 of 3 tested animals, a positive response of:
(i) corneal opacity ≥3; and/or
(ii) iritis >1.5;
calculated as the mean scores following grading at 24, 48 and 72 hours after instillation of the substance.

A.3.2.2 Reversible effects on the eye (Category 2).

A single category is provided in Table A.3.2 for substances that have the potential to induce reversible eye irritation.

TABLE A.3.2—REVERSIBLE EYE EFFECTS

A substance is classified as Eye irritant Category 2A (irritating to eyes) when it produces in at least in 2 of 3 tested animals a positive response of:
(i) corneal opacity ≥1; and/or
(ii) iritis ≥1; and/or
(iii) conjunctival redness ≥2; and/or
(iv) conjunctival edema (chemosis) ≥2
calculated as the mean scores following grading at 24, 48 and 72 hours after instillation of the substance, and which fully reverses within an observation period of normally 21 days.
An eye irritant is considered mildly irritating to eyes (Category 2B) when the effects listed above are fully reversible within 7 days of observation.

A.3.2.3 For those chemicals where there is pronounced variability among animal responses, this information may be taken into account in determining the classification.

A.3.3 Classification Criteria for Substances Using Other Data Elements

A.3.3.1 Existing human and animal data should be the first line of analysis, as they give information directly relevant to effects on the eye. Possible skin corrosion shall be evaluated prior to consideration of serious eye damage/eye irritation in order to avoid testing for local effects on eyes with skin corrosive substances. *In vitro* alternatives that have been scientifically validated and accepted shall be used to make classification decisions. Likewise, pH extremes like ≤2 and ≥11.5, may indicate serious eye damage, especially when associated with significant buffering capacity. Generally, such substances are expected to produce significant effects on the eyes. In the absence of any other information, a mixture/substance is considered to cause serious eye damage (Eye Category 1) if it has a pH ≤2 or ≥11.5. However, if consideration of acid/alkaline reserve suggests the substance may not have the potential to cause serious eye damage despite the low or high pH value, then further evaluation may be necessary. In some cases enough information may be available from structurally related compounds to make classification decisions.

A.3.3.2 A tiered approach to the evaluation of initial information shall be used where applicable, recognizing that all elements may not be relevant in certain cases (Figure A.3.1).

A.3.3.3 The tiered approach explains how to organize existing information on a substance and to make a weight-of-evidence decision, where appropriate, about hazard assessment and hazard classification.

A.3.3.4 All the above information that is available on a substance shall be evaluated. Although information might be gained from the evaluation of single parameters within a tier, consideration should be given to the totality of existing information and making an overall weight-of-evidence determination. This is especially true when there is conflict in information available on some parameters.

Figure A.3.1 Evaluation strategy for serious eye damage and eye irritation (See also Figure A.2.1)

Step	Parameter	Finding	Conclusion
1a:	Existing human or animal data, eye[1]	Serious Eye Damage	Category 1[2]
		Eye Irritant	Category 2[2]
	No/insufficient data or unknown		
1b:	Existing human or animal data, skin corrosion	Skin corrosive	Category 1[2]
	No/insufficient data or unknown		
1c:	Existing human or animal data, eye[1]	Existing data that show that substance does not cause serious eye damage or eye irritation	Not Classified
	No/insufficient data		
2:	Other, existing skin/eye data in animals[3]	Yes; existing data that show that substance may cause serious eye damage or eye irritation	Category1 or Category 2[2]
	No/insufficient data		
3:	Existing *ex vivo / in vitro* data[4]	Positive: serious eye damage	Category 1[2]
		Positive: eye irritant	Category 2[2]
	No/insufficient data / negative response		
4:	pH-Based assessment (with consideration of buffering capacity of the chemical, or no buffering capacity data)[5]	pH ≤ 2 or ≥11.5	Category 1[2]
	Not a pH extreme, no pH data, or extreme pH with low/no buffering capacity		
5:	Validated structure/activity relationship (SAR) models	Severe damage to eyes	Category 1[2]
		Eye irritant	Category 2[2]
		Skin Corrosive	Category 1[2]
	No/insufficient data		
6:	Consideration of the total weight of evidence[6]	Serious eye damage	Category 1[2]
		Eye irritant	Category 2[2]
	No concern based on consideration of the sum of available data		
7:	**Not Classified**		

Notes to Figure A.3.1:

[1] *Evidence of existing human or animal data may be derived from single or repeated exposure(s) in occupational, consumer, transportation, or emergency response scenarios; from ethically-conducted human clinical studies; or from purposely-generated data from animal studies conducted according to scientifically validated test methods. At present, there are no internationally accepted test methods for human skin or eye irritation testing.*

[2] *Classify in the appropriate harmonized category, as shown in Tables A.3.1 and A.3.2.*

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[3] *Pre-existing animal data should be carefully reviewed to determine if sufficient skin or eye corrosion/irritation evidence is available through other, similar information.*

[4] *Evidence from studies using scientifically validated protocols with isolated human/animal tissues or other, non-tissue-based, though scientifically validated, protocols should be assessed. Examples of, scientifically validated test methods for identifying eye corrosives and severe irritants (i.e., Serious Eye Damage) include OECD TG 437 (Bovine Corneal Opacity and Permeability (BCOP)) and TG 438 (Isolated Chicken Eye). Positive test results from a scientifically validated in vitro test for skin corrosion would likely also lead to a conclusion to classify as causing Serious Eye Damage.*

[5] *Measurement of pH alone may be adequate, but assessment of acid or alkali reserve (buffering capacity) would be preferable.*

[6] *All information that is available on a chemical should be considered and an overall determination made on the total weight of evidence. This is especially true when there is conflict in information available on some parameters. The weight of evidence including information on skin irritation could lead to classification of eye irritation. It is recognized that not all skin irritants are eye irritants as well. Professional judgment should be exercised in making such a determination.*

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A.3.4 Classification Criteria for Mixtures

A.3.4.1 Classification of Mixtures When Data Are Available for the Complete Mixture

A.3.4.1.1 The mixture will be classified using the criteria for substances.

A.3.4.1.2 Unlike other hazard classes, there are alternative tests available for skin corrosivity of certain types of chemicals that can give an accurate result for classification purposes, as well as being simple and relatively inexpensive to perform. When considering testing of the mixture, chemical manufacturers are encouraged to use a tiered weight of evidence strategy as included in the criteria for classification of substances for skin corrosion and serious eye damage and eye irritation to help ensure an accurate classification, as well as avoid unnecessary animal testing. In the absence of any other information, a mixture is considered to cause serious eye damage (Eye Category 1) if it has a pH ≤2 or ≥11.5. However, if consideration of acid/alkaline reserve suggests the

substance or mixture may not have the potential to cause serious eye damage despite the low or high pH value, then further evaluation may be necessary.

A.3.4.2 Classification of Mixtures When Data Are Not Available for the Complete Mixture: Bridging Principles

A.3.4.2.1 Where the mixture itself has not been tested to determine its skin corrosivity or potential to cause serious eye damage or eye irritation, but there are sufficient data on both the individual ingredients and similar tested mixtures to adequately characterize the hazards of the mixture, these data will be used in accordance with the following bridging principles, as found in paragraph A.0.5 of this Appendix: Dilution, Batching, Concentration of mixtures, Interpolation within one toxicity category, Substantially similar mixtures, and Aerosols.

A.3.4.3 Classification of Mixtures When Data Are Available for All Ingredients or Only for Some Ingredients of the Mixture

A.3.4.3.1 For purposes of classifying the eye corrosion/irritation hazards of mixtures in the tiered approach:

The "relevant ingredients" of a mixture are those which are present in concentrations ≥1% (weight/weight for solids, liquids, dusts, mists and vapors and volume/volume for gases.) If the classifier has reason to suspect that an ingredient present at a concentration <1% will affect classification of the mixture for eye corrosion/irritation, that ingredient shall also be considered relevant.

A.3.4.3.2 In general, the approach to classification of mixtures as seriously damaging to the eye or eye irritant when data are available on the ingredients, but not on the mixture as a whole, is based on the theory of additivity, such that each corrosive or irritant ingredient contributes to the overall irritant or corrosive properties of the mixture in proportion to its potency and concentration. A weighting factor of 10 is used for corrosive ingredients when they are present at a concentration below the concentration limit for classification with Category 1, but are at a concentration that will contribute to the classification of the mixture as an irritant. The mixture is classified as seriously damaging to the eye or eye irritant when the sum of the concentrations of such ingredients exceeds a threshold cut-off value/concentration limit.

A.3.4.3.3 Table A.3.3 provides the cut-off value/concentration limits to be used to determine if the mixture should be classified as seriously damaging to the eye or an eye irritant.

A.3.4.3.4 Particular care must be taken when classifying certain types of chemicals such as acids and bases, inorganic salts, aldehydes, phenols, and surfactants. The approach explained in A.3.4.3.1 and A.3.4.3.2 might not work given that many of such substances are corrosive or irritant at concentrations <1%. For mixtures containing strong acids or bases, the pH should be used as classification criteria (See A.3.4.1) since pH will be a better indicator of serious eye damage than the concentration limits of Table A.3.3. A mixture containing corrosive or irritant ingredients that cannot be classified based on the additivity approach applied in Table A.3.3 due to chemical characteristics that make this approach unworkable, should be classified as Eye Category 1 if it contains ≥1% of a corrosive ingredient and as Eye Category 2 when it contains ≥3% of an irritant ingredient. Classification of mixtures with ingredients for which the approach in Table A.3.3 does not apply is summarized in Table A.3.4.

A.3.4.3.5 On occasion, reliable data may show that the reversible/irreversible eye effects of an ingredient will not be evident when present at a level above the generic cut-off values/concentration limits mentioned in Tables A.3.3 and A.3.4. In these cases the mixture could be classified according to those data (See also A.0.4.3 *Use of cut-off values/concentration limits*"). On occasion, when it is expected that the skin corrosion/irritation or the reversible/irreversible eye effects of an ingredient will not be evident when present at a level above the generic concentration/cut-off levels mentioned in Tables A.3.3 and A.3.4, testing of the mixture may be considered. In those cases, the tiered weight of evidence strategy should be applied as referred to in section A.3.3, Figure A.3.1 and explained in detail in this chapter.

A.3.4.3.6 If there are data showing that (an) ingredient(s) may be corrosive or irritant at a concentration of <1% (corrosive) or <3% (irritant), the mixture should be classified accordingly (See also paragraph A.0.4.3, *Use of cut-off values/concentration limits*).

Table A.3.3—Concentration of Ingredients of a Mixture Classified as Skin Category 1 and/or Eye Category 1 or 2 That Would Trigger Classification of the Mixtures as Hazardous to the Eye

	Concentration triggering classification of a mixture as:	
	Irreversible eye effects	Reversible eye effects
Sum of ingredients classified as:	**Category 1**	**Category 2**
Eye or Skin Category 1	≥3%	≥1% but <3%.
Eye Category 2		≥10%.
(10 × Eye Category 1) + Eye Category 2		≥10%.
Skin Category 1 + Eye Category 1	≥3%	≥1% but <3%.
10 × (Skin Category 1 + Eye Category 1) + Eye Category 2		≥10%.

Note: *A mixture may be classified as Eye Category 2B in cases when all relevant ingredients are classified as Eye Category 2B.*

Table A.3.4—Concentration of Ingredients of a Mixture for Which the Additivity Approach Does Not Apply, That Would Trigger Classification of the Mixture as Hazardous to the Eye

Ingredient	Concentration	Mixture classified as: Eye
Acid with pH ≤2	≥1%	Category 1.
Base with pH ≥11.5	≥1%	Category 1.
Other corrosive (Category 1) ingredients for which additivity does not apply	≥1%	Category 1.
Other irritant (Category 2) ingredients for which additivity does not apply, including acids and bases	≥3%	Category 2.

A.4 RESPIRATORY OR SKIN SENSITIZATION

A.4.1 DEFINITIONS AND GENERAL CONSIDERATIONS

A.4.1.1 *Respiratory sensitizer* means a chemical that will lead to hypersensitivity of the airways following inhalation of the chemical.

Skin sensitizer means a chemical that will lead to an allergic response following skin contact.

A.4.1.2 For the purpose of this chapter, sensitization includes two phases: the first phase is induction of specialized immunological memory in an individual by exposure to an allergen. The second phase is elicitation, i.e., production of a cell-mediated or antibody-mediated allergic response by exposure of a sensitized individual to an allergen.

A.4.1.3 For respiratory sensitization, the pattern of induction followed by elicitation phases is shared in common with skin sensitization. For skin sensitization, an induction phase is required in which the immune system learns to react; clinical symptoms can then arise when subsequent exposure is sufficient to elicit a visible skin reaction (elicitation phase). As a consequence, predictive tests usually follow this pattern in which there is an induction phase, the response to which is measured by a standardized elicitation phase, typically involving a patch test. The local lymph node assay is the exception, directly measuring the induction response. Evidence of skin sensitization in humans normally is assessed by a diagnostic patch test.

A.4.1.4 Usually, for both skin and respiratory sensitization, lower levels are necessary for elicitation than are required for induction.

A.4.1.5 The hazard class “respiratory or skin sensitization” is differentiated into:

(a) Respiratory sensitization; and

(b) Skin sensitization.

A.4.2 CLASSIFICATION CRITERIA FOR SUBSTANCES

A.4.2.1 RESPIRATORY SENSITIZERS

A.4.2.1.1 Hazard Categories.

A.4.2.1.1.1 Effects seen in either humans or animals will normally justify classification in a weight of evidence approach for respiratory sensitizers. Substances may be allocated to one of the two sub-categories 1A or 1B using a weight of evidence approach in accordance with the criteria given in Table A.4.1 and on the basis of reliable and good quality evidence from human cases or epidemiological studies and/or observations from appropriate studies in experimental animals.

A.4.2.1.1.2 Where data are not sufficient for sub-categorization, respiratory sensitizers shall be classified in Category 1.

TABLE A.4.1—HAZARD CATEGORY AND SUB-CATEGORIES FOR RESPIRATORY SENSITIZERS

Category 1	Respiratory sensitizer
	A substance is classified as a respiratory sensitizer.
	(a) if there is evidence in humans that the substance can lead to specific respiratory hypersensitivity and/or
	(b) if there are positive results from an appropriate animal test.[1]
Sub-category 1A	Substances showing a high frequency of occurrence in humans; or a probability of occurrence of a high sensitization rate in humans based on animal or other tests.[1] Severity of reaction may also be considered.
Sub-category 1B	Substances showing a low to moderate frequency of occurrence in humans; or a probability of occurrence of a low to moderate sensitization rate in humans based on animal or other tests.[1] Severity of reaction may also be considered.

[1]*At this writing, recognized and validated animal models for the testing of respiratory hypersensitivity are not available. Under certain circumstances, data from animal studies may provide valuable information in a weight of evidence assessment.*

A.4.2.1.2 Human evidence.

A.4.2.1.2.1 Evidence that a substance can lead to specific respiratory hypersensitivity will normally be based on human experience. In this context, hypersensitivity is normally seen as asthma, but other hypersensitivity reactions such as

rhinitis/conjunctivitis and alveolitis are also considered. The condition will have the clinical character of an allergic reaction. However, immunological mechanisms do not have to be demonstrated.

A.4.2.1.2.2 When considering the human evidence, it is necessary that in addition to the evidence from the cases, the following be taken into account:

(a) The size of the population exposed;

(b) The extent of exposure.

A.4.2.1.2.3 The evidence referred to above could be:

(a) Clinical history and data from appropriate lung function tests related to exposure to the substance, confirmed by other supportive evidence which may include:

(i) *In vivo* immunological test (e.g., skin prick test);

(ii) *In vitro* immunological test (e.g., serological analysis);

(iii) Studies that may indicate other specific hypersensitivity reactions where immunological mechanisms of action have not been proven, e.g., repeated low-level irritation, pharmacologically mediated effects;

(iv) A chemical structure related to substances known to cause respiratory hypersensitivity;

(b) Data from positive bronchial challenge tests with the substance conducted according to accepted guidelines for the determination of a specific hypersensitivity reaction.

A.4.2.1.2.4 Clinical history should include both medical and occupational history to determine a relationship between exposure to a specific substance and development of respiratory hypersensitivity. Relevant information includes aggravating factors both in the home and workplace, the onset and progress of the disease, family history and medical history of the patient in question. The medical history should also include a note of other allergic or airway disorders from childhood and smoking history.

A.4.2.1.2.5 The results of positive bronchial challenge tests are considered to provide sufficient evidence for classification on their own. It is, however, recognized that in practice many of the examinations listed above will already have been carried out.

A.4.2.1.3 Animal studies.

A.4.2.1.3.1 Data from appropriate animal studies[2] which may be indicative of the potential of a substance to cause sensitization by inhalation in humans[3] may include:

[2]*At this writing, recognized and validated animal models for the testing of respiratory hypersensitivity are not available. Under certain circumstances, data from animal studies may provide valuable information in a weight of evidence assessment.*

[3]*The mechanisms by which substances induce symptoms of asthma are not yet fully known. For preventive measures, these substances are considered respiratory sensitizers. However, if on the basis of the evidence, it can be demonstrated that these substances induce symptoms of asthma by irritation only in people with bronchial hyperactivity, they should not be considered as respiratory sensitizers.*

(a) Measurements of Immunoglobulin E (IgE) and other specific immunological parameters, for example in mice

(b) Specific pulmonary responses in guinea pigs.

A.4.2.2 SKIN SENSITIZERS

A.4.2.2.1 Hazard categories.

A.4.2.2.1.1 Effects seen in either humans or animals will normally justify classification in a weight of evidence approach for skin sensitizers. Substances may be allocated to one of the two sub-categories 1A or 1B using a weight of evidence approach in accordance with the criteria given in Table A.4.2 and on the basis of reliable and good quality evidence from human cases or epidemiological studies and/or observations from appropriate studies in experimental animals according to the guidance values provided in A.4.2.2.2.1 and A.4.2.2.3.2 for sub-category 1A and in A.4.2.2.2.2 and A.4.2.2.3.3 for sub-category 1B.

A.4.2.2.1.2 Where data are not sufficient for sub-categorization, skin sensitizers shall be classified in Category 1.

TABLE A.4.2—HAZARD CATEGORY AND SUB-CATEGORIES FOR SKIN SENSITIZERS

Category 1	Skin sensitizer
	A substance is classified as a skin sensitizer.

	(a) if there is evidence in humans that the substance can lead to sensitization by skin contact in a substantial number of persons, or
	(b) if there are positive results from an appropriate animal test.
Sub-category 1A	Substances showing a high frequency of occurrence in humans and/or a high potency in animals can be presumed to have the potential to produce significant sensitization in humans. Severity of reaction may also be considered.
Sub-category 1B	Substances showing a low to moderate frequency of occurrence in humans and/or a low to moderate potency in animals can be presumed to have the potential to produce sensitization in humans. Severity of reaction may also be considered.

A.4.2.2.2 Human evidence.

A.4.2.2.2.1 Human evidence for sub-category 1A may include:

(a) Positive responses at ≤500 μg/cm^2 (Human Repeat Insult Patch Test (HRIPT), Human Maximization Test (HMT)—induction threshold);

(b) Diagnostic patch test data where there is a relatively high and substantial incidence of reactions in a defined population in relation to relatively low exposure;

(c) Other epidemiological evidence where there is a relatively high and substantial incidence of allergic contact dermatitis in relation to relatively low exposure.

A.4.2.2.2.2 Human evidence for sub-category 1B may include:

(a) Positive responses at >500 μg/cm^2 (HRIPT, HMT—induction threshold);

(b) Diagnostic patch test data where there is a relatively low but substantial incidence of reactions in a defined population in relation to relatively high exposure;

(c) Other epidemiological evidence where there is a relatively low but substantial incidence of allergic contact dermatitis in relation to relatively high exposure.

A.4.2.2.3 Animal studies

A.4.2.2.3.1 For Category 1, when an adjuvant type test method for skin sensitization is used, a response of at least 30% of the animals is considered as positive. For a non-adjuvant Guinea pig test method a response of at least 15% of the animals is considered positive. For Category 1, a stimulation index of three or more is considered a positive response in the local lymph node assay.[4]

[4]*Test methods for skin sensitization are described in OECD Guideline 406 (the Guinea Pig Maximization test and the Buehler guinea pig test) and Guideline 429 (Local Lymph Node Assay). Other methods may be used provided that they are scientifically validated. The Mouse Ear Swelling Test (MEST), appears to be a reliable screening test to detect moderate to strong sensitizers, and can be used, in accordance with professional judgment, as a first stage in the assessment of skin sensitization potential.*

A.4.2.2.3.2 Animal test results for sub-category 1A can include data with values indicated in Table A.4.3 below:

TABLE A.4.3—ANIMAL TEST RESULTS FOR SUB-CATEGORY 1A

Assay	**Criteria**
Local lymph node assay	EC3 value ≤2%.
Guinea pig maximization test	≥30% responding at ≤0.1% intradermal induction dose *or*
	≥60% responding at >0.1% to ≤1% intradermal induction dose.
Buehler assay	≥15% responding at ≤0.2% topical induction dose *or*
	≥60% responding at >0.2% to ≤20% topical induction dose.

Note: *EC3 refers to the estimated concentration of test chemical required to induce a stimulation index of 3 in the local lymph node assay.*

A.4.2.2.3.3 Animal test results for sub-category 1B can include data with values indicated in Table A.4.4 below:

TABLE A.4.4—ANIMAL TEST RESULTS FOR SUB-CATEGORY 1B

Assay	**Criteria**
Local lymph node assay	EC3 value >2%.
Guinea pig maximization test	≥30% to <60% responding at >0.1% to ≤1% intradermal induction dose or
	≥30% responding at >1% intradermal induction dose.
Buehler assay	≥15% to <60% responding at >0.2% to ≤20% topical induction dose or
	≥15% responding at >20% topical induction dose.

Note: *EC3 refers to the estimated concentration of test chemical required to induce a stimulation index of 3 in the local lymph node assay.*

A.4.2.2.4 Specific considerations.

A.4.2.2.4.1 For classification of a substance, evidence shall include one or more of the following using a weight of evidence approach:

(a) Positive data from patch testing, normally obtained in more than one dermatology clinic;

(b) Epidemiological studies showing allergic contact dermatitis caused by the substance. Situations in which a high proportion of those exposed exhibit characteristic symptoms are to be looked at with special concern, even if the number of cases is small;

(c) Positive data from appropriate animal studies;

(d) Positive data from experimental studies in man (See paragraph A.0.2.6 of this Appendix);

(e) Well documented episodes of allergic contact dermatitis, normally obtained in more than one dermatology clinic;

(f) Severity of reaction.

A.4.2.2.4.2 Evidence from animal studies is usually much more reliable than evidence from human exposure. However, in cases where evidence is available from both sources, and there is conflict between the results, the quality and reliability of the evidence from both sources must be assessed in order to resolve the question of classification on a case-by-case basis. Normally, human data are not generated in controlled experiments with volunteers for the purpose of hazard classification but rather as part of risk assessment to confirm lack of effects seen in animal tests. Consequently, positive human data on skin sensitization are usually derived from case-control or other, less defined studies. Evaluation of human data must, therefore, be carried out with caution as the frequency of cases reflect, in addition to the inherent properties of the substances, factors such as the exposure situation, bioavailability, individual predisposition and preventive measures taken. Negative human data should not normally be used to negate positive results from animal studies. For both animal and human data, consideration should be given to the impact of vehicle.

A.4.2.2.4.3 If none of the above-mentioned conditions are met, the substance need not be classified as a skin sensitizer. However, a combination of two or more indicators of skin sensitization, as listed below, may alter the decision. This shall be considered on a case-by-case basis.

(a) Isolated episodes of allergic contact dermatitis;

(b) Epidemiological studies of limited power, e.g., where chance, bias or confounders have not been ruled out fully with reasonable confidence;

(c) Data from animal tests, performed according to existing guidelines, which do not meet the criteria for a positive result described in A.4.2.2.3, but which are sufficiently close to the limit to be considered significant;

(d) Positive data from non-standard methods;

(e) Positive results from close structural analogues.

A.4.2.2.4.4 Immunological contact urticaria.

A.4.2.2.4.4.1 Substances meeting the criteria for classification as respiratory sensitizers may, in addition, cause immunological contact urticaria. Consideration shall be given to classifying these substances as skin sensitizers.

A.4.2.2.4.4.2 Substances which cause immunological contact urticaria without meeting the criteria for respiratory sensitizers shall be considered for classification as skin sensitizers.

A.4.2.2.4.4.3 There is no recognized animal model available to identify substances which cause immunological contact urticaria. Therefore, classification will normally be based on human evidence, similar to that for skin sensitization.

A.4.3 Classification Criteria for Mixtures

A.4.3.1 Classification of Mixtures When Data Are Available for the Complete Mixture

When reliable and good quality evidence, as described in the criteria for substances, from human experience or appropriate studies in experimental animals, is available for the mixture, then the mixture shall be classified by weight of evidence evaluation of these data. Care must be exercised in evaluating data on mixtures that the dose used does not render the results inconclusive.

A.4.3.2 Classification of Mixtures When Data Are Not Available for the Complete Mixture: Bridging Principles

A.4.3.2.1 Where the mixture itself has not been tested to determine its sensitizing properties, but there are sufficient data on both the individual ingredients and similar tested mixtures to adequately characterize the hazards of the mixture, these data will be used in accordance with the following agreed bridging principles as found in paragraph A.0.5 of this Appendix: Dilution, Batching, Concentration of mixtures, Interpolation, Substantially similar mixtures, and Aerosols.

A.4.3.3 Classification of Mixtures When Data Are Available for All Ingredients or Only for Some Ingredients of the Mixture

The mixture shall be classified as a respiratory or skin sensitizer when at least one ingredient has been classified as a respiratory or skin sensitizer and is present at or above the appropriate cut-off value/concentration limit for the specific endpoint as shown in Table A.4.5.

Table A.4.5—Cut-Off Values/Concentration Limits of Ingredients of a Mixture Classified as Either Respiratory Sensitizers or Skin Sensitizers That Would Trigger Classification of the Mixture

	Cut-off values/concentration limits triggering classification of a mixture as:		
	Respiratory Sensitizer Category 1		Skin Sensitizer Category 1
Ingredient classified as:	**Solid/liquid**	**Gas**	**All physical states**
Respiratory Sensitizer, Category 1	≥0.1%	≥0.1%	
Respiratory Sensitizer, Sub-category 1A	≥0.1%	≥0.1%	
Respiratory Sensitizer, Sub-category 1B	≥1.0%	≥0.2%	
Skin Sensitizer, Category 1			≥0.1%
Skin Sensitizer, Sub-category 1A			≥0.1%
Skin Sensitizer, Sub-category 1B			≥1.0%

A.5 GERM CELL MUTAGENICITY

A.5.1 Definitions and General Considerations

A.5.1.1 A *mutation* is defined as a permanent change in the amount or structure of the genetic material in a cell. The term *mutation* applies both to heritable genetic changes that may be manifested at the phenotypic level and to the underlying DNA modifications when known (including, for example, specific base pair changes and chromosomal translocations). The term *mutagenic* and *mutagen* will be used for agents giving rise to an increased occurrence of mutations in populations of cells and/or organisms.

A.5.1.2 The more general terms *genotoxic* and *genotoxicity* apply to agents or processes which alter the structure, information content, or segregation of DNA, including those which cause DNA damage by interfering with normal replication processes, or which in a non-physiological manner (temporarily) alter its replication. Genotoxicity test results are usually taken as indicators for mutagenic effects.

A.5.1.3 This hazard class is primarily concerned with chemicals that may cause mutations in the germ cells of humans that can be transmitted to the progeny. However, mutagenicity/genotoxicity tests *in vitro* and in mammalian somatic cells *in vivo* are also considered in classifying substances and mixtures within this hazard class.

A.5.2 Classification Criteria for Substances

A.5.2.1 The classification system provides for two different categories of germ cell mutagens to accommodate the weight of evidence available. The two-category system is described in the Figure A.5.1.

Figure A.5.1—Hazard Categories for Germ Cell Mutagens

CATEGORY 1: Substances known to induce heritable mutations or to be regarded as if they induce heritable mutations in the germ cells of humans.
Category 1A: Substances known to induce heritable mutations in germ cells of humans.
Positive evidence from human epidemiological studies.
Category 1B: Substances which should be regarded as if they induce heritable mutations in the germ cells of humans.
(a) Positive result(s) from *in vivo* heritable germ cell mutagenicity tests in mammals; or
(b) Positive result(s) from *in vivo* somatic cell mutagenicity tests in mammals, in combination with some evidence that the substance has potential to cause mutations to germ cells. This supporting evidence may, for example, be derived from mutagenicity/genotoxicity tests in germ cells *in vivo,* or by demonstrating the ability of the substance or its metabolite(s) to interact with the genetic material of germ cells; or
(c) Positive results from tests showing mutagenic effects in the germ cells of humans, without demonstration of transmission to progeny; for example, an increase in the frequency of aneuploidy in sperm cells of exposed people.
CATEGORY 2: Substances which cause concern for humans owing to the possibility that they may induce heritable mutations in the germ cells of humans.
Positive evidence obtained from experiments in mammals and/or in some cases from *in vitro* experiments, obtained from:
(a) Somatic cell mutagenicity tests *in vivo,* in mammals; or
(b) Other *in vivo* somatic cell genotoxicity tests which are supported by positive results from *in vitro* mutagenicity assays.
Note: *Substances which are positive in in vitro mammalian mutagenicity assays, and which also show chemical structure activity*

relationship to known germ cell mutagens, should be considered for classification as Category 2 mutagens.

A.5.2.2 Specific considerations for classification of substances as germ cell mutagens:

A.5.2.2.1 To arrive at a classification, test results are considered from experiments determining mutagenic and/or genotoxic effects in germ and/or somatic cells of exposed animals. Mutagenic and/or genotoxic effects determined in *in vitro* tests shall also be considered.

A.5.2.2.2 The system is hazard based, classifying chemicals on the basis of their intrinsic ability to induce mutations in germ cells. The scheme is, therefore, not meant for the (quantitative) risk assessment of chemical substances.

A.5.2.2.3 Classification for heritable effects in human germ cells is made on the basis of scientifically validated tests. Evaluation of the test results shall be done using expert judgment and all the available evidence shall be weighed for classification.

A.5.2.2.4 The classification of substances shall be based on the total weight of evidence available, using expert judgment. In those instances where a single well-conducted test is used for classification, it shall provide clear and unambiguously positive results. The relevance of the route of exposure used in the study of the substance compared to the route of human exposure should also be taken into account.

A.5.3 Classification Criteria for Mixtures[5]

[5]*It should be noted that the classification criteria for health hazards usually include a tiered scheme in which test data available on the complete mixture are considered as the first tier in the evaluation, followed by the applicable bridging principles, and lastly, cut-off values/concentration limits or additivity. However, this approach is not used for Germ Cell Mutagenicity. These criteria for Germ Cell Mutagenicity consider the cut-off values/concentration limits as the primary tier and allow the classification to be modified only on a case-by-case evaluation based on available test data for the mixture as a whole.*

A.5.3.1 Classification of Mixtures When Data Are Available for All Ingredients or Only for Some Ingredients of the Mixture

A.5.3.1.1 Classification of mixtures shall be based on the available test data for the individual ingredients of the mixture using cut-off values/concentration limits for the ingredients classified as germ cell mutagens.

A.5.3.1.2 The mixture will be classified as a mutagen when at least one ingredient has been classified as a Category 1A, Category 1B or Category 2 mutagen and is present at or above the appropriate cut-off value/concentration limit as shown in Table A.5.1 below for Category 1 and 2 respectively.

Table A.5.1—Cut-Off Values/Concentration Limits of Ingredients of a Mixture Classified as Germ Cell Mutagens That Would Trigger Classification of the Mixture

	Cut-off/concentration limits triggering classification of a mixture as:	
Ingredient classified as:	**Category 1 mutagen**	**Category 2 mutagen**
Category 1A/B mutagen	≥0.1%	
Category 2 mutagen		≥1.0%

Note: *The cut-off values/concentration limits in the table above apply to solids and liquids (w/w units) as well as gases (v/v units).*

A.5.3.2 Classification of Mixtures When Data Are Available for the Mixture Itself

The classification may be modified on a case-by-case basis based on the available test data for the mixture as a whole. In such cases, the test results for the mixture as a whole must be shown to be conclusive taking into account dose and other factors such as duration, observations and analysis (e.g. statistical analysis, test sensitivity) of germ cell mutagenicity test systems.

A.5.3.3 Classification of Mixtures When Data Are Not Available for the Complete Mixture: Bridging Principles

A.5.3.3.1 Where the mixture itself has not been tested to determine its germ cell mutagenicity hazard, but there are sufficient data on both the individual ingredients and similar tested mixtures to adequately characterize the hazards of the mixture, these data will be used in accordance with the following bridging principles as found in paragraph A.0.5 of this Appendix: Dilution, Batching, and Substantially similar mixtures.

A.5.4 Examples of Scientifically Validated Test Methods

A.5.4.1 Examples of *in vivo* heritable germ cell mutagenicity tests are:

(a) Rodent dominant lethal mutation test (OECD 478)

(b) Mouse heritable translocation assay (OECD 485)

(c) Mouse specific locus test

A.5.4.2 Examples of *in vivo* somatic cell mutagenicity tests are:

(a) Mammalian bone marrow chromosome aberration test (OECD 475)

(b) Mouse spot test (OECD 484)

(c) Mammalian erythrocyte micronucleus test (OECD 474)

A.5.4.3 Examples of mutagenicity/genotoxicity tests in germ cells are:

(a) Mutagenicity tests:

(i) Mammalian spermatogonial chromosome aberration test (OECD 483)

(ii) Spermatid micronucleus assay

(b) Genotoxicity tests:

(i) Sister chromatid exchange analysis in spermatogonia

(ii) Unscheduled DNA synthesis test (UDS) in testicular cells

A.5.4.4 Examples of genotoxicity tests in somatic cells are:

(a) Liver Unscheduled DNA Synthesis (UDS) *in vivo* (OECD 486)

(b) Mammalian bone marrow Sister Chromatid Exchanges (SCE)

A.5.4.5 Examples of *in vitro* mutagenicity tests are:

(a) *In vitro* mammalian chromosome aberration test (OECD 473)

(b) *In vitro* mammalian cell gene mutation test (OECD 476)

(c) Bacterial reverse mutation tests (OECD 471)

A.5.4.6 As new, scientifically validated tests arise, these may also be used in the total weight of evidence to be considered.

A.6 CARCINOGENICITY

A.6.1 DEFINITIONS

Carcinogen means a substance or a mixture of substances which induce cancer or increase its incidence. Substances and mixtures which have induced benign and malignant tumors in well-performed experimental studies on animals are considered also to be presumed or suspected human carcinogens unless there is strong evidence that the mechanism of tumor formation is not relevant for humans.

Classification of a substance or mixture as posing a carcinogenic hazard is based on its inherent properties and does not provide information on the level of the human cancer risk which the use of the substance or mixture may represent.

A.6.2 CLASSIFICATION CRITERIA FOR SUBSTANCES[6]

[6]*See Non-mandatory Appendix F Part A for further guidance regarding hazard classification for carcinogenicity. This appendix is consistent with the GHS adn is provided as guidance excerpted from the International Agency for Research on Cancer (IARC) "Monographs on the Evaluation of Carcinogenic Risks to Humans" (2006).*

A.6.2.1 For the purpose of classification for carcinogenicity, substances are allocated to one of two categories based on strength of evidence and additional weight of evidence considerations. In certain instances, route-specific classification may be warranted.

FIGURE A.6.1—HAZARD CATEGORIES FOR CARCINOGENS

CATEGORY 1: Known or presumed human carcinogens.
The classification of a substance as a Category 1 carcinogen is done on the basis of epidemiological and/or animal data. This classification is further distinguished on the basis of whether the evidence for classification is largely from human data (Category 1A) or from animal data (Category 1B):

Category 1A: Known to have carcinogenic potential for humans. Classification in this category is largely based on human evidence.
Category 1B: Presumed to have carcinogenic potential for humans. Classification in this category is largely based on animal evidence.
The classification of a substance in Category 1A and 1B is based on strength of evidence together with weight of evidence considerations (See paragraph A.6.2.5). Such evidence may be derived from:
—human studies that establish a causal relationship between human exposure to a substance and the development of cancer (known human carcinogen); or
—animal experiments for which there is sufficient evidence to demonstrate animal carcinogenicity (presumed human carcinogen).
In addition, on a case by case basis, scientific judgment may warrant a decision of presumed human carcinogenicity derived from studies showing limited evidence of carcinogenicity in humans together with limited evidence of carcinogenicity in experimental animals.
CATEGORY 2: Suspected human carcinogens.
The classification of a substance in Category 2 is done on the basis of evidence obtained from human and/or animal studies, but which is not sufficiently convincing to place the substance in Category 1A or B. This classification is based on strength of evidence together with weight of evidence considerations (See paragraph A.6.2.5). Such evidence may be from either limited evidence of carcinogenicity in human studies or from limited evidence of carcinogenicity in animal studies.
Other considerations: Where the weight of evidence for the carcinogenicity of a substance does not meet the above criteria, any positive study conducted in accordance with established scientific principles, and which reports statistically significant findings regarding the carcinogenic potential of the substance, must be noted on the safety data sheet.

A.6.2.2 Classification as a carcinogen is made on the basis of evidence from reliable and acceptable methods, and is intended to be used for substances which have an intrinsic property to produce such toxic effects. The evaluations are to be based on all existing data, peer-reviewed published studies and additional data accepted by regulatory agencies.

A.6.2.3 *Carcinogen classification* is a one-step, criterion-based process that involves two interrelated determinations: evaluations of strength of evidence and consideration of all other relevant information to place substances with human cancer potential into hazard categories.

A.6.2.4 *Strength of evidence* involves the enumeration of tumors in human and animal studies and determination of their level of statistical significance. Sufficient human evidence demonstrates causality between human exposure and the development of cancer, whereas sufficient evidence in animals shows a causal relationship between the agent and an increased incidence of tumors. Limited evidence in humans is demonstrated by a positive association between exposure and cancer, but a causal relationship cannot be stated. Limited evidence in animals is provided when data suggest a carcinogenic effect, but are less than sufficient. (Guidance on consideration of important factors in the classification of carcinogenicity and a more detailed description of the terms “limited” and “sufficient” have been developed by the International Agency for Research on Cancer (IARC) and are provided in non-mandatory Appendix F).

A.6.2.5 *Weight of evidence:* Beyond the determination of the strength of evidence for carcinogenicity, a number of other factors should be considered that influence the overall likelihood that an agent may pose a carcinogenic hazard in humans. The full list of factors that influence this determination is very lengthy, but some of the important ones are considered here.

A.6.2.5.1 These factors can be viewed as either increasing or decreasing the level of concern for human carcinogenicity. The relative emphasis accorded to each factor depends upon the amount and coherence of evidence bearing on each. Generally there is a requirement for more complete information to decrease than to increase the level of concern. Additional considerations should be used in evaluating the tumor findings and the other factors in a case-by-case manner.

A.6.2.5.2 Some important factors which may be taken into consideration, when assessing the overall level of concern are:

(a) Tumor type and background incidence;

(b) Multisite responses;

(c) Progression of lesions to malignancy;

(d) Reduced tumor latency;

Additional factors which may increase or decrease the level of concern include:

(e) Whether responses are in single or both sexes;

(f) Whether responses are in a single species or several species;

(g) Structural similarity or not to a substance(s) for which there is good evidence of carcinogenicity;

(h) Routes of exposure;

(i) Comparison of absorption, distribution, metabolism and excretion between test animals and humans;

(j) The possibility of a confounding effect of excessive toxicity at test doses; and,

(k) Mode of action and its relevance for humans, such as mutagenicity, cytotoxicity with growth stimulation, mitogenesis, immunosuppression.

Mutagenicity: It is recognized that genetic events are central in the overall process of cancer development. Therefore evidence of mutagenic activity *in vivo* may indicate that a substance has a potential for carcinogenic effects.

A.6.2.5.3 A substance that has not been tested for carcinogenicity may in certain instances be classified in Category 1A, Category 1B, or Category 2 based on tumor data from a structural analogue together with substantial support from consideration of other important factors such as formation of common significant metabolites, e.g., for benzidine congener dyes.

A.6.2.5.4 The classification should also take into consideration whether or not the substance is absorbed by a given route(s); or whether there are only local tumors at the site of administration for the tested route(s), and adequate testing by other major route (s) show lack of carcinogenicity.

A.6.2.5.5 It is important that whatever is known of the physico-chemical, toxicokinetic and toxicodynamic properties of the substances, as well as any available relevant information on chemical analogues, i.e., structure activity relationship, is taken into consideration when undertaking classification.

A.6.3 Classification Criteria for Mixtures[7]

[7]*It should be noted that the classification criteria for health hazards usually include a tiered scheme in which test data available on the complete mixture are considered as the first tier in the evaluation, followed by the applicable bridging principles, and lastly, cut-off values/concentration limit or additivity. However, this approach is not used for Carcinogenicity. These criteria for Carcinogenicity consider the cut-off values/concentration limits as the primary tier and allow the classification to be modified only on a case-by-case evaluation based on available test data for the mixture as a whole.*

A.6.3.1 The mixture shall be classified as a carcinogen when at least one ingredient has been classified as a Category 1 or Category 2 carcinogen and is present at or above the appropriate cut-off value/concentration limit as shown in Table A.6.1.

TABLE A.6.1—CUT-OFF VALUES/CONCENTRATION LIMITS OF INGREDIENTS OF A MIXTURE CLASSIFIED AS CARCINOGEN THAT WOULD TRIGGER CLASSIFICATION OF THE MIXTURE

Ingredient classified as:	Category 1 carcinogen	Category 2 carcinogen
Category 1 carcinogen	≥0.1%	
Category 2 carcinogen		≥0.1% (note 1).

Note: *If a Category 2 carcinogen ingredient is present in the mixture at a concentration between 0.1% and 1%, information is required on the SDS for a product. However, a label warning is optional. If a Category 2 carcinogen ingredient is present in the mixture at a concentration of ≥1%, both an SDS and a label is required and the information must be included on each.*

A.6.3.2 Classification of Mixtures When Data Are Available for the Complete Mixture

A mixture may be classified based on the available test data for the mixture as a whole. In such cases, the test results for the mixture as a whole must be shown to be conclusive taking into account dose and other factors such as duration, observations and analysis (e.g., statistical analysis, test sensitivity) of carcinogenicity test systems.

A.6.3.3 Classification of Mixtures When Data Are Not Available for the Complete Mixture: Bridging Principles

Where the mixture itself has not been tested to determine its carcinogenic hazard, but there are sufficient data on both the individual ingredients and similar tested mixtures to adequately characterize the hazards of the mixture, these data will be used in accordance with the following bridging principles as found in paragraph A.0.5 of this Appendix: Dilution; Batching; and Substantially similar mixtures.

A.6.4 Classification of Carcinogenicity[8]

[8]*See Non-mandatory Appendix F for further guidance regarding hazard classification for carcinogenicity and how to relate carcinogenicity classification information from IARC and NTP to GHS.*

A.6.4.1 Chemical manufacturers, importers and employers evaluating chemicals may treat the following sources as establishing that a substance is a carcinogen or potential carcinogen for hazard communication purposes in lieu of applying the criteria described herein:

A.6.4.1.1 National Toxicology Program (NTP), “Report on Carcinogens” (latest edition);

A.6.4.1.2 International Agency for Research on Cancer (IARC) “Monographs on the Evaluation of Carcinogenic Risks to Humans” (latest editions)

A.6.4.2 Where OSHA has included cancer as a health hazard to be considered by classifiers for a chemical covered by 29 CFR part 1910, Subpart Z, Toxic and Hazardous Substances, chemical manufacturers, importers, and employers shall classify the

chemical as a carcinogen.

A.7 REPRODUCTIVE TOXICITY

A.7.1 DEFINITIONS AND GENERAL CONSIDERATIONS

A.7.1.1 *Reproductive toxicity* includes *adverse effects on sexual function and fertility* in adult males and females, as well as *adverse effects on development of the offspring.* Some reproductive toxic effects cannot be clearly assigned to either impairment of sexual function and fertility or to developmental toxicity. Nonetheless, chemicals with these effects shall be classified as reproductive toxicants.

For classification purposes, the known induction of genetically based inheritable effects in the offspring is addressed in *Germ cell mutagenicity* (See A.5).

A.7.1.2 *Adverse effects on sexual function and fertility* means any effect of chemicals that interferes with reproductive ability or sexual capacity. This includes, but is not limited to, alterations to the female and male reproductive system, adverse effects on onset of puberty, gamete production and transport, reproductive cycle normality, sexual behaviour, fertility, parturition, pregnancy outcomes, premature reproductive senescence, or modifications in other functions that are dependent on the integrity of the reproductive systems.

A.7.1.3 *Adverse effects on development of the offspring* means any effect of chemicals which interferes with normal development of the conceptus either before or after birth, which is induced during pregnancy or results from parental exposure. These effects can be manifested at any point in the life span of the organism. The major manifestations of developmental toxicity include death of the developing organism, structural abnormality, altered growth and functional deficiency.

A.7.1.4 Adverse effects on or via lactation are also included in reproductive toxicity, but for classification purposes, such effects are treated separately (See A.7.2.1).

A.7.2 CLASSIFICATION CRITERIA FOR SUBSTANCES

A.7.2.1 For the purpose of classification for reproductive toxicity, substances shall be classified in one of two categories in accordance with Figure A.7.1(a). Effects on sexual function and fertility, and on development, shall be considered. In addition, effects on or via lactation shall be classified in a separate hazard category in accordance with Figure A.7.1(b).

FIGURE A.7.1(a)—HAZARD CATEGORIES FOR REPRODUCTIVE TOXICANTS

CATEGORY 1: Known or presumed human reproductive toxicant.
Substance shall be classified in Category 1 for reproductive toxicity when they are known to have produced an adverse effect on sexual function and fertility or on development in humans or when there is evidence from animal studies, possibly supplemented with other information, to provide a strong presumption that the substance has the capacity to interfere with reproduction in humans. The classification of a substance is further distinguished on the basis of whether the evidence for classification is primarily from human data (Category 1A) or from animal data (Category 1B).
Category 1A: Known human reproductive toxicant.
The classification of a substance in this category is largely based on evidence from humans.
Category 1B: Presumed human reproductive toxicant.
The classification of a substance in this category is largely based on evidence from experimental animals. Data from animal studies shall provide sufficient evidence of an adverse effect on sexual function and fertility or on development in the absence of other toxic effects, or if occurring together with other toxic effects the adverse effect on reproduction is considered not to be a secondary non-specific consequence of other toxic effects. However, when there is mechanistic information that raises doubt about the relevance of the effect for humans, classification in Category 2 may be more appropriate.
CATEGORY 2: Suspected human reproductive toxicant.
Substances shall be classified in Category 2 for reproductive toxicity when there is some evidence from humans or experimental animals, possibly supplemented with other information, of an adverse effect on sexual function and fertility, or on development, in the absence of other toxic effects, or if occurring together with other toxic effects the adverse effect on reproduction is considered not to be a secondary non-specific consequence of the other toxic effects, and where the evidence is not sufficiently convincing to place the substance in Category 1. For instance, deficiencies in the study may make the quality of evidence less convincing, and in view of this, Category 2 would be the more appropriate classification.

FIGURE A.7.1(b)—HAZARD CATEGORY FOR EFFECTS ON OR VIA LACTATION

EFFECTS ON OR VIA LACTATION
Effects on or via lactation shall be classified in a separate single category. Chemicals that are absorbed by women and have been shown to interfere with lactation or that may be present (including metabolites) in breast milk in amounts sufficient to cause concern for the health of a breastfed child, shall be classified to indicate this property hazardous to breastfed babies. This classification shall be assigned on the basis of:
(a) absorption, metabolism, distribution and excretion studies that indicate the likelihood the substance would be present in potentially toxic levels in breast milk; and/or
(b) results of one or two generation studies in animals which provide clear evidence of adverse effect in the offspring due to transfer in the milk or adverse effect on the quality of the milk; and/or
(c) human evidence indicating a hazard to babies during the lactation period.

A.7.2.2 BASIS OF CLASSIFICATION

A.7.2.2.1 Classification is made on the basis of the criteria, outlined above, an assessment of the total weight of evidence, and the use of expert judgment. Classification as a reproductive toxicant is intended to be used for substances which have an intrinsic, specific property to produce an adverse effect on reproduction and substances should not be so classified if such an effect is produced solely as a non-specific secondary consequence of other toxic effects.

A.7.2.2.2 In the evaluation of toxic effects on the developing offspring, it is important to consider the possible influence of maternal toxicity.

A.7.2.2.3 For human evidence to provide the primary basis for a Category 1A classification there must be reliable evidence of an adverse effect on reproduction in humans. Evidence used for classification shall be from well conducted epidemiological studies, if available, which include the use of appropriate controls, balanced assessment, and due consideration of bias or confounding factors. Less rigorous data from studies in humans may be sufficient for a Category 1A classification if supplemented with adequate data from studies in experimental animals, but classification in Category 1B may also be considered.

A.7.2.3 WEIGHT OF EVIDENCE

A.7.2.3.1 Classification as a reproductive toxicant is made on the basis of an assessment of the total weight of evidence using expert judgment. This means that all available information that bears on the determination of reproductive toxicity is considered together. Included is information such as epidemiological studies and case reports in humans and specific reproduction studies along with sub-chronic, chronic and special study results in animals that provide relevant information regarding toxicity to reproductive and related endocrine organs. Evaluation of substances chemically related to the material under study may also be included, particularly when information on the material is scarce. The weight given to the available evidence will be influenced by factors such as the quality of the studies, consistency of results, nature and severity of effects, level of statistical significance for intergroup differences, number of endpoints affected, relevance of route of administration to humans and freedom from bias. Both positive and negative results are considered together in a weight of evidence determination. However, a single, positive study performed according to good scientific principles and with statistically or biologically significant positive results may justify classification (See also A.7.2.2.3).

A.7.2.3.2 Toxicokinetic studies in animals and humans, site of action and mechanism or mode of action study results may provide relevant information, which could reduce or increase concerns about the hazard to human health. If it is conclusively demonstrated that the clearly identified mechanism or mode of action has no relevance for humans or when the toxicokinetic differences are so marked that it is certain that the hazardous property will not be expressed in humans then a chemical which produces an adverse effect on reproduction in experimental animals should not be classified.

A.7.2.3.3 In some reproductive toxicity studies in experimental animals the only effects recorded may be considered of low or minimal toxicological significance and classification may not necessarily be the outcome. These effects include, for example, small changes in semen parameters or in the incidence of spontaneous defects in the fetus, small changes in the proportions of common fetal variants such as are observed in skeletal examinations, or in fetal weights, or small differences in postnatal developmental assessments.

A.7.2.3.4 Data from animal studies shall provide sufficient evidence of specific reproductive toxicity in the absence of other systemic toxic effects. However, if developmental toxicity occurs together with other toxic effects in the dam (mother), the potential influence of the generalized adverse effects should be assessed to the extent possible. The preferred approach is to consider adverse effects in the embryo/fetus first, and then evaluate maternal toxicity, along with any other factors which are likely to have influenced these effects, as part of the weight of evidence. In general, developmental effects that are observed at maternally toxic doses should not be automatically discounted. Discounting developmental effects that are observed at maternally toxic doses can only be done on a case-by-case basis when a causal relationship is established or refuted.

A.7.2.3.5 If appropriate information is available it is important to try to determine whether developmental toxicity is due to a specific maternally mediated mechanism or to a non-specific secondary mechanism, like maternal stress and the disruption of homeostasis. Generally, the presence of maternal toxicity should not be used to negate findings of embryo/fetal effects, unless it can be clearly demonstrated that the effects are secondary non-specific effects. This is especially the case when the effects in the offspring are significant, e.g., irreversible effects such as structural malformations. In some situations it is reasonable to assume that reproductive toxicity is due to a secondary consequence of maternal toxicity and discount the effects, for example if the chemical is so toxic that dams fail to thrive and there is severe inanition; they are incapable of nursing pups; or they are prostrate or dying.

A.7.2.4 MATERNAL TOXICITY

A.7.2.4.1 Development of the offspring throughout gestation and during the early postnatal stages can be influenced by toxic effects in the mother either through non-specific mechanisms related to stress and the disruption of maternal homeostasis, or by specific maternally-mediated mechanisms. So, in the interpretation of the developmental outcome to decide classification for developmental effects it is important to consider the possible influence of maternal toxicity. This is a complex issue because of uncertainties surrounding the relationship between maternal toxicity and developmental outcome. Expert judgment and a weight of evidence approach, using all available studies, shall be used to determine the degree of influence to be attributed to maternal toxicity when interpreting the criteria for classification for developmental effects. The adverse effects in the embryo/fetus shall be first considered, and then maternal toxicity, along with any other factors which are likely to have influenced these effects, as weight of evidence, to help reach a conclusion about classification.

A.7.2.4.2 Based on pragmatic observation, it is believed that maternal toxicity may, depending on severity, influence development via non-specific secondary mechanisms, producing effects such as depressed fetal weight, retarded ossification, and

possibly resorptions and certain malformations in some strains of certain species. However, the limited numbers of studies which have investigated the relationship between developmental effects and general maternal toxicity have failed to demonstrate a consistent, reproducible relationship across species. Developmental effects which occur even in the presence of maternal toxicity are considered to be evidence of developmental toxicity, unless it can be unequivocally demonstrated on a case by case basis that the developmental effects are secondary to maternal toxicity. Moreover, classification shall be considered where there is a significant toxic effect in the offspring, e.g., irreversible effects such as structural malformations, embryo/fetal lethality, or significant post-natal functional deficiencies.

A.7.2.4.3 Classification shall not automatically be discounted for chemicals that produce developmental toxicity only in association with maternal toxicity, even if a specific maternally-mediated mechanism has been demonstrated. In such a case, classification in Category 2 may be considered more appropriate than Category 1. However, when a chemical is so toxic that maternal death or severe inanition results, or the dams (mothers) are prostrate and incapable of nursing the pups, it is reasonable to assume that developmental toxicity is produced solely as a secondary consequence of maternal toxicity and discount the developmental effects. Classification is not necessarily the outcome in the case of minor developmental changes, e.g., a small reduction in fetal/pup body weight or retardation of ossification when seen in association with maternal toxicity.

A.7.2.4.4 Some of the endpoints used to assess maternal toxicity are provided below. Data on these endpoints, if available, shall be evaluated in light of their statistical or biological significance and dose-response relationship.

(a) Maternal mortality: An increased incidence of mortality among the treated dams over the controls shall be considered evidence of maternal toxicity if the increase occurs in a dose-related manner and can be attributed to the systemic toxicity of the test material. Maternal mortality greater than 10% is considered excessive and the data for that dose level shall not normally be considered to need further evaluation.

(b) Mating index (Number of animals with seminal plugs or sperm/Number of mated × 100)

(c) Fertility index (Number of animals with implants/Number of matings × 100)

(d) Gestation length (If allowed to deliver)

(e) Body weight and body weight change: Consideration of the maternal body weight change and/or adjusted (corrected) maternal body weight shall be included in the evaluation of maternal toxicity whenever such data are available. The calculation of an adjusted (corrected) mean maternal body weight change, which is the difference between the initial and terminal body weight minus the gravid uterine weight (or alternatively, the sum of the weights of the fetuses), may indicate whether the effect is maternal or intrauterine. In rabbits, the body weight gain may not be a useful indicator of maternal toxicity because of normal fluctuations in body weight during pregnancy.

(f) Food and water consumption (if relevant): The observation of a significant decrease in the average food or water consumption in treated dams (mothers) compared to the control group may be useful in evaluating maternal toxicity, particularly when the test material is administered in the diet or drinking water. Changes in food or water consumption must be evaluated in conjunction with maternal body weights when determining if the effects noted are reflective of maternal toxicity or more simply, unpalatability of the test material in feed or water.

(g) Clinical evaluations (including clinical signs, markers, and hematology and clinical chemistry studies): The observation of increased incidence of significant clinical signs of toxicity in treated dams (mothers) relative to the control group is useful in evaluating maternal toxicity. If this is to be used as the basis for the assessment of maternal toxicity, the types, incidence, degree and duration of clinical signs shall be reported in the study. Clinical signs of maternal intoxication include, but are not limited to: coma, prostration, hyperactivity, loss of righting reflex, ataxia, or labored breathing.

(h) Post-mortem data: Increased incidence and/or severity of post-mortem findings may be indicative of maternal toxicity. This can include gross or microscopic pathological findings or organ weight data, including absolute organ weight, organ-to-body weight ratio, or organ-to-brain weight ratio. When supported by findings of adverse histopathological effects in the affected organ(s), the observation of a significant change in the average weight of suspected target organ(s) of treated dams (mothers), compared to those in the control group, may be considered evidence of maternal toxicity.

A.7.2.5 Animal and Experimental Data

A.7.2.5.1 A number of scientifically validated test methods are available, including methods for developmental toxicity testing (e.g., OECD Test Guideline 414, ICH Guideline S5A, 1993), methods for peri- and post-natal toxicity testing (e.g., ICH S5B, 1995), and methods for one or two-generation toxicity testing (e.g., OECD Test Guidelines 415, 416)

A.7.2.5.2 Results obtained from screening tests (e.g., OECD Guidelines 421—Reproduction/Developmental Toxicity Screening Test, and 422—Combined Repeated Dose Toxicity Study with Reproduction/Development Toxicity Screening Test) can also be used to justify classification, although the quality of this evidence is less reliable than that obtained through full studies.

A.7.2.5.3 Adverse effects or changes, seen in short- or long-term repeated dose toxicity studies, which are judged likely to impair reproductive function and which occur in the absence of significant generalized toxicity, may be used as a basis for classification, e.g., histopathological changes in the gonads.

A.7.2.5.4 Evidence from *in vitro* assays, or non-mammalian tests, and from analogous substances using structure-activity

relationship (SAR), can contribute to the procedure for classification. In all cases of this nature, expert judgment must be used to assess the adequacy of the data. Inadequate data shall not be used as a primary support for classification.

A.7.2.5.5 It is preferable that animal studies are conducted using appropriate routes of administration which relate to the potential route of human exposure. However, in practice, reproductive toxicity studies are commonly conducted using the oral route, and such studies will normally be suitable for evaluating the hazardous properties of the substance with respect to reproductive toxicity. However, if it can be conclusively demonstrated that the clearly identified mechanism or mode of action has no relevance for humans or when the toxicokinetic differences are so marked that it is certain that the hazardous property will not be expressed in humans then a substance which produces an adverse effect on reproduction in experimental animals should not be classified.

A.7.2.5.6 Studies involving routes of administration such as intravenous or intraperitoneal injection, which may result in exposure of the reproductive organs to unrealistically high levels of the test substance, or elicit local damage to the reproductive organs, e.g., by irritation, must be interpreted with extreme caution and on their own are not normally the basis for classification.

A.7.2.5.7 There is general agreement about the concept of a limit dose, above which the production of an adverse effect may be considered to be outside the criteria which lead to classification. Some test guidelines specify a limit dose, other test guidelines qualify the limit dose with a statement that higher doses may be necessary if anticipated human exposure is sufficiently high that an adequate margin of exposure would not be achieved. Also, due to species differences in toxicokinetics, establishing a specific limit dose may not be adequate for situations where humans are more sensitive than the animal model.

A.7.2.5.8 In principle, adverse effects on reproduction seen only at very high dose levels in animal studies (for example doses that induce prostration, severe inappetence, excessive mortality) do not normally lead to classification, unless other information is available, for example, toxicokinetics information indicating that humans may be more susceptible than animals, to suggest that classification is appropriate.

A.7.2.5.9 However, specification of the actual “limit dose” will depend upon the test method that has been employed to provide the test results.

A.7.3 Classification Criteria for Mixtures[9]

[9]*It should be noted that the classification criteria for health hazards usually include a tiered scheme in which test data available on the complete mixture are considered as the first tier in the evaluation, followed by the applicable bridging principles, and lastly, cut-off values/concentration limits or additivity. However, this approach is not used for Reproductive Toxicity. These criteria for Reproductive Toxicity consider the cut-off values/concentration limits as the primary tier and allow the classification to be modified only on a case-by-case evaluation based on available test data for the mixture as a whole.*

A.7.3.1 Classification of Mixtures When Data Are Available for All Ingredients or Only for Some Ingredients of the Mixture

A.7.3.1.1 The mixture shall be classified as a reproductive toxicant when at least one ingredient has been classified as a Category 1 or Category 2 reproductive toxicant and is present at or above the appropriate cut-off value/concentration limit specified in Table A.7.1 for Category 1 and 2, respectively.

A.7.3.1.2 The mixture shall be classified for effects on or via lactation when at least one ingredient has been classified for effects on or via lactation and is present at or above the appropriate cut-off value/concentration limit specified in Table A.7.1 for the additional category for effects on or via lactation.

Table A.7.1—Cut-Off Values/Concentration Limits of Ingredients of a Mixture Classified as Reproductive Toxicants or for Effects on or via Lactation That Trigger Classification of the Mixture

	Cut-off values/concentration limits triggering classification of a mixture as:		
Ingredients classified as:	**Category 1 reproductive toxicant**	**Category 2 reproductive toxicant**	**Additional category for effects on or via lactation**
Category 1 reproductive toxicant	≥0.1%		
Category 2 reproductive toxicant		≥0.1%	
Additional category for effects on or via lactation			≥0.1%

A.7.3.2 Classification of Mixtures When Data Are Available for the Complete Mixture

Available test data for the mixture as a whole may be used for classification on a case-by-case basis. In such cases, the test results for the mixture as a whole must be shown to be conclusive taking into account dose and other factors such as duration, observations and analysis (e.g., statistical analysis, test sensitivity) of reproduction test systems.

A.7.3.3 Classification of Mixtures When Data Are Not Available for the Complete Mixture: Bridging Principles

A.7.3.3.1 Where the mixture itself has not been tested to determine its reproductive toxicity, but there are sufficient data on both the individual ingredients and similar tested mixtures to adequately characterize the hazards of the mixture, these data shall be

used in accordance with the following bridging principles as found in paragraph A.0.5 of this Appendix: Dilution, Batching, and Substantially similar mixtures.

A.8 SPECIFIC TARGET ORGAN TOXICITY SINGLE EXPOSURE

A.8.1 DEFINITIONS AND GENERAL CONSIDERATIONS

A.8.1.1 *Specific target organ toxicity—single exposure, (STOT-SE)* means specific, non-lethal target organ toxicity arising from a single exposure to a chemical. All significant health effects that can impair function, both reversible and irreversible, immediate and/or delayed and not specifically addressed in A.1 to A.7 and A.10 of this Appendix are included. Specific target organ toxicity following repeated exposure is classified in accordance with *SPECIFIC TARGET ORGAN TOXICITY—REPEATED EXPOSURE* (A.9 of this Appendix) and is therefore not included here.

A.8.1.2 Classification identifies the chemical as being a specific target organ toxicant and, as such, it presents a potential for adverse health effects in people who are exposed to it.

A.8.1.3 The adverse health effects produced by a single exposure include consistent and identifiable toxic effects in humans; or, in experimental animals, toxicologically significant changes which have affected the function or morphology of a tissue/organ, or have produced serious changes to the biochemistry or hematology of the organism, and these changes are relevant for human health. Human data is the primary source of evidence for this hazard class.

A.8.1.4 Assessment shall take into consideration not only significant changes in a single organ or biological system but also generalized changes of a less severe nature involving several organs.

A.8.1.5 Specific target organ toxicity can occur by any route that is relevant for humans, i.e., principally oral, dermal or inhalation.

A.8.1.6 The classification criteria for specific organ systemic toxicity single exposure are organized as criteria for substances Categories 1 and 2 (See A.8.2.1), criteria for substances Category 3 (See A.8.2.2) and criteria for mixtures (See A.8.3). See also Figure A.8.1.

A.8.2 CLASSIFICATION CRITERIA FOR SUBSTANCES

A.8.2.1 SUBSTANCES OF CATEGORY 1 AND CATEGORY 2

A.8.2.1.1 Substances shall be classified for immediate or delayed effects separately, by the use of expert judgment on the basis of the weight of all evidence available, including the use of recommended guidance values (See A.8.2.1.9). Substances shall then be classified in Category 1 or 2, depending upon the nature and severity of the effect(s) observed, in accordance with Figure A.8.1.

FIGURE A.8.1—HAZARD CATEGORIES FOR SPECIFIC TARGET ORGAN TOXICITY FOLLOWING SINGLE EXPOSURE

CATEGORY 1: Substances that have produced significant toxicity in humans, or that, on the basis of evidence from studies in experimental animals can be presumed to have the potential to produce significant toxicity in humans following single exposure Substances are classified in Category 1 for STOT-SE on the basis of: (a) reliable and good quality evidence from human cases or epidemiological studies; or (b) observations from appropriate studies in experimental animals in which significant and/or severe toxic effects of relevance to human health were produced at generally low exposure concentrations. Guidance dose/concentration values are provided below (See A.8.2.1.9) to be used as part of weight-of-evidence evaluation.
CATEGORY 2: Substances that, on the basis of evidence from studies in experimental animals, can be presumed to have the potential to be harmful to human health following single exposure Substances are classified in Category 2 for STOT-SE on the basis of observations from appropriate studies in experimental animals in which significant toxic effects, of relevance to human health, were produced at generally moderate exposure concentrations. Guidance dose/concentration values are provided below (See A.8.2.1.9) in order to help in classification. In exceptional cases, human evidence can also be used to place a substance in Category 2 (See A.8.2.1.6).
CATEGORY 3: Transient target organ effects There are target organ effects for which a substance does not meet the criteria to be classified in Categories 1 or 2 indicated above. These are effects which adversely alter human function for a short duration after exposure and from which humans may recover in a reasonable period without leaving significant alteration of structure or function. This category only includes narcotic effects and respiratory tract irritation. Substances are classified specifically for these effects as discussed in A.8.2.2.
Note: The primary target organ/system shall be identified where possible, and where this is not possible, the substance shall be identified as a general toxicant. The data shall be evaluated and, where possible, shall not include secondary effects (e.g., a hepatotoxicant can produce secondary effects in the nervous or gastro-intestinal systems).

A.8.2.1.2 The relevant route(s) of exposure by which the classified substance produces damage shall be identified.

A.8.2.1.3 Classification is determined by expert judgment, on the basis of the weight of all evidence available including the guidance presented below.

A.8.2.1.4 Weight of evidence of all available data, including human incidents, epidemiology, and studies conducted in experimental animals is used to substantiate specific target organ toxic effects that merit classification.

A.8.2.1.5 The information required to evaluate specific target organ toxicity comes either from single exposure in humans (e.g., exposure at home, in the workplace or environmentally), or from studies conducted in experimental animals. The standard animal studies in rats or mice that provide this information are acute toxicity studies which can include clinical observations and detailed macroscopic and microscopic examination to enable the toxic effects on target tissues/organs to be identified. Results of acute toxicity studies conducted in other species may also provide relevant information.

A.8.2.1.6 In exceptional cases, based on expert judgment, it may be appropriate to place certain substances with human evidence of target organ toxicity in Category 2: (a) when the weight of human evidence is not sufficiently convincing to warrant Category 1 classification, and/or (b) based on the nature and severity of effects. Dose/concentration levels in humans shall not be considered in the classification and any available evidence from animal studies shall be consistent with the Category 2 classification. In other words, if there are also animal data available on the substance that warrant Category 1 classification, the chemical shall be classified as Category 1.

A.8.2.1.7 Effects considered to support classification for Category 1 and 2

A.8.2.1.7.1 Classification is supported by evidence associating single exposure to the substance with a consistent and identifiable toxic effect.

A.8.2.1.7.2 Evidence from human experience/incidents is usually restricted to reports of adverse health consequences, often with uncertainty about exposure conditions, and may not provide the scientific detail that can be obtained from well-conducted studies in experimental animals.

A.8.2.1.7.3 Evidence from appropriate studies in experimental animals can furnish much more detail, in the form of clinical observations, and macroscopic and microscopic pathological examination and this can often reveal hazards that may not be life-threatening but could indicate functional impairment. Consequently all available evidence, and evidence relevance to human health, must be taken into consideration in the classification process. Relevant toxic effects in humans and/or animals include, but are not limited to:

(a) Morbidity resulting from single exposure;

(b) Significant functional changes, more than transient in nature, in the respiratory system, central or peripheral nervous systems, other organs or other organ systems, including signs of central nervous system depression and effects on special senses (e.g., sight, hearing and sense of smell);

(c) Any consistent and significant adverse change in clinical biochemistry, hematology, or urinalysis parameters;

(d) Significant organ damage that may be noted at necropsy and/or subsequently seen or confirmed at microscopic examination;

(e) Multi-focal or diffuse necrosis, fibrosis or granuloma formation in vital organs with regenerative capacity;

(f) Morphological changes that are potentially reversible but provide clear evidence of marked organ dysfunction; and,

(g) Evidence of appreciable cell death (including cell degeneration and reduced cell number) in vital organs incapable of regeneration.

A.8.2.1.8 Effects considered not to support classification for Category 1 and 2

Effects may be seen in humans and/or animals that do not justify classification. Such effects include, but are not limited to:

(a) Clinical observations or small changes in bodyweight gain, food consumption or water intake that may have some toxicological importance but that do not, by themselves, indicate “significant” toxicity;

(b) Small changes in clinical biochemistry, hematology or urinalysis parameters and/or transient effects, when such changes or effects are of doubtful or of minimal toxicological importance;

(c) Changes in organ weights with no evidence of organ dysfunction;

(d) Adaptive responses that are not considered toxicologically relevant; and,

(e) Substance-induced species-specific mechanisms of toxicity, i.e., demonstrated with reasonable certainty to be not relevant for human health, shall not justify classification.

A.8.2.1.9 Guidance values to assist with classification based on the results obtained from studies conducted in experimental animals for Category 1 and 2

A.8.2.1.9.1 In order to help reach a decision about whether a substance shall be classified or not, and to what degree it shall be classified (Category 1 vs. Category 2), dose/concentration “guidance values” are provided for consideration of the dose/concentration which has been shown to produce significant health effects. The principal argument for proposing such guidance values is that all chemicals are potentially toxic and there has to be a reasonable dose/concentration above which a degree of toxic

effect is acknowledged.

A.8.2.1.9.2 Thus, in animal studies, when significant toxic effects are observed that indicate classification, consideration of the dose/concentration at which these effects were seen, in relation to the suggested guidance values, provides useful information to help assess the need to classify (since the toxic effects are a consequence of the hazardous property(ies) and also the dose/concentration).

A.8.2.1.9.3 The guidance value (C) ranges for single-dose exposure which has produced a significant non-lethal toxic effect are those applicable to acute toxicity testing, as indicated in Table A.8.1.

TABLE A.8.1—GUIDANCE VALUE RANGES FOR SINGLE-DOSE EXPOSURES

Route of exposure	Units	Guidance value ranges for:		
		Category 1	Category 2	Category 3
Oral (rat)	mg/kg body weight	C ≤300	2000 ≥C >300	Guidance values do not apply.
Dermal (rat or rabbit)	mg/kg body weight	C ≤1,000	2000 ≥C >1,000	
Inhalation (rat) gas	ppmV/4h	C ≤2,500	20,000 ≥C >2,500	
Inhalation (rat) vapor	mg/1/4h	C ≤10	20 ≥C >10	
Inhalation (rat) dust/mist/fume	mg/l/4h	C ≤1.0	5.0 ≥C >1.0	

A.8.2.1.9.4 The guidance values and ranges mentioned in Table A.8.1 are intended only for guidance purposes, i.e., to be used as part of the weight of evidence approach, and to assist with decisions about classification. They are not intended as strict demarcation values. Guidance values are not provided for Category 3 since this classification is primarily based on human data; animal data may be included in the weight of evidence evaluation.

A.8.2.1.9.5 Thus, it is feasible that a specific profile of toxicity occurs at a dose/concentration below the guidance value, e.g., <2000 mg/kg body weight by the oral route, however the nature of the effect may result in the decision not to classify. Conversely, a specific profile of toxicity may be seen in animal studies occurring at above a guidance value, e.g., ≥2000 mg/kg body weight by the oral route, and in addition there is supplementary information from other sources, e.g., other single dose studies, or human case experience, which supports a conclusion that, in view of the weight of evidence, classification is the prudent action to take.

A.8.2.1.10 Other considerations

A.8.2.1.10.1 When a substance is characterized only by use of animal data the classification process includes reference to dose/concentration guidance values as one of the elements that contribute to the weight of evidence approach.

A.8.2.1.10.2 When well-substantiated human data are available showing a specific target organ toxic effect that can be reliably attributed to single exposure to a substance, the substance shall be classified. Positive human data, regardless of probable dose, predominates over animal data. Thus, if a substance is unclassified because specific target organ toxicity observed was considered not relevant or significant to humans, if subsequent human incident data become available showing a specific target organ toxic effect, the substance shall be classified.

A.8.2.1.10.3 A substance that has not been tested for specific target organ toxicity shall, where appropriate, be classified on the basis of data from a scientifically validated structure activity relationship and expert judgment-based extrapolation from a structural analogue that has previously been classified together with substantial support from consideration of other important factors such as formation of common significant metabolites.

A.8.2.2 SUBSTANCES OF CATEGORY 3

A.8.2.2.1 Criteria for respiratory tract irritation

The criteria for classifying substances as Category 3 for respiratory tract irritation are:

(a) Respiratory irritant effects (characterized by localized redness, edema, pruritis and/or pain) that impair function with symptoms such as cough, pain, choking, and breathing difficulties are included. It is recognized that this evaluation is based primarily on human data;

(b) Subjective human observations supported by objective measurements of clear respiratory tract irritation (RTI) (e.g., electrophysiological responses, biomarkers of inflammation in nasal or bronchoalveolar lavage fluids);

(c) The symptoms observed in humans shall also be typical of those that would be produced in the exposed population rather than being an isolated idiosyncratic reaction or response triggered only in individuals with hypersensitive airways. Ambiguous reports simply of “irritation” should be excluded as this term is commonly used to describe a wide range of sensations including those such as smell, unpleasant taste, a tickling sensation, and dryness, which are outside the scope of classification for respiratory tract irritation;

(d) There are currently no scientifically validated animal tests that deal specifically with RTI; however, useful information may be obtained from the single and repeated inhalation toxicity tests. For example, animal studies may provide useful information in terms

of clinical signs of toxicity (dyspnoea, rhinitis etc) and histopathology (e.g., hyperemia, edema, minimal inflammation, thickened mucous layer) which are reversible and may be reflective of the characteristic clinical symptoms described above. Such animal studies can be used as part of weight of evidence evaluation; and,

(e) This special classification will occur only when more severe organ effects including the respiratory system are not observed as those effects would require a higher classification.

A.8.2.2.2 Criteria for narcotic effects

The criteria for classifying substances in Category 3 for narcotic effects are:

(a) Central nervous system depression including narcotic effects in humans such as drowsiness, narcosis, reduced alertness, loss of reflexes, lack of coordination, and vertigo are included. These effects can also be manifested as severe headache or nausea, and can lead to reduced judgment, dizziness, irritability, fatigue, impaired memory function, deficits in perception and coordination, reaction time, or sleepiness; and,

(b) Narcotic effects observed in animal studies may include lethargy, lack of coordination righting reflex, narcosis, and ataxia. If these effects are not transient in nature, then they shall be considered for classification as Category 1 or 2.

A.8.3 Classification Criteria for Mixtures

A.8.3.1 Mixtures are classified using the same criteria as for substances, or alternatively as described below. As with substances, mixtures may be classified for specific target organ toxicity following single exposure, repeated exposure, or both.

A.8.3.2 Classification of Mixtures When Data Are Available for the Complete Mixture

When reliable and good quality evidence from human experience or appropriate studies in experimental animals, as described in the criteria for substances, is available for the mixture, then the mixture shall be classified by weight of evidence evaluation of this data. Care shall be exercised in evaluating data on mixtures, that the dose, duration, observation or analysis, do not render the results inconclusive.

A.8.3.3 Classification of Mixtures When Data Are Not Available for the Complete Mixture: Bridging Principles

A.8.3.3.1 Where the mixture itself has not been tested to determine its specific target organ toxicity, but there are sufficient data on both the individual ingredients and similar tested mixtures to adequately characterize the hazards of the mixture, these data shall be used in accordance with the following bridging principles as found in paragraph A.0.5 of this Appendix: Dilution, Batching, Concentration of mixtures, Interpolation within one toxicity category, Substantially similar mixtures, or Aerosols.

A.8.3.4 Classification of Mixtures When Data Are Available for All Ingredients or Only for Some Ingredients of the Mixture

A.8.3.4.1 Where there is no reliable evidence or test data for the specific mixture itself, and the bridging principles cannot be used to enable classification, then classification of the mixture is based on the classification of the ingredient substances. In this case, the mixture shall be classified as a specific target organ toxicant (specific organ specified), following single exposure, repeated exposure, or both when at least one ingredient has been classified as a Category 1 or Category 2 specific target organ toxicant and is present at or above the appropriate cut-off value/concentration limit specified in Table A.8.2 for Categories 1 and 2, respectively.

Table A.8.2—Cut-Off Values/Concentration Limits of Ingredients of a Mixture Classified as a Specific Target Organ Toxicant That Would Trigger Classification of the Mixture as Category 1 or 2

	Cut-off values/concentration limits triggering classification of a mixture as:	
Ingredient classified as:	**Category 1**	**Category 2**
Category 1 Target organ toxicant	≥1.0%	
Category 2 Target organ toxicant		≥1.0%

A.8.3.4.2 These cut-off values and consequent classifications shall be applied equally and appropriately to both single- and repeated-dose target organ toxicants.

A.8.3.4.3 Mixtures shall be classified for either or both single and repeated dose toxicity independently.

A.8.3.4.4 Care shall be exercised when toxicants affecting more than one organ system are combined that the potentiation or synergistic interactions are considered, because certain substances can cause target organ toxicity at <1% concentration when other ingredients in the mixture are known to potentiate its toxic effect.

A.8.3.4.5 Care shall be exercised when extrapolating the toxicity of a mixture that contains Category 3 ingredient(s). A cut-off value/concentration limit of 20%, considered as an additive of all Category 3 ingredients for each hazard endpoint, is appropriate; however, this cut-off value/concentration limit may be higher or lower depending on the Category 3 ingredient(s) involved and the

fact that some effects such as respiratory tract irritation may not occur below a certain concentration while other effects such as narcotic effects may occur below this 20% value. Expert judgment shall be exercised. Respiratory tract irritation and narcotic effects are to be evaluated separately in accordance with the criteria given in A.8.2.2. When conducting classifications for these hazards, the contribution of each ingredient should be considered additive, unless there is evidence that the effects are not additive.

A.9 SPECIFIC TARGET ORGAN TOXICITY REPEATED OR PROLONGED EXPOSURE

A.9.1 DEFINITIONS AND GENERAL CONSIDERATIONS

A.9.1.1 *Specific target organ toxicity—repeated exposure (STOT-RE)* means specific target organ toxicity arising from repeated exposure to a substance or mixture. All significant health effects that can impair function, both reversible and irreversible, immediate and/or delayed and not specifically addressed in A.1 to A.7 and A.10 of this Appendix are included. Specific target organ toxicity following a single-event exposure is classified in accordance with *SPECIFIC TARGET ORGAN TOXICITY—SINGLE EXPOSURE* (A.8 of this Appendix) and is therefore not included here.

A.9.1.2 Classification identifies the substance or mixture as being a specific target organ toxicant and, as such, it may present a potential for adverse health effects in people who are exposed to it.

A.9.1.3 These adverse health effects produced by repeated exposure include consistent and identifiable toxic effects in humans, or, in experimental animals, toxicologically significant changes which have affected the function or morphology of a tissue/organ, or have produced serious changes to the biochemistry or hematology of the organism and these changes are relevant for human health. Human data will be the primary source of evidence for this hazard class.

A.9.1.4 Assessment shall take into consideration not only significant changes in a single organ or biological system but also generalized changes of a less severe nature involving several organs.

A.9.1.5 Specific target organ toxicity can occur by any route that is relevant for humans, e.g., principally oral, dermal or inhalation.

A.9.2 CLASSIFICATION CRITERIA FOR SUBSTANCES

A.9.2.1 Substances shall be classified as STOT-RE by expert judgment on the basis of the weight of all evidence available, including the use of recommended guidance values which take into account the duration of exposure and the dose/concentration which produced the effect(s), (See A.9.2.9). Substances shall be placed in one of two categories, depending upon the nature and severity of the effect(s) observed, in accordance with Figure A.9.1.

FIGURE A.9.1—HAZARD CATEGORIES FOR SPECIFIC TARGET ORGAN TOXICITY FOLLOWING REPEATED EXPOSURE

CATEGORY 1: Substances that have produced significant toxicity in humans, or that, on the basis of evidence from studies in experimental animals can be presumed to have the potential to produce significant toxicity in humans following repeated or prolonged exposure
Substances are classified in Category 1 for specific target organ toxicity (repeated exposure) on the basis of:
(a) reliable and good quality evidence from human cases or epidemiological studies; or,
(b) observations from appropriate studies in experimental animals in which significant and/or severe toxic effects, of relevance to human health, were produced at generally low exposure concentrations. Guidance dose/concentration values are provided below (See A.9.2.9) to be used as part of weight-of-evidence evaluation.
CATEGORY 2: Substances that, on the basis of evidence from studies in experimental animals can be presumed to have the potential to be harmful to human health following repeated or prolonged exposure
Substances are classified in Category 2 for specific target organ toxicity (repeated exposure) on the basis of observations from appropriate studies in experimental animals in which significant toxic effects, of relevance to human health, were produced at generally moderate exposure concentrations. Guidance dose/concentration values are provided below (See A.9.2.9) in order to help in classification.
In exceptional cases human evidence can also be used to place a substance in Category 2 (See A.9.2.6).
Note: The primary target organ/system shall be identified where possible, or the substance shall be identified as a general toxicant. The data shall be carefully evaluated and, where possible, shall not include secondary effects (e.g., a hepatotoxicant can produce secondary effects in the nervous or gastro-intestinal systems).

A.9.2.2 The relevant route of exposure by which the classified substance produces damage shall be identified.

A.9.2.3 Classification is determined by expert judgment, on the basis of the weight of all evidence available including the guidance presented below.

A.9.2.4 Weight of evidence of all data, including human incidents, epidemiology, and studies conducted in experimental animals, is used to substantiate specific target organ toxic effects that merit classification.

A.9.2.5 The information required to evaluate specific target organ toxicity comes either from repeated exposure in humans, e.g., exposure at home, in the workplace or environmentally, or from studies conducted in experimental animals. The standard animal studies in rats or mice that provide this information are 28 day, 90 day or lifetime studies (up to 2 years) that include hematological, clinico-chemical and detailed macroscopic and microscopic examination to enable the toxic effects on target tissues/organs to be identified. Data from repeat dose studies performed in other species may also be used. Other long-term exposure studies, e.g., for carcinogenicity, neurotoxicity or reproductive toxicity, may also provide evidence of specific target organ

toxicity that could be used in the assessment of classification.

A.9.2.6 In exceptional cases, based on expert judgment, it may be appropriate to place certain substances with human evidence of specific target organ toxicity in Category 2: (a) when the weight of human evidence is not sufficiently convincing to warrant Category 1 classification, and/or (b) based on the nature and severity of effects. Dose/concentration levels in humans shall not be considered in the classification and any available evidence from animal studies shall be consistent with the Category 2 classification. In other words, if there are also animal data available on the substance that warrant Category 1 classification, the substance shall be classified as Category 1.

A.9.2.7 Effects Considered To Support Classification

A.9.2.7.1 Classification is supported by reliable evidence associating repeated exposure to the substance with a consistent and identifiable toxic effect.

A.9.2.7.2 Evidence from human experience/incidents is usually restricted to reports of adverse health consequences, often with uncertainty about exposure conditions, and may not provide the scientific detail that can be obtained from well-conducted studies in experimental animals.

A.9.2.7.3 Evidence from appropriate studies in experimental animals can furnish much more detail, in the form of clinical observations, hematology, clinical chemistry, macroscopic and microscopic pathological examination and this can often reveal hazards that may not be life-threatening but could indicate functional impairment. Consequently all available evidence, and relevance to human health, must be taken into consideration in the classification process. Relevant toxic effects in humans and/or animals include, but are not limited to:

(a) Morbidity or death resulting from repeated or long-term exposure. Morbidity or death may result from repeated exposure, even to relatively low doses/concentrations, due to bioaccumulation of the substance or its metabolites, or due to the overwhelming of the de-toxification process by repeated exposure;

(b) Significant functional changes in the central or peripheral nervous systems or other organ systems, including signs of central nervous system depression and effects on special senses (e.g., sight, hearing and sense of smell);

(c) Any consistent and significant adverse change in clinical biochemistry, hematology, or urinalysis parameters;

(d) Significant organ damage that may be noted at necropsy and/or subsequently seen or confirmed at microscopic examination;

(e) Multi-focal or diffuse necrosis, fibrosis or granuloma formation in vital organs with regenerative capacity;

(f) Morphological changes that are potentially reversible but provide clear evidence of marked organ dysfunction (e.g., severe fatty change in the liver); and,

(g) Evidence of appreciable cell death (including cell degeneration and reduced cell number) in vital organs incapable of regeneration.

A.9.2.8 Effects Considered Not To Support Classification

Effects may be seen in humans and/or animals that do not justify classification. Such effects include, but are not limited to:

(a) Clinical observations or small changes in bodyweight gain, food consumption or water intake that may have some toxicological importance but that do not, by themselves, indicate “significant” toxicity;

(b) Small changes in clinical biochemistry, hematology or urinalysis parameters and/or transient effects, when such changes or effects are of doubtful or of minimal toxicological importance;

(c) Changes in organ weights with no evidence of organ dysfunction;

(d) Adaptive responses that are not considered toxicologically relevant;

(e) Substance-induced species-specific mechanisms of toxicity, i.e., demonstrated with reasonable certainty to be not relevant for human health, shall not justify classification.

A.9.2.9 Guidance Values To Assist With Classification Based on the Results Obtained From Studies Conducted in Experimental Animals

A.9.2.9.1 In studies conducted in experimental animals, reliance on observation of effects alone, without reference to the duration of experimental exposure and dose/concentration, omits a fundamental concept of toxicology, i.e., all substances are potentially toxic, and what determines the toxicity is a function of the dose/concentration and the duration of exposure. In most studies conducted in experimental animals the test guidelines use an upper limit dose value.

A.9.2.9.2 In order to help reach a decision about whether a substance shall be classified or not, and to what degree it shall be classified (Category 1 vs. Category 2), dose/concentration “guidance values” are provided in Table A.9.1 for consideration of the dose/concentration which has been shown to produce significant health effects. The principal argument for proposing such guidance values is that all chemicals are potentially toxic and there has to be a reasonable dose/concentration above which a degree of toxic effect is acknowledged. Also, repeated-dose studies conducted in experimental animals are designed to produce toxicity at the highest dose used in order to optimize the test objective and so most studies will reveal some toxic effect at least at this highest dose. What is therefore to be decided is not only what effects have been produced, but also at what dose/concentration they were produced and how relevant is that for humans.

A.9.2.9.3 Thus, in animal studies, when significant toxic effects are observed that indicate classification, consideration of the duration of experimental exposure and the dose/concentration at which these effects were seen, in relation to the suggested guidance values, provides useful information to help assess the need to classify (since the toxic effects are a consequence of the hazardous property(ies) and also the duration of exposure and the dose/concentration).

A.9.2.9.4 The decision to classify at all can be influenced by reference to the dose/concentration guidance values at or below which a significant toxic effect has been observed.

A.9.2.9.5 The guidance values refer to effects seen in a standard 90-day toxicity study conducted in rats. They can be used as a basis to extrapolate equivalent guidance values for toxicity studies of greater or lesser duration, using dose/exposure time extrapolation similar to Haber's rule for inhalation, which states essentially that the effective dose is directly proportional to the exposure concentration and the duration of exposure. The assessment should be done on a case-by-case basis; for example, for a 28-day study the guidance values below would be increased by a factor of three.

A.9.2.9.6 Thus for Category 1 classification, significant toxic effects observed in a 90-day repeated-dose study conducted in experimental animals and seen to occur at or below the (suggested) guidance values (C) as indicated in Table A.9.1 would justify classification:

TABLE A.9.1—GUIDANCE VALUES TO ASSIST IN CATEGORY 1 CLASSIFICATION

[Applicable to a 90-day study]

Route of exposure	Units	Guidance values (dose/concentration)
Oral (rat)	mg/kg body weight/day	C ≤10.
Dermal (rat or rabbit)	mg/kg body weight/day	C ≤20.
Inhalation (rat) gas	ppmV/6h/day	C ≤50.
Inhalation (rat) vapor	mg/liter/6h/day	C ≤0.2.
Inhalation (rat) dust/mist/fume	mg/liter/6h/day	C ≤0.02.

A.9.2.9.7 For Category 2 classification, significant toxic effects observed in a 90-day repeated-dose study conducted in experimental animals and seen to occur within the (suggested) guidance value ranges as indicated in Table A.9.2 would justify classification:

TABLE A.9.2—GUIDANCE VALUES TO ASSIST IN CATEGORY 2 CLASSIFICATION

[Applicable to a 90-day study]

Route of exposure	Units	Guidance values (dose/concentration)
Oral (rat)	mg/kg body weight/day	10 <C ≤100.
Dermal (rat or rabbit)	mg/kg body weight/day	20 <C ≤200.
Inhalation (rat) gas	ppmV/6h/day	50 <C ≤250.
Inhalation (rat) vapor	mg/liter/6h/day	0.2 <C ≤1.0.
Inhalation (rat) dust/mist/fume	mg/liter/6h/day	0.02 <C ≤0.2.

A.9.2.9.8 The guidance values and ranges mentioned in A.2.9.9.6 and A.2.9.9.7 are intended only for guidance purposes, i.e., to be used as part of the weight of evidence approach, and to assist with decisions about classification. They are not intended as strict demarcation values.

A.9.2.9.9 Thus, it is possible that a specific profile of toxicity occurs in repeat-dose animal studies at a dose/concentration below the guidance value, e.g., <100 mg/kg body weight/day by the oral route, however the nature of the effect, e.g., nephrotoxicity seen only in male rats of a particular strain known to be susceptible to this effect, may result in the decision not to classify. Conversely, a specific profile of toxicity may be seen in animal studies occurring at above a guidance value, e.g., ≥100 mg/kg body weight/day by the oral route, and in addition there is supplementary information from other sources, e.g., other long-term administration studies, or human case experience, which supports a conclusion that, in view of the weight of evidence, classification is prudent.

A.9.2.10 OTHER CONSIDERATIONS

A.9.2.10.1 When a substance is characterized only by use of animal data the classification process includes reference to dose/concentration guidance values as one of the elements that contribute to the weight of evidence approach.

A.9.2.10.2 When well-substantiated human data are available showing a specific target organ toxic effect that can be reliably attributed to repeated or prolonged exposure to a substance, the substance shall be classified. Positive human data, regardless of probable dose, predominates over animal data. Thus, if a substance is unclassified because no specific target organ toxicity was seen at or below the dose/concentration guidance value for animal testing, if subsequent human incident data become available showing a specific target organ toxic effect, the substance shall be classified.

A.9.2.10.3 A substance that has not been tested for specific target organ toxicity may in certain instances, where appropriate, be classified on the basis of data from a scientifically validated structure activity relationship and expert judgment-based extrapolation from a structural analogue that has previously been classified together with substantial support from consideration of other important factors such as formation of common significant metabolites.

A.9.3 Classification Criteria for Mixtures

A.9.3.1 Mixtures are classified using the same criteria as for substances, or alternatively as described below. As with substances, mixtures may be classified for specific target organ toxicity following single exposure, repeated exposure, or both.

A.9.3.2 Classification of Mixtures When Data Are Available for the Complete Mixture

When reliable and good quality evidence from human experience or appropriate studies in experimental animals, as described in the criteria for substances, is available for the mixture, then the mixture shall be classified by weight of evidence evaluation of these data. Care shall be exercised in evaluating data on mixtures, that the dose, duration, observation or analysis, do not render the results inconclusive.

A.9.3.3 Classification of Mixtures When Data Are Not Available for the Complete Mixture: Bridging Principles

A.9.3.3.1 Where the mixture itself has not been tested to determine its specific target organ toxicity, but there are sufficient data on both the individual ingredients and similar tested mixtures to adequately characterize the hazards of the mixture, these data shall be used in accordance with the following bridging principles as found in paragraph A.0.5 of this Appendix: Dilution; Batching; Concentration of mixtures; Interpolation within one toxicity category; Substantially similar mixtures; and Aerosols.

A.9.3.4 Classification of Mixtures When Data Are Available for All Ingredients or Only for Some Ingredients of the Mixture

A.9.3.4.1 Where there is no reliable evidence or test data for the specific mixture itself, and the bridging principles cannot be used to enable classification, then classification of the mixture is based on the classification of the ingredient substances. In this case, the mixture shall be classified as a specific target organ toxicant (specific organ specified), following single exposure, repeated exposure, or both when at least one ingredient has been classified as a Category 1 or Category 2 specific target organ toxicant and is present at or above the appropriate cut-off value/concentration limit specified in Table A.9.3 for Category 1 and 2 respectively.

Table A.9.3—Cut-Off Value/Concentration Limits of Ingredients of a Mixture Classified as a Specific Target Organ Toxicant That Would Trigger Classification of the Mixture as Category 1 or 2

	Cut-off values/concentration limits triggering classification of a mixture as:	
Ingredient classified as:	**Category 1**	**Category 2**
Category 1 Target organ toxicant	≥1.0%	
Category 2 Target organ toxicant		≥1.0%

A.9.3.4.2 These cut-off values and consequent classifications shall be applied equally and appropriately to both single- and repeated-dose target organ toxicants.

A.9.3.4.3 Mixtures shall be classified for either or both single- and repeated-dose toxicity independently.

A.9.3.4.4 Care shall be exercised when toxicants affecting more than one organ system are combined that the potentiation or synergistic interactions are considered, because certain substances can cause specific target organ toxicity at <1% concentration when other ingredients in the mixture are known to potentiate its toxic effect.

A.10 ASPIRATION HAZARD

A.10.1 Definitions and General and Specific Considerations

A.10.1.1 *Aspiration* means the entry of a liquid or solid chemical directly through the oral or nasal cavity, or indirectly from vomiting, into the trachea and lower respiratory system.

A.10.1.2 Aspiration toxicity includes severe acute effects such as chemical pneumonia, varying degrees of pulmonary injury or death following aspiration.

A.10.1.3 Aspiration is initiated at the moment of inspiration, in the time required to take one breath, as the causative material lodges at the crossroad of the upper respiratory and digestive tracts in the laryngopharyngeal region.

A.10.1.4 Aspiration of a substance or mixture can occur as it is vomited following ingestion. This may have consequences for labeling, particularly where, due to acute toxicity, a recommendation may be considered to induce vomiting after ingestion. However, if the substance/mixture also presents an aspiration toxicity hazard, the recommendation to induce vomiting may need to be modified.

A.10.1.5 Specific Considerations

A.10.1.5.1 The classification criteria refer to kinematic viscosity. The following provides the conversion between dynamic and kinematic viscosity:

$$\frac{\text{Dynamic viscosity (mPa·s)}}{\text{Density (g/cm}^3\text{)}} = \text{Kinematic viscosity (mm}^2\text{/s)}$$

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A.10.1.5.2 Although the definition of aspiration in A.10.1.1 includes the entry of solids into the respiratory system, classification according to (b) in table A.10.1 for Category 1 is intended to apply to liquid substances and mixtures only.

A.10.1.5.3 Classification of aerosol/mist products.

Aerosol and mist products are usually dispensed in containers such as self-pressurized containers, trigger and pump sprayers. Classification for these products shall be considered if their use may form a pool of product in the mouth, which then may be aspirated. If the mist or aerosol from a pressurized container is fine, a pool may not be formed. On the other hand, if a pressurized container dispenses product in a stream, a pool may be formed that may then be aspirated. Usually, the mist produced by trigger and pump sprayers is coarse and therefore, a pool may be formed that then may be aspirated. When the pump mechanism may be removed and contents are available to be swallowed then the classification of the products should be considered.

A.10.2 Classification Criteria for Substances

Table A.10.1—Criteria for Aspiration Toxicity

Category	Criteria
Category 1: Chemicals known to cause human aspiration toxicity hazards or to be regarded as if they cause human aspiration toxicity hazard	A substance shall be classified in Category 1: (a) If reliable and good quality human evidence indicates that it causes aspiration toxicity (See note); or (b) If it is a hydrocarbon and has a kinematic viscosity ≤20.5 mm^2/s, measured at 40 °C.

Note: Examples of substances included in Category 1 are certain hydrocarbons, turpentine and pine oil.

A.10.3 Classification Criteria for Mixtures

A.10.3.1 Classification When Data Are Available for the Complete Mixture

A mixture shall be classified in Category 1 based on reliable and good quality human evidence.

A.10.3.2 Classification of Mixtures When Data Are Not Available for the Complete Mixture: Bridging Principles

A.10.3.2.1 Where the mixture itself has not been tested to determine its aspiration toxicity, but there are sufficient data on both the individual ingredients and similar tested mixtures to adequately characterize the hazard of the mixture, these data shall be used in accordance with the following bridging principles as found in paragraph A.0.5 of this Appendix: Dilution; Batching; Concentration of mixtures; Interpolation within one toxicity category; and Substantially similar mixtures. For application of the dilution bridging principle, the concentration of aspiration toxicants shall not be less than 10%.

A.10.3.3 Classification of Mixtures When Data Are Available for All Ingredients or Only for Some Ingredients of the Mixture

A.10.3.3.1 A mixture which contains ≥10% of an ingredient or ingredients classified in Category 1, and has a kinematic viscosity ≤20.5 mm^2/s, measured at 40 °C, shall be classified in Category 1.

A.10.3.3.2 In the case of a mixture which separates into two or more distinct layers, one of which contains ≥10% of an ingredient or ingredients classified in Category 1 and has a kinematic viscosity ≤20.5 mm^2/s, measured at 40 °C, then the entire mixture shall be classified in Category 1.

APPENDIX B TO §1910.1200—PHYSICAL CRITERIA (MANDATORY)

B.1 EXPLOSIVES

B.1.1 DEFINITIONS AND GENERAL CONSIDERATIONS

B.1.1.1 An *explosive chemical* is a solid or liquid chemical which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. Pyrotechnic chemicals are included even when they do not evolve gases.

A *pyrotechnic chemical* is a chemical designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as the result of non-detonative self-sustaining exothermic chemical reactions.

An *explosive item* is an item containing one or more explosive chemicals.

A *pyrotechnic item* is an item containing one or more pyrotechnic chemicals.

An *unstable explosive* is an explosive which is thermally unstable and/or too sensitive for normal handling, transport, or use.

An *intentional explosive* is a chemical or item which is manufactured with a view to produce a practical explosive or pyrotechnic effect.

B.1.1.2 The class of explosives comprises:

(a) Explosive chemicals;

(b) Explosive items, except devices containing explosive chemicals in such quantity or of such a character that their inadvertent or accidental ignition or initiation shall not cause any effect external to the device either by projection, fire, smoke, heat or loud noise; and

(c) Chemicals and items not included under (a) and (b) above which are manufactured with the view to producing a practical explosive or pyrotechnic effect.

B.1.2 CLASSIFICATION CRITERIA

Chemicals and items of this class shall be classified as unstable explosives or shall be assigned to one of the following six divisions depending on the type of hazard they present:

(a) Division 1.1—Chemicals and items which have a mass explosion hazard (a mass explosion is one which affects almost the entire quantity present virtually instantaneously);

(b) Division 1.2—Chemicals and items which have a projection hazard but not a mass explosion hazard;

(c) Division 1.3—Chemicals and items which have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard:

(i) Combustion of which gives rise to considerable radiant heat; or

(ii) Which burn one after another, producing minor blast or projection effects or both;

(d) Division 1.4—Chemicals and items which present no significant hazard: chemicals and items which present only a small hazard in the event of ignition or initiation. The effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire shall not cause virtually instantaneous explosion of almost the entire contents of the package;

(e) Division 1.5—Very insensitive chemicals which have a mass explosion hazard: chemicals which have a mass explosion hazard but are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions;

(f) Division 1.6—Extremely insensitive items which do not have a mass explosion hazard: items which contain only extremely insensitive detonating chemicals and which demonstrate a negligible probability of accidental initiation or propagation.

B.1.3 ADDITIONAL CLASSIFICATION CONSIDERATIONS

B.1.3.1 Explosives shall be classified as unstable explosives or shall be assigned to one of the six divisions identified in B.1.2 in accordance with the three step procedure in Part I of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6). The first step is to ascertain whether the substance or mixture has explosive effects (Test Series 1). The second step is the acceptance procedure (Test Series 2 to 4) and the third step is the assignment to a hazard division (Test Series 5 to 7). The assessment whether a candidate for “ammonium nitrate emulsion or suspension or gel, intermediate for blasting explosives (ANE)” is insensitive enough for

inclusion as an oxidizing liquid (See B.13) or an oxidizing solid (See B.14) is determined by Test Series 8 tests.

NOTE: Classification of solid chemicals shall be based on tests performed on the chemical as presented. If, for example, for the purposes of supply or transport, the same chemical is to be presented in a physical form different from that which was tested and which is considered likely to materially alter its performance in a classification test, classification must be based on testing of the chemical in the new form.

B.1.3.2 Explosive properties are associated with the presence of certain chemical groups in a molecule which can react to produce very rapid increases in temperature or pressure. The screening procedure in B.1.3.1 is aimed at identifying the presence of such reactive groups and the potential for rapid energy release. If the screening procedure identifies the chemical as a potential explosive, the acceptance procedure (See section 10.3 of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6)) is necessary for classification.

NOTE: Neither a Series 1 type (a) propagation of detonation test nor a Series 2 type (a) test of sensitivity to detonative shock is necessary if the exothermic decomposition energy of organic materials is less than 800 J/g.

B.1.3.3 If a mixture contains any known explosives, the acceptance procedure is necessary for classification.

B.1.3.4 A chemical is not classified as explosive if:

(a) There are no chemical groups associated with explosive properties present in the molecule. Examples of groups which may indicate explosive properties are given in Table A6.1 in Appendix 6 of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6); or

(b) The substance contains chemical groups associated with explosive properties which include oxygen and the calculated oxygen balance is less than −200.

The oxygen balance is calculated for the chemical reaction:

$C_xH_yO_z + [x + (y/4) - (z/2)]\ O_2 \rightarrow x.\ CO_2 + (y/2)\ H_2O$

using the formula:

oxygen balance = $-1600\ [2x + (y/2) - z]$/molecular weight;

or

(c) The organic substance or a homogenous mixture of organic substances contains chemical groups associated with explosive properties but the exothermic decomposition energy is less than 500 J/g and the onset of exothermic decomposition is below 500 °C (932 °F). The exothermic decomposition energy may be determined using a suitable calorimetric technique; or

(d) For mixtures of inorganic oxidizing substances with organic material(s), the concentration of the inorganic oxidizing substance is:

(i) Less than 15%, by mass, if the oxidizing substance is assigned to Category 1 or 2;

(ii) Less than 30%, by mass, if the oxidizing substance is assigned to Category 3.

B.2 FLAMMABLE GASES

B.2.1 DEFINITION

Flammable gas means a gas having a flammable range with air at 20 °C (68 °F) and a standard pressure of 101.3 kPa (14.7 psi).

B.2.2 CLASSIFICATION CRITERIA

A flammable gas shall be classified in one of the two categories for this class in accordance with Table B.2.1:

TABLE B.2.1—CRITERIA FOR FLAMMABLE GASES

Category	Criteria
1	Gases, which at 20 °C (68 °F) and a standard pressure of 101.3 kPa (14.7 psi):
	(a) are ignitable when in a mixture of 13% or less by volume in air; or
	(b) have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit.
2	Gases, other than those of Category 1, which, at 20 °C (68 °F) and a standard pressure of 101.3 kPa (14.7 psi), have a flammable range while mixed in air.

NOTE: Aerosols should not be classified as flammable gases. See B.3.

B.2.3 Additional Classification Considerations

Flammability shall be determined by tests or by calculation in accordance with ISO 10156 (incorporated by reference; See §1910.6). Where insufficient data are available to use this method, equivalent validated methods may be used.

B.3 FLAMMABLE AEROSOLS

B.3.1 Definition

Aerosol means any non-refillable receptacle containing a gas compressed, liquefied or dissolved under pressure, and fitted with a release device allowing the contents to be ejected as particles in suspension in a gas, or as a foam, paste, powder, liquid or gas.

B.3.2 Classification Criteria

B.3.2.1 Aerosols shall be considered for classification as flammable if they contain any component which is classified as flammable in accordance with this Appendix, i.e.:

Flammable liquids (See B.6);

Flammable gases (See B.2);

Flammable solids (See B.7).

NOTE 1: Flammable components do not include pyrophoric, self-heating or water-reactive chemicals.

NOTE 2: Flammable aerosols do not fall additionally within the scope of flammable gases, flammable liquids, or flammable solids.

B.3.2.2 A flammable aerosol shall be classified in one of the two categories for this class in accordance with Table B.3.1.

TABLE B.3.1—CRITERIA FOR FLAMMABLE AEROSOLS

Category	Criteria
1	Contains ≥85% flammable components and the chemical heat of combustion is ≥30 kJ/g; or (a) For spray aerosols, in the ignition distance test, ignition occurs at a distance ≥75 cm (29.5 in), or (b) For foam aerosols, in the aerosol foam flammability test (i) The flame height is ≥20 cm (7.87 in) and the flame duration ≥2 s; or (ii) The flame height is ≥4 cm (1.57 in) and the flame duration ≥7 s
2	Contains >1% flammable components, or the heat of combustion is ≥20 kJ/g; and (a) for spray aerosols, in the ignition distance test, ignition occurs at a distance ≥15 cm (5.9 in), or in the enclosed space ignition test, the (i) Time equivalent is ≤300 s/m^3; or (ii) Deflagration density is ≤300 g/m^3 (b) For foam aerosols, in the aerosol foam flammability test, the flame height is ≥4 cm and the flame duration is ≥2 s and it does not meet the criteria for Category 1

NOTE: Aerosols not submitted to the flammability classification procedures in this Appendix shall be classified as extremely flammable (Category 1).

B.3.3 Additional Classification Considerations

B.3.3.1 To classify a flammable aerosol, data on its flammable components, on its chemical heat of combustion and, if applicable, the results of the aerosol foam flammability test (for foam aerosols) and of the ignition distance test and enclosed space test (for spray aerosols) are necessary.

B.3.3.2 The chemical heat of combustion (ΔHc), in kilojoules per gram (kJ/g), is the product of the theoretical heat of combustion (ΔHcomb), and a combustion efficiency, usually less than 1.0 (a typical combustion efficiency is 0.95 or 95%).

For a composite aerosol formulation, the chemical heat of combustion is the summation of the weighted heats of combustion for the individual components, as follows:

$$\Delta Hc\ (product) = \sum_{i}^{n} [\ wi\% \times \Delta Hc(i)]$$

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Where:

ΔHc = chemical heat of combustion (kJ/g);

wi% = mass fraction of component i in the product;

ΔHc(i) = specific heat of combustion (kJ/g) of component i in the product;

The chemical heats of combustion shall be found in literature, calculated or determined by tests (See ASTM D240-02, ISO 13943, Sections 86.1 to 86.3, and NFPA 30B (incorporated by reference; See §1910.6)).

B.3.3.3 The Ignition Distance Test, Enclosed Space Ignition Test and Aerosol Foam Flammability Test shall be performed in accordance with sub-sections 31.4, 31.5 and 31.6 of the of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6).

B.4 OXIDIZING GASES

B.4.1 DEFINITION

Oxidizing gas means any gas which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does.

NOTE: "Gases which cause or contribute to the combustion of other material more than air does" means pure gases or gas mixtures with an oxidizing power greater than 23.5% (as determined by a method specified in ISO 10156 or 10156-2 (incorporated by reference, See §1910.6) or an equivalent testing method.)

B.4.2 CLASSIFICATION CRITERIA

An oxidizing gas shall be classified in a single category for this class in accordance with Table B.4.1:

TABLE B.4.1—CRITERIA FOR OXIDIZING GASES

Category	Criteria
1	Any gas which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does.

B.4.3 ADDITIONAL CLASSIFICATION CONSIDERATIONS

Classification shall be in accordance with tests or calculation methods as described in ISO 10156 (incorporated by reference; See §1910.6) and ISO 10156-2 (incorporated by reference; See §1910.6).

B.5 GASES UNDER PRESSURE

B.5.1 DEFINITION

Gases under pressure are gases which are contained in a receptacle at a pressure of 200 kPa (29 psi) (gauge) or more, or which are liquefied or liquefied and refrigerated.

They comprise compressed gases, liquefied gases, dissolved gases and refrigerated liquefied gases.

B.5.2 CLASSIFICATION CRITERIA

Gases under pressure shall be classified in one of four groups in accordance with Table B.5.1:

TABLE B.5.1—CRITERIA FOR GASES UNDER PRESSURE

Group	Criteria
Compressed gas	A gas which when under pressure is entirely gaseous at −50 °C (−8 °F), including all gases with a critical temperature[1] ≤−50 °C (−58 °F).
Liquefied gas	A gas which when under pressure is partially liquid at temperatures above −50 °C (−58 °F). A distinction is made between:
	(a) High pressure liquefied gas: A gas with a critical temperature[1] between −50 °C (−58 °F) and +65 °C (149 °F); and
	(b) Low pressure liquefied gas: A gas with a critical temperature[1] above +65 °C (149 °F).
Refrigerated liquefied gas	A gas which is made partially liquid because of its low temperature.
Dissolved gas	A gas which when under pressure is dissolved in a liquid phase solvent.

[1] *The critical temperature is the temperature above which a pure gas cannot be liquefied, regardless of the degree of compression.*

B.6 FLAMMABLE LIQUIDS

B.6.1 DEFINITION

Flammable liquid means a liquid having a flash point of not more than 93 °C (199.4 °F).

Flash point means the minimum temperature at which a liquid gives off vapor in sufficient concentration to form an ignitable mixture with air near the surface of the liquid, as determined by a method identified in Section B.6.3.

B.6.2 Classification Criteria

A flammable liquid shall be classified in one of four categories in accordance with Table B.6.1:

Table B.6.1—Criteria for Flammable Liquids

Category	Criteria
1	Flash point <23 °C (73.4 °F) and initial boiling point ≤35 °C (95 °F).
2	Flash point <23 °C (73.4 °F) and initial boiling point >35 °C (95 °F).
3	Flash point ≥23 °C (73.4 °F) and ≤60 °C (140 °F).
4	Flash point >60 °C (140 °F) and ≤93 °C (199.4 °F).

B.6.3 Additional Classification Considerations

The flash point shall be determined in accordance with ASTM D56-05, ASTM D3278, ASTM D3828, ASTM D93-08 (incorporated by reference; See §1910.6), or any other method specified in GHS Revision 3, Chapter 2.6.

The initial boiling point shall be determined in accordance with ASTM D86-07a or ASTM D1078 (incorporated by reference; See §1910.6).

B.7 FLAMMABLE SOLIDS

B.7.1 Definitions

Flammable solid means a solid which is a readily combustible solid, or which may cause or contribute to fire through friction.

Readily combustible solids are powdered, granular, or pasty chemicals which are dangerous if they can be easily ignited by brief contact with an ignition source, such as a burning match, and if the flame spreads rapidly.

B.7.2 Classification Criteria

B.7.2.1 Powdered, granular or pasty chemicals shall be classified as flammable solids when the time of burning of one or more of the test runs, performed in accordance with the test method described in the UN ST/SG/AC.10 (incorporated by reference; See §1910.6), Part III, sub-section 33.2.1, is less than 45 s or the rate of burning is more than 2.2 mm/s (0.0866 in/s).

B.7.2.2 Powders of metals or metal alloys shall be classified as flammable solids when they can be ignited and the reaction spreads over the whole length of the sample in 10 min or less.

B.7.2.3 Solids which may cause fire through friction shall be classified in this class by analogy with existing entries (e.g., matches) until definitive criteria are established.

B.7.2.4 A flammable solid shall be classified in one of the two categories for this class using Method N.1 as described in Part III, sub-section 33.2.1 of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6), in accordance with Table B.7.1:

Table B.7.1—Criteria for Flammable Solids

Category	Criteria
1	Burning rate test:
	Chemicals other than metal powders:
	(a) Wetted zone does not stop fire; and
	(b) Burning time <45 s or burning rate >2.2 mm/s.
	Metal powders: Burning time ≤5 min.
2	Burning rate test:
	Chemicals other than metal powders:
	(a) Wetted zone stops the fire for at least 4 min; and
	(b) Burning time <45 s or burning rate >2.2 mm/s.
	Metal powders: Burning time >5 min and ≤10 min.

NOTE: Classification of solid chemicals shall be based on tests performed on the chemical as presented. If, for example, for the purposes of supply or transport, the same chemical is to be presented in a physical form different from that which was tested and which is considered likely to materially alter its performance in a classification test, classification must be based on testing of the chemical in the new form.

B.8 SELF-REACTIVE CHEMICALS

B.8.1 DEFINITIONS

Self-reactive chemicals are thermally unstable liquid or solid chemicals liable to undergo a strongly exothermic decomposition even without participation of oxygen (air). This definition excludes chemicals classified under this section as explosives, organic peroxides, oxidizing liquids or oxidizing solids.

A self-reactive chemical is regarded as possessing explosive properties when in laboratory testing the formulation is liable to detonate, to deflagrate rapidly or to show a violent effect when heated under confinement.

B.8.2 CLASSIFICATION CRITERIA

B.8.2.1 A self-reactive chemical shall be considered for classification in this class unless:

(a) It is classified as an explosive according to B.1 of this appendix;

(b) It is classified as an oxidizing liquid or an oxidizing solid according to B.13 or B.14 of this appendix, except that a mixture of oxidizing substances which contains 5% or more of combustible organic substances shall be classified as a self-reactive chemical according to the procedure defined in B.8.2.2;

(c) It is classified as an organic peroxide according to B.15 of this appendix;

(d) Its heat of decomposition is less than 300 J/g; or

(e) Its self-accelerating decomposition temperature (SADT) is greater than 75 °C (167 °F) for a 50 kg (110 lb) package.

B.8.2.2 Mixtures of oxidizing substances, meeting the criteria for classification as oxidizing liquids or oxidizing solids, which contain 5% or more of combustible organic substances and which do not meet the criteria mentioned in B.8.2.1 (a), (c), (d) or (e), shall be subjected to the self-reactive chemicals classification procedure in B.8.2.3. Such a mixture showing the properties of a self-reactive chemical type B to F shall be classified as a self-reactive chemical.

B.8.2.3 Self-reactive chemicals shall be classified in one of the seven categories of “types A to G” for this class, according to the following principles:

(a) Any self-reactive chemical which can detonate or deflagrate rapidly, as packaged, will be defined as self-reactive chemical TYPE A;

(b) Any self-reactive chemical possessing explosive properties and which, as packaged, neither detonates nor deflagrates rapidly, but is liable to undergo a thermal explosion in that package will be defined as self-reactive chemical TYPE B;

(c) Any self-reactive chemical possessing explosive properties when the chemical as packaged cannot detonate or deflagrate rapidly or undergo a thermal explosion will be defined as self-reactive chemical TYPE C;

(d) Any self-reactive chemical which in laboratory testing meets the criteria in (d)(i), (ii), or (iii) will be defined as self-reactive chemical TYPE D:

(i) Detonates partially, does not deflagrate rapidly and shows no violent effect when heated under confinement; or

(ii) Does not detonate at all, deflagrates slowly and shows no violent effect when heated under confinement; or

(iii) Does not detonate or deflagrate at all and shows a medium effect when heated under confinement;

(e) Any self-reactive chemical which, in laboratory testing, neither detonates nor deflagrates at all and shows low or no effect when heated under confinement will be defined as self-reactive chemical TYPE E;

(f) Any self-reactive chemical which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows only a low or no effect when heated under confinement as well as low or no explosive power will be defined as self-reactive chemical TYPE F;

(g) Any self-reactive chemical which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows no effect when heated under confinement nor any explosive power, provided that it is thermally stable (self-accelerating decomposition temperature is 60 °C (140 °F) to 75 °C (167 °F) for a 50 kg (110 lb) package), and, for liquid mixtures, a diluent having a boiling point greater than or equal to 150 °C (302 °F) is used for desensitization will be defined as self-reactive chemical TYPE G. If the mixture is not thermally stable or a diluent having a boiling point less than 150 °C (302 °F) is used for desensitization, the mixture shall be defined as self-reactive chemical TYPE F.

B.8.3 ADDITIONAL CLASSIFICATION CONSIDERATIONS

B.8.3.1 For purposes of classification, the properties of self-reactive chemicals shall be determined in accordance with test series A to H as described in Part II of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6).

B.8.3.2 Self-accelerating decomposition temperature (SADT) shall be determined in accordance with the UN ST/SG/AC.10, Part II, section 28 (incorporated by reference; See §1910.6).

B.8.3.3 The classification procedures for self-reactive substances and mixtures need not be applied if:

(a) There are no chemical groups present in the molecule associated with explosive or self-reactive properties; examples of such groups are given in Tables A6.1 and A6.2 in the Appendix 6 of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6); or

(b) For a single organic substance or a homogeneous mixture of organic substances, the estimated SADT is greater than 75 °C (167 °F) or the exothermic decomposition energy is less than 300 J/g. The onset temperature and decomposition energy may be estimated using a suitable calorimetric technique (See 20.3.3.3 in Part II of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6)).

B.9 PYROPHORIC LIQUIDS

B.9.1 DEFINITION

Pyrophoric liquid means a liquid which, even in small quantities, is liable to ignite within five minutes after coming into contact with air.

B.9.2 CLASSIFICATION CRITERIA

A pyrophoric liquid shall be classified in a single category for this class using test N.3 in Part III, sub-section 33.3.1.5 of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6), in accordance with Table B.9.1:

TABLE B.9.1—CRITERIA FOR PYROPHORIC LIQUIDS

Category	Criteria
1	The liquid ignites within 5 min when added to an inert carrier and exposed to air, or it ignites or chars a filter paper on contact with air within 5 min.

B.9.3 ADDITIONAL CLASSIFICATION CONSIDERATIONS

The classification procedure for pyrophoric liquids need not be applied when experience in production or handling shows that the chemical does not ignite spontaneously on coming into contact with air at normal temperatures (i.e., the substance is known to be stable at room temperature for prolonged periods of time (days)).

B.10 PYROPHORIC SOLIDS

B.10.1 DEFINITION

Pyrophoric solid means a solid which, even in small quantities, is liable to ignite within five minutes after coming into contact with air.

B.10.2 CLASSIFICATION CRITERIA

A pyrophoric solid shall be classified in a single category for this class using test N.2 in Part III, sub-section 33.3.1.4 of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6), in accordance with Table B.10.1:

TABLE B.10.1—CRITERIA FOR PYROPHORIC SOLIDS

Category	Criteria
1	The solid ignites within 5 min of coming into contact with air.

NOTE: Classification of solid chemicals shall be based on tests performed on the chemical as presented. If, for example, for the purposes of supply or transport, the same chemical is to be presented in a physical form different from that which was tested and which is considered likely to materially alter its performance in a classification test, classification must be based on testing of the chemical in the new form.

B.10.3 ADDITIONAL CLASSIFICATION CONSIDERATIONS

The classification procedure for pyrophoric solids need not be applied when experience in production or handling shows that the chemical does not ignite spontaneously on coming into contact with air at normal temperatures (i.e., the chemical is known to be stable at room temperature for prolonged periods of time (days)).

B.11 SELF-HEATING CHEMICALS

B.11.1 DEFINITION

A *self-heating chemical* is a solid or liquid chemical, other than a pyrophoric liquid or solid, which, by reaction with air and without energy supply, is liable to self-heat; this chemical differs from a pyrophoric liquid or solid in that it will ignite only when in large amounts (kilograms) and after long periods of time (hours or days).

NOTE: Self-heating of a substance or mixture is a process where the gradual reaction of that substance or mixture with oxygen (in air) generates heat. If the rate of heat production exceeds the rate of heat loss, then the temperature of the substance or mixture will rise which, after an induction time, may lead to self-ignition and combustion.

B.11.2 CLASSIFICATION CRITERIA

B.11.2.1 A self-heating chemical shall be classified in one of the two categories for this class if, in tests performed in accordance with test method N.4 in Part III, sub-section 33.3.1.6 of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6), the result meets the criteria shown in Table B.11.1.

TABLE B.11.1—CRITERIA FOR SELF-HEATING CHEMICALS

Category	Criteria
1	A positive result is obtained in a test using a 25 mm sample cube at 140 °C (284 °F).
2	A negative result is obtained in a test using a 25 mm cube sample at 140 °C (284 °F), a positive result is obtained in a test using a 100 mm sample cube at 140 °C (284 °F), and:
	(a) The unit volume of the chemical is more than 3 m^3; or
	(b) A positive result is obtained in a test using a 100 mm cube sample at 120 °C (248 °F) and the unit volume of the chemical is more than 450 liters; or
	(c) A positive result is obtained in a test using a 100 mm cube sample at 100 °C (212 °F).

B.11.2.2 Chemicals with a temperature of spontaneous combustion higher than 50 °C (122 °F) for a volume of 27 m^3 shall not be classified as self-heating chemicals.

B.11.2.3 Chemicals with a spontaneous ignition temperature higher than 50 °C (122 °F) for a volume of 450 liters shall not be classified in Category 1 of this class.

B.11.3 ADDITIONAL CLASSIFICATION CONSIDERATIONS

B.11.3.1 The classification procedure for self-heating chemicals need not be applied if the results of a screening test can be adequately correlated with the classification test and an appropriate safety margin is applied.

B.11.3.2 Examples of screening tests are:

(a) The Grewer Oven test (VDI guideline 2263, part 1, 1990, Test methods for the Determination of the Safety Characteristics of Dusts) with an onset temperature 80°K above the reference temperature for a volume of 1 *l;*

(b) The Bulk Powder Screening Test (Gibson, N. Harper, D. J. Rogers, R. Evaluation of the fire and explosion risks in drying powders, Plant Operations Progress, 4 (3), 181-189, 1985) with an onset temperature 60°K above the reference temperature for a volume of 1 *l.*

B.12 CHEMICALS WHICH, IN CONTACT WITH WATER, EMIT FLAMMABLE GASES

B.12.1 DEFINITION

Chemicals which, in contact with water, emit flammable gases are solid or liquid chemicals which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.

B.12.2 CLASSIFICATION CRITERIA

B.12.2.1 A chemical which, in contact with water, emits flammable gases shall be classified in one of the three categories for this class, using test N.5 in Part III, sub-section 33.4.1.4 of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6), in accordance with Table B.12.1:

TABLE B.12.1—CRITERIA FOR CHEMICALS WHICH, IN CONTACT WITH WATER, EMIT FLAMMABLE GASES

Category	Criteria
1	Any chemical which reacts vigorously with water at ambient temperatures and demonstrates generally a tendency for the gas produced to ignite spontaneously, or which reacts readily with water at ambient temperatures such that the rate of evolution of flammable gas is equal to or greater

	than 10 liters per kilogram of chemical over any one minute.
2	Any chemical which reacts readily with water at ambient temperatures such that the maximum rate of evolution of flammable gas is equal to or greater than 20 liters per kilogram of chemical per hour, and which does not meet the criteria for Category 1.
3	Any chemical which reacts slowly with water at ambient temperatures such that the maximum rate of evolution of flammable gas is equal to or greater than 1 liter per kilogram of chemical per hour, and which does not meet the criteria for Categories 1 and 2.

NOTE: Classification of solid chemicals shall be based on tests performed on the chemical as presented. If, for example, for the purposes of supply or transport, the same chemical is to be presented in a physical form different from that which was tested and which is considered likely to materially alter its performance in a classification test, classification must be based on testing of the chemical in the new form.

B.12.2.2 A chemical is classified as a chemical which, in contact with water emits flammable gases if spontaneous ignition takes place in any step of the test procedure.

B.12.3 ADDITIONAL CLASSIFICATION CONSIDERATIONS

The classification procedure for this class need not be applied if:

(a) The chemical structure of the chemical does not contain metals or metalloids;

(b) Experience in production or handling shows that the chemical does not react with water, (e.g., the chemical is manufactured with water or washed with water); or

(c) The chemical is known to be soluble in water to form a stable mixture.

B.13 OXIDIZING LIQUIDS

B.13.1 DEFINITION

Oxidizing liquid means a liquid which, while in itself not necessarily combustible, may, generally by yielding oxygen, cause, or contribute to, the combustion of other material.

B.13.2 CLASSIFICATION CRITERIA

An oxidizing liquid shall be classified in one of the three categories for this class using test O.2 in Part III, sub-section 34.4.2 of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6), in accordance with Table B.13.1:

TABLE B.13.1—CRITERIA FOR OXIDIZING LIQUIDS

Category	Criteria
1	Any chemical which, in the 1:1 mixture, by mass, of chemical and cellulose tested, spontaneously ignites; or the mean pressure rise time of a 1:1 mixture, by mass, of chemical and cellulose is less than that of a 1:1 mixture, by mass, of 50% perchloric acid and cellulose;
2	Any chemical which, in the 1:1 mixture, by mass, of chemical and cellulose tested, exhibits a mean pressure rise time less than or equal to the mean pressure rise time of a 1:1 mixture, by mass, of 40% aqueous sodium chlorate solution and cellulose; and the criteria for Category 1 are not met;
3	Any chemical which, in the 1:1 mixture, by mass, of chemical and cellulose tested, exhibits a mean pressure rise time less than or equal to the mean pressure rise time of a 1:1 mixture, by mass, of 65% aqueous nitric acid and cellulose; and the criteria for Categories 1 and 2 are not met.

B.13.3 ADDITIONAL CLASSIFICATION CONSIDERATIONS

B.13.3.1 For organic chemicals, the classification procedure for this class shall not be applied if:

(a) The chemical does not contain oxygen, fluorine or chlorine; or

(b) The chemical contains oxygen, fluorine or chlorine and these elements are chemically bonded only to carbon or hydrogen.

B.13.3.2 For inorganic chemicals, the classification procedure for this class shall not be applied if the chemical does not contain oxygen or halogen atoms.

B.13.3.3 In the event of divergence between test results and known experience in the handling and use of chemicals which shows them to be oxidizing, judgments based on known experience shall take precedence over test results.

B.13.3.4 In cases where chemicals generate a pressure rise (too high or too low), caused by chemical reactions not characterizing the oxidizing properties of the chemical, the test described in Part III, sub-section 34.4.2 of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6) shall be repeated with an inert substance (e.g., diatomite (kieselguhr)) in place of the cellulose in order to clarify the nature of the reaction.

B.14 OXIDIZING SOLIDS

B.14.1 DEFINITION

Oxidizing solid means a solid which, while in itself is not necessarily combustible, may, generally by yielding oxygen, cause, or contribute to, the combustion of other material.

B.14.2 CLASSIFICATION CRITERIA

An oxidizing solid shall be classified in one of the three categories for this class using test O.1 in Part III, sub-section 34.4.1 of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6), in accordance with Table B.14.1:

TABLE B.14.1—CRITERIA FOR OXIDIZING SOLIDS

Category	Criteria
1	Any chemical which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time less than the mean burning time of a 3:2 mixture, by mass, of potassium bromate and cellulose.
2	Any chemical which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time equal to or less than the mean burning time of a 2:3 mixture (by mass) of potassium bromate and cellulose and the criteria for Category 1 are not met.
3	Any chemical which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time equal to or less than the mean burning time of a 3:7 mixture (by mass) of potassium bromate and cellulose and the criteria for Categories 1 and 2 are not met.

NOTE 1: Some oxidizing solids may present explosion hazards under certain conditions (e.g., when stored in large quantities). For example, some types of ammonium nitrate may give rise to an explosion hazard under extreme conditions and the "Resistance to detonation test" (IMO: Code of Safe Practice for Solid Bulk Cargoes, 2005, Annex 3, Test 5) may be used to assess this hazard. When information indicates that an oxidizing solid may present an explosion hazard, it shall be indicated on the Safety Data Sheet.

NOTE 2: Classification of solid chemicals shall be based on tests performed on the chemical as presented. If, for example, for the purposes of supply or transport, the same chemical is to be presented in a physical form different from that which was tested and which is considered likely to materially alter its performance in a classification test, classification must be based on testing of the chemical in the new form.

B.14.3 ADDITIONAL CLASSIFICATION CONSIDERATIONS

B.14.3.1 For organic chemicals, the classification procedure for this class shall not be applied if:

(a) The chemical does not contain oxygen, fluorine or chlorine; or

(b) The chemical contains oxygen, fluorine or chlorine and these elements are chemically bonded only to carbon or hydrogen.

B.14.3.2 For inorganic chemicals, the classification procedure for this class shall not be applied if the chemical does not contain oxygen or halogen atoms.

B.14.3.3 In the event of divergence between test results and known experience in the handling and use of chemicals which shows them to be oxidizing, judgements based on known experience shall take precedence over test results.

B.15 ORGANIC PEROXIDES

B.15.1 DEFINITION

B.15.1.1 *Organic peroxide* means a liquid or solid organic chemical which contains the bivalent -0-0- structure and as such is considered a derivative of hydrogen peroxide, where one or both of the hydrogen atoms have been replaced by organic radicals. The term organic peroxide includes organic peroxide mixtures containing at least one organic peroxide. Organic peroxides are thermally unstable chemicals, which may undergo exothermic self-accelerating decomposition. In addition, they may have one or more of the following properties:

(a) Be liable to explosive decomposition;

(b) Burn rapidly;

(c) Be sensitive to impact or friction;

(d) React dangerously with other substances.

B.15.1.2 An organic peroxide is regarded as possessing explosive properties when in laboratory testing the formulation is liable to detonate, to deflagrate rapidly or to show a violent effect when heated under confinement.

B.15.2 CLASSIFICATION CRITERIA

B.15.2.1 Any organic peroxide shall be considered for classification in this class, unless it contains:

(a) Not more than 1.0% available oxygen from the organic peroxides when containing not more than 1.0% hydrogen peroxide; or

(b) Not more than 0.5% available oxygen from the organic peroxides when containing more than 1.0% but not more than 7.0% hydrogen peroxide.

NOTE:The available oxygen content (%) of an organic peroxide mixture is given by the formula:

$$16\times\sum_{i}^{n}\left(\frac{n_i\times c_i}{m_i}\right)$$

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Where:

n_i = number of peroxygen groups per molecule of organic peroxide *i*;

c_i = concentration (mass %) of organic peroxide *i*;

m_i = molecular mass of organic peroxide *i*.

B.15.2.2 Organic peroxides shall be classified in one of the seven categories of “Types A to G” for this class, according to the following principles:

(a) Any organic peroxide which, as packaged, can detonate or deflagrate rapidly shall be defined as organic peroxide TYPE A;

(b) Any organic peroxide possessing explosive properties and which, as packaged, neither detonates nor deflagrates rapidly, but is liable to undergo a thermal explosion in that package shall be defined as organic peroxide TYPE B;

(c) Any organic peroxide possessing explosive properties when the chemical as packaged cannot detonate or deflagrate rapidly or undergo a thermal explosion shall be defined as organic peroxide TYPE C;

(d) Any organic peroxide which in laboratory testing meets the criteria in (d)(i), (ii), or (iii) shall be defined as organic peroxide TYPE D:

(i) Detonates partially, does not deflagrate rapidly and shows no violent effect when heated under confinement; or

(ii) Does not detonate at all, deflagrates slowly and shows no violent effect when heated under confinement; or

(iii) Does not detonate or deflagrate at all and shows a medium effect when heated under confinement;

(e) Any organic peroxide which, in laboratory testing, neither detonates nor deflagrates at all and shows low or no effect when heated under confinement shall be defined as organic peroxide TYPE E;

(f) Any organic peroxide which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows only a low or no effect when heated under confinement as well as low or no explosive power shall be defined as organic peroxide TYPE F;

(g) Any organic peroxide which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows no effect when heated under confinement nor any explosive power, provided that it is thermally stable (self-accelerating decomposition temperature is 60 °C (140 °F) or higher for a 50 kg (110 lb) package), and, for liquid mixtures, a diluent having a boiling point of not less than 150 °C (302 °F) is used for desensitization, shall be defined as organic peroxide TYPE G. If the organic peroxide is not thermally stable or a diluent having a boiling point less than 150 °C (302 °F) is used for desensitization, it shall be defined as organic peroxide TYPE F.

B.15.3 ADDITIONAL CLASSIFICATION CONSIDERATIONS

B.15.3.1 For purposes of classification, the properties of organic peroxides shall be determined in accordance with test series A to H as described in Part II of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6).

B.15.3.2 Self-accelerating decomposition temperature (SADT) shall be determined in accordance with the UN ST/SG/AC.10 (incorporated by reference; See §1910.6), Part II, section 28.

B.15.3.3 Mixtures of organic peroxides may be classified as the same type of organic peroxide as that of the most dangerous ingredient. However, as two stable ingredients can form a thermally less stable mixture, the SADT of the mixture shall be determined.

B.16 CORROSIVE TO METALS

B.16.1 Definition

A *chemical which is corrosive to metals* means a chemical which by chemical action will materially damage, or even destroy, metals.

B.16.2 Classification Criteria

A chemical which is corrosive to metals shall be classified in a single category for this class, using the test in Part III, sub-section 37.4 of the UN ST/SG/AC.10 (incorporated by reference; See §1910.6), in accordance with Table B.16.1:

Table B.16.1—Criteria for Chemicals Corrosive to Metal

Category	Criteria
1	Corrosion rate on either steel or aluminium surfaces exceeding 6.25 mm per year at a test temperature of 55 °C (131 °F) when tested on both materials.

NOTE: Where an initial test on either steel or aluminium indicates the chemical being tested is corrosive, the follow-up test on the other metal is not necessary.

B.16.3 Additional Classification Considerations

The specimen to be used for the test shall be made of the following materials:

(a) For the purposes of testing steel, steel types S235JR+CR (1.0037 resp.St 37-2), S275J2G3+CR (1.0144 resp.St 44-3), ISO 3574, Unified Numbering System (UNS) G 10200, or SAE 1020;

(b) For the purposes of testing aluminium: Non-clad types 7075-T6 or AZ5GU-T6.

Appendix C to §1910.1200—Allocation of Label Elements (Mandatory)

C.1 The label for each hazardous chemical shall include the product identifier used on the safety data sheet.

C.1.1 The labels on shipped containers shall also include the name, address, and telephone number of the chemical manufacturer, importer, or responsible party.

C.2 The label for each hazardous chemical that is classified shall include the signal word, hazard statement(s), pictogram(s), and precautionary statement(s) specified in C.4 for each hazard class and associated hazard category, except as provided for in C.2.1 through C.2.4.

C.2.1 Precedence of Hazard Information

C.2.1.1 If the signal word “Danger” is included, the signal word “Warning” shall not appear;

C.2.1.2 If the skull and crossbones pictogram is included, the exclamation mark pictogram shall not appear where it is used for acute toxicity;

C.2.1.3 If the corrosive pictogram is included, the exclamation mark pictogram shall not appear where it is used for skin or eye irritation;

C.2.1.4 If the health hazard pictogram is included for respiratory sensitization, the exclamation mark pictogram shall not appear where it is used for skin sensitization or for skin or eye irritation.

C.2.2 Hazard Statement Text

C.2.2.1 The text of all applicable hazard statements shall appear on the label, except as otherwise specified. The information in italics shall be included as part of the hazard statement as provided. For example: “causes damage to organs (*state all organs affected*) through prolonged or repeated exposure (*state route of exposure if no other routes of exposure cause the hazard*)”. Hazard statements may be combined where appropriate to reduce the information on the label and improve readability, as long as all of the hazards are conveyed as required.

C.2.2.2 If the chemical manufacturer, importer, or responsible party can demonstrate that all or part of the hazard statement is inappropriate to a specific substance or mixture, the corresponding statement may be omitted from the label.

C.2.3 Pictograms

C.2.3.1 Pictograms shall be in the shape of a square set at a point and shall include a black hazard symbol on a white background with a red frame sufficiently wide to be clearly visible. A square red frame set at a point without a hazard symbol is not a pictogram and is not permitted on the label.

C.2.3.2 One of eight standard hazard symbols shall be used in each pictogram. The eight hazard symbols are depicted in Figure C.1. A pictogram using the exclamation mark symbol is presented in Figure C.2, for the purpose of illustration.

Figure C.1 – Hazard Symbols and Classes

Flame	Flame Over Circle	Exclamation Mark	Exploding Bomb
			
Flammables Self Reactives Pyrophorics Self-heating Emits Flammable Gas Organic Peroxides	Oxidizers	Irritant Dermal Sensitizer Acute Toxicity (harmful) Narcotic Effects Respiratory Tract Irritation	Explosives Self Reactives Organic Peroxides
Corrosion	**Gas Cylinder**	**Health Hazard**	**Skull and Crossbones**
			
Corrosives	Gases Under Pressure	Carcinogen Respiratory Sensitizer Reproductive Toxicity Target Organ Toxicity Mutagenicity Aspiration Toxicity	Acute Toxicity (severe)

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Figure C.2 – Exclamation Mark Pictogram

C.2.3.3 Where a pictogram required by the Department of Transportation under Title 49 of the Code of Federal Regulations appears on a shipped container, the pictogram specified in C.4 for the same hazard shall not appear.

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C.2.4 PRECAUTIONARY STATEMENT TEXT

C.2.4.1 There are four types of precautionary statements presented, “prevention,” “response,” “storage,” and “disposal.” The core part of the precautionary statement is presented in bold print. This is the text, except as otherwise specified, that shall appear on the label. Where additional information is required, it is indicated in plain text.

C.2.4.2 When a backslash or diagonal mark (/) appears in the precautionary statement text, it indicates that a choice has to be made between the separated phrases. In such cases, the chemical manufacturer, importer, or responsible party can choose the most appropriate phrase(s). For example, “Wear protective gloves/protective clothing/eye protection/face protection” could read “wear eye protection”.

C.2.4.3 When three full stops (* * *) appear in the precautionary statement text, they indicate that all applicable conditions are not listed. For example, in “Use explosion-proof electrical/ventilating/lighting/* * */equipment”, the use of “* * *” indicates that other equipment may need to be specified. In such cases, the chemical manufacturer, importer, or responsible party can choose the other conditions to be specified.

C.2.4.4 When text *in italics* is used in a precautionary statement, this indicates specific conditions applying to the use or allocation of the precautionary statement. For example, “Use explosion-proof electrical/ventilating/lighting/* * */equipment” is only required for flammable solids “*if dust clouds can occur*”. Text in italics is intended to be an explanatory, conditional note and is not intended to appear on the label.

C.2.4.5 Where square brackets ([ ]) appear around text in a precautionary statement, this indicates that the text in square brackets is not appropriate in every case and should be used only in certain circumstances. In these cases, conditions for use explaining when the text should be used are provided. For example, one precautionary statement states: “[In case of inadequate ventilation] wear respiratory protection.” This statement is given with the condition for use “- text in square brackets may be used if additional information is provided with the chemical at the point of use that explains what type of ventilation would be adequate for safe use”. This means that, if additional information is provided with the chemical explaining what type of ventilation would be adequate for safe use, the text in square brackets should be used and the statement would read: “In case of inadequate ventilation wear respiratory protection.” However, if the chemical is supplied without such ventilation information, the text in square brackets should not be used, and the precautionary statement should read: “Wear respiratory protection.”

C.2.4.6 Precautionary statements may be combined or consolidated to save label space and improve readability. For example, “Keep away from heat, sparks and open flame,” “Store in a well-ventilated place” and “Keep cool” can be combined to read “Keep away from heat, sparks and open flame and store in a cool, well-ventilated place.”

C.2.4.7 In most cases, the precautionary statements are independent (e.g., the phrases for explosive hazards do not modify those related to certain health hazards, and products that are classified for both hazard classes shall bear appropriate precautionary statements for both). Where a chemical is classified for a number of hazards, and the precautionary statements are similar, the most stringent shall be included on the label (this will be applicable mainly to preventive measures). An order of precedence may be imposed by the chemical manufacturer, importer or responsible party in situations where phrases concern “Response.” Rapid action may be crucial. For example, if a chemical is carcinogenic and acutely toxic, rapid action may be crucial, and first aid measures for acute toxicity will take precedence over those for long-term effects. In addition, medical attention to delayed health effects may be required in cases of incidental exposure, even if not associated with immediate symptoms of intoxication.

C.2.4.8 If the chemical manufacturer, importer, or responsible party can demonstrate that a precautionary statement is inappropriate to a specific substance or mixture, the precautionary statement may be omitted from the label.

C.3 Supplementary Hazard Information

C.3.1 To ensure that non-standardized information does not lead to unnecessarily wide variation or undermine the required information, supplementary information on the label is limited to when it provides further detail and does not contradict or cast doubt on the validity of the standardized hazard information.

C.3.2 Where the chemical manufacturer, importer, or distributor chooses to add supplementary information on the label, the placement of supplemental information shall not impede identification of information required by this section.

C.3.3 Where an ingredient with unknown acute toxicity is used in a mixture at a concentration ≥1%, and the mixture is not classified based on testing of the mixture as a whole, a statement that X% of the mixture consists of ingredient(s) of unknown acute toxicity is required on the label.

C.4 REQUIREMENTS FOR SIGNAL WORDS, HAZARD STATEMENTS, PICTOGRAMS, AND PRECAUTIONARY STATEMENTS

C.4.1 ACUTE TOXICITY – ORAL
(Classified in Accordance with Appendix A.1)

Hazard category	Signal word	Hazard statement	Pictogram
1	Danger	Fatal if swallowed	Skull and crossbones
2	Danger	Fatal if swallowed	

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Wash ...thoroughly after handling. ... Chemical manufacturer, importer, or distributor to specify parts of the body to be washed after handling. **Do not eat, drink or smoke when using this product.**	**If swallowed: Immediately call a poison center/doctor/...** ... Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice. **Specific treatment (see ... on this label)** ... Reference to supplemental first aid instruction. - *if immediate administration of antidote is required.* **Rinse mouth.**	**Store locked up.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.1 ACUTE TOXICITY – ORAL (CONTINUED)
(Classified in Accordance with Appendix A.1)

Hazard category	Signal word	Hazard statement	Pictogram
3	Danger	Toxic if swallowed	Skull and crossbones

Precautionary statements

Prevention	Response	Storage	Disposal
Wash ... thoroughly after handling. ... Chemical manufacturer, importer, or distributor to specify parts of the body to be washed after handling. **Do not eat, drink or smoke when using this product.**	**If swallowed: Immediately call a poison center/doctor/...** ... Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice. **Specific treatment (see ... on this label)** ... Reference to supplemental first aid instruction. - *If immediate administration of antidote is required.* **Rinse mouth.**	**Store locked up.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.1 ACUTE TOXICITY – ORAL (CONTINUED)
(Classified in Accordance with Appendix A.1)

Hazard category	Signal word	Hazard statement	Pictogram
4	Warning	Harmful if swallowed	Exclamation mark

Precautionary statements

Prevention	Response	Storage	Disposal
Wash ... thoroughly after handling. ... Chemical manufacturer, importer, or distributor to specify parts of the body to be washed after handling. **Do not eat, drink or smoke when using this product.**	**If swallowed: Call a poison center/doctor/.../ if you feel unwell.** ... Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice. **Rinse mouth.**		**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.2 ACUTE TOXICITY - DERMAL
(Classified in Accordance with Appendix A.1)

Pictogram
Skull and crossbones

Hazard category	Signal word	Hazard statement
1	Danger	Fatal in contact with skin
2	Danger	Fatal in contact with skin

Precautionary statements

Prevention	Response	Storage	Disposal
Do not get in eyes, on skin, or on clothing. **Wash ... thoroughly after handling.** ... Chemical manufacturer, importer, or distributor to specify parts of the body to be washed after handling. **Do not eat, drink or smoke when using this product.** **Wear protective gloves/protective clothing.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**If on skin: Wash with plenty of water/...** ... Chemical manufacturer, importer, or distributor may specify a cleansing agent if appropriate, or may recommend an alternative agent in exceptional cases if water is clearly inappropriate. **Immediately call a poison center/doctor/...** ... Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice. **Specific treatment (see ... on this label)** ... Reference to supplemental first aid instruction. - *if immediate measures such as specific cleansing agent is advised.* **Take off immediately all contaminated clothing and wash it before reuse.**	**Store locked up.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.2 ACUTE TOXICITY – DERMAL (CONTINUED)
(Classified in Accordance with Appendix A.1)

Hazard category	Signal word	Hazard statement	Pictogram
3	Danger	Toxic in contact with skin	Skull and crossbones

Precautionary statements

Prevention	Response	Storage	Disposal
Wear protective gloves/protective clothing. Chemical manufacturer, importer, or distributor to specify type of equipment.	**If on skin: Wash with plenty of water/…** … Chemical manufacturer, importer, or distributor may specify a cleansing agent if appropriate, or may recommend an alternative agent in exceptional cases if water is clearly inappropriate. **Call a poison center/doctor/…/If you feel unwell.** … Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice. **Specific treatment (see … on this label)** … Reference to supplemental first aid instruction. - *if measures such as specific cleansing agent is advised.* **Take off immediately all contaminated clothing and wash it before reuse.**	**Store locked up.**	**Dispose of contents/container to…** … in accordance with local/regional/national/international regulations (to be specified).

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C.4.2 ACUTE TOXICITY – DERMAL (CONTINUED)
(Classified in Accordance with Appendix A.1)

Pictogram
Exclamation mark

Hazard category	Signal word	Hazard statement
4	Warning	Harmful in contact with skin

Precautionary statements

Prevention	Response	Storage	Disposal
Wear protective gloves/protective clothing Chemical manufacturer, importer, or distributor to specify type of equipment.	**If on skin: Wash with plenty of water/...** ... Chemical manufacturer, importer, or distributor may specify a cleansing agent if appropriate, or may recommend an alternative agent in exceptional cases if water is clearly inappropriate. **Call a poison center/doctor/...if you feel unwell.** ... Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice. **Specific treatment (see ... on this label)** ... Reference to supplemental first aid instruction. - *if measures such as specific cleansing agent is advised.* **Take off contaminated clothing and wash it before reuse.**		**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.3 ACUTE TOXICITY - INHALATION
(Classified in Accordance with Appendix A.1)

Hazard category	Signal word	Hazard statement
1	Danger	Fatal if inhaled
2	Danger	Fatal if inhaled

Pictogram
Skull and crossbones

Precautionary statements

Prevention	Response	Storage	Disposal
Do not breathe dust/fume/gas/mist/ vapors/spray. Chemical manufacturer, importer, or distributor to specify applicable conditions. **Use only outdoors or in a well-ventilated area.** **[In case of inadequate ventilation] wear respiratory protection.** Chemical manufacturer, importer, or distributor to specify equipment. - *Text in square brackets may be used if additional information is provided with the chemical at the point of use that explains what type of ventilation would be adequate for safe use.*	**If inhaled: Remove person to fresh air and keep comfortable for breathing.** **Immediately call a poison center/doctor/...** ... Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice. **Specific treatment is urgent (see ... on this label)** ... Reference to supplemental first aid instruction. - *If immediate administration of antidote is required.*	**Store in a well-ventilated place. Keep container tightly closed.** - *If product is volatile as to generate hazardous atmosphere.* **Store locked up.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.3 ACUTE TOXICITY – INHALATION (CONTINUED)
(Classified in Accordance with Appendix A.1)

Hazard category	Signal word	Hazard statement	Pictogram
3	Danger	Toxic if inhaled	Skull and crossbones

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Avoid breathing dust/fume/gas/mist/ vapors/spray. Chemical manufacturer, importer, or distributor to specify applicable conditions. **Use only outdoors or in a well-ventilated area.**	**If inhaled: Remove person to fresh air and keep comfortable for breathing.** **Call a poison center/doctor/...** ... Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice. **Specific treatment (see ... on this label)** ... Reference to supplemental first aid instruction. - *If immediate specific measures are required.*	**Store in a well-ventilated place. Keep container tightly closed.** - *If product is volatile so as to generate hazardous atmosphere.* **Store locked up.**	**Dispose of content/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.3 ACUTE TOXICITY – INHALATION (CONTINUED)
(Classified in Accordance with Appendix A.1)

Hazard category	Signal word	Hazard statement	Pictogram
4	Warning	Harmful if inhaled	Exclamation mark

Precautionary statements

Prevention	Response	Storage	Disposal
Avoid breathing dust/fume/gas/mist/ vapors/spray. Chemical manufacturer, importer, or distributor to specify applicable conditions. **Use only outdoors or in a well-ventilated area.**	**If inhaled: Remove person to fresh air and keep comfortable for breathing.** **Call a poison center/doctor/…/if you feel unwell.** … Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice.		

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C.4.4 SKIN CORROSION/IRRITATION
(Classified in Accordance with Appendix A.2)

Hazard category	Signal word	Hazard statement
1A to 1C	Danger	Causes severe skin burns and eye damage

Pictogram
Corrosion

Precautionary statements

Prevention	Response	Storage	Disposal
Do not breathe dusts or mists. - *if inhalable particles of dusts or mists may occur during use.* **Wash ...thoroughly after handling.** ...Chemical manufacturer, importer, or distributor to specify parts of the body to be washed after handling. **Wear protective gloves/protective clothing/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**If swallowed: Rinse mouth. Do NOT induce vomiting.** **If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.** **Wash contaminated clothing before reuse.** **If inhaled: Remove person to fresh air and keep comfortable for breathing.** **Immediately call a poison center/doctor/...** ...Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice. **Specific treatment (see ... on this label)** ... Reference to supplemental first aid instruction. - *Manufacturer, importer, or distributor may specify a cleansing agent if appropriate.* **If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.**	**Store locked up.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/internatio nal regulations (to be specified).

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C.4.4 SKIN CORROSION/IRRITATION (CONTINUED)
(Classified in Accordance with Appendix A.2)

Hazard category	Signal word	Hazard statement	Pictogram
2	Warning	Causes skin irritation	Exclamation mark

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Wash ... thoroughly after handling. ... Chemical manufacturer, importer, or distributor to specify parts of the body to be washed after handling. **Wear protective gloves.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**If on skin: Wash with plenty of water/...** ... Chemical manufacturer, importer, or distributor may specify a cleansing agent if appropriate, or may recommend an alternative agent in exceptional cases if water is clearly inappropriate. **Specific treatment (see ... on this label)** ... Reference to supplemental first aid instruction. - *Manufacturer, importer, or distributor may specify a cleansing agent if appropriate.* **If skin irritation occurs: Get medical advice/attention.** **Take off contaminated clothing and wash it before reuse.**		

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C.4.5 EYE DAMAGE/IRRITATION
(Classified in Accordance with Appendix A.3)

Pictogram
Corrosion

Hazard category	Signal word	Hazard statement
1	Danger	Causes serious eye damage

Precautionary statements

Prevention	Response	Storage	Disposal
Wear eye protection/face protection. Chemical manufacturer, importer, or distributor to specify type of equipment.	**If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.** **Immediately call a poison center/doctor/...** ... Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice.		

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C.4.5 EYE DAMAGE/IRRITATION (CONTINUED)
(Classified in Accordance with Appendix A.3)

Hazard category	Signal word	Hazard statement	Pictogram: Exclamation mark
2A	Warning	Causes serious eye irritation	

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Wash ... thoroughly after handling. ... Chemical manufacturer, importer, or distributor to specify parts of the body to be washed after handling. **Wear eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.** **If eye irritation persists: Get medical advice/attention.**		

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C.4.5 EYE DAMAGE/IRRITATION (CONTINUED)
(Classified in Accordance with Appendix A.3)

Hazard category	Signal word	Hazard statement	Pictogram *No Pictogram*
2B	Warning	Causes eye irritation	

Precautionary statements

Prevention	Response	Storage	Disposal
Wash ... thoroughly after handling. ... Chemical manufacturer, importer, or distributor to specify parts of the body to be washed after handling.	**If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.** **If eye irritation persists: Get medical advice/attention.**		

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C.4.6 SENSITIZATION - RESPIRATORY
(Classified in Accordance with Appendix A.4)

Hazard category	Signal word	Hazard statement	Pictogram
1 (including both sub-categories 1A and 1B)	Danger	May cause allergy or asthma symptoms or breathing difficulties if inhaled	Health hazard

Precautionary statements

Prevention	Response	Storage	Disposal
Avoid breathing dust/fume/gas/mist/ vapors/spray. Chemical manufacturer, importer, or distributor to specify applicable conditions. **[In case of inadequate ventilation] wear respiratory protection.** Chemical manufacturer, importer, or distributor to specify equipment. *- Text in square brackets may be used if additional information is provided with the chemical at the point of use that explains what type of ventilation would be adequate for safe use.*	**If inhaled: If breathing is difficult, remove person to fresh air and keep comfortable for breathing.** **If experiencing respiratory symptoms: Call a poison center/doctor/...** ... Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice.		**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.7 SENSITIZATION - SKIN
(Classified in Accordance with Appendix A.4)

Hazard category	Signal word	Hazard statement	Pictogram
1 (including both sub-categories 1A and 1B)	Warning	May cause an allergic skin reaction	Exclamation mark

Precautionary statements

Prevention	Response	Storage	Disposal
Avoid breathing dust/fume/gas/mist/ vapors/spray. Chemical manufacturer, importer, or distributor to specify applicable conditions. **Contaminated work clothing must not be allowed out of the workplace.** **Wear protective gloves.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**If on skin: Wash with plenty of water/...** ... Chemical manufacturer, importer, or distributor may specify a cleansing agent if appropriate, or may recommend an alternative agent in exceptional cases if water is clearly inappropriate. **If skin irritation or rash occurs: Get medical advice/attention.** **Specific treatment (see ... on this label)** ... Reference to supplemental first aid instruction. - *Manufacturer, importer, or distributor may specify a cleansing agent if appropriate.* **Wash contaminated clothing before reuse.**		**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.8 GERM CELL MUTAGENICITY
(Classified in Accordance with Appendix A.5)

Hazard category	Signal word	Hazard statement
1A and 1B	Danger	May cause genetic defects <...>
2	Warning	Suspected of causing genetic defects <...> *(state route of exposure if no other routes of exposure cause the hazard)*

Pictogram
Health hazard

Precautionary statements

Prevention	Response	Storage	Disposal
Obtain special instructions before use. **Do not handle until all safety precautions have been read and understood.** **Wear protective gloves/protective clothing/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment, as required.	**If exposed or concerned: Get medical advice/attention.**	**Store locked up.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.9 CARCINOGENICITY
(Classified in Accordance with Appendix A.6)

Pictogram
Health hazard

Hazard category	Signal word	Hazard statement
1A and 1B	Danger	May cause cancer <...>
2	Warning	Suspected of causing cancer <...>

(state route of exposure if no other routes of exposure cause the hazard)

Precautionary statements

Prevention	Response	Storage	Disposal
Obtain special instructions before use. **Do not handle until all safety precautions have been read and understood.** **Wear protective gloves/protective clothing/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment, as required.	**If exposed or concerned: Get medical advice/attention.**	**Store locked up.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

Note: If a Category 2 carcinogen ingredient is present in the mixture at a concentration between 0.1% and 1%, information is required on the SDS for a product; however, a label warning is optional. If a Category 2 carcinogen ingredient is present in the mixture at a concentration of ≥ 1%, both an SDS and a label is required and the information must be included on each.

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C.4.10 TOXIC TO REPRODUCTION
(Classified in Accordance with Appendix A.7)

Pictogram
Health hazard

Hazard category	Signal word	Hazard statement
1A and 1B	Danger	May damage fertility or the unborn child <...> <<...>>
2	Warning	Suspected of damaging fertility or the unborn child <...> <<...>> *(state specific effect if known)* *(state route of exposure if no other routes of exposure cause the hazard)*

Precautionary statements

Prevention	Response	Storage	Disposal
Obtain special instructions before use. **Do not handle until all safety precautions have been read and understood.** **Wear protective gloves/protective clothing/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment, as required.	**If exposed or concerned: Get medical advice/attention.**	**Store locked up.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.10 TOXIC TO REPRODUCTION (CONTINUED)
(Classified in Accordance with Appendix A.7)
(EFFECTS ON OR VIA LACTATION)

Hazard category	Signal word	Hazard statement	Pictogram
No designated number	*No signal word*	May cause harm to breast-fed children	*No Pictogram*

(See Table A.7.1 in Appendix A.7)

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Obtain special instructions before use. **Do not breathe dusts or mists.** - *If inhalable particles of dusts or mists may occur during use.* **Avoid contact during pregnancy/while nursing.** **Wash ... thoroughly after handling.** ...Chemical manufacturer, importer, or distributor to specify parts of the body to be washed after handling. **Do not eat, drink or smoke when using this product.**	**If exposed or concerned: Get medical advice/attention.**		

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C.4.11 SPECIFIC TARGET ORGAN TOXICITY (Single Exposure)
(Classified in Accordance with Appendix A.8)

Hazard category	Signal word	Hazard statement	Pictogram Health hazard
1	Danger	Causes damage to organs <...> <<...>> <...> *(or state all organs affected if known)* <<...>> *(state route of exposure if no other routes of exposure cause the hazard)*	

Precautionary statements

Prevention	Response	Storage	Disposal
Do not breathe dust/fume/gas/mist/vapors/spray. Chemical manufacturer, importer, or distributor to specify applicable conditions. **Wash ...thoroughly after handling.** ... Chemical manufacturer, importer, or distributor to specify parts of the body to be washed after handling. **Do not eat, drink or smoke when using this product.**	**If exposed: Call a poison center/doctor/...** ... Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice. **Specific treatment (see ... on this label)** ... Reference to supplemental first aid instruction. - *if immediate measures are required.*	**Store locked up.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.11 SPECIFIC TARGET ORGAN TOXICITY (Single Exposure) (CONTINUED)
(Classified in Accordance with Appendix A.8)

Hazard category	Signal word	Hazard statement	Pictogram Health hazard
2	Warning	May cause damage to organs <...> <<...>> *<...> (or state all organs affected, if known)* *<<...>> (state route of exposure if no other routes of exposure cause the hazard)*	

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Do not breathe dust/fume/gas/mist/ vapors/spray. Chemical manufacturer, importer, or distributor to specify applicable conditions. **Wash ... thoroughly after handling.** ... Chemical manufacturer, importer, or distributor to specify parts of the body to be washed after handling. **Do not eat, drink or smoke when using this product.**	**If exposed or concerned: Call a poison center/doctor/...** ... Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice.	**Store locked up.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.11 SPECIFIC TARGET ORGAN TOXICITY (Single Exposure) (CONTINUED)
(Classified in Accordance with Appendix A.8)

Hazard category	Signal word	Hazard statement	Pictogram: Exclamation mark
3	Warning	May cause respiratory irritation; or May cause drowsiness or dizziness	

Precautionary statements

Prevention	Response	Storage	Disposal
Avoid breathing dust/fume/gas/mist/ vapors/spray. Chemical manufacturer, importer, or distributor to specify applicable conditions. **Use only outdoors or in a well-ventilated area.**	**If inhaled: Remove person to fresh air and keep comfortable for breathing.** **Call a poison center/doctor/.../If you feel unwell.** ... Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice.	**Store in a well-ventilated place. Keep container tightly closed.** - *If product is volatile so as to generate hazardous atmospheres.* **Store locked up.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.12 SPECIFIC TARGET ORGAN TOXICITY (Repeated Exposure)
(Classified in Accordance with Appendix A.9)

Pictogram
Health hazard

Hazard category	**Signal word**	**Hazard statement**
1	Danger	Causes damage to organs <...> through prolonged or repeated exposure <<...>> <...> *(state all organs affected, if known)* <<...>> *(state route of exposure if no other routes of exposure cause the hazard)*

Precautionary statements

Prevention	**Response**	**Storage**	**Disposal**
Do not breathe dust/fume/gas/mist/vapors/spray. Chemical manufacturer, importer, or distributor to specify applicable conditions. **Wash ... thoroughly after handling.** ...Chemical manufacturer, importer, or distributor to specify parts of the body to be washed after handling. **Do not eat, drink or smoke when using this product.**	**Get medical advice/attention if you feel unwell.**		**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.12 SPECIFIC TARGET ORGAN TOXICITY (Repeated Exposure) (CONTINUED)
(Classified in Accordance with Appendix A.9)

Hazard category	Signal word	Hazard statement	Pictogram Health hazard
2	Warning	May cause damage to organs <...> through prolonged or repeated exposure <<...>> <...> *(state all organs affected, if known)* <<...>> *(state route of exposure if no other routes of exposure cause the hazard)*	

Precautionary statements

Prevention	Response	Storage	Disposal
Do not breathe dust/fume/gas/mist/vapors/spray. Chemical manufacturer, importer, or distributor to specify applicable conditions.	**Get medical advice/attention if you feel unwell.**		**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.13 ASPIRATION HAZARD
(Classified in Accordance with Appendix A.10)

Hazard category	Signal word	Hazard statement	Pictogram Health hazard
1	Danger	May be fatal if swallowed and enters airways	

Precautionary statements

Prevention	Response	Storage	Disposal
	If swallowed: Immediately call a poison center/doctor/... ... Chemical manufacturer, importer, or distributor to specify the appropriate source of emergency medical advice. **Do NOT induce vomiting.**	**Store locked up.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.14 EXPLOSIVES
(Classified in Accordance with Appendix B.1)

Hazard category	Signal word	Hazard statement
Unstable explosive	Danger	Unstable explosive

Pictogram
Exploding bomb

Precautionary statements

Prevention	Response	Storage	Disposal
Obtain special instructions before use. **Do not handle until all safety precautions have been read and understood.** **Wear personal protective equipment/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment, as required.	**Explosion risk in case of fire.** **Do NOT fight fire when fire reaches explosives.** **Evacuate area.**	**Store ...** ...in accordance with local/regional/ national/international regulations (to be specified).	**Dispose of contents/container to ...** ...in accordance with local/regional/ national/international regulations (to be specified).

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C.4.14 EXPLOSIVES (CONTINUED)
(Classified in Accordance with Appendix B.1)

Pictogram
Exploding bomb

Hazard category	Signal word	Hazard statement
Division 1.1	Danger	Explosive; mass explosion hazard
Division 1.2	Danger	Explosive; severe projection hazard
Division 1.3	Danger	Explosive; fire, blast or projection hazard

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition source(s). **Keep wetted with...** ... Chemical manufacturer, importer, or distributor to specify appropriate material. - *if drying out increases explosion hazard, except as needed for manufacturing or operating processes (e.g., nitrocellulose).* **Ground/bond container and receiving equipment.** - *if the explosive is electrostatically sensitive.* **Do not subject to grinding/shock/.../friction.** ...Chemical manufacturer, importer, or distributor to specify applicable rough handling. **Wear face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**In case of fire: evacuate area.** **Explosion risk in case of fire.** **Do NOT fight fire when fire reaches explosives.**	**Store ...** ...in accordance with local/regional/national/ international regulations (to be specified).	**Dispose of contents/container to ...** ... in accordance with local/ regional/national/ international regulations (to be specified).

Note: Unpackaged explosives or explosives repacked in packagings other than the original or similar packaging shall have the label elements assigned to Division 1.1 unless the hazard is shown to correspond to one of the hazard categories in Appendix B.1, in which case the corresponding symbol, signal word and/or the hazard statement shall be assigned.

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C.4.14 EXPLOSIVES (CONTINUED)
(Classified in Accordance with Appendix B.1)

Hazard category	Signal word	Hazard statement	Pictogram
Division 1.4	Warning	Fire or projection hazard	Exploding bomb[1]

Precautionary statements[1]			
Prevention	**Response**	**Storage**	**Disposal**
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition source(s). **Ground/bond container and receiving equipment.** - *if the explosive is electrostatically sensitive.* **Do not subject to grinding/shock/.../friction.** Chemical manufacturer, importer, or distributor to specify applicable rough handling. **Wear face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**In case of fire: Evacuate area.** **Explosion risk in case of fire.** - *except if explosives are 1.4S ammunition and components thereof.* **Do NOT fight fire when fire reaches explosives.** **Fight fire with normal precautions from a reasonable distance** - *if explosives are 1.4S ammunition and components thereof.*	**Store ...** ...in accordance with local/regional/ national/internation al regulations (to be specified).	**Dispose of contents/container to...** ... in accordance with local/regional/national/i nternational regulations (to be specified).

Note: Unpackaged explosives or explosives repacked in packagings other than the original or similar packaging shall have the label elements assigned to Division 1.1 unless the hazard is shown to correspond to one of the hazard categories in Appendix B.1, in which case the corresponding symbol, signal word and/or the hazard statement shall be assigned.[1]

[1] *Except no pictogram is required for explosives that are 1.4S small arms ammunition and components thereof. Labels for 1.4S small arms ammunition and components shall include appropriate precautionary statements.*

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C.4.14 EXPLOSIVES (CONTINUED)
(Classified in Accordance with Appendix B.1)

Pictogram
No pictogram

Hazard category	Signal word	Hazard statement
Division 1.5	Danger	May mass explode in fire

Precautionary statements

Prevention	Response	Storage	Disposal
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition source(s). **Keep wetted with...** ... Chemical manufacturer, importer, or distributor to specify appropriate material. - *if drying out increases explosion hazard, except as needed for manufacturing or operating processes (e.g., nitrocellulose).* **Ground/bond container and receiving equipment** - *if the explosive is electrostatically sensitive.* **Do not subject to grinding/shock/.../friction.** ...Chemical manufacturer, importer, or distributor to specify applicable rough handling. **Wear face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**In case of fire: Evacuate area.** **Explosion risk in case of fire.** **Do NOT fight fire when fire reaches explosives.**	**Store ...** ...in accordance with [local/regional/ national/international regulations (to be specified).	**Dispose of contents/container to ...** ... in accordance with local/regional/ national/international regulations (to be specified).

Note: Unpackaged explosives or explosives repacked in packagings other than the original or similar packaging shall have the label elements assigned to Division 1.1 unless the hazard is shown to correspond to one of the hazard categories in Appendix B.1, in which case the corresponding symbol, signal word and/or the hazard statement shall be assigned.

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C.4.14 EXPLOSIVES (CONTINUED)
(Classified in Accordance with Appendix B.1)

Pictogram
No pictogram

Hazard category
Division 1.6

Signal word
No signal word

Hazard statement
No hazard statement

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
None assigned.	None assigned	None assigned	None assigned

Note: Unpackaged explosives or explosives repacked in packagings other than the original or similar packaging shall have the label elements assigned to Division 1.1 unless the hazard is shown to correspond to one of the hazard categories in Appendix B.1, in which case the corresponding symbol, signal word and/or the hazard statement shall be assigned.

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C.4.15 FLAMMABLE GASES
(Classified in Accordance with Appendix B.2)

Hazard category	Signal word	Hazard statement
1	Danger	Extremely flammable gas

Pictogram
Flame

Precautionary statements

Prevention	Response	Storage	Disposal
Keep away from heat/sparks/open flames/hot surfaces. -No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition source(s).	**Leaking gas fire: Do not extinguish, unless leak can be stopped safely.** **Eliminate all ignition sources if safe to do so.**	**Store in well-ventilated place.**	

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C.4.15 FLAMMABLE GASES (CONTINUED)
(Classified in Accordance with Appendix B.2)

Hazard category	Signal word	Hazard statement	Pictogram *No Pictogram*
2	Warning	Flammable gas	

Precautionary statements

Prevention	Response	Storage	Disposal
Keep away from heat/sparks/open flames/hot surfaces. -No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition sources(s).	**Leaking gas fire: Do not extinguish, unless leak can be stopped safely.** **Eliminate all ignition sources if safe to do so.**	**Store in well-ventilated place.**	

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C.4.16 FLAMMABLE AEROSOLS
(Classified in Accordance with Appendix B.3)

Hazard category	Signal word	Hazard statement
1	Danger	Extremely flammable aerosol
2	Warning	Flammable aerosol

Pictogram
Flame

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Keep away from heat/sparks/open flames/hot surfaces. -No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition sources(s). **Do not spray on an open flame or other ignition source.** **Pressurized container: Do not pierce or burn, even after use.**		**Protect from sunlight. Do not expose to temperatures exceeding 50 °C/122 °F.**	

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C.4.17 OXIDIZING GASES
(Classified in Accordance with Appendix B.4)

Pictogram
Flame over circle

Hazard category	Signal word	Hazard statement
1	Danger	May cause or intensify fire; oxidizer

Precautionary statements

Prevention	Response	Storage	Disposal
Keep/Store away from clothing/.../combustible materials. ...Chemical manufacturer, importer, or distributor to specify other incompatible materials. **Keep reduction valves/valves and fittings free from oil and grease.**	**In case of fire: Stop leak if safe to do so.**	**Store in well-ventilated place.**	

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C.4.18 GASES UNDER PRESSURE
(Classified in Accordance with Appendix B.5)

Hazard category	Signal word	Hazard statement	Pictogram: Gas cylinder
Compressed gas	Warning	Contains gas under pressure; may explode if heated	
Liquefied gas	Warning	Contains gas under pressure; may explode if heated	
Dissolved gas	Warning	Contains gas under pressure; may explode if heated	

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
		Protect from sunlight. Store in a well-ventilated place.	

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C.4.18 GASES UNDER PRESSURE (CONTINUED)
(Classified in Accordance with Appendix B.5)

Hazard category	Signal word	Hazard statement
Refrigerated liquefied gas	Warning	Contains refrigerated gas; may cause cryogenic burns or injury

Pictogram
Gas cylinder

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Wear cold insulating gloves/face shield/eye protection.	**Thaw frosted parts with lukewarm water. Do not rub affected area.** **Get immediate medical advice/attention**	**Store in well-ventilated place.**	

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C.4.19 FLAMMABLE LIQUIDS
(Classified in Accordance with Appendix B.6)

Pictogram
Flame

Hazard category	Signal word	Hazard statement
1	Danger	Extremely flammable liquid and vapor
2	Danger	Highly flammable liquid and vapor
3	Warning	Flammable liquid and vapor

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition source(s). **Keep container tightly closed.** **Ground/Bond container and receiving equipment** - *If electrostatically sensitive material is for reloading.* - *If product is volatile so as to generate hazardous atmosphere.* **Use explosion-proof electrical/ventilating/ lighting/.../equipment.** ... Chemical manufacturer, importer, or distributor to specify other equipment. **Use only non-sparking tools.** **Take precautionary measures against static discharge.** **Wear protective gloves/eye protection/face protection** Chemical manufacturer, importer, or distributor to specify type of equipment.	**If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.** **In case of fire: Use ... to extinguish.** ... Chemical manufacturer, importer, or distributor to specify appropriate media. - *If water increases risk.*	**Store in a well-ventilated place. Keep cool.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/ international regulations (to be specified).

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C.4.19 FLAMMABLE LIQUIDS (CONTINUED)
(Classified in Accordance with Appendix B.6)

Pictogram
No Pictogram

Hazard category	**Signal word**	**Hazard statement**
4	Warning	Combustible liquid

Precautionary statements

Prevention	**Response**	**Storage**	**Disposal**
Keep away from flames and hot surfaces. – No smoking. **Wear protective gloves/eye protection/face protection** Chemical manufacturer, importer, or distributor to specify type of equipment.	**In case of fire: Use ... to extinguish.** ... Chemical manufacturer, importer, or distributor to specify appropriate media. - *if water increases risk*	**Store in a well-ventilated place. Keep cool.**	**Dispose of contents/container to...** in accordance with local/regional/ national/international regulations (to be specified).

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C.4.20 FLAMMABLE SOLIDS
(Classified in Accordance with Appendix B.7)

Hazard category	Signal word	Hazard statement
1	Danger	Flammable solid
2	Warning	Flammable solid

Pictogram
Flame

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition source(s). **Ground/Bond container and receiving equipment.** - *If electrostatically sensitive material is for reloading.* **Use explosion-proof electrical/ventilating/ lighting/... /equipment.** - Chemical manufacturer, importer, or distributor to specify other equipment. - *If dust cloud can occur.* **Wear protective gloves/eye protection/face protection** Chemical manufacturer, importer, or distributor to specify type of equipment.	**In case of fire: Use ... to extinguish** ... Chemical manufacturer, importer, or distributor to specify appropriate media. - *If water increases risk.*		

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C.4.21 SELF-REACTIVE SUBSTANCES AND MIXTURES
(Classified in Accordance with Appendix B.8)

Pictogram
Exploding bomb

Hazard category	Signal word	Hazard statement
Type A	Danger	Heating may cause an explosion

Precautionary statements		
Prevention	**Response**	**Storage**	**Disposal**
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition source(s). **Keep/Store away from clothing/.../combustible materials.** ... Chemical manufacturer, importer, or distributor to specify other incompatible materials. **Keep only in original container.** **Wear protective gloves/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**In case of fire: Use ... to extinguish** ... Chemical manufacturer, importer, or distributor to specify appropriate media. - *If water increases risk.* **In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion.**	**Store in a well-ventilated place. Keep cool.** **Store at temperatures not exceeding** ...°C/...°F. ... Chemical manufacturer, importer, or distributor to specify temperature. **Store away from other materials.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.21 SELF-REACTIVE SUBSTANCES AND MIXTURES (CONTINUED)
(Classified in Accordance with Appendix B.8)

Hazard category	Signal word	Hazard statement	Pictograms
Type B	Danger	Heating may cause a fire or explosion	Exploding bomb and flame

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition source(s). **Keep/Store away from clothing/.../combustible materials.** ... Chemical manufacturer, importer, or distributor to specify other incompatible materials. **Keep only in original container.** **Wear protective gloves/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**In case of fire: Use ... to extinguish.** ... Chemical manufacturer, importer, or distributor to specify appropriate media. - *If water increases risk.* **In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion.**	**Store in a well-ventilated place. Keep cool.** **Store at temperatures not exceeding ...°C/...°F.** ... Chemical manufacturer, importer, or distributor to specify temperature. **Store away from other materials.**	**Dispose of contents/container to...** ...in accordance with local/regional/national/international regulations (to be specified).

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C.4.21 SELF-REACTIVE SUBSTANCES AND MIXTURES(CONTINUED)
(Classified in Accordance with Appendix B.8)

Hazard category	Signal word	Hazard statement	Pictogram Flame
Type C	Danger	Heating may cause a fire	
Type D	Danger	Heating may cause a fire	
Type E	Warning	Heating may cause a fire	
Type F	Warning	Heating may cause a fire	

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition source(s). **Keep/Store away from clothing/.../combustible materials.** ...Chemical manufacturer, importer, or distributor to specify other incompatible materials. **Keep only in original container.** **Wear protective gloves/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**In case of fire: Use ... to extinguish** ...Chemical manufacturer, importer, or distributor to specify appropriate media. - *If water increases risk,*	**Store in a well-ventilated place. Keep cool.** **Store at temperatures not exceeding ...°C/...°F.** ...Chemical manufacturer, importer, or distributor to specify temperature. **Store away from other materials.**	**Dispose of contents/container to...** ...in accordance with local/regional/national/international regulations (to be specified).

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C.4.22 PYROPHORIC LIQUIDS
(Classified in Accordance with Appendix B.9)

Hazard category	Signal word	Hazard statement
1	Danger	Catches fire spontaneously if exposed to air

Pictogram
Flame

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition sources(s). **Do not allow contact with air.** **Wear protective gloves/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**If on skin: Immerse in cool water/wrap with wet bandages** **In case of fire: Use ... to extinguish** .. Chemical manufacturer, importer, or distributor to specify appropriate media. - *If water increases risk*	**Store contents under ...** .. Chemical manufacturer, importer, or distributor to specify appropriate liquid or inert gas.	

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C.4.23 PYROPHORIC SOLIDS
(Classified in Accordance with Appendix B.10)

Hazard category	Signal word	Hazard statement
1	Danger	Catches fire spontaneously if exposed to air

Pictogram
Flame

Precautionary statements

Prevention	Response	Storage	Disposal
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition source(s). **Do not allow contact with air.** **Wear protective gloves/eye protection/face protection** Chemical manufacturer, importer, or distributor to specify type of equipment.	**Brush off loose particles from skin. Immerse in cool water/wrap in wet bandages.** **In case of fire: Use ... to extinguish** ... Chemical manufacturer, importer, or distributor to specify appropriate media. - *If water increases risk:*	**Store contents under ...** ... Chemical manufacturer, importer, or distributor to specify appropriate liquid or inert gas.	

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C.4.24 SELF-HEATING SUBSTANCES AND MIXTURES
(Classified in Accordance with Appendix B.11)

Hazard category	Signal word	Hazard statement
1	Danger	Self-heating; may catch fire
2	Warning	Self-heating in large quantities; may catch fire

Pictogram
Flame

Precautionary statements

Prevention	Response	Storage	Disposal
Keep cool. Protect from sunlight.		**Maintain air gap between stacks/pallets.**	
Wear protective gloves/eye protection/face protection. Chemical manufacturer, importer, or distributor to specify type of equipment.		**Store bulk masses greater than ... kg/...lbs at temperatures not exceeding ...°C/... °F.** ... Chemical manufacturer, importer, or distributor to specify mass and temperature. **Store away from other materials.**	

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C.4.25 SUBSTANCES AND MIXTURES WHICH, IN CONTACT WITH WATER, EMIT FLAMMABLE GASES
(Classified in Accordance with Appendix B.12)

Pictogram
Flame

Hazard category	Signal word	Hazard statement
1	Danger	In contact with water releases flammable gases, which may ignite spontaneously
2	Danger	In contact with water releases flammable gas

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Do not allow contact with water. **Handle under inert gas. Protect from moisture.** **Wear protective gloves/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**Brush off loose particles from skin and immerse in cool water/wrap in wet bandages.** **In case of fire: Use ... to extinguish** ...Chemical manufacturer, importer, or distributor to specify appropriate media. - *If water increases risk*	**Store in a dry place. Store in a closed container.**	**Dispose of contents/container to...** ...in accordance with local/regional/national/ international regulations (to be specified).

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C.4.25 SUBSTANCES AND MIXTURES WHICH, IN CONTACT WITH WATER, EMIT FLAMMABLE GASES (CONTINUED)

(Classified in Accordance with Appendix B.12)

Hazard category	Signal word	Hazard statement	Pictogram
3	Warning	In contact with water releases flammable gas	Flame

Precautionary statements

Prevention	Response	Storage	Disposal
Handle under inert gas. Protect from moisture. **Wear protective gloves/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**In case of fire: Use ... to extinguish.** ... Chemical manufacturer, importer, or distributor to specify appropriate media. - *If water increases risk:*	**Store in a dry place. Store in a closed container.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.26 OXIDIZING LIQUIDS
(Classified in Accordance with Appendix B.13)

Pictogram
Flame over circle

Hazard category	Signal word	Hazard statement
1	Danger	May cause fire or explosion; strong oxidizer

Precautionary statements

Prevention	Response	Storage	Disposal
Keep away from heat. **Keep/Store away from clothing and other combustible materials.** **Take any precaution to avoid mixing with combustibles/...** ... Chemical manufacturer, importer, or distributor to specify other incompatible materials. **Wear protective gloves /eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment. **Wear fire/flame resistant/retardant clothing.**	**If on clothing: Rinse immediately contaminated clothing and skin with plenty of water before removing clothes.** **In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.** **In case of fire: Use ... to extinguish.** ... Chemical manufacturer, importer, or distributor to specify appropriate media. - *if water increases risk*		**Dispose of contents/container to...** ... in accordance with local/regional/ national/international regulations (to be specified).

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C.4.26 OXIDIZING LIQUIDS (CONTINUED)
(Classified in Accordance with Appendix B.13)

Hazard category	Signal word	Hazard statement
2	Danger	May intensify fire; oxidizer
3	Warning	May intensify fire; oxidizer

Pictogram
Flame over circle

Precautionary statements		
Prevention	**Response**	**Storage**
Keep away from heat. **Keep/Store away from clothing/.../combustible materials.** ...Chemical manufacturer, importer, or distributor to specify other incompatible materials. **Take any precaution to avoid mixing with combustibles/...** ... Chemical manufacturer, importer, or distributor to specify other incompatible materials. **Wear protective gloves/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**In case of fire: Use ... to extinguish.** ... Chemical manufacturer, importer, or distributor to specify appropriate media. - *if water increases risk.*	

Disposal
Dispose of contents/container to... ...in accordance with local/regional/national/international regulations (to be specified).

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C.4.27 OXIDIZING SOLIDS
(Classified in Accordance with Appendix B.14)

Pictogram
Flame over circle

Hazard category	Signal word	Hazard statement
1	Danger	May cause fire or explosion; strong oxidizer

Precautionary statements

Prevention	Response	Storage	Disposal
Keep away from heat. **Keep away from clothing and other combustible materials.** **Take any precaution to avoid mixing with combustibles/...** ...Chemical manufacturer, importer, or distributor to specify other incompatible materials. **Wear protective gloves/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment. **Wear fire/flame resistant/retardant clothing.**	**If on clothing: Rinse immediately contaminated clothing and skin with plenty of water before removing clothes.** **In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.** **In case of fire: Use ... to extinguish.** ...Chemical manufacturer, importer, or distributor to specify appropriate media. - *If water increases risk*		**Dispose of contents/container to...** ...in accordance with local/regional/ national/international regulations (to be specified).

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C.4.27 OXIDIZING SOLIDS (CONTINUED)
(Classified in Accordance with Appendix B.14)

Hazard category	Signal word	Hazard statement
2	Danger	May intensify fire; oxidizer
3	Warning	May intensify fire; oxidizer

Pictogram
Flame over circle

Precautionary statements			
Prevention	**Response**	**Storage**	**Disposal**
Keep away from heat. **Keep/Store away from clothing/.../ combustible materials.** ... Chemical manufacturer, importer, or distributor to specify incompatible materials. **Take any precaution to avoid mixing with combustibles/...** ... Chemical manufacturer, importer, or distributor to specify other incompatible materials. **Wear protective gloves/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.	**In case of fire: Use ... to extinguish.** ... Chemical manufacturer, importer, or distributor to specify appropriate media. - *If water increases risk.*		**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.28 ORGANIC PEROXIDES
(Classified in Accordance with Appendix B.15)

Hazard category	Signal word	Hazard statement
Type A	Danger	Heating may cause an explosion

Pictogram
Exploding bomb

Precautionary statements

Prevention	Response	Storage	Disposal
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition source(s). **Keep/Store away from clothing/.../combustible materials.** ... Chemical manufacturer, importer, or distributor to specify incompatible materials. **Keep only in original container.** **Wear protective gloves/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.		**Store at temperatures not exceeding ...°C/...°F. Keep cool.** ... Chemical manufacturer, importer, or distributor to specify temperature. **Protect from sunlight.** **Store away from other materials.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.28 ORGANIC PEROXIDES (CONTINUED)
(Classified in Accordance with Appendix B.15)

Hazard category	Signal word	Hazard statement	Pictograms
Type B	Danger	Heating may cause a fire or explosion	Exploding bomb and flame

Precautionary statements

Prevention	Response	Storage	Disposal
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition source(s). **Keep /Store away from clothing/.../combustible materials.** ... Chemical manufacturer, importer, or distributor to specify incompatible materials. **Keep only in original container.** **Wear protective gloves/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.		**Store at temperatures not exceeding ...°C/ ...°F. Keep cool.** Chemical manufacturer, importer, or distributor to specify temperature. **Protect from sunlight.** **Store away from other materials.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.28 ORGANIC PEROXIDES (CONTINUED)
(Classified in Accordance with Appendix B.15)

Hazard category	Signal word	Hazard statement
Type C	Danger	Heating may cause a fire
Type D	Danger	Heating may cause a fire
Type E	Warning	Heating may cause a fire
Type F	Warning	Heating may cause a fire

Pictogram
Flame

Precautionary statements

Prevention	Response	Storage	Disposal
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Chemical manufacturer, importer, or distributor to specify applicable ignition source(s). **Keep/Store away from clothing/.../ combustible materials** ... Chemical manufacturer, importer, or distributor to specify incompatible materials. **Keep only in original container.** **Wear protective gloves/eye protection/face protection.** Chemical manufacturer, importer, or distributor to specify type of equipment.		**Store at temperatures not exceeding ... °C/ ... °F. Keep cool.** ... Chemical manufacturer, importer, or distributor to specify temperature. **Protect from sunlight.** **Store away from other materials.**	**Dispose of contents/container to...** ... in accordance with local/regional/national/international regulations (to be specified).

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C.4.29 CORROSIVE TO METALS
(Classified in Accordance with Appendix B.16)

Pictogram
Corrosion

Hazard category	Signal word	Hazard statement
1	Warning	May be corrosive to metals

Precautionary statements

Prevention	Response	Storage	Disposal
Keep only in original container.	**Absorb spillage to prevent material damage.**	**Store in corrosive resistant/... container with a resistant inner liner.** ... Chemical manufacturer, importer, or distributor to specify other compatible materials.	

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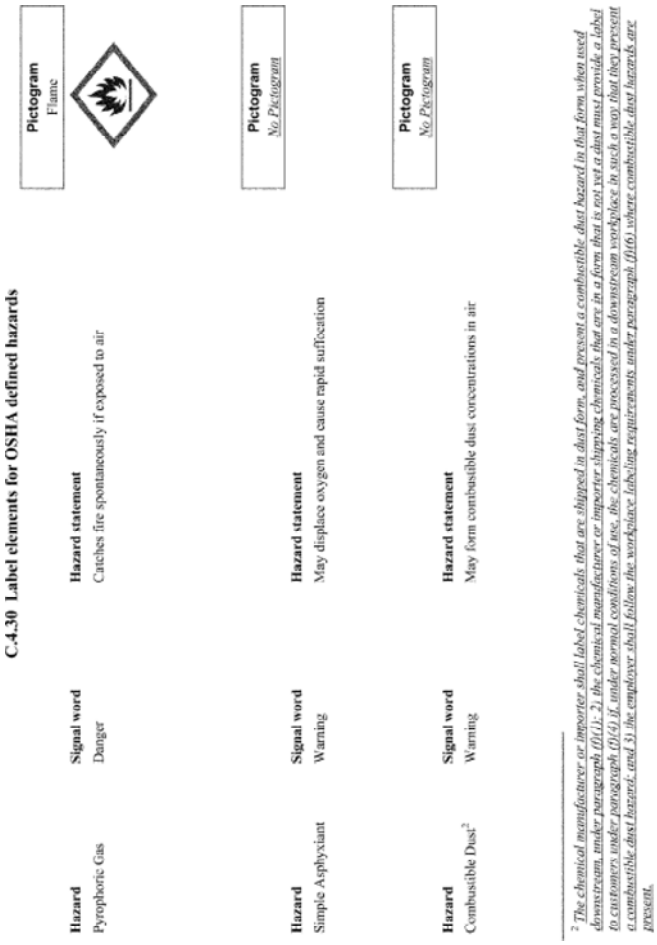

C.4.30 Label elements for OSHA defined hazards

Pictogram	Signal word	Hazard	Hazard statement
Flame	Danger	Pyrophoric Gas	Catches fire spontaneously if exposed to air
No Pictogram	Warning	Simple Asphyxiant	May displace oxygen and cause rapid suffocation
No Pictogram	Warning	Combustible Dust[2]	May form combustible dust concentrations in air

[2] *The chemical manufacturer or importer shall label chemicals that are shipped in dust form, and present a combustible dust hazard in that form when used downstream, under paragraph (f)(1). 2) the chemical manufacturer or importer shipping chemicals that are in a form that is not yet a dust must provide a label to customers under paragraph (f)(5) if, under normal conditions of use, the chemicals are processed in a downstream workplace in such a way that they present a combustible dust hazard; and 3) the employer shall follow the workplace labeling requirements under paragraph (f)(6) where combustible dust hazards are present.*

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APPENDIX D TO §1910.1200—SAFETY DATA SHEETS (MANDATORY)

A safety data sheet (SDS) shall include the information specified in Table D.1 under the section number and heading indicated for sections 1-11 and 16. If no relevant information is found for any given subheading within a section, the SDS shall clearly indicate that no applicable information is available. Sections 12-15 may be included in the SDS, but are not mandatory.

TABLE D.1—MINIMUM INFORMATION FOR AN SDS

Heading	Subheading
1. Identification	(a) Product identifier used on the label; (b) Other means of identification; (c) Recommended use of the chemical and restrictions on use; (d) Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party; (e) Emergency phone number.
2. Hazard(s) identification	(a) Classification of the chemical in accordance with paragraph (d) of §1910.1200; (b) Signal word, hazard statement(s), symbol(s) and precautionary statement(s) in accordance with paragraph (f) of §1910.1200. (Hazard symbols may be provided as graphical reproductions in black and white or the name of the symbol, e.g., flame, skull and crossbones); (c) Describe any hazards not otherwise classified that have been identified during the classification process; (d) Where an ingredient with unknown acute toxicity is used in a mixture at a concentration ≥1% and the mixture is not classified based on testing of the mixture as a whole, a statement that X% of the mixture consists of ingredient(s) of unknown acute toxicity is required.
3. Composition/information on ingredients	Except as provided for in paragraph (i) of §1910.1200 on trade secrets:
	For Substances
	(a) Chemical name;
	(b) Common name and synonyms;
	(c) CAS number and other unique identifiers;
	(d) Impurities and stabilizing additives which are themselves classified and which contribute to the classification of the substance.
	For Mixtures

	In addition to the information required for substances:
	(a) The chemical name and concentration (exact percentage) or concentration ranges of all ingredients which are classified as health hazards in accordance with paragraph (d) of §1910.1200 and
	(1) Are present above their cut-off/concentration limits; or
	(2) Present a health risk below the cut-off/concentration limits.
	(b) The concentration (exact percentage) shall be specified unless a trade secret claim is made in accordance with paragraph (i) of §1910.1200, when there is batch-to-batch variability in the production of a mixture, or for a group of substantially similar mixtures (*See* A.0.5.1.2) with similar chemical composition. In these cases, concentration ranges may be used.
	For All Chemicals Where a Trade Secret is Claimed
	Where a trade secret is claimed in accordance with paragraph (i) of §1910.1200, a statement that the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret is required.
4. First-aid measures	(a) Description of necessary measures, subdivided according to the different routes of exposure, i.e., inhalation, skin and eye contact, and ingestion; (b) Most important symptoms/effects, acute and delayed. (c) Indication of immediate medical attention and special treatment needed, if necessary.
5. Fire-fighting measures	(a) Suitable (and unsuitable) extinguishing media. (b) Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products). (c) Special protective equipment and precautions for fire-fighters.
6. Accidental release measures	(a) Personal precautions, protective equipment, and emergency procedures. (b) Methods and materials for containment and cleaning up.
7. Handling and storage	(a) Precautions for safe handling. (b) Conditions for safe storage, including any incompatibilities.
8. Exposure controls/personal protection	(a) OSHA permissible exposure limit (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available. (b) Appropriate engineering controls. (c) Individual protection measures, such as personal protective equipment.
9. Physical and chemical properties	(a) Appearance (physical state, color, etc.);
	(b) Odor;
	(c) Odor threshold;
	(d) pH;
	(e) Melting point/freezing point;
	(f) Initial boiling point and boiling range;
	(g) Flash point;
	(h) Evaporation rate;
	(i) Flammability (solid, gas);
	(j) Upper/lower flammability or explosive limits;
	(k) Vapor pressure;
	(l) Vapor density;
	(m) Relative density;
	(n) Solubility(ies);
	(o) Partition coefficient: n-octanol/water;
	(p) Auto-ignition temperature;
	(q) Decomposition temperature;
	(r) Viscosity.
10. Stability and reactivity	(a) Reactivity;
	(b) Chemical stability;
	(c) Possibility of hazardous reactions;
	(d) Conditions to avoid (e.g., static discharge, shock, or vibration);
	(e) Incompatible materials;
	(f) Hazardous decomposition products.
11. Toxicological information	Description of the various toxicological (health) effects and the available data used to identify those effects, including:
	(a) Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact);
	(b) Symptoms related to the physical, chemical and toxicological characteristics;
	(c) Delayed and immediate effects and also chronic effects from short- and long-term exposure;
	(d) Numerical measures of toxicity (such as acute toxicity estimates).
	(e) Whether the hazardous chemical is listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest edition), or by OSHA.
12. Ecological information (Non-mandatory)	(a) Ecotoxicity (aquatic and terrestrial, where available); (b) Persistence and degradability; (c) Bioaccumulative potential; (d) Mobility in soil; (e) Other adverse effects (such as hazardous to the ozone layer).
13. Disposal considerations (Non-mandatory)	Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging.
14. Transport information (Non-mandatory)	(a) UN number;
	(b) UN proper shipping name;
	(c) Transport hazard class(es);

	(d) Packing group, if applicable;
	(e) Environmental hazards (e.g., Marine pollutant (Yes/No));
	(f) Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code);
	(g) Special precautions which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance either within or outside their premises.
15. Regulatory information (Non-mandatory)	Safety, health and environmental regulations specific for the product in question.
16. Other information, including date of preparation or last revision	The date of preparation of the SDS or the last change to it.

APPENDIX E TO §1910.1200—DEFINITION OF "TRADE SECRET" (MANDATORY)

The following is a reprint of the *Restatement of Torts* section 757, comment *b* (1939):

b. Definition of trade secret. A trade secret may consist of any formula, pattern, device or compilation of information which is used in one's business, and which gives him an opportunity to obtain an advantage over competitors who do not know or use it. It may be a formula for a chemical compound, a process of manufacturing, treating or preserving materials, a pattern for a machine or other device, or a list of customers. It differs from other secret information in a business (see s759 of the *Restatement of Torts* which is not included in this Appendix) in that it is not simply information as to single or ephemeral events in the conduct of the business, as, for example, the amount or other terms of a secret bid for a contract or the salary of certain employees, or the security investments made or contemplated, or the date fixed for the announcement of a new policy or for bringing out a new model or the like. A trade secret is a process or device for continuous use in the operations of the business. Generally it relates to the production of goods, as, for example, a machine or formula for the production of an article. It may, however, relate to the sale of goods or to other operations in the business, such as a code for determining discounts, rebates or other concessions in a price list or catalogue, or a list of specialized customers, or a method of bookkeeping or other office management.

Secrecy. The subject matter of a trade secret must be secret. Matters of public knowledge or of general knowledge in an industry cannot be appropriated by one as his secret. Matters which are completely disclosed by the goods which one markets cannot be his secret. Substantially, a trade secret is known only in the particular business in which it is used. It is not requisite that only the proprietor of the business know it. He may, without losing his protection, communicate it to employees involved in its use. He may likewise communicate it to others pledged to secrecy. Others may also know of it independently, as, for example, when they have discovered the process or formula by independent invention and are keeping it secret. Nevertheless, a substantial element of secrecy must exist, so that, except by the use of improper means, there would be difficulty in acquiring the information. An exact definition of a trade secret is not possible. Some factors to be considered in determining whether given information is one's trade secret are: (1) The extent to which the information is known outside of his business; (2) the extent to which it is known by employees and others involved in his business; (3) the extent of measures taken by him to guard the secrecy of the information; (4) the value of the information to him and his competitors; (5) the amount of effort or money expended by him in developing the information; (6) the ease or difficulty with which the information could be properly acquired or duplicated by others.

Novelty and prior art. A trade secret may be a device or process which is patentable; but it need not be that. It may be a device or process which is clearly anticipated in the prior art or one which is merely a mechanical improvement that a good mechanic can make. Novelty and invention are not requisite for a trade secret as they are for patentability. These requirements are essential to patentability because a patent protects against unlicensed use of the patented device or process even by one who discovers it properly through independent research. The patent monopoly is a reward to the inventor. But such is not the case with a trade secret. Its protection is not based on a policy of rewarding or otherwise encouraging the development of secret processes or devices. The protection is merely against breach of faith and reprehensible means of learning another's secret. For this limited protection it is not appropriate to require also the kind of novelty and invention which is a requisite of patentability. The nature of the secret is, however, an important factor in determining the kind of relief that is appropriate against one who is subject to liability under the rule stated in this Section. Thus, if the secret consists of a device or process which is a novel invention, one who acquires the secret wrongfully is ordinarily enjoined from further use of it and is required to account for the profits derived from his past use. If, on the other hand, the secret consists of mechanical improvements that a good mechanic can make without resort to the secret, the wrongdoer's liability may be limited to damages, and an injunction against future use of the improvements made with the aid of the secret may be inappropriate.

APPENDIX F TO §1910.1200—GUIDANCE FOR HAZARD CLASSIFICATIONS RE: CARCINOGENICITY (NON-MANDATORY)

The mandatory criteria for classification of a chemical for carcinogenicity under HCS (§1910.1200) are found in Appendix A.6 to this section. This non-mandatory Appendix provides additional guidance on hazard classification for carcinogenicity. Part A of Appendix F includes background guidance provided by GHS based on the Preamble of the International Agency for Research on Cancer (IARC) "Monographs on the Evaluation of Carcinogenic Risks to Humans" (2006). Part B provides IARC classification information. Part C provides background guidance from the National Toxicology Program (NTP) "Report on Carcinogens" (RoC), and Part D is a table that compares GHS carcinogen hazard categories to carcinogen classifications under IARC and NTP, allowing classifiers to be able to use information from IARC and NTP RoC carcinogen classifications to complete their classifications under the GHS, and thus the HCS.

PART A: BACKGROUND GUIDANCE[1]

[1]*The text of Appendix F, Part A, on the IARC Monographs, is paraphrased from the 2006 Preamble to the "Monographs on the Evaluation of Carcinogenic Risks to Humans"; the Classifier is referred to the full IARC Preamble for the complete text. The text is*

not part of the agreed GHS text on the harmonized system developed by the OECD Task Force-HCL.

As noted in Footnote 6 of Appendix A.6. to this section, the GHS includes as guidance for classifiers information taken from the Preamble of the International Agency for Research on Cancer (IARC) "Monographs on the Evaluation of Carcinogenic Risks to Humans" (2006), providing guidance on the evaluation of the strength and evidence of carcinogenic risks to humans. This guidance also discusses some additional considerations in classification and an approach to analysis, rather than hard-and-fast rules. Part A is consistent with Appendix A.6, and should help in evaluating information to determine carcinogenicity.

Carcinogenicity in humans:

The evidence relevant to carcinogenicity from studies in humans is classified into one of the following categories:

(a) Sufficient evidence of carcinogenicity: A causal relationship has been established between exposure to the agent and human cancer. That is, a positive relationship has been observed between the exposure and cancer in studies in which chance, bias and confounding could be ruled out with reasonable confidence.

(b) Limited evidence of carcinogenicity: A positive association has been observed between exposure to the agent and cancer for which a causal interpretation is considered by the Working Group to be credible, but chance, bias or confounding could not be ruled out with reasonable confidence.

In some instances, the above categories may be used to classify the degree of evidence related to carcinogenicity in specific organs or tissues.

Carcinogenicity in experimental animals:

The evidence relevant to carcinogenicity in experimental animals is classified into one of the following categories:

(a) Sufficient evidence of carcinogenicity: A causal relationship has been established between the agent and an increased incidence of malignant neoplasms or of an appropriate combination of benign and malignant neoplasms in two or more species of animals or two or more independent studies in one species carried out at different times or in different laboratories or under different protocols. An increased incidence of tumors in both sexes of a single species in a well-conducted study, ideally conducted under Good Laboratory Practices, can also provide sufficient evidence.

Exceptionally, a single study in one species and sex might be considered to provide sufficient evidence of carcinogenicity when malignant neoplasms occur to an unusual degree with regard to incidence, site, type of tumor or age at onset, or when there are strong findings of tumors at multiple sites.

(b) Limited evidence of carcinogenicity: The data suggest a carcinogenic effect but are limited for making a definitive evaluation because, e.g. the evidence of carcinogenicity is restricted to a single experiment; there are unresolved questions regarding the adequacy of the design, conduct or interpretation of the studies; the agent increases the incidence only of benign neoplasms or lesions of uncertain neoplastic potential; or the evidence of carcinogenicity is restricted to studies that demonstrate only promoting activity in a narrow range of tissues or organs.

Guidance on How To Consider Important Factors in Classification of Carcinogenicity (See Reference Section)

The weight of evidence analysis called for in GHS and the HCS (§1910.1200) is an integrative approach that considers important factors in determining carcinogenic potential along with the strength of evidence analysis. The IPCS "*Conceptual Framework for Evaluating a Mode of Action for Chemical Carcinogenesis"* (2001), International Life Sciences Institute (ILSI) "*Framework for Human Relevance Analysis of Information on Carcinogenic Modes of Action"* (Meek, *et al.,* 2003; Cohen *et al.,* 2003, 2004), and Preamble to the IARC Monographs (2006; Section B.6. (Scientific Review and Evaluation; Evaluation and Rationale)) provide a basis for systematic assessments that may be performed in a consistent fashion. The IPCS also convened a panel in 2004 to further develop and clarify the human relevance framework. However, the above documents are not intended to dictate answers, nor provide lists of criteria to be checked off.

Mode of Action

Various documents on carcinogen assessment all note that mode of action in and of itself, or consideration of comparative metabolism, should be evaluated on a case-by-case basis and are part of an analytic evaluative approach. One must look closely at any mode of action in animal experiments, taking into consideration comparative toxicokinetics/toxicodynamics between the animal test species and humans to determine the relevance of the results to humans. This may lead to the possibility of discounting very specific effects of certain types of substances. Life stage-dependent effects on cellular differentiation may also lead to qualitative differences between animals and humans. Only if a mode of action of tumor development is conclusively determined not to be operative in humans may the carcinogenic evidence for that tumor be discounted. However, a weight of evidence evaluation for a substance calls for any other tumorigenic activity to be evaluated, as well.

Responses in Multiple Animal Experiments

Positive responses in several species add to the weight of evidence that a substance is a carcinogen. Taking into account all of the factors listed in A.6.2.5.2 and more, such chemicals with positive outcomes in two or more species would be provisionally

considered to be classified in GHS Category 1B until human relevance of animal results are assessed in their entirety. It should be noted, however, that positive results for one species in at least two independent studies, or a single positive study showing unusually strong evidence of malignancy may also lead to Category 1B.

Responses Are in One Sex or Both Sexes

Any case of gender-specific tumors should be evaluated in light of the total tumorigenic response to the substance observed at other sites (multi-site responses or incidence above background) in determining the carcinogenic potential of the substance.

If tumors are seen only in one sex of an animal species, the mode of action should be carefully evaluated to see if the response is consistent with the postulated mode of action. Effects seen only in one sex in a test species may be less convincing than effects seen in both sexes, unless there is a clear patho-physiological difference consistent with the mode of action to explain the single sex response.

Confounding Effects of Excessive Toxicity or Localized Effects

Tumors occurring only at excessive doses associated with severe toxicity generally have doubtful potential for carcinogenicity in humans. In addition, tumors occurring only at sites of contact and/or only at excessive doses need to be carefully evaluated for human relevance for carcinogenic hazard. For example, forestomach tumors, following administration by gavage of an irritating or corrosive, non-mutagenic chemical, may be of questionable relevance. However, such determinations must be evaluated carefully in justifying the carcinogenic potential for humans; any occurrence of other tumors at distant sites must also be considered.

Tumor Type, Reduced Tumor Latency

Unusual tumor types or tumors occurring with reduced latency may add to the weight of evidence for the carcinogenic potential of a substance, even if the tumors are not statistically significant.

Toxicokinetic behavior is normally assumed to be similar in animals and humans, at least from a qualitative perspective. On the other hand, certain tumor types in animals may be associated with toxicokinetics or toxicodynamics that are unique to the animal species tested and may not be predictive of carcinogenicity in humans. Very few such examples have been agreed internationally. However, one example is the lack of human relevance of kidney tumors in male rats associated with compounds causing α2u-globulin nephropathy (IARC, Scientific Publication N° 147[2]). Even when a particular tumor type may be discounted, expert judgment must be used in assessing the total tumor profile in any animal experiment.

[2]*While most international agencies do not consider kidney tumors coincident with α2u-globulin nephropathy to be a predictor of risk in humans, this view is not universally held. (See: Doi et al., 2007).*

PART B: INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC)[3]

[3]*Preamble of the International Agency for Research on Cancer (IARC) "Monographs on the Evaluation of Carcinogenic Risks to Humans" (2006).*

IARC Carcinogen Classification Categories:

Group 1: The agent is *carcinogenic to humans*

This category is used when there is *sufficient evidence of carcinogenicity* in humans. Exceptionally, an agent may be placed in this category when evidence of carcinogenicity in humans is less than *sufficient* but there is *sufficient evidence of carcinogenicity* in experimental animals and strong evidence in exposed humans that the agent acts through a relevant mechanism of carcinogenicity.

Group 2:

This category includes agents for which, at one extreme, the degree of evidence of carcinogenicity in humans is almost *sufficient,* as well as those for which, at the other extreme, there are no human data but for which there is evidence of carcinogenicity in experimental animals. Agents are assigned to either Group 2A (*probably carcinogenic to humans*) or Group 2B (*possibly carcinogenic to humans*) on the basis of epidemiological and experimental evidence of carcinogenicity and mechanistic and other relevant data. The terms *probably carcinogenic* and *possibly carcinogenic* have no quantitative significance and are used simply as descriptors of different levels of evidence of human carcinogenicity, with *probably carcinogenic* signifying a higher level of evidence than *possibly carcinogenic.*

Group 2A: The agent is *probably carcinogenic to human.*

This category is used when there is *limited evidence of carcinogenicity* in humans and *sufficient evidence of carcinogenicity* in experimental animals. In some cases, an agent may be classified in this category when there is *inadequate evidence of carcinogenicity* in humans and *sufficient evidence of carcinogenicity* in experimental animals and strong evidence that the carcinogenesis is mediated by a mechanism that also operates in humans. Exceptionally, an agent may be classified in this category solely on the basis of *limited evidence of carcinogenicity* in humans. An agent may be assigned to this category if it clearly belongs, based on mechanistic considerations, to a class of agents for which one or more members have been classified in Group 1 or Group 2A.

Group 2B: The agent is *possibly carcinogenic to humans.*

This category is used for agents for which there is *limited evidence of carcinogenicity* in humans and less than *sufficient evidence of carcinogenicity* in experimental animals. It may also be used when there is *inadequate evidence of carcinogenicity* in humans but there is *sufficient evidence of carcinogenicity* in experimental animals. In some instances, an agent for which there is *inadequate evidence of carcinogenicity* in humans and less than *sufficient evidence of carcinogenicity* in experimental animals together with supporting evidence from mechanistic and other relevant data may be placed in this group. An agent may be classified in this category solely on the basis of strong evidence from mechanistic and other relevant data.

PART C: NATIONAL TOXICOLOGY PROGRAM (NTP), "REPORT ON CARCINOGENS", BACKGROUND GUIDANCE

NTP Listing Criteria[4]:

[4] *See: http://ntp.niehs.nih.gov/go/15209.*

The criteria for listing an agent, substance, mixture, or exposure circumstance in the Report on Carcinogens (RoC) are as follows:

Known To Be A Human Carcinogen: There is sufficient evidence of carcinogenicity from studies in humans[5] that indicates a causal relationship between exposure to the agent, substance, or mixture, and human cancer.

[5] *This evidence can include traditional cancer epidemiology studies, data from clinical studies, and/or data derived from the study of tissues or cells from humans exposed to the substance in question that can be useful for evaluating whether a relevant cancer mechanism is operating in people.*

Reasonably Anticipated To Be A Human Carcinogen: There is limited evidence of carcinogenicity from studies in humans that indicates that a causal interpretation is credible, but that alternative explanations, such as chance, bias, or confounding factors, could not adequately be excluded,

or

there is sufficient evidence of carcinogenicity from studies in experimental animals that indicates there is an increased incidence of malignant and/or a combination of malignant and benign tumors in multiple species or at multiple tissue sites, or by multiple routes of exposure, or to an unusual degree with regard to incidence, site, or type of tumor, or age at onset,

or

there is less than sufficient evidence of carcinogenicity in humans or laboratory animals; however, the agent, substance, or mixture belongs to a well-defined, structurally-related class of substances whose members are listed in a previous Report on Carcinogens as either known to be a human carcinogen or reasonably anticipated to be a human carcinogen, or there is convincing relevant information that the agent acts through mechanisms indicating it would likely cause cancer in humans.

Conclusions regarding carcinogenicity in humans or experimental animals are based on scientific judgment, with consideration given to all relevant information. Relevant information includes, but is not limited to, dose response, route of exposure, chemical structure, metabolism, pharmacokinetics, sensitive sub-populations, genetic effects, or other data relating to mechanism of action or factors that may be unique to a given substance. For example, there may be substances for which there is evidence of carcinogenicity in laboratory animals, but there are compelling data indicating that the agent acts through mechanisms that do not operate in humans and would therefore not reasonably be anticipated to cause cancer in humans.

PART D: TABLE RELATING APPROXIMATE EQUIVALENCES AMONG IARC, NTP ROC, AND GHS CARCINOGENICITY CLASSIFICATIONS

The following table may be used to perform hazard classifications for carcinogenicity under the HCS (§1910.1200). It relates the approximated GHS hazard categories for carcinogenicity to the classifications provided by IARC and NTP, as described in Parts B and C of this Appendix.

APPROXIMATE EQUIVALENCES AMONG CARCINOGEN CLASSIFICATION SCHEMES

IARC	GHS	NTP RoC
Group 1	Category 1A	Known.
Group 2A	Category 1B	Reasonably Anticipated (See Note 1).
Group 2B	Category 2	Reasonably Anticipated (See Note 1).

Note 1:

1. *Limited evidence of carcinogenicity from studies in humans (corresponding to IARC 2A/GHS 1B);*

2. *Sufficient evidence of carcinogenicity from studies in experimental animals (again, essentially corresponding to IARC 2A/GHS*

1B);

3. *Less than sufficient evidence of carcinogenicity in humans or laboratory animals; however:*

a. *The agent, substance, or mixture belongs to a well-defined, structurally-related class of substances whose members are listed in a previous RoC as either "Known" or "Reasonably Anticipated" to be a human carcinogen, or*

b. *There is convincing relevant information that the agent acts through mechanisms indicating it would likely cause cancer in humans.*

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Appendix E

Telecommunication Tower Climbing and Fall Protection Program

TELECOMMUNICATION TOWER CLIMBING AND FALL PROTECTION PROGRAM

Health and Safety Program No. 7.4
Revision #: 0 Issue Date: October 15, 2003 Revision Date: June 9, 2003

1.0 PURPOSE

The purpose of this Program is to present sufficient details of proven present day methods, equipment, and training requirements necessary to provide safe and adequate procedures for workers climbing, moving, resting, and working at elevated work sites. This Program provides minimum requirements for climbing communication towers and addresses the requirements of the Occupational Safety and Health Administration (OSHA) Fall Protection Standard 29 CFR Subpart M – Fall Protection.

This Program is issued by AMEC E&I, Inc. (AMEC) and was modeled after the United States Department of the Interior, Bureau of Land Management's (BLM) *Telecommunications Tower Climbing and Fall Protection Manual, May 1998*. It is designed to provide specific guidelines, instructions, procedures, and criteria for establishing and maintaining a fall protection policy and program for communications tower climbing and maintenance performed by AMEC employees and contractors.

2.0 SCOPE

This Program applies to all AMEC employees who climb or perform work on communications towers. All communication towers that require climbing by AMEC employees shall be in compliance with OSHA standards for Fall Protection.

DEFINITIONS

Aerial device – Any vehicle-mounted device, telescoping or articulating, or both, which is used to position personnel.

Anchorage – A secure point of attachment for lifelines, lanyards or deceleration devices.

Attachment – A device such as a tie, band, or fastening that joins one thing to another.

Body Belt – A belt that consists of a belt strap and D-rings, and may include a cushion section or a tool saddle. ***Note: As of January 1, 1998, the Body Belt can not be used as a fall protection device. They may, however, still be used as a positioning device.***

Carabiner – A connector component generally comprised of a trapezoidal or oval shaped body with a normally closed gate or similar arrangement that may be opened to permit the body to receive an object, and when released, automatically closes to retain the object.
Carabiners are generally one of three types, namely:

1. The locking type **(required by AMEC)** with a self-closing, self-locking gate that remains closed and locked until intentionally unlocked and opened for connection or disconnection; or
2. The non-locking type **(not permitted by AMEC)** with a self-closing gate that remains closed, but not locked, until intentionally opened by the user for connection or disconnection;

or

3. The manual locking type **(not recommended, but permitted by AMEC)** with a selfclosing gate that remains closed but not locked (unless purposely locked by the user) until intentionally opened by the user for connection or disconnection.

Climbing – The vertical (ascending and descending) and horizontal movement to access the elevated work position. See Transferring and Transitioning. **A climber must be mechanically attached during all climbing, work, or rest activities.**

Competent person – One who, because of training, experience, and authority, is capable of identifying and correcting hazardous or dangerous conditions in the personal fall arrest system or any component thereof under consideration, as well as its application and use with related equipment.

Deceleration device – Any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., that serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on an employee during fall arrest.

Deceleration distance – The additional vertical distance that a falling worker travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of a full body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the worker comes to a full stop (1.1 m (3.5 feet) maximum).

Drop zone – The area or space on a tower directly under a worker into which he/she would fall before the fall arrest system stops the fall.

Detachable ladders – Detachable ladders are those that are not permanently installed to a structure but are the normal means of accessing the facilities on the structure as well as the structure itself.

Energy (shock) absorber – A component whose primary function is to dissipate energy and limit deceleration forces on the body during fall arrest. Such devices may employ various principles such as deformation, friction, tearing of materials or breaking of stitches to accomplish energy absorption. An energy absorber causes an increase in the deceleration distance.

Engineered anchorage – A fall protection anchorage that is designed and will operate to withstand the maximum expected impact load while maintaining a specified overload capacity factor (OCF) of two.

Engineered system – A fall protection system that is designed to absorb the energy of a worker(s) during a fall while accommodating the static loads of tools and hardware. See fall protection system.

Fall arrest system – The assemblage of equipment such as a full body harness in conjunction with a deceleration device and anchorage to limit the forces a worker experiences during a fall from one elevation to another.

Fall prevention system – A system intended to prevent a worker from falling from one elevation to another. Such systems include positioning device systems, guardrail, barriers, and restraint systems. Fall prevention systems are used in an attempt to prevent workers from falling from an elevation. It should be noted that these devices do not absolutely prevent a worker from falling; their function is to keep the worker at the same elevation.

Fall protection system (hardware) – Consists of either a fall prevention system or a fall arrest system. The system must have three integral parts: an anchorage, a climber's body attachment device, and a means of connecting the body attachment device to the anchorage.

Free fall distance – The vertical displacement of the fall arrest attachment point on the employee's body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, and lifeline/lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.

Full body harness – A component with a design of straps that is fastened about the worker in a manner so as to contain the torso and distribute the fall arrest forces over at least the upper thighs or buttocks, pelvis, chest and shoulders with means for attaching it to other components or subsystems.

***NOTE**: Wherever the word "harness" is used by itself in this manual, it refers to full body harness unless otherwise specified.*

Hazard – Anything that can potentially endanger personnel, impair safe working conditions, and conceivably cause injury, or loss of life.

Job Safety Analysis (JSA) – A study of a specific task or work assignment to (1) identify each step involved with a particular task, (2) identify the known or potential hazards associated with each step, (3) develop solutions that will eliminate, minimize, or control the hazards, and (4) identify residual risks (See AMEC Job Safety Analysis Program).

Job site – The assembly point at the structure or equipment where the workers, tools, and vehicles are assembled to perform the climbing to the work position.

Lanyard – A flexible line of rope, wire rope, or strap that generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage. AMEC only allows the use of double lanyard systems when used for fall protection.

Lifeline – A component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and that serves as a means for connecting other components of a personal fall arrest system to the anchorage.

Near Miss Accident – An accident or incident that does not result in injury to personnel.

Overload capacity factor – The number by which a maximum load is multiplied to assure that the system does not fail when loaded to the design load.

Pole Climbers/Gaffs – Devices that are used by tower workers for ascending, descending, and

maintaining a work position on wood poles when no other means of support are available. Pole climbers or gaffs are secured to the tower worker's legs by foot and leg straps and are driven into the wood pole surface to provide support for the tower worker.
Pole strap – See Positioning strap.

Positioning strap – A strap with snaphook(s) to connect to the D-rings of a climber's full body harness. Used as a positioning device (also known as pole strap or safety strap).

Qualified climber – A worker who has received appropriate training, satisfies physical fitness requirements, understands the methods, and has routinely demonstrated proficiency in climbing. A qualified climber will have an in depth knowledge of the hazards and equipment associated with climbing. The Supervisor shall confirm the worker's climbing knowledge and ability. A climber who has not climbed for a period of one (1) year will be retrained. Climbers who climb at least once a year will be retrained on a periodic three- (3) year cycle.

Rollout – A movement process by which a snaphook or carabiner accidentally disengages from an anchorage or object to which it is coupled.

Safety strap – See Positioning strap.

Self-retracting lanyard/lifeline – A device that contains a drum-wound web lanyard or steel line that may be slowly extracted from or retracted onto the drum under slight tension during normal movement of the user. The line has means for attachment to the fall arrest attachment on the body support. After onset of a fall, the device automatically locks the drum and arrests the fall. The device may have integral means for energy absorption.

Snaphook – A connector comprised of a hook-shaped member with a normally closed keeper or similar arrangement that may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. Snaphooks are to be the locking type with a self-closing, self-locking keeper that remains closed and locked until unlocked and pressed open for connection or disconnection (two distinct operations are required to open a locking type snaphook). **Non-locking snaphooks are prohibited.**

Total fall distance – The maximum vertical distance between the person's position before a fall and after the fall is arrested. The total fall distance includes maximum free fall distance plus maximum deceleration distance. Total fall distance excludes dynamic elongation.

Tower Climbing and Fall Protection Program – A program intended to prevent falls and injuries to workers due to accidents when ascending, descending, and working at elevations.

Transferring – The act of moving from one distinct object to another (e.g., between an aerial device and a structure).

Transitioning – The act of moving from one location to another on equipment or a structure while going around or over an obstruction.

Work position – The elevated location on the structure or equipment where the worker is in position to perform the assigned work or task.

Written work procedure – A set of specific instructions outlining the course of action for

performing tasks in a safe and timely manner, as identified in the Job Safety Analysis (JSA) (See the AMEC Job Safety Analysis Program).

4.0 RESPONSIBILITIES

4.1 EMPLOYEES

Affected employees are responsible for:

- Complying with the general requirements of this Program and any specific requirements developed to address the fall hazards of the particular site or project that they may be working.
- Identifying unsafe and unhealthful conditions that exist or are anticipated at a job site.
- Participating in the review of the work procedure plan or Job Safety Analysis (JSA) to obtain an understanding of the safety and health requirements and the work procedures of the job.
- Inspecting their personal fall protection equipment prior to each use.

4.2 SUPERVISOR

The Supervisor is responsible for:

- Specifying, in concurrence with the crew, the fall protection system to be used before engaging in the work activity.
- Ensuring that the JSA safety requirements and pertinent work procedures are clearly defined and well understood by all.
- Addressing any and all safety concerns, expressed by any member of the work crew. The Supervisor shall stop all work and resolve the issue before proceeding.
- Being aware of changes in conditions and events that may require review and modifications of the fall protection system or work procedure.
- Ensuring that all climbing and fall protection equipment is inspected prior to each use.

4.3 LOCAL HEALTH AND SAFETY REPRESENTATIVE (LHSR)

LHSR is responsible for ensuring that:

- The established Tower Climbing and Fall Protection Program is carried out in an effective manner.
- Employees receive the proper training required in the use, care, and inspection of fall protection equipment.
- The proficiency requirements, that allow workers to perform climbing activities, are met.
- Fall protection equipment is inspected on an annual basis by a competent person.

5.0 REQUIRMENTS

5.1 PERSONAL PROTECTIVE EQUIPMENT

5.1.1 General

This section identifies the application of personal protective equipment (PPE) used by workers while climbing, resting, and performing work at elevated locations. The equipment described is utilized to help place the worker in a desirable working position and to eliminate potential fall accident injuries.

- Personal protective equipment is to be stored in a dry, dark, secure area and protected from cuts, abrasions, and chemicals when not in use.
- Mandatory inspection of equipment before each use will serve to minimize accidents resulting from deterioration of equipment. All fall protection equipment shall be periodically inspected on at least an annual basis, by the LHSR or a competent person, and a documented record of the inspection shall be maintained by LHSR in the office or site files.
- Manufacturer's instructions and recommendations shall be incorporated into inspection, replacement, and preventive maintenance programs. Defective equipment shall be immediately removed from service and tagged "Do Not Use" until repaired, and reported to the program LHSR. If defective equipment is determined to be non-repairable, it shall be disposed of immediately.

5.1.2 Fall Prevention/Positioning Equipment

5.1.2.1 FULL BODY HARNESS

A full body harness, as defined in OSHA 1926.500, means straps that may be secured about the worker in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders. It will be provided with a means for attaching to other components of a personal fall arrest system.

Full body harnesses used by AMEC employees shall be certified by the manufacturer to meet all OSHA standards and regulations. It is recognized that many different body harness designs are available to climbers that offer advantages for certain tower structure designs and for the type of work to be performed. The climber may use personal preference in selecting the most appropriate harness to wear and shall ensure the harness fits properly.
A full body harness, when used in conjunction with pole climbers, permits work positioning and limits the exposure to falls while the worker has both hands free to perform a work task. A full body harness with positioning strap or lanyard however, will not prevent falling vertically (sliding) down wood poles. The full body harness, with a positioning strap or lanyard, is a fall prevention system when the positioning strap or lanyard will limit falls to 610 mm (2 feet) or less. Non-composite (100 percent leather) positioning straps and body belt buckle straps **shall not be used**.

Full body harnesses shall have a chest strap and a seat strap to distribute part of the load across the buttocks. The D-ring located at the center of the upper back will normally be the connection point for a safety lanyard to distribute forces to the body most effectively. The D-ring located front and center of the upper chest may be worn when the work procedure warrants.
Full body harnesses shall be periodically inspected for the following:

- Cuts, tears, and chafing
- Electrical burns
- Physical deterioration
- Ultraviolet deterioration
- Wear on connection devices
- Evidence of shock loading
- Chemical damage and/or deterioration

Suspect body harnesses shall be destroyed. Body harnesses shall be stored in a dry, dark, and

protected environment.

5.1.2.2 POSITIONING STRAP/ROPE LANYARD

Positioning straps or rope lanyards shall have each end snapped into a separate D-ring of full body harness when in a rest or work position. Rope lanyards will be spliced by the manufacturer or by the manufacturer's qualified representative to connect fittings, other ropes, extensions, and attachments with a minimum four tuck splice. Single lanyard systems are not allowed by AMEC for fall protection. Only double lanyard systems are to be used. This allows employees to be 100 percent tied off at all times.

a. Snaphook gates shall face outward away from the worker's body. **The use of non-locking snaphooks as part of a personal fall arrest system and/or positioning device is prohibited.** Multiple snaphooks of the locking type and/or approved carabiners may be attached to a single D-ring.

b. Tools, handlines, or other objects that may interfere with the snaphook and cause rollout shall not be attached to or hung from the positioning strap.

c. Positioning straps and rope lanyards shall be inspected for the following:

- Snaphook keeper spring tension
- Exposure of colored wear-warning inner layer
- Elongation of holes in positioning strap material
- Cuts, burns, extra holes, or fraying of material
- Loose or worn rivets
- Cracks, burns, or corrosion in the snaphook
- Excessive side movement of the snaphook keeper
- Chemical damage and/or deterioration

5.1.2.3 POLE CLIMBERS/GAFFS

Pole climbers may not be used if the gaffs are less than 32 mm (1-1/4 inches) in length as measured on the underside of the gaff. The gaffs of pole climbers shall be covered with gaff protectors when not being used.

Pole climbers shall be inspected before each use and shall be inspected for the following conditions:

- Fractured or cracked gaffs or leg irons
- Wear on stirrup and leg irons
- Loose or dull gaffs
- Proper sharpening of gaffs
- Broken straps or buckles
-

If any of these conditions exist, the defect shall be corrected before the climbers are used. Pole climbers may not be worn when working on ladders (unless using the wood structure as access to a work position on a ladder) or when working from an aerial device. Pole climbers may be worn on ladders, in aerial devices, or when walking if used as part of an access system

incidental to work activity. ASTM F887-91a provides detailed information for care of pole climbers.

5.1.3 Fall Arrest Equipment

All fall arrest equipment shall have locking-type snaphooks or approved carabiners that meet or exceed applicable OSHA and ANSI requirements. Fall arrest equipment shall be used as a component of the system as shown in Attachment A. This equipment minimizes physical trauma to the worker, comfortably supports the worker after a fall until a rescue can be made, and suspends the worker in a more easily retrievable position for rescuers.

- Fall arrest equipment should be attached to an engineered anchorage above the worker's waist. Regardless of the attachment height, the length of the body attachment shall be such that the free fall distance (see definition) shall not exceed 1.9 m (6 feet).
- Fall arrest equipment receiving an impact or shock load from a fall shall be removed from service, tagged “Do Not Use”, and equipment manager. This type of incident is considered a “Near Miss Accident” and should also be reported to the Supervisor and the LHSR. The equipment shall be returned to the manufacturer for inspection and repair. It shall be repaired only by a qualified person at an authorized facility, or shall be destroyed.
- The preventive maintenance and inspection program for PPE shall include determination of\shelf and service lifetimes and the load limitations for the system to be used as per manufacturer’s recommendations.

5.1.3.1 LANYARDS WITH ENERGY ABSORBER

Lanyards and their associated energy absorbers shall be used in accordance with the following:

- Possible falls into a fall arrest system shall not exceed 1.9 m (6 feet) free fall, 2.9 m (9.5 feet) total fall distance, and 8 kN (1800 pounds) maximum force.
- Manufacturer's shock force data or test data should be incorporated into the total arrest system design (including anchorage).
- Energy absorbers that have shock force indicators should be used (when available).
- Lanyards shall be equipped with locking snaphooks or carabiners.
- Lanyards shall not be knotted.
- Lanyards shall not be attached back onto themselves unless a carabiner is used.
- Only double lanyard systems shall be used for fall protection.

Lanyards and energy absorbers shall be inspected for the following:

- Partial activation of the energy absorbing device.
- Cuts, tears, and chafing.
- Electrical burns.
- Physical and ultraviolet light deterioration.
- Wear on snaphooks.
- Operation of snaphooks.
- Chemical damage and/or deterioration.

Suspect lanyards and/or energy absorbing equipment shall be tagged “Do Not Use” before they

are destroyed and reported to the Supervisor and the Office Safety Coordinator. Lanyards and energy absorbing devices shall be stored in a dry, dark, and protected environment.

5.1.3.2 SELF-RETRACTING LANYARD/LIFELINE

Self-retracting lanyards and lifelines are attached to an automatic rewinding reel that quickly arrests a fall and limits the shock load to the worker. Self-retracting lanyards and lifelines limit the freedom of movement up to the length of the lanyard or webbing.
Self-retracting lanyards and lifelines shall be used in accordance with the following:

- Manufacturer's energy absorbing data or test data should be incorporated into the total arrest
- system design (including anchorage).
- Self-retracting lanyards that have shock force indicators should be used (when available).
- Self-retractable lanyards shall be equipped with locking snaphooks or carabiners.
- Self-retracting lifelines shall be permanently marked with the manufacturer's name, model
- number, rating, and date of manufacture.

Self-retracting lanyards and lifelines shall be inspected for the following:

- Partial activation of the energy absorbing device
- Snaphook keeper spring tension
- Cuts, burns, extra holes, or fraying of material
- Excessive side movement of the snaphook keeper
- Chemical damage and/or deterioration

Suspect or shock activated self-retracting lanyards and lifelines shall be tagged “Do Not Use”, reported to the Supervisor and the Office Safety Coordinator, and returned to the manufacturer or other authorized repair service for repair. Periodical inspections shall be in accordance with the manufacturer's recommendations.

5.1.3.3 FIXED LADDER SAFETY CLIMBING SYSTEM

Fixed ladder safety climbing devices usually consisting of a fixed rail, tube, or tensioned cable with slider shall be maintained to permit the worker using the system to climb without continually having to hold, push, or pull any part of the system, leaving both hands free for climbing. The connection between the slider and the attachment point on a full body harness shall not exceed 230 mm (9 inches). These systems shall be activated within 610 mm (2 feet) after a fall occurs, in order to limit the descending velocity of the worker to 2.1 m/sec (7 ft/sec) or less. These systems are typically mounted on the face of a fixed ladder on the structure.
The climber shall inspect the structure, system, and personal protective equipment (PPE) prior to use to determine that they are in good working order. If a climbing system is found to be defective, the climber will use an approved alternative climbing and fall arrest method or elect not to climb.

5.1.4 Rescue Equipment

Controlled descent devices are used to make emergency descents from aerial devices or elevated positions on structures. Controlled descent devices shall be sized to include the maximum elevated position obtainable from the bucket, platform, or elevated position. The rate of descent

may be controlled by the worker (or rescuer) or by a friction type brake.
These devices shall be attached to the full body harness such that the worker (or rescuer) will have control of the descent and be able to attach and detach themselves. Supervisors shall be responsible for determining that the necessary components to affect the attachment between the descent device and the climber's full body harness are stored with the descent device.
Controlled descent devices shall be stored in a clean, dry, protected environment. They shall be cleaned and carefully inspected prior to and after each use.

5.1.5 Personal Safety Equipment

A Job Safety Analysis shall be completed and maintained current at each job site. Prior to the start of any work at the job site or work area, the Job Safety Analysis (JSA) shall be reviewed to determine what personal protective equipment and safety equipment are necessary, and if there are any new hazards at the site. Refer to the AMEC Job Safety Analysis program for further information. Personal protective equipment shall be worn as required. Personal safety equipment includes head protection, foot protection, eye protection, ear protection, and other equipment such as gloves and coveralls. Tower climbers may consolidate the issues of safety and personal preference in selecting their choice of personal safety equipment best suited for the job.

Note: *Observers* ***shall not*** *enter the work area unless authorized by the Supervisor and will be equipped with personal protective equipment dictated by the hazards present.*

The following list specifies safety equipment that is either required or recommended to be used while on the job site and for climbing towers:
Head Protection – All personnel shall wear hard hats or approved safety helmets on the job site whether they are on the ground or climbing the tower. Anyone within the guy-wire distance (radius) of a communications tower construction project must wear a hard hat and exercise caution. When using hard hat liners, it is important the hard hat fits over the additional headgear. Hard hats or safety helmets will also be equipped with chinstraps.

Foot Protection – Steel toed, reinforced soled tower climbing boots or shoes are recommended for tower climbers. The specific climbing conditions such as tower structure and weather conditions will dictate to the climber what the best foot protection will be. The most suitable type of footwear for ground workers may be considerably different than what the climber requires. Personal preference in selecting the most appropriate safety footwear shall prevail. Tennis and other soft-soled shoes shall not be used for tower climbing.

Hand Protection – Leather work gloves are recommended when climbing towers.

Eye Protection – Safety goggles or safety glasses should be used whenever eye safety is at risk.
Ear Protection – Earplugs should be used whenever ear safety is at risk.

Clothing – Suitable work clothes should be worn when climbing towers to offer protection from cuts and abrasion, weather conditions, and other tower structure hazards. Adequate work clothing should consist of coveralls, pants, and shirts made of material suitable for outdoor working conditions. Tower climbing with only short pants (shorts) and/or no shirt are prohibited. Clothing should not be too loose or ragged and should be free from snag hazards such as loops and belts.

Communications Devices – Two-way, hands free, voice-actuated radio head sets should be

worn by the tower climber and ground safety person to provide reliable communications during the work, negating the need for hand signals.

5.1.6 Personal Conduct

When tower climbing, always follow safe climbing practices and watch for any unsafe climbing practices by others at the job site. Unsafe climbing practices must be eliminated or corrected before accidents occur. Typical unsafe climbing practices that are prohibited while working on towers are:

- Climbing or descending too fast
- Climbing too close to ropes and handlines (lifelines)
- Fatigue
- Climbing through or past unprotected electrical conductors
- Using too long steps in climbing or descending
- Not inspecting tower before climbing
- Inattention while ascending or descending
- Belting off to a tower at wrong position
- Physically unfit for climbing
- Horseplay
- Catching material thrown up from ground while on tower
- Failure to get a good hand hold
- Improper balancing of body weight
- Holding on to antenna lines, coax, conduits, etc. for support
- Showing off (Fancy Dancing)
- Climbing while under the influence of alcohol or drugs
- Climbing when ill or on medication that may negatively impact or impair good judgment or
- performance

5.2 ANCHORAGES, AERIAL, AND FIXED CLIMBING DEVICES

5.2.1 Anchorage

Attachment to slanted structure members should be avoided. Anchors may be welded (closed) eyebolts, rigging points, slings, ropes, or other attachments designed into the structure or a lanyard wrapped around structural members that limits movement of the lanyard at the connection point. The tower manufacturer shall identify the acceptable anchorage point for supporting the fall protection system.

Anchorages shall meet the minimum requirements of an engineered system for each worker attached. An engineered system shall be in compliance with the mandatory criteria for personal fall arrest systems in OSHA 29 CFR-1910.66 App C, and must meet and/or consider the following criteria:

- An anchorage of sufficient design to withstand a static load of 22.2 kN (5,000 pounds) or the maximum anticipated impact load times an overload capacity factor (OCF) of at least 2.0 for one worker.

- An additional OCF of 0.2 multiplier for each additional worker attached to the anchorage.
- Inclusion of additional static and dynamic loads associated with hardware and rigging attached to the anchorage.
- Energy absorbing properties of the fall arrest system, when incorporated into the anchorage design, will usually reduce the maximum forces imposed onto the anchorage.
- Attachment around a lattice steel tower member supported by one bolt on each end may be permitted with the proper fall arrest equipment if multiple-bolted members are not available.
- Preferred lattice anchorages are around multiple bolted angle iron members or around and above joints where multiple members are connected.
- Lattice steel tower member anchorage notes:

  - Attachments around and above all steel tower joints are permitted.
  - Attachment around a steel lattice tower member supported by one bolt on each end may be permitted with the proper fall arrest equipment if multiple-bolted members are not available.
  - Attachment around multiple bolted tower members is permitted.
  - Anchorages shall be visually inspected at the time of attachment for loose or missing bolts, cracks, and bends. Damaged anchorages shall be repaired prior to use.
  - Fall arrest anchorages that have received a shock load shall be immediately inspected for damage.
  - The Supervisor, in concurrence with the worker, shall determine if the anchorage is to be reused.
  - Damage to anchorages shall be reported.

5.2.2 Aerial Devices

Only qualified operators shall be permitted to operate an aerial device. Qualified operators shall be certified through training and experience to operate the aerial device employed. Bucket and platform anchorages shall meet the minimum engineered loads while limiting potential free falls to 1.9 m (6 feet) for a full body harness. Aerial device anchorages shall receive an annual inspection by a competent person and a visual inspection prior to use. Boom straps are the preferred anchorage. Walking surfaces shall have an anti-skid surface.

5.2.3 Communication Structure Climbing Safety Devices

Communications tower ladder climbing devices shall be kept in good repair. Devices determined to be hazardous shall be immediately removed from service, reported to the Supervisor, and tagged or clearly marked as "**Defective – Do Not Use**". Corrective measures shall be completed prior to the next climb.

5.3 FALL PROTECTION REQUIREMENTS FOR ELEVATED WORK

5.3.1 General

Towers should be designed to eliminate or minimize the need for climbing. Aerial devices should be the first preference for work at elevated locations. This section defines the fall protection requirements for working at elevations on communications towers and related equipment. The design and type of structure determines the method of climbing, PPE to be used, and fall protection devices required for climbing, transferring, resting, working, and rescue.

5.3.2 Qualified Climber Classification

An employee may become a "Qualified Climber" after successfully completing appropriate training and satisfying physical fitness requirements. Qualified climbers shall be trained in accordance with Section 8 (Training), and shall be equipped in accordance with the requirements of their profession and position descriptions. Qualified climbers shall climb, move, rest, and work in accordance with the requirements of this policy manual. Qualified climbers shall have passed a physical examination to determine that they are physically fit for the stresses of tower climbing. The schedule for medical examinations is as follows:
New climber – baseline
Qualified climber – every two (2) years
Additional examinations – Any time that management questions an employee's continued capacity to meet the physical or medical requirements of the position

See the AMEC Medical Surveillance program for further information.

A qualified climber who has not climbed for a period of one (1) year will require retraining to maintain his/her "Qualified Climber" classification. Qualified climbers who climb at least once a year will be retrained on a periodic three- (3) year cycle to maintain their "Qualified Climber" classification.

5.3.3 Climbing Limitations:
During all climbing activities at least two (2) individuals will be present on the job site. At least one of these individuals will be trained in proper climbing techniques. Another individual will be present who, at a minimum, will be familiar with the procedures for summoning help and will not be assigned any activities that preclude performing the primary role of serving as the ground worker for safety support purposes.

Tower climbers should not service radio antenna systems connected to live radio- transmitting equipment. All transmitters should be de-activated and prevented from being activated while tower climbers are climbing in the vicinity or servicing the antenna systems. (Reference OSHA Regulations 29 CFR 1910.268 (m)(7) & (p)(3)

Telecommunications, and 29 CFR 1910.97 (a)(2)(i) Non-ionizing Radiation.) If the transmitters cannot be deactivated, AMEC employees will wear a personal monitor that measures the concentration of electromagnetic radiation present and is preset with an alarm system that warns the wearer when exposure is within one-half of the 10 milliwatts per square centimeter allowed by OSHA.

5.3.4 Common Requirements
Prior to any tower climbing work, a Job Safety Analysis (JSA) form must be reviewed and completed for the job site (see the AMEC Job Safety Analysis Program). The JSA shall include a pre-climb tower checklist and inspection report to accurately determine the overall tower condition and what PPE is required. Towers that are deemed "questionable" or found to have structural defects or inoperable safety devices shall not be climbed**.**
Tower climbing is **prohibited** during rainfall events. **Climbing activities will be halted when lightning or dangerous storms are imminent.**

Workers shall be attached to an engineered anchorage at all times when working or resting at elevated locations (six feet and above). Moving, relocating, transitioning, and transferring are all activities that are incidental to the work and also require attachment to an engineered anchorage.

Tower climbers should check for a safe "drop zone" area on the tower when positioning themselves at the work position. (See definitions for drop zone and work position.)
Free falls into a full body harness shall be limited to 1800 pounds (8 kN) and/or no more than 6 feet (1.9 m) with a maximum additional 1.1 m (3.5 feet) for deceleration of the fall arrest device (2.9 m (9.5 feet) total fall distance).

5.3.4.1 CLIMBING AND WALKING SURFACES

Climbing and walking surfaces on equipment and ladder rungs shall be furnished with nonskid surfaces where possible. Ladders with deteriorated nonskid surfaces shall be removed from service until repaired. The walking surfaces shall be kept free of clutter. Climbing and walking of crossarms (crossed tower members and diagonal bracing) in lieu of a ladder is not recommended. Climbing pathways should be clear of any obstructions.

5.3.4.2 WORKING FROM AN AERIAL DEVICE

Prior to the bucket or platform being raised, workers shall be attached to an engineered anchorage on the aerial device by a full body harness in conjunction with a shock absorbing or retractable lanyard. Snaphooks shall be of the locking type.
Working or standing on the lip of a bucket or top rail of an aerial device shall not be permitted.

5.3.4.3 TRANSFERRING BETWEEN AN AERIAL DEVICE AND A STRUCTURE

Transfers between an aerial device and a structure are discouraged. If transfers between a single or multiple occupancy aerial device and an aerial ladder, cablecart, or other equipment are required, they shall be in accordance with the following procedure:

a) Buckets and platforms shall be positioned to remain stable during a transfer. The platform or bucket shall have a fixed-pin or a locking mechanism to provide stability during transfer.
b) The transfer shall be made from the aerial device by a door, step, or secured ladder designed solely for the purpose of assisting the worker over the rim of the bucket or platform. Portable ladders shall not extend beyond the rim of the bucket. Portable ladders shall be removed from the bucket after the worker returns to the bucket. Platform guardrail systems must meet the design requirements of ANSI/SIA A92.2.
c) The aerial device shall be attended at all times when employees are transferring from or to the aerial device. The aerial device shall be considered to be attended as long as a qualified operator remains at the controls either in the bucket or at ground level. The climber and the operator shall remain in voice and/or visual contact at all times when a climber is aloft. While a climber is working aloft and not transferring, the operator may work on other jobs at the site provided the operator is available when needed at the controls.
d) A climber transferring between an aerial device and a structure shall be attached to the structure with both feet on the floor of the bucket or platform prior to making the transfer. The employee shall not be connected to the aerial device while attaching to the structure. The unattached time shall be kept to a minimum.
e) There shall be a second individual present at the location at any time this procedure is performed.

5.3.5 Communications Structure Requirements

All towers subject to climbing shall be inspected prior to commencing tower-climbing activities by the climber or another qualified individual possessing the necessary experience and knowledge of communication towers to evaluate the structure. Items such as the condition of the tower components, and the climbing safety cable will be evaluated.

The individual climber will make the final decision as to whether a tower is suitable for climbing.

5.3.5.1 FIXED LADDERS

Fixed ladders shall be used for ascending and descending communications structures, except where work assignments or conditions dictate otherwise. When ladder safety climbing systems are available and operational, they shall be used to ascend and descend a communications structure. Transitioning to the work position shall be accomplished while maintaining 100 percent attachment using a full body harness and lanyard or lifeline in conjunction with an energy-absorbing or self-retracting lanyard or lifeline.

In situations where ladder safety climbing systems are not available or operational and climbing has been determined necessary, qualified climbers will be allowed to climb while maintaining 100 percent attachment.

One hundred percent attachment is not required while using approved work platforms, having guardrails and kickboards in accordance with OSHA 29 CFR 1910.23 and 1910.24, as a means of transitioning from the climbing ladder or other means of ascent/descent to the work position. Fall arrest systems or devices shall permit the climber to climb without intervention on the part of the climber. Both hands shall be free for climbing at all times. The connection between the slider and the point of attachment to the full body harness shall not exceed 230 mm (9 inches).

5.3.5.2 PORTABLE STRAIGHT OR EXTENSION LADDERS

Portable straight or extension ladders shall be placed at an angle that will not permit slippage of the ladder base when climbing. A ground worker should support unsecured ladders until the climber has transferred from the ladder or has secured the ladder. The ladder shall be secured (tied) to the equipment to prevent slippage. (Reference OSHA Regulations 29 CFR 1917.119 - Portable Ladders.)

5.3.6 Pole Structures

All pole communication structures that require climbing shall be equipped with safety climbing systems and fall arrest devices. When climbing on step bolts, fixed ladders, or moving between work or rest positions, climbers shall maintain 100 percent attachment.

5.3.6.1 WOOD POLE STRUCTURES

Wood pole towers are not recommended for use as communications structures.
Wood poles, however, when used shall be climbed with a full body harness and positioning strap. Prior to climbing wood poles, an inspection shall be made for shell rot or other defects by the worker to determine that the structure is capable of sustaining the additional or unbalanced loads to which they will be subjected. Where poles or structures may be unsafe for climbing, they shall be maintained by use of an aerial device or shall not be climbed until made safe by guying, bracing, or other adequate means of support.

5.3.6.2 NON-WOOD POLE STRUCTURES

Concrete, fiberglass, and steel poles shall be equipped with fall arrest devices if climbing is required for servicing antenna systems. If climbed, climbers shall maintain 100 percent attachment to the structure with a full body harness and positioning strap. This includes bolt tightening, resting, and other activities incidental to climbing or transitioning from one location to another on the pole.

5.3.7 Roof Top And Miscellaneous Structures

Employees positioned on a horizontal or vertical surface with an unprotected side or edge that is six (6) feet or more above a lower level shall be protected from falling by use of guardrail systems, safety net systems, or personal fall arrest systems. Roof tops are considered elevated working surfaces and require the employee to be tied off to an anchorage point that will withstand 5,000 pounds per person or the maximum anticipated impact load times an OCF of at least 2.0 for one worker (Reference OSHA 29 CFR 1910.66).

5.3.8 Detachable Ladders

A qualified climber in the process of installing or removing detachable ladders on the structure shall use an appropriate fall protection system.

5.4 RESCUE PROCEDURES AND PRECAUTIONS

5.4.1 General Requirements

A Job Safety Analysis (JSA) shall be reviewed and completed by the work group and signed by the Supervisor prior to each tower climbing job assignment. It shall list each step of the task in the proposed order of occurrence, and shall include an examination of each step to determine the hazard potential. After identifying each potential hazard, a determination shall be made on how each hazard could be eliminated or minimized following safe job procedures. A vital step will be rescue procedures and equipment to be used in the event of an incident.

The rescue procedure shall provide prompt rescue of employees or a means of self-rescue (e.g. providing controlled descent device, radio, etc.). A work briefing (meeting) shall be held at the beginning of each day, job, or change in work procedure to review the potential hazards involved in the work to be performed and potential rescue methods available. These discussions will help to ensure the availability of proper rescue equipment and to facilitate quick rescue of the worker. Rescue of fall victims shall be included in all training and job planning. Aerial devices, cranes, handlines (lifelines), or other device capable of lifting the climber should be readily available.

5.4.2 Rescue

Rescue procedures that provide for the prompt rescue of a worker when working in an elevated position or in the event of a fall shall be established. These procedures shall assure that selfrescue techniques are available.

Workers shall be trained and shall have demonstrated proficiency in the rescue procedures relevant to the work they perform. Qualified climbers and others involved with climbing activities on a regular basis shall practice rescue at least annually.

5.4.3 Precautions

5.4.3.1 GENERAL

Manufacturer's recommendations, in addition to AMEC requirements, should be followed for the care, use, replacement, and maintenance of PPE and all climbing and safety equipment. Only PPE certified by the manufacturer to meet all OSHA standards and regulations is authorized. No personal owned or home-built equipment will be used in place of OSHAcompliant PPE.

5.4.3.2 SAFETY AND HEALTH PRECAUTIONS

Employees will not be assigned to work in hazardous areas/activities except in pairs, and always with established communications. Tower climbing will only be accomplished using qualified climbers assisted by knowledgeable ground-support personnel.

5.4.3.3 CHECK-OUT-CHECK-IN

A "Check-Out-Check-In" system providing a record containing the itinerary, name of employee, work area, estimated time of return and miscellaneous information such as other crew members will be used for all tower-climbing activities. In the event an employee does not return or contact the office at the prearranged time, search and rescue procedures shall be initiated.

5.4.3.4 RADIO STATION DEACTIVATION, 29 CFR 1910.97 AND 1910.268

As per Section 6.2.1 (d), and OSHA Regulations 29 CFR 1910.97 for non-ionizing radiation, climbers shall not be permitted to work on antenna systems connected to live radio transmitters nor be exposed to hazardous levels of electromagnetic radiation (radio frequency energy). OSHA defines the radiation protection guide for radio stations as 10 milliwatts per square centimeter in 29 CFR 1910.97(a)(2)(i). Should climbing or transitioning to the tower work position involve working in close proximity to energized radio transmitter antenna systems, those transmitters feeding the antenna systems should be deactivated prior to the tower being climbed. Check-Out-Check-In procedures require notification and coordination with the affected radio system dispatchers. Coordination with dispatchers shall include an estimated time for radio system reactivation of the tower being serviced. If the transmitters cannot be deactivated, AMEC employees will wear detectors that indicate the presence and concentration of electromagnetic radiation present and are preset with an alarm system that warns the wearer when the exposure is in excess of the 10 milliwatts per square centimeter allowed by OSHA.

5.4.3.5 MEDICAL SERVICES AND FIRST AID, 29 CFR 1910.151

All employees whose work assignment in the field places them beyond reasonable accessibility to a medical facility in terms of time and distance (15 minutes and/or 10 miles) must be adequately trained to render first aid. All climbers shall have current Cardiopulmonary Resuscitation (CPR) and first aid certification before accepting field assignments.

5.4.3.6 MEDICAL CONDITION OF THE CLIMBER

Tower climbing is prohibited for a climber who is ill and/or on medication that may inhibit actions or cause over stimulation, dizziness, or drowsiness. All team members should be aware of medical conditions of the other team members. Stress and physical exertion may induce an adverse reaction and ground crews should be alert and able to recognize symptoms. The medicated climber will not function as a ground safety person because they may be required to perform a rescue.

5.4.3.7 SAFEGUARDS FOR PERSONAL PROTECTION WORKING NEAR ENERGIZED EQUIPMENT,29 CFR 1910.335

Whenever AMEC employees are operating within the close proximity of an electrical power line or service drop, they should inform the utility company. The utility company should move, cover, or barricade the exposed energized source. **Do not trust the wire of the service drop to be insulated unless it is totally encapsulated.**

6.0 TRAINING

6.1 GENERAL REQUIREMENTS

The AMEC's policy for training of employees for tower climbing consists of a four-part program. The program is based on employees becoming certified to hold a "Qualified Climber" classification as defined in Section 6.2. Qualified climbers will be trained in accordance with

this policy. The four-part program is generally described as follows:

Program – Climbers will be tested for knowledge, understanding and competency with the AMEC Telecommunications Tower Climbing and Fall Protection Program.

Climbing Techniques and Equipment – Climbers will be trained in the principles of fall protection, use and care of a full body harness, safety climbing devices and tower climbing techniques. Training may also include use of aerial manlifts and transferring between equipment.

Tower Rescue Techniques – Climbers will be trained in recognizing emergencies and using proper tower rescue techniques. Training will also include first aid and CPR instruction leading to certification.

Physical Fitness – Climbers will be tested for physical fitness at a level necessary to perform the job of tower climbing.

Climbers shall be trained in the use of fall protection and rescue equipment and the application limits, proper anchoring, tie-off techniques, determination of elongation and deceleration distance, methods of use, and inspection and storage of the system. They shall become familiar with manufacturer's recommendations, reduction in strength caused by certain tie-offs, and the maximum allowed free fall distance and total fall distance.

Due to the variety of required climbing techniques and associated hazards in tower work, it is essential that each respective climber be given sufficient training to master the required skills and that they possess the basic physical fitness required to perform the work. The worker shall demonstrate proficiency in climbing functions and shall understand the hazards associated with each function.

Climbing instruction shall be presented in such a way the climber can recognize and avoid dangerous conditions while at the same time mastering the rigors of climbing, resting, and positioning for work.

Each piece of equipment used for climbing and work position attachment shall be explained and demonstrated. The worker shall become proficient in the use and care of the equipment to avoid abuse or use beyond its predetermined life. Workers shall be made aware of all the aspects on the equipment and materials that they are working with regarding the stresses and resultant effects on safety margins while climbing or working aloft.

6.2 GENERAL TRAINING REQUIREMENTS FOR QUALIFIED CLIMBERS

Workers whose job assignment requires climbing poles, steel communications towers, or other similar structures shall be trained as qualified climbers. Training shall be specific to the type of work to be performed. When the worker successfully completes this training, the climber may be considered for classification as a “qualified climber”.

Required training shall be by classroom and on-the-job and shall include:

Recognition of hazards unique to the work to be performed and to avoid unsafe actions while mastering the rigors of climbing and positioning for work on the structure.

Selection of the proper climbing equipment and fall protection system for the specific type of

work to be performed.

Proper use of the fall protection devices at the work position.

Various methods for climbing wood poles, steel lattice radio towers, and other similar structures such as transitioning, belting, and other climbing techniques.

Methods to identify energized power lines, apparatus, other auxiliary equipment on the tower, and to be knowledgeable of the rules applicable to work on and around the structure near energized power lines.

Techniques for safely performing aerial rescue of an injured or ill climber.

Proper care, inspection, and maintenance of PPE and climbing equipment and fall protection systems or devices.

Demonstrated proficiency in climbing structures and performing at elevated work positions.

Passing the prescribed physical examination and fitness test.

CPR and first aid training, certification kept current.

Knowledge of the JSA process, and recognition of unsafe conditions and defective safety climbing/arrest equipment.

6.3 DOCUMENTATION

Documentation shall consist of a certificate indicating that the individual has successfully completed the course of instruction and has demonstrated proficiency in the Tower Climbing and Fall Protection Program. Documentation shall be issued when the employee successfully completes the training. The employee shall retain a copy of the documentation and a copy will be maintained in the employee's Health and Safety file for the duration of the worker's certification or employment. Attachment B contains example certificates that may be used. The use of these specific certificates is not mandatory.

7.0 REFERENCES

The following publications provide detailed information and specifications for the purchase, maintenance, and use of fall protection equipment. When the following standards are superseded by an approved revision, the revision shall apply.

- ANSI Std A14.1, Portable Wood Ladders, Safety Requirements For
- ANSI Std A14.2, Portable Metal Ladders, Safety Requirements For
- ANSI Std A14.3, Fixed Ladders, Safety Requirements For
- ANSI Std A14.4, Job-Made Wooden Ladders, Safety Requirements for
- ANSI Std A14.5, Safety Requirements for Portable Reinforced Plastic Ladders
- ANSI Std A14.7, Mobile Ladders, Stands, and Mobile Work Platforms, Safety Requirements
- ANSI Std A92.2, Vehicle Mounted Elevating and Rotating Aerial Devices (SIA)
- ANSI Std A92.3, Elevating Work Platforms, Manually Propelled (SIA)
- ANSI Std A92.5, Boom-Supported Elevated Work Platforms
- ANSI Std A92.6, Work Platforms, Self Propelled Elevating (SIA)
- ANSI Std C2, National Electrical Safety Code

 ANSI Std P1307, Trial Guide for Fall Protection for the utility Industry
 ANSI Std Z133.1, Tree Care Operations – Pruning, Trimming, Repairing, Maintaining, and Removing Trees, and Cutting – Safety Requirements
 ANSI Std Z359.1, Personal Fall Arrest Systems, Subsystems, and Components
 ASTM F887, Standard Specifications for Personal Climbing Equipment
 ASTM Std, Non-Conductive Rope for Utility Purposes
 OSHA 29 CFR 1910.97, Subpart G – Non-ionizing Radiation
 OSHA 29 CFR 1910.27 – Fixed Ladders
 OSHA 29 CFR 1910.66, App C – Personal Fall Arrest Systems
 OSHA 29 CFR 1910.132 to 1910.138 – Personal Protective Equipment
 OSHA 29 CFR 1910, Subpart R – Special Industries (1910.261 to 1910.272 App C)
 OSHA 29 CFR 1926, Safety and Health Regulations for Construction, Subpart M – Fall Protection (1926.500 to 1926.503)
 IEEE Std 516, Guide for Maintenance Methods on Energized Power Lines (ANSI)

Appendix F

Job Hazard Analysis

JHA No.: JHA - CNET - 15 - ALL - 001 Rev 03

Job Hazard Analysis

Job/JHA Title: Clean Air Status and Trends Network (CASTNET) **Date of Analysis:** 27OCT15

Job Location: All CASTNET sites. **Team Leader:** Kevin Mishoe

Work Activity Description (begin on next line)
Onsite operation of remote CASTNET sites.

Instructions: The Team Leader will gather the appropriate team, including subject matter experts, operators, and support personnel, to analyze the job for hazards. Using the table below or similar format, address the four phases of this process:

- **Identify Key Job Steps:** Break the job down into individual key steps where work activities are presented in sequential order.
- **Identify Job Hazards:** Create a list of known or potential hazards within each step of the job. Consider hazards associated with the various tools, equipment or other hardware involved in the job. Consider environmental hazards such as thermal stress, biohazards, etc.
- **Identify Safe Practices and Equipment:** List one or more prevention or control measures to address each hazard identified, emphasizing engineering and administrative controls over PPE. Once this has been completed, the JHA Team will determine whether the job can be performed in a manner that eliminates the identified hazards.
- **Identify Hazards and PPE:** Complete the checklists for hazard identification and PPE requirements. Information from the RA and applicable permits are included in this section.

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Ergonomics	Ergonomic Issues	Ergonomic Issues • Use safe lifting techniques.
2. Communication	Safety, crew unity	• Talk to each other. • Let other crewmembers know when you see a hazard. • Avoid working near known hazard trees. • Always know the wherabouts of fellow crewmembers. • Carry a radio and spare batteries or cell phone • Review Emergency Evacuation Procedures (see below).

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Key Work Steps	Hazards/Potential Hazards	Safe Practices
3. Mobilization: Travel on Forest Roads	1. Poor visibility 2. Backing 3. Clearing obstacles from roadway 4. Carbon monoxide poisoning 5. Vehicle wear/tear	1. Use care in tall brush and grass, clear debris from roadways rather than trying to drive over or around 2. Drive on the main roadway, avoid soft gravel shoulders, do not straddle a gravel berm or drive with wheels on berm, pull over and stop if you have to look at a map 3. Slow down! Don't drive on the road if there is potential for resource or vehicle damage. Use 4WD drive to get out of trouble, not into trouble. Consider carrying and using chains if conditions warrant. Know how to put on chains, ask about road conditions before traveling. 4. Follow from a safe distance. Pull off road when oncoming vehicle is passing 5. Keep windows clean inside and out, keep dash clear. Maintain safe speeds, replace badly damaged or cracked windshields, make sure wipers are in good condition. 6. Try to park so that you do not have to back up to leave. Use mirrors and a spotter, if you do not have a spotter, get out to check behind your vehicle before backing. 7. Keep vehicle well ventilated when idling/heating by opening a window at least 6 inches. 8. When descending forest roads, use a lower gear to control your speed, rather than the brakes. Take care of the vehicle you drive.
4. Parking	Run-away vehicle	Use chock blocks when parking, set parking brake, do not leave vehicle unattended when it is running.
5. Connecting trailer	TRAILORING Pinching fingers, mashing toes, back strain	Use caution, be aware of hand placement, use proper lifting techniques (i.e. lift with legs not the back, get assistance as necessary). Wear gloves, steel-toed shoes, and back support. Use trailer jack to lift tongue.
6. Towing Trailer	Trailer disconnecting Tire Blowout Bearing seizure, failure Sway or whipping stopping	Verify ball and coupler are same size, use safety chains crossed under coupler, use lock or bolt to secure coupler latch Inspect tires for wear and correct pressure Check for overheating during (after approximately 10 miles) each trip, repack at least once a year. Use slower speed, especially in windy situations. Increase following distance, extra weight of trailer increases stopping distance. Do not compensate for sway, hold steady course. Be alert when turning, do not "curb" the trailer tires.

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Key Work Steps	Hazards/Potential Hazards	Safe Practices
7. Backing Trailer	Jack knifing, hitting objects	Physically inspect path yourself before backing, use a guide person, and avoid sharp turns.
8. Lifting and carrying items	8A) Muscle strain/injury	8A) Muscle Strain/Injury Use proper lifting techniques when lifting heavy objects; get assistance or use mechanical device (dolly or cart).
	8B) Slips/Trips/Falls	8B) Slips/Trips/Falls • Slow down, watch out for spills, and clean up puddles. • Maintain clear passage; do not store items in aisleways. • Watch for obstacles in path. • Use activity appropriate equipment to reach overhead items (e.g., ladder, step stool) • Do not run up or down the stairs. • Always have one hand free to hold handrail when climbing up and down the stairs.

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Key Work Steps	Hazards/Potential Hazards	Safe Practices
9. Wreck of vehicle while being driven	Wreck of vehicle while being driven	Wreck of vehicle while being driven • All drivers shall be have proper license. • Supervisors shall verify that drivers are capable and qualified on each type of equipment before allowing the equipment to be used unsupervised. • Keep wind shields, windshield wipers, side mirrors and side windows clean • Drivers shall conduct a pre-operation vehicle safety check • Drivers shall plan ahead to minimize or eliminate the need for backing. Always check to the rear before backing and use an observer (spotter) when available. If an observer is not available, the driver shall walk around the vehicle to make sure rear is clear prior to backing. (Get out and look) • Seat belts shall be worn when driving by driver and passengers. • Choose the safest location possible to park equipment. Avoid parking in blind spots of other equipment. • If so equipped, driver is to be sure the back-up alarm is working • Adjust vehicle speed for load and weather. Tire chains should be utilized as dictated by weather conditions. • Operators should always check and be sure of load height. • When operating a vehicle off the roadway, be aware of possible hidden objects in the grass and unstable terrain. • Never allow anyone between truck and trailer when backing to hook trailer • Make sure tilt beds or ramps are secured before putting trailer in use • If carrying a load, perform periodic checks of equipment on long trips to assure the load is secure.
10. Loading/unloading of equipment	Crush and pinch points created when loading/unloading equipment	Crush and pinch points created when loading/unloading equipment • Be aware of crushing and pinching hazards when loading, unloading and fastening down equipment. • Make sure cargo is properly loaded, secured and covered using only approved chain and load binders. Check for loose material on bed and trailer. Secure loose material. • Wear protective equipment consistent with the hazard (hard hats, safety glasses, leather gloves, safety shoes, etc.)

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Key Work Steps	Hazards/Potential Hazards	Safe Practices
		• Hook/unhook on stable ground with the trailer secure.
11. Hypothermia	Cold Stress	Check weather prior to on-water activities; wear adequate clothing and gloves, if appropriate, for weather, rain wear where appropriate due to water spray to remain dry; maintain body temperature; recognize and treat any medical condition by calling 911 (or local emergency number) at once.
12. Hyperthermia	Heat stress	Check weather prior to work activities; Know signs/symptoms of heat-related illnesses: monitor yourself and coworkers; Block out direct sun or other heat sources; Use cooling fans/air-conditioning; rest regularly; Drink lots of water, about 1 cup every 15 minutes; Wear light weight, light colored, loose-fitting clothes, Avoid alcohol, caffeinated drinks, or heavy meals. Call 911 (or local emergency number) at once.
13. Onsite hazards	13A). Exposure to hazardous Inhalation atmospheres.	13A). Ensure that ozone analyzers are vented outside of the monitoring shelter. Handling of compressed gas cylinders Oxygen deficiency; heavy object; gases under pressure; chemical (low concentrations); gases present are NH3, N Propyl Nitrate and a mixture of CO, SO2 and NO. • A cylinder should always carry a legible label or stencil identifying its contents. Do not use the cylinder if the contents are not properly identified. • Labels or identifying markings on cylinders should face out such that they are clearly visible. • Ensure cylinders are stored and used in a dry, well ventilated area. • All cylinders, whether full or empty, must be secured in an upright position by a chain or strap system made for this purpose. • Cylinders should be stored out of direct sunlight and away from other heat sources. Cylinders should be stored at temperatures above freezing and below 125 degrees F. • Cylinder valves should be closed except when the cylinder is in active use. • Always use an appropriate pressure regulator with each cylinder. • Open cylinder valves and regulators slowly. • The main cylinder valve should always be opened before opening the downstream regulator valve. • Once the cylinder is installed, test for leaks. If gas leaks are detected, shut down the system, relieve pressure and tighten connections until leaks are corrected. If you

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Key Work Steps	Hazards/Potential Hazards	Safe Practices
		cannot correct the problem, lock and tag out the system until repairs can be made by trained personnel. • Do not vent any gas inside a building without adequate ventilation. • Never bleed a cylinder below 25 pounds per square inch (psi). • If a cylinder valve leaks and it can be safely moved, take it outdoors and slowly empty the bottle. If moving the cylinder is not possible or safe, evacuate the area and call the fire department. • Any and all repairs and refilling shall be made only by qualified individuals. • Do not place a cylinder where it might become part of an electric circuit. • Cylinders that are not connected or in use, must be fitted with a valve protection cap. • Valve protection caps must be in place when cylinders are moved. • No tools, including wrenches and hammers shall be used to open or close cylinder valves. • Cylinder valves must be verified closed before moving the cylinder. • Larger cylinders, which cannot be easily carried, shall be moved using a wheeled cart. • Cylinders shall never be rolled or dragged, nor lifted by the valve cap. • Cylinders must never be violently struck or allowed to strike another object. • Foot protection meeting the most current ANSI Z41 standard for safety shoes is required when moving gas cylinders. • Safety glasses or other face and eye protection should be employed when installing or removing regulators.
	13B). Training – Identifying Poisonous Plants	13B). Provide training on identifying the specific poisonous plants that could be present at the site
	 POISON IVY (Rhus toxicondendron L.)  POISON OAK (Rhus diversiloba)  POISON SUMAC (Rhus toxicondendron vernix)	
	13B). 1 Poison Ivy	13B). 1 Poison Ivy: • Grows everywhere in United States except Hawaii and Alaska. • In the East, Midwest, and the South, it grows as a vine.

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Key Work Steps	Hazards/Potential Hazards	Safe Practices
		• In the Northern and Western United States, it grows as a shrub. • Each leaf has three leaflets. • Leaves are green in the summer and red in the fall. • In the late summer and fall, white berries may grow from the stems.
	13B). 2 Poison Oak 	13B). 2 Poison Oak: • Oak-like fuzzy leaves in clusters of three. • It has two distinct kinds: • Eastern poison oak (New Jersey to Texas) grows as a low shrub. • Western poison oak (Pacific Coast) grows to six-foot-tall clumps or vines up to 30 feet long. • It may have clusters of yellow berries.
	13B). 3 Poison Sumac 	13B). 3 Poison Sumac: • Grows in standing water in peat bogs in the Northeast and Midwest and in swampy areas in parts of the Southeast. • Each leaf has clusters of seven to 13 smooth-edged leaflets. • The plants can grow up to 15 feet tall. • The leaves are orange in spring, green in summer and red, and orange or yellow in fall. • There may be clumps of pale yellow or cream-colored berries.
	13B). 4 Giant Hogweed  Giant Hogweed  Giant Hogweed Flower (clusters may reach up to 2.5 feet across)	13B). 4 Giant Hogweed: • Hogweed is a public health hazard. Its clear, watery sap has toxins that cause photo-dermatitis. Skin contact followed by exposure to sunlight produces painful, burning blisters that may develop into purplish or blackened scars. Contact with the eyes can cause temporary or permanent blindness. • Since its introduction into North America, this plant has become established in rich moist soils along roadsides, stream banks and waste ground. In the eastern US, it is known to occur in Maine, New York, Pennsylvania, Connecticut, and now Massachusetts. • A biennial or perennial herb growing 8 to 15 feet tall, giant hogweed usually has a taproot or occasionally fibrous root. The hollow stems are 2 to 4 inches in diameter with dark reddish-purple splotches and coarse white hairs. • The deeply incised compound leaves grow up to 5 feet in width. Hairs on the underside of the leaf are stiff, dense and stubby. • The large umbrella-shaped flower heads are up to 2 1/2 feet in diameter across a flat

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Key Work Steps	Hazards/Potential Hazards	Safe Practices
	 Giant Hogweed Flower Leaves  Giant Hogweed Stem Thick stem with coarse hairs, Blistery dark purple splotches.	top with numerous small flowers produced in mid-May through July. • Some plants die after flowering; others flower for several years. The plant produces flattened, 3/8 inch long, oval dry fruits that have a broadly rounded base and broad marginal ridges. Plants sprout in the early spring (or late winter in mild years) from the roots or from seed. • Grows in standing water in peat bogs in the Northeast and Midwest and in swampy areas in parts of the Southeast. • Each leaf has clusters of seven to 13 smooth-edged leaflets. • The plants can grow up to 15 feet tall. • The leaves are orange in spring, green in summer and red, and orange or yellow in fall. • There may be clumps of pale yellow or cream-colored berries.
	13C). Hand Contact	13C). Hand Contact • Apply IvyX (or similar product) to hands, forearms and other potentially exposed parts of the body, prior to starting work in the morning and again right after lunch. • Leather Gloves must be worn at all times when digging, screening or carrying field equipment. • Leather gloves should be of sufficient length to cover the entire wrist and cuff of the shirt. • Carefully remove gloves, without touching the exterior surface, when taking notes and prior to lunch or restroom breaks. • Gloves that become worn should be replaced immediately. • Do not scratch or rub the face or other exposed skin while wearing gloves. • Workers will apply Tecnu (or similar product) to the hands and forearms immediately after removing their gloves, prior to lunch and again at the end of the day. Tecnu will help cleanse the urushiol oil from the skin before it can be absorbed. Sensitive individuals can also apply prior to showering in the evening.
	13C). 1 Arm Contact	13C). 1 Arm Contact • Apply IvyX (or similar product) to hands, forearms and other potentially exposed parts of the body, prior to starting work in the morning and again right after lunch. • Wear light weight, long sleeved shirts as the sleeves will provide a physical barrier between the skin and any urushiol oil encountered. Disposable gauntlets may we worn over arms to keep oil from clothing as

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Key Work Steps	Hazards/Potential Hazards	Safe Practices
		well. • Have the sleeves pulled down to the base of the hand, covering the forearm and wrist (all exposed skin). • Workers will apply Tecnu (or similar product) to the hands and forearms immediately after removing their gloves, prior to lunch and again at the end of the day. Tecnu will help cleanse the urushiol oil from the skin before it can be absorbed. Sensitive individuals can also apply prior to showering in the evening.
	13C). 2 Leg Contact	13C). 2 Leg Contact • Wear long pants and boots. • Assume boots are contaminated with the urushiol oil and only handle with gloved hands.
	13D). Exposure from Handling Contaminated Equipment	13D). Exposure from Handling Contaminated Equipment • Exposure from Handling Contaminated Equipment • Do not handle any field equipment that may have come in contact with poison ivy/oak/sumac without gloves. • Decontaminate all equipment at the end of each workday with a solution of water and dish soap. • Scrub all surfaces of the screens and shovels with a brush. • Rinse with cool water using a portable garden sprayer.
	13D). 1 Exposure from Handling Contaminated Clothing	13D). 1 Exposure from Handling Contaminated Clothing • Wash clothing potentially contaminated with urushiol oil prior to wearing again. • Handle contaminated clothing with gloves as the oil can remain on environmental surfaces for up to 5 years.
	13E). Contact with biting insects (i.e., spiders, bees, ticks, etc.)	13E). Contact with stinging/biting insects • Look for signs of insects. Discuss the types of insects expected at the Site and be able to identify them. • Wear Modified Level D PPE as described in the HASP. In addition, wear long sleeve shirts, pants tucked into boots, and a hat. Wear light colored fabric in order to see insects. Protective netting that may be worn over your head/face maybe necessary in some instances. • Avoid contact with the insects if possible. • Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate

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Key Work Steps	Hazards/Potential Hazards	Safe Practices
		response kits if applicable. • Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite.
	13F). Electricity	13F). Exposure to electricity • Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. • Never do repairs on electrical equipment unless you are both authorized and qualified to do so. • Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. • Watch for wires and connections which are damaged, worn or broken. • Use a Ground Fault Circuit Interrupter (GFCI) when using electrically-powered sampling equipment outdoors or in a damp area. Do not handle any electrical equipment, including cords and plugs, with wet hands. Keep all sampling equipment (except the portion that is designed to be submersed in water) dry. • When unplugging a cord, pull on the plug rather than the cord.
	13G). Working at height – (Applies only to White Face Mountain, NY – site WFM007)	13G). Working at height • Always wear an inspected and approved fall protection device. • Only work at height after being trained in the proper use of your fall protection device. • Always have a second person onsite when using fall protection devices.

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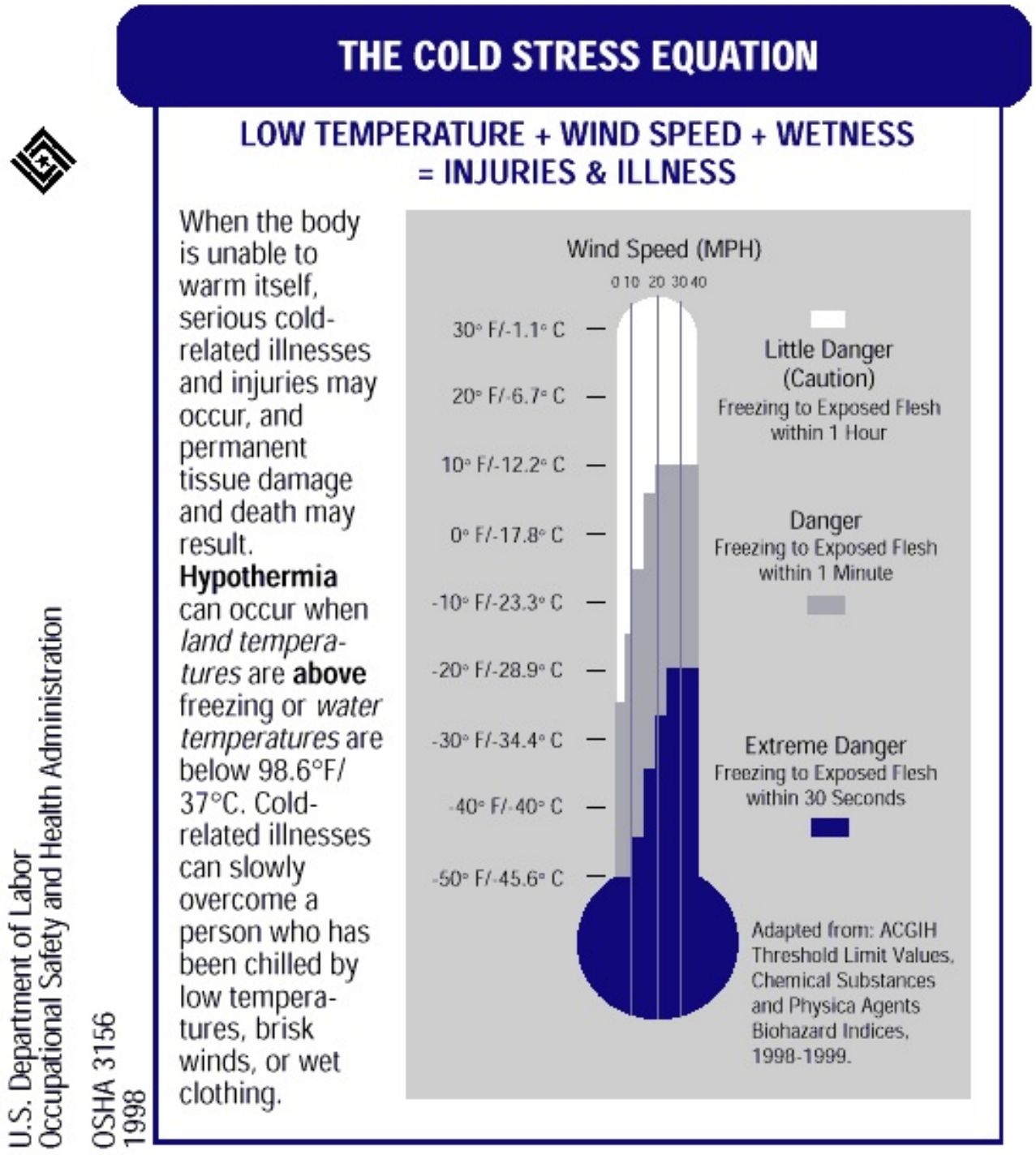
Job Hazard Analysis



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Job Hazard Analysis

OSHA QUICK CARD™

Protect Yourself
Heat Stress

When the body is unable to cool itself by sweating, several heat-induced illnesses such as heat stress or heat exhaustion and the more severe heat stroke can occur, and can result in death.

Factors Leading to Heat Stress

High temperature and humidity; direct sun or heat; limited air movement; physical exertion; poor physical condition; some medicines; and inadequate tolerance for hot workplaces.

Symptoms of Heat Exhaustion

- Headaches, dizziness, lightheadedness or fainting.
- Weakness and moist skin.
- Mood changes such as irritability or confusion.
- Upset stomach or vomiting.

Symptoms of Heat Stroke

- Dry, hot skin with no sweating.
- Mental confusion or losing consciousness.
- Seizures or convulsions.

Preventing Heat Stress

- Know signs/symptoms of heat-related illnesses; monitor yourself and coworkers.
- Block out direct sun or other heat sources.
- Use cooling fans/air-conditioning; rest regularly.
- Drink lots of water; about 1 cup every 15 minutes.
- Wear lightweight, light colored, loose-fitting clothes.
- Avoid alcohol, caffeinated drinks, or heavy meals.

What to Do for Heat-Related Illness

- Call 911 (or local emergency number) at once.

While waiting for help to arrive:

- Move the worker to a cool, shaded area.
- Loosen or remove heavy clothing.
- Provide cool drinking water.
- Fan and mist the person with water.

For more complete information:

OSHA Occupational Safety and Health Administration
U.S. Department of Labor
www.osha.gov (800) 321-OSHA

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Complete the following checklists for hazard identification and PPE requirements. Information from the RA and applicable permits are included in this section.

Hazard Identification

Standard Hazards			
☒ Falling Objects	☒ Slips and Trips	☒ Pinch Points	☒ Rotating Equipment
☒ Falls	☐ Power Equipment / Tools	☒ Elevated Work Surfaces	☐ _____
Eye Hazards			
☐ Particulates	☐ Liquid Splashes	☐ Welding Arc	☐ _____
Hearing Hazards			
☒ None	☐ Impact Noise	☐ High Frequency Noise	☐ High Ambient Noise
Respiratory Hazards			
☒ None	☐ Dust / Particulates	☐ Organic Vapors	☐ Acid Gases
☐ Oxygen Deficient	☐ Welding Fumes	☐ Aerosols / Particulates	☐ Be, Hg, Cr, Pb
☐ _____	☐ Radon	☐ Asbestos	☐ _____
Chemical Hazards			
☒ None	☐ Organic Solvents	☐ Reactive Metals	☐ PCBs
☐ Acids / Bases	☐ Oxidizers	☐ Volatiles / Semi-volatiles	☐ _____

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Hazard Identification (concluded)

Environmental Hazards			
☐ None	☒ Temperature Extremes	☒ Wet Location	☒ Bio Hazards (snakes, insects, spiders, bird / mouse droppings, fungus, etc.)
☐ Explosive Vapors	☐ Confined Space	☐ Engulfment Hazard	☐ _____
Electrical Hazards			
☐ None	☒ Energized Equipment or Circuits	☐ Overhead Utilities ☐ Underground Utilities ☐ Hidden Utilities	☐ Wet Location
Fire Hazards			
☒ None	☐ Cutting, Welding, or Grinding Generated Sparks or Heat Sources	☐ Flammable Materials Present	☐ Oxygen Enriched Location
Ergonomic Hazards			
☒ Lifting	☒ Bending	☒ Twisting	☒ Pulling / Tugging
Computer Use in the: ☐ Office ☒ Field	☐ Repetitive Motion	☐ _____	☐ _____
Radiological Hazards			
☒ None	☐ Loose Contamination	☐ Fixed Contamination	☐ Radiation
☐ Airborne Contamination	☐ Radon	☐ EMF	☐ Criticality
☐ Alpha	☐ Beta	☐ Gamma / X-rays	☐ Neutron
☐ Tritium	☐ TRU	☐ Depleted Uranium	☐ Enriched Uranium
Other Hazards			
☐			
☐			
☐			
☐			
☐			

Hazard identification completed by: Marcus Stewart Date: 27OCT15

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PPE and Monitoring Requirements

Standard PPE			
☒ Hard Hat	☒ Safety Shoes	☒ Safety Glasses	☐ Boot Covers
☐ Aprons	☐ Rubber Boots	☐ _____	☐ _____
Eye Protection			
☐ Welding Glasses ☐ Welding Helmet	☐ Face Shield	☐ Chemical Goggles	☐ Welding Screens
Hearing Protection			
☐ Ear Plugs	☐ Ear Muffs	☐ Ear Plugs and Muffs	☐ _____
Respiratory Protection			
☒ None	☐ Dust Mask	☐ Full Face APR ☐ Half Face APR Cart. Type _____	☐ PAPR Cart. Type _____
☐ SCBA	☐ Airline Respirator	☐ _____	☐ _____
Protective Clothing			
☐ Tyvek® Coveralls	☐ Poly-coated Tyvek® Coveralls	☐ Saranex® Coveralls	☐ Fully Encapsulating Suit
☐ Cotton Coveralls	☐ Modesty Clothing	☐ Fire Resistant Clothing	☐ _____
Hand Protection			
☐ None	☒ Cotton Gloves	☒ Leather Gloves	☐ Glove Liners
☐ Nitrile Gloves ☐ Viton® Gloves ☐ Butyl Gloves ☐ Neoprene Gloves	Surgical Gloves ☐ Latex ☒ Non-Latex	☐ Cut-resistant Gloves	☐ _____
Monitoring Requirements			
☐ Oxygen	☐ Flammable Gases/Vapors	☐ Toxic Gas/Vapors	☐ H_2S/CO
☐ Asbestos	☐ Full-time IH Coverage	☐ Part-time IH coverage	☐ Be, Hg, Cr, Pb
☐ Metals (specify): _____			
☐ Organic Vapors (specify): _____			
☐ Radioactive Air Particles	☐ TLD Required	☐ CAM	☐ Radon
☐ Full time RCT Coverage	☐ Part-time RCT Coverage	☐ Radioactive Air Particles	☐ _____
☐ _____		☐ _____	

PPE and monitoring requirements completed by: Marcus Stewart Date: 27OCT15

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Job Hazard Analysis

JHA Preparation Team

Kevin Mishoe	Marcus Stewart	

Effective Date: from 01FEB16 **through** 31JAN17

Approvals
(Signatures)

☒ Job Supervisor/Team Lead	10/28/15	☐ Project HSE	
☒ Project Manager	10/27/15	☒ Office HSE	10/28/15
☐ RSO		☐ Office Manager	
☐ Regional ES&H Manager		☐ Corporate ES&H Director	
☐ Other -		☐ Other -	