Appendix 3.12-2
Fire Prevention Procedures

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RASWP 021 - Fire Prevention

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Revision History

Revision #	Date	Nature of Revision
01	01/16/2009	Document first created.
02	09/29/2014	Procedure language input to new template. Title and content expanded to include overall Fire Prevention in addition to Fire Extinguishers.
03	04/16/2015	Added additional language for monthly/annual inspections and 6- and 12-year maintenance.
04	04/21/2016	Revision to Section 6.15 - Installation of Above Ground Storage Tanks (ASTs). The requirements for use of secondary containment or dikes to control spills were updated.

CONTENTS

1.0 PURPOSE

This procedure outlines the Fire Prevention controls that are required to be in place at RES Americas facilities, offices, and projects.

2.0 SCOPE

Unless specifically noted herein, this procedure shall apply to all Work conducted by/for Renewable Energy Systems Americas Inc. and any of its affiliate or subsidiary companies hereafter referred to in this procedure as the "RES Americas."

3.0 REFERENCE DOCUMENTS

3.1 RASOP 005 - Risk Assessment Procedure - 01199R00008

3.2 RASWP 014 – Hot Work - 01199R00061

3.3 NFPA 10 / 2013 - Standard for Portable Fire Extinguishers

3.4 NFPA 30 / 2012 – Flammable and Combustible Liquids

3.5 29 CFR 1910.106 – Flammable Liquids

3.6 29 CFR 1926.152 – Fire Protection and Prevention

3.7 29 CFR 1917.156 – Fuel Handling and Storage

3.8 29 CFR 1910.157 – Portable Fire Extinguishers

4.0 DEFINITIONS

4.1 # - pound or lb.

4.2 AST – Above Ground Storage Tank.

4.3 Hot Work - Any activity that can be a source of ignition when flammable material is present or can be a fire hazard regardless of the presence of flammable material in the workplace. This includes, but is not limited to welding, soldering, cutting, brazing, and grinding.

4.4 HSQE – Health, Safety, Quality, and Environment Department.

4.5 Hydrostatic Testing - Pressure testing of the extinguisher to verify its strength against unwanted rupture.

4.6 Incipient Fires - Fires which are in the initial or beginning stage and which can be controlled or extinguished by portable fire extinguishers, standpipe, or small hose system without the need for protective clothing or breathing apparatus.

4.7 **Inspection -** A visual check of fire protection systems and equipment to ensure that they are in place, charged, and ready for use in the event of fire.

4.8 **LP** – Liquefied Petroleum.

4.9 **NFPA** – National Fire Protection Association.

4.10 **PM -** RES Americas Construction Project Manager.

4.11 **PPE (Personal Protective Equipment) -** Specialized clothing or equipment worn by an employee to protect against a hazard, e.g., safety glasses, hard-toe footwear, work gloves.

4.12 **Red-tagged -** An item that has been tagged "Do Not Use" and removed from service due to an Operational Defect that inhibits the ability to use it in a safe manner.

4.13 **Sprinkler System -** A fire protection system with overhead discharge nozzles installed in a systematic pattern that ejects an extinguishing medium from ceiling to floor level.

4.14 **SRP -** RES Americas Senior Responsible Person

5.0 RESPONSIBILITIES

5.1 General

5.1.1 It is the responsibility of each manager, supervisor, employee, and Contractor to ensure implementation of this procedure.

5.1.2 It is the responsibility of each employee to report immediately any unsafe act or condition to his or her supervisor and to become familiar with the use and location of firefighting equipment.

5.2 All Employees

5.2.1 Employees are responsible for reporting fire hazards to their supervisors. Actual fires beyond the incipient stage and capabilities of the firefighting controls present shall be reported immediately to the local fire department before any attempts are made to extinguish the fire. Employees shall not attempt to extinguish fires beyond the incipient stage.

5.3 Contractors

5.3.1 Contractors shall ensure that there are an adequate number of portable fire extinguishers for each work area, relative to the potential fire hazard. In general, fire extinguishers are required at or within:

a) Site vehicles.

b) Mobile equipment (where feasible).

c) Mechanics trucks.

d) Boom trucks (carrier mounted cranes).

e) Fuel trucks.

f) Portable generators.

g) Flammable/combustible gas and liquid storage areas.

h) Refueling areas.

i) Combustible material storage areas.

j) Hot Work activities.

k) Kitchens and/or heat generating appliances and equipment like grills, microwaves, stoves, and toasters.

5.3.2 Contractors shall ensure that fire extinguishers are recharged after each use and remain in operable conditions at all times.

5.3.3 Contractors shall ensure that damaged or defective fire extinguishers are removed from service and replaced immediately.

5.3.4 Contractors shall also ensure that monthly, annual, and multi-year testing, inspection, and maintenance is performed on all portable fire extinguishers in accordance with OSHA regulations and NFPA 10 (Standard for Portable Fire Extinguisher) recommendations. Records of inspections and testing shall be maintained and retained by the Contractor and made available to RES upon request.

5.3.5 Inspection tags shall be in place and up to date for all fire extinguishers in use.

5.4 RES Americas Senior Responsible Person (SRP)

5.4.1 For office and O&M locations, the SRP shall ensure service contracts are in place for the annual servicing of fire protection systems, portable firefighting equipment, and any audible alarms associated with the location.

5.4.2 The SRP shall ensure that employees are trained in the general principles of fire protection, the use and function of various types of fire equipment, and in safe handling methods for flammable and combustible substances.

5.4.3 The SRP shall ensure that all local, state, and federal guidelines are being followed in the setup, maintenance, and use of fire prevention equipment.

6.0 PROCEDURE

6.1 Classes of Fires

6.1.1 Class A fires involve ordinary combustible such as paper, cloth, wood, rubber, and some plastics.

6.1.2 Class B fires involve flammable liquids such as gasoline, thinners, oil-based paints, and greases.

6.1.3 Class C fires involve energized electrical equipment such as computers, copy machines, television sets, and video equipment.

6.1.4 Class D fires involve combustible metals such as magnesium, sodium, titanium, zinc, and potassium.

6.2 Fire Loading

6.2.1 The following is a description of the three degrees of fire loading within a given fire. Higher fire load locations require extra precautions and firefighting equipment.

a) Light (Low) Fire Load: An Occupancy in which Class A combustible materials including furniture, window treatments and its contents is of minor quantity. Small amounts of Class B flammable liquids such as duplicating cleaning solvents are included provided that they are kept in closed containers and stored properly.

b) Ordinary (Moderate) Fire Load: An occupancy in which Class A combustibles, Class B flammable liquids and Class C energized electrical equipment are in greater amounts than expected under a low hazard. These locations include dining areas, storage areas and parking garages and assembly halls.

c) Extra (High) Fire Load: An occupancy in which the total amount of Class A combustibles, Class B flammable liquids, and Class C energized electrical equipment present is over and above those classified as moderate hazard. These occupancies and areas include laboratories, cooking areas, trade shops and warehouses.

6.3 Selection of Portable Fire Extinguishers

6.3.1 When selecting a fire extinguisher, one must be familiar with the classes of fires and the fire loading in order to provide the appropriate type of fire extinguisher.

6.4 Inspections (Monthly)

6.4.1 All portable fire extinguishers in use shall be placed into a monthly inspection program. The monthly inspection shall be performed by the appropriate department for their responsible facilities.

6.4.2 Monthly inspections shall be documented (date, inspector) such that inspection records are readily retrievable and identifiable to specific extinguishers. Documentation methods may include use of an inspection tag attached to the fire extinguisher, a checklist or spreadsheet maintained on file, other electronic methods, or use of a permanent marker on the side of the extinguisher.

6.4.3 The monthly inspection shall include a check of the following items:

a) The extinguisher is in its proper location.

b) The extinguisher is not obstructed.

c) The extinguisher is clean.

d) All seals and pins are in place and have not been removed or tampered with.

e) If applicable, the extinguisher pressure is within the operable range (not over or under pressure).

f) Examine the extinguisher for obvious signs of physical damage, leakage, corrosion, or clogged nozzles.

g) The annual service tag is present on the extinguisher and up-to-date.

6.4.4 Any fire extinguishers found, in use or being stored, that are deficient for items d, e, f, and/or g above shall be taken out of service and red-tagged until corrective actions are completed.

6.5 Inspections (Annual and Multi-Year)

6.5.1 All portable fire extinguishers shall have annual maintenance, internal inspections, and hydrostatic tests completed by a qualified person in accordance with NFPA 10 (Standard for Portable Fire Extinguishers). For the typical ABC dry powder extinguishers, the internal inspection frequency is every 6 years; the hydrostatic test frequency is every 12 years.

6.5.2 The scheduling of annual maintenance and multi-year inspections and tests is the responsibility of fire extinguisher owner.

6.6 Mounting and Placement

6.6.1 All portable fire extinguishers shall be installed on brackets, mounted in wall cabinets, or securely mounted to posts.

6.6.2 Extinguishers having a gross weight not exceeding 40 pounds shall be installed so that the top of the extinguisher is not more than five feet from the floor or ground (or four feet for compliance with the Americans with Disabilities Act).

6.6.3 Extinguishers having a gross weight exceeding 40 pounds shall be installed so the top of the extinguisher is not more than three and one half feet above the floor or ground.

6.6.4 The bottom of the extinguisher in either case shall not be less than four inches above the floor.

6.6.5 Where the extinguisher is likely to be obscured from view, a sign shall be installed demarcating the location of the fire extinguisher. The sign shall be visible from a distance of at least 50 feet if the extinguisher cannot be relocated.

6.7 Travel Distances

6.7.1 Where it is deemed necessary for fire control measures, a portable fire extinguisher of suitable size and type shall be placed conspicuously within 50 feet of any hazard unless a shorter distance has been deemed necessary by other means (e.g., Risk Assessment).

6.8 Training

6.8.1 When either RES or a Contractor has provided a portable fire extinguisher for use in the workplace, the employer shall also provide an educational program to familiarize employees with the general principles of fire extinguisher use and the hazards involved with incipient stage firefighting.

6.8.2 The employer shall provide the education required as stated in this section upon initial employment and at least annually thereafter.

6.8.3 Training records shall be maintained and held by the employer and made available to RES Americas upon request.

6.9 Flammable/Combustible Liquid Storage and Use (Fire Prevention)

6.9.1 Hot Work activities or ignition sources shall not exist or occur within 50 feet of areas of where 5 gallons or more of flammable/combustible liquids are stored or used.

6.9.2 Smoking is prohibited at or in the vicinity of operations which constitute a fire hazard and those operations shall be conspicuously posted with signs stating: "No Smoking or Open Flame."

6.9.3 Combustible material may not be stored or piled higher than 20 feet.

6.9.4 Storage area driveways shall be fifteen feet wide and maintained free from rubbish, equipment, or other materials.

6.9.5 Flammable and Combustible storage areas and containers shall be demarcated with the appropriate NFPA labels.

6.9.6 Storage areas shall be kept free from accumulation of unnecessary combustible material. Weeds and grass shall be kept down and a regular procedure shall be provided for the periodic clean-up of the entire area.

6.9.7 No combustible material shall be stored within ten feet of a building or structure.

6.9.8 Portable fire extinguishing equipment suitable for the fire hazard involved shall be provided at convenient, conspicuously accessible locations in the yard. Portable fire extinguishers not less than 2A, 20# shall be placed so that the minimum distance to the nearest unit shall not exceed 50 feet.

6.10 Safety Cans

6.10.1 Approved safety cans (metal, pressure-relieving top, spark arrestor) shall be used for handling and use of flammable/combustible liquid quantities of 5 gallons or less.

6.11 Storage of Flammable/Combustible Liquid Containers and Cabinets

6.11.1 No more than 25 gallons of flammable/combustible liquids can be stored outside of an approved cabinet. All Storage cabinets containing flammable liquids shall be labelled "Flammable - Keep Away."

6.11.2 Quantities of flammable liquid in excess of 25 gallons shall be stored in an acceptable or approved cabinet meeting the requirements in 29 CFR 1926.152.

6.11.3 No more than 60 gallons of flammable liquids or 120 gallons of combustible liquids can be stored in the same storage cabinet.

6.11.4 All flammable/combustible liquids must be stored away from sources of ignition.

6.12 Storage of Flammable/Combustible Liquids Outside of Buildings

6.12.1 At least one portable fire extinguisher with a rating of not less than 20B shall be located outside of, but not less than 25 feet or more than 50 feet, from any flammable liquid storage area located outside.

6.12.2 At least one portable fire extinguisher with a rating of not less than 20BC shall be provided on all tank trucks or other vehicles used for transporting or dispensing flammable or combustible liquids.

6.13 Dispensing and Transfer of Fuel

6.13.1 Areas in which flammable or combustible liquids are transferred at one time, in quantities greater than 5 gallons from one tank or container to another tank or container shall be separated from other operations by 25 feet in distance. Spill kits shall be provided to contain spills.

6.13.2 Transfer of flammable liquids from one container to another should be performed when containers are electrically interconnected or bonded.

6.13.3 Dispensing units shall be protected against collision damage.

6.13.4 Dispensing nozzles shall be auto-closing and without a latch-open device.

6.13.5 Flammable liquids shall be kept in closed containers when not in use.

6.13.6 Leakage or spillage of flammable or combustible liquids shall be disposed of promptly and safely.

6.13.7 Flammable/combustible liquids may only be used where there are no open flames or other source of ignition within 50 feet of operation.

6.14 Service and Fueling Areas

6.14.1 Flammable/combustible liquids shall be stored in approved containers or tanks.

6.14.2 Tank trucks shall comply with NFPA No. 385-1966.

6.14.3 Clearly identified and easily accessible switches shall be provided at a location remote from the dispensing devices to shut off the power to all dispensing devices in the event of an emergency.

6.14.4 There shall be no smoking or open flames in the areas used for:

a) Fuelling.

b) Servicing fuel systems for internal combustion engines.

c) Receiving fuel.

d) Dispensing of flammable/combustible liquids.

6.14.5 Highly visible and legible signs prohibiting smoking or open flames shall be posted in the fuel storage and dispensing area.

6.14.6 The motors of all equipment being fuelled shall be turned off during fueling.

6.14.7 Each service or fuelling area shall be provided with at least one fire extinguisher having a rating of not less than 20BC, located so that there is a fire extinguisher within 50 feet of the:

a) Pump.

b) Dispenser.

c) Underground or above ground pipe opening.

d) Lubrication or service area.

6.15 Installation of Above Ground Storage Tanks (ASTs)

6.15.1 Gravity fed tanks shall not be used to dispense fuel.

6.15.2 The distance between any two flammable/combustible liquid storage tanks shall be not less than three feet or 1/6 (one sixth) of the sum of their diameter.

6.15.3 When ASTs are compacted in three or more rows or in an irregular pattern, greater spacing or other means approved by HSQE shall be provided so that inside tanks are accessible for firefighting purposes.

6.15.4 Minimum separation between a liquefied gas containers and flammable or combustible liquid storage tanks shall be 20 feet.

6.15.5 Dikes or secondary containment-type tanks shall be used for the control of spills. If/when dikes are used, the volume of the dike shall be capable of holding 110% of the greatest amount of liquid which can be released from the largest tank within the storage area, assuming a full tank.

6.15.6 ASTs shall be positioned in such a way that the AST is protected from impact or rupture using berms or barriers.

6.15.7 ASTs containing oil products will be properly grounded and have bonding equipment for use during fuel transfer.

6.16 Demarcating Above Ground Storage Tanks (ASTs)

6.16.1 ASTs containing diesel fuel will be labeled “Diesel Fuel” or “Fuel Oil,” “No Smoking,” and display the NFPA diamond designated: Health - 0, Flammability – 2, Reactivity – 0.

6.16.2 ASTs containing gasoline will be labeled “Flammable Liquid” and “No Smoking” and display the NFPA diamond designated: Health -1, Flammability – 3, Reactivity – 0.

6.16.3 ASTs or other storage tanks containing used/waste oil will be labeled “Waste Oil” and “Combustible,” “No Smoking”, and display the NFPA diamond designated: Health -1, Flammability – 2, Reactivity – 0.

6.17 Venting

6.17.1 ASTs shall be adequately vented to prevent the development of pressure or vacuum as a result of filling, emptying or atmospheric temperature changes, from exceeding the design pressure of the tank or vessel.

6.17.2 Venting devices shall be normally closed except when venting due to pressure or vacuum conditions.

6.17.3 ASTs shall have some form of construction or device that shall relieve excessive internal pressure caused by exposure to fire.

6.17.4 Vent pipes for ASTs storing Class 1 liquids shall be located so that vapors are released at a safe point outside of buildings and not less than 12 feet above adjacent ground levels.

6.18 Flammable/Compressed Gases; Gas Welding and Cutting

6.18.1 Compressed Gas or LP Gas Cylinders shall:

a) Have valve protection caps in place except when in use, hooded up, or secured for movement.

b) Oil or grease shall not be used to lubricate caps.

c) Be hoisted only while secured, as on a cradle or pallet, and shall not be hoisted by mallet, choker sling, or cylinder cap.

d) Be moved only by tilting or rolling on their bottom edge.

e) Be secured in an upright position at all times except, if necessary, for short periods of time while cylinders are carried.

f) Have valves closed when cylinders are empty, being moved, or stored.

g) Be secured upright when hoisted.

h) Not be freed when frozen by prying the valves or caps with bars or by hitting the valve with a tool.

i) Not be thawed by boiling water.

j) Not be exposed to spark, hot slag, or flame.

k) Not be permitted to become part of electrical circuits or have electrodes struck against them to strike arcs.

l) Not be used as rollers or supports.

m) Not have contents used for purposes not authorized by the supplier.

n) Not have gases mixed within, except by gas suppliers.

o) Be stored so that oxygen cylinders are separated from fuel gas cylinders and combustible materials by either a minimum distance of 20 feet or a barrier having a fire resistance rating of 30 minutes.

p) Not have LPG cylinders stored within buildings.

q) Not have objects that might either damage the safety device or obstruct the valve placed on top of the cylinder when in use.

6.19 Use of Compressed or LP Gas

6.19.1 Before regulators are connected to cylinder valves, the valves shall be opened slightly (cracked) and closed immediately to clear away dust or dirt.

6.19.2 Valves shall not be cracked if gas could reach possible sources of ignition.

6.19.3 Cylinder valves should be opened slowly to prevent regulator damage and shall not be opened more than 1½ turns. Any special wrench required for emergency closing shall be positioned on the valve stem during cylinder use.

6.19.4 Pressure reducing regulators shall be attached to cylinder valves when cylinders are supplying torches or devices equipped with shut-off valves.

6.19.5 Cylinder valves shall be closed and gas released from the regulator or manifold before regulators are removed.

6.19.6 Leaking fuel gas cylinder valves shall be closed and the gland nut tightened. If the leak continues, the cylinder shall be "Red-tagged," removed from service, and moved to a location where the leak shall be non-hazardous.

6.19.7 If a plug or safety device leaks, the cylinder shall be "Red-tagged," removed from service, and move it to a location where the leak shall be non-hazardous.

6.20 Hoses

6.20.1 Fuel and oxygen hoses shall be easily distinguishable by color. Oxygen and fuel hoses shall not be interchangeable.

6.20.2 When oxygen and fuel gas hoses are taped together, not more than four of each 12 inches shall be taped.

6.20.3 Hoses shall be inspected before each use. Hoses subjected to flashback or showing evidence of severe wear or damage shall be tested to twice the normal working pressure but not less than 200 psi before reuse.

6.20.4 Hose coupling shall not unlock or disconnect without rotary motion.

6.20.5 Hose connections shall be clamped or securely fastened to withstand twice the normal working pressure but not less than 300 psi without leaking.

6.21 Torches

6.21.1 Torch tips shall be cleaned with devices designed only for that purpose.

6.21.2 Torches shall be inspected before each use for leaking shut-off valves, hose couplings and tip connections. Torches with such defects shall not be used.

6.21.3 Torches shall not be lighted from matches, cigarette lighters, other flames or hot work.

6.21.4 Torches shall be fitted with spark arrestors and flashback protection.

6.22 Pressure Regulators

6.22.1 Pressure regulators, including associated gauges, shall be maintained in safe working order and removed from the cylinder valves at the end of each shift and properly stored.

6.23 Operation Precaution

6.23.1 Gas welding equipment shall be maintained free of oil and grease, and visually inspected at the beginning of each shift.

6.24 Fire Watch

6.24.1 A fire watch shall be required whenever hot work operations are performed in locations where other than a minor fire might develop, or any of the following conditions exist:

a) Appreciable combustible material, in building construction or contents, closer than 35 feet (10.7 m) to the point of operation.

b) Appreciable combustibles are more than 35 feet (10.7 m) away but are easily ignited by sparks.

c) Wall or floor openings within a 35-foot (10.7 m) radius expose combustible material in adjacent areas including concealed spaces in walls or floors.

d) Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation.

6.24.2 Fire watchers shall have fire extinguishing equipment readily available and be trained in proper use.

6.24.3 Fire watchers shall watch for fires in all exposed areas, try to extinguish them only when obviously within the capacity of the equipment available, or otherwise sound the alarm.

6.24.4 A fire watch shall be maintained for at least a half hour after completion of applicable hot work operations to detect and extinguish possible smoldering fires.

6.24.5 Persons assigned to fire watch must have no other responsibilities but to perform the fire watch.

6.25 Hazardous Atmospheres

6.25.1 Personnel are not permitted to work in atmospheres where the lower explosive limit (LEL) or lower flammability limit (LFL) exceeds 10%.

6.26 Housekeeping

6.26.1 All work areas and offices shall be kept free of clutter.

6.26.2 Inspect all extension cords for insulation nicks and damaged prongs.

6.26.3 Maintain garbage in covered roll-offs, trash bins, or other containers for ultimate disposal.

6.26.4 Rags, spill cleanup materials, and other wastes contaminated with flammable or combustible substances must be placed in containers with close-fitting metal covers, located at least five feet from other flammable liquids, and labelled “Flammable.”

7.0 DELIVERABLES

7.1 None.

8.0 APPENDICES

8.1 None.