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Construction Site Hurricane Protection

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Engineering and construction firms that operate in the “hurricane belt” are acutely aware of the hazards that hurricanes pose to construction sites, with their incomplete structures; expensive machinery and equipment; materials and finishes that are easily damaged by water; flood-prone excavations; and building materials such as lumber, sheathing and piping that can quickly become projectiles in high winds. However, contractors often make the mistake of waiting to “batten down the hatches” until a hurricane is imminent, with inadequate time to protect the project.

Enclosed in this information kit are documents to aid in preparing a Hurricane Action Plan that can help you protect your construction site from this storm event.

These materials were compiled by Allianz Risk Consulting (ARC) risk specialists based on extensive years of consultation with construction and engineering firms that operate in hurricane-prone regions. This information kit provides general information and recommendations that may apply to many different situations. Any recommendations described in this information kit are not intended to be specific to your unique situation. Consult with your staff and specialists to determine how and whether the information in this information kit might guide you in developing specific plans and procedures for your operations. This information kit does not substitute for legal advice, which should come from your own counsel.

Hurricane Action Planning Kit Materials Include:

- Pre-construction Checklist
- Tropical Storm Checklist
- Hurricane Watch Checklist
- Hurricane Warning Checklist
- Hurricane Recovery Checklist
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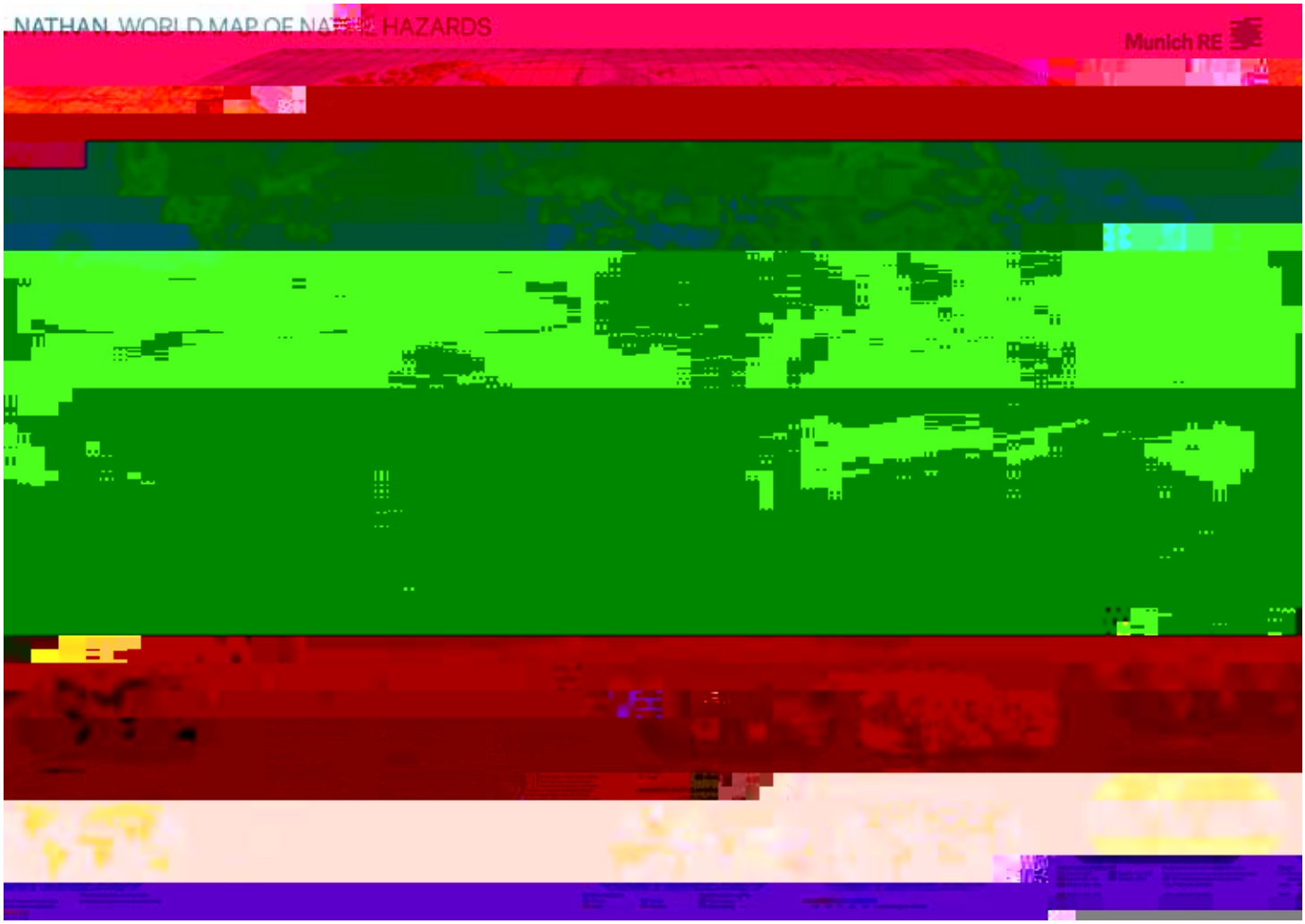
Hurricane Preparedness for the Construction Site

Hurricane Action Plans should consider the following:



Definitions*

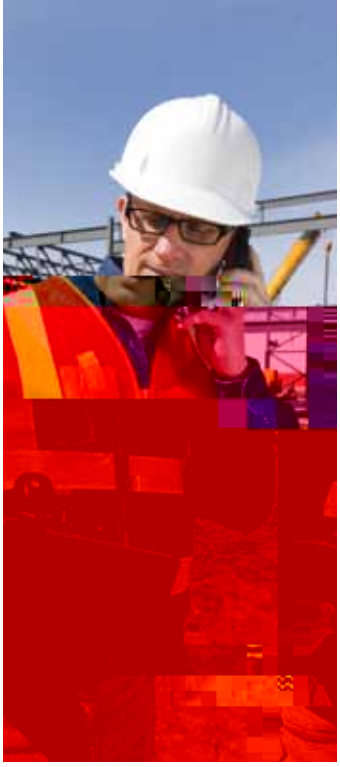
The following definitions are critical to understanding hurricanes and their potential impact on construction projects:

The portion of the year having a relatively high incidence of hurricanes. The hurricane season in the Atlantic, Caribbean and Gulf of Mexico runs from June 1 to November 30. The hurricane season in the Eastern Pacific basin runs from May 15 to November 30. The hurricane season in the Central Pacific basin runs from June 1 to November 30.

A tropical cyclone in which the maximum sustained surface wind (using the U.S. 1-minute average) is 74 mph (64 knots) or more. The term “hurricane” is used for Northern Hemisphere tropical cyclones east of the International Dateline to the Greenwich Meridian. The term “typhoon” is used for Pacific tropical cyclones north of the Equator and west of the International Dateline.

An announcement that hurricane conditions (sustained winds of 74 mph or higher) are expected somewhere within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane warning is issued less than 24 to 36 hours in advance of the anticipated onset of tropical storm-force winds.

An announcement that hurricane conditions (sustained winds of 74 mph or higher) are possible within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane watch is issued 48 hours in advance of the anticipated onset of tropical storm-force winds.



Definitions* continued

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A hurricane that is classified as Category 3 or higher.

When a storm is named and becomes a Tropical Storm (as defined for the purposes of this guide).

An abnormal rise in sea level accompanying a hurricane or other intense storm, and whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the cyclone. Storm surge is usually estimated by subtracting the normal or astronomic high tide from the observed storm tide.

An organized system of persistent clouds and thunderstorms with a closed, low-level circulation and maximum sustained winds of 38 mph (33 knots) or less.

An organized system of strong thunderstorms with a well-defined circulation and maximum sustained winds of 39 to 73 mph (34 to 63 knots).

* Source is the National Oceanic and Atmospheric Administration (NOAA) National Hurricane Center

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Activate when a tropical storm is named with winds of 39 mph or higher

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Tropical Storm Checklist

Hurricane Action Plan

Weather forecasts are not 100 percent accurate. Therefore, it is best to take precautions even if the construction project is not directly in the projected path of the tropical storm.

- S Review your Hurricane Action Plan and update if required.
- Activate the individual responsible for tracking the storm and advise the Person-in-Charge.
- Ensure that the hurricane response and recovery team information is up to date and accurate. The Person-in-Charge should have an updated, printed copy of the list for safe-keeping.
- Conduct a project meeting reviewing the members of the hurricane response/recovery team and their responsibilities. Review and confirm action items with the individuals responsible.
- Ensure that all hurricane planning items have been addressed.
- Monitor material deliveries and begin to consider the impact of material deliveries and the potential of stopping deliveries (especially for non-critical deliveries).
- Determine material requirements (plywood, netting, banding, plastic sheeting, trailer anchors and tie-downs, concrete anchor screws) for protecting the site in its current state of completion and determine the material source and availability.
- Prepare to secure the site (protect/secure materials and equipment, cover exterior openings, complete structures, brace equipment, clean site, etc).
- Review what off-site company resources are available to assist with recovery.
- Contact the corporate safety director, human resources and information technology personnel, as needed.
- Consider updating the project's Critical Path Method (CPM) Schedule Logic Diagram. This will be useful for reflecting the project's pre-storm status and later establishing delays caused by the storm, damages and subsequent repairs.

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Activate less than 48 hours in advance of a storm with anticipated sustained winds of 74 mph or higher

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Hurricane Watch Checklist

Hurricane Action Plan

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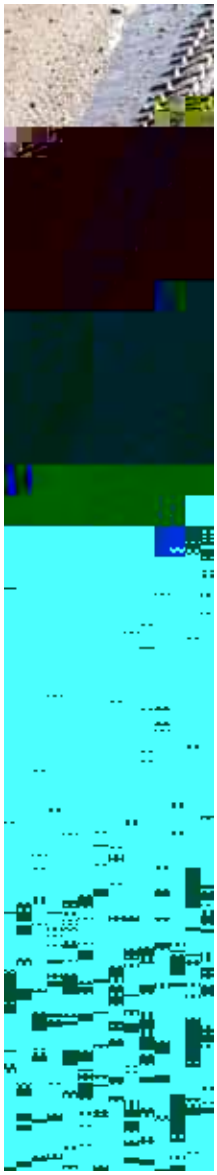
- If completion of structures is not possible or new construction is not fully strengthened, install and fortify temporary bracing to the greatest extent possible. Brace/secure all roof-mounted equipment or any other equipment prone to movement by high winds.
- Band and bundle building materials that cannot be removed.
- Move materials that cannot be relocated or secured otherwise to shipping containers/storage boxes. Cover all materials that cannot be relocated and elevate them to at least 4 inches above the floor to reduce water damage exposure.
- Remove and secure formwork if it cannot be filled with concrete. In some situations, it may be possible to secure formwork using materials such as heavy structural steel components and banding.
- Consider preparations to prevent water damage to the structure, such as grading, sandbagging materials, ensuring roof is clear of debris that could block scuppers, arranging for dewatering pumps and generators if required, etc.
- If emergency personnel are remaining on site during the event, ensure that adequate supplies for their well-being and protection are available and that safety precautions have been taken.
- A design engineer should examine the structures and advise to minimize damage potential.
- Remove scaffolds when possible. If removal of scaffolds is not feasible, remove and secure all boards from scaffolds. Secure all mobile scaffolds to columns or place in shipping (e.g., Conex) boxes.
- Keep evacuation routes open for all vehicles.
- Fully charge all devices and batteries.
- Consider flooding cofferdams, if prudent, to minimize the forces acting on them, such as wind and storm surge.



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- Flood cofferdams, if determined to be the best option for damage reduction.

- Implement building code requirements governing hurricane and high-wind preparations for cranes and hoisting equipment. Some municipalities establish fines and penalties for not following hurricane and high-wind-event precautions for hoisting equipment.

- Contact the crane subcontractor regarding preparing the crane for adverse weather.

- Ensure hoisting equipment abides by all manufacturers' recommendations, including the placement and removal of advertisement banners and the use and/or removal of rigging.

- Remove portable equipment from the jobsite, or store it in shipping containers. For large portable equipment welding machines, compressors, etc., that cannot be placed in shipping containers or stored inside a structure, band the equipment together and protect/secure it as well as possible.

- All crane booms, buckets and blades should be lowered to the ground.

- Hydraulic cranes should have booms retracted and stored.

- Any counterweighted hoist should have the counterweight locked below the top tie-in.

- Inspect all crane counterweights and crane components to ensure they have the greatest likelihood to survive the storm.

- Generally, tower cranes should be allowed to weathervane (move with the wind to minimize the forces acting on the crane).

- Lubricate the tower crane turntable prior to the event.

- All power at the base of the tower should be disconnected.

- All rigging must be removed from the hoist block.

- Backfill excavations if feasible.

- Fuel all vehicles and emergency equipment (such as generators).

- Remove fence screening, signs, banners, etc.

- Secure essential traffic control devices using anchors, sandbags and "tie downs." Remove the devices only if their absence will not create unsafe driving conditions. Collect and remove non-essential barricades.

- Ensure fire protection systems are operational to the extent possible and that adequate fire extinguishers are available.

- Construction equipment should be moved to a location as far as possible from trees, structures or electrical wires, which could fall on them during a storm. Equipment, with brakes set, should also be relocated to as high an elevation as possible to reduce the likelihood of water damage and improve future access to equipment.

- In addition to monitoring the progress of the storm via the Internet, the use of lightning detection equipment can provide valuable information regarding the impending storm. It is considered prudent to take shelter in the interior of a building (taking shelter in construction field trailers should be a last resort) when lightning detectors indicate that lighting is within 8 miles of the site. Work should be immediately stopped in the event of lighting.

- Protect incomplete underground utilities, processes and drainage piping from flotation and the infiltration of sand and silt.

- Fill water coolers and place inside gang boxes for additional weight and for the water needs of recovery personnel. Water may not be available following a storm or municipal water may be contaminated.

- Make de-watering arrangements for meter pits and other in-ground vaults that contain electronic equipment.

- Inform employees and subcontractors about whom to contact regarding a resumption of site activities.

- If employees are to remain onsite to operate pumps or minimize damage, safety is critical. Consideration must be given to the security of the shelter taken during the storm from a structural, flooding, storm-surge and projectile-impact standpoint. Consult a structural engineer to verify that the shelter protection is adequate. Depending on the severity of the storm, onsite personnel must be self sufficient (potentially for several weeks) and will require provisions. The choice to remain during the storm, if absolutely necessary, must be entirely voluntary, well considered and not taken lightly.
- Make a video/photographic record of the jobsite and surrounding properties to document the project condition and status prior to the storm.
- Establish a meeting place, if possible, for key recovery members.
- Inform construction personnel regarding when to leave the project site and how to determine when to return.
- If treaties or agreements exist for recovery assistance by Contractors, contact them to plan recovery efforts.
- If authorities require evacuation, immediately vacate the site.
- Once the site is secure, instruct subcontractors and employees to vacate the jobsite and not to return until the danger has passed.

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Activate after the storm

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Hurricane Recovery Checklist

Hurricane Action Plan

- Despite the disruptive nature of the event, before making repairs, ensure that all safety procedures have been implemented including the permitting of Hot Work, fall protection, lockout tag-out, smoking prohibitions (safe areas), etc.
- Always ensure that a safety manager is present prior to beginning a hurricane recovery operation.
- Determine if the site is safe to enter and what hazards are present. Also, determine what trades and personnel should return to the site.
- Determine what medical facilities are currently handling emergencies in the event of an injury. Some facilities may have been evacuated or heavily damaged in the storm.
- Recovery personnel must be equipped with appropriate personal protective equipment (PPE). This should include, but not be limited to, hardhats, steel-toed boots, eye protection, gloves, respirators, chemical protective suits, etc. (Enforce all typical work safety practices).
- Recovery workers should have proper immunization if they are working in areas where there is a potential for disease exposure. Contact your local medical provider or the Centers for Disease Control (CDC) for assistance.
- Maintain proper first aid equipment and clean water to aid in disinfection.
- Workers should take extra care when walking through standing water, as it can mask hidden hazards, such as depressions, sharp debris, tripping hazards, etc., and can contain chemicals and harbor disease.
- If you or your employees encounter hazardous materials, stay upwind, isolate and secure/guard the area, and notify local experts of the incident for proper remediation.
- Have insecticides to protect against insects, which can carry disease.
- Repair roads, as needed, to allow unencumbered site access.
- Evaluate structures before entering (if required, utilize a structural engineer). Repairs may be required to make the structure safe prior to entry.
- Use caution when removing damaged building components so as not to further compromise and possibly collapse the structure.
- Use caution regarding protruding materials that could injure employees.
- Barricade and clearly identify unsafe areas to prevent entry. If a barricade is not feasible, post a guard to prevent unauthorized entry until the hazard is eliminated.

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- If tower cranes, hoists or scaffolds have been damaged, notify the appropriate subcontractors and engineers.

- Investigate the site for dangerous conditions, such as collapse, live wires, leaking gas, piping damage or situations that could start a fire.

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Hurricane Response Team Form

Hurricane Action Plan

Hurricane Role

1 _____ Work Title _____

Hurricane Role_____

Residence Location _____

Cell Phone _____ Residence Phone _____

Personal email_____

_____ Work Title _____

Hurricane Role_____

Residence Location _____

Cell Phone _____ Residence Phone _____

Personal email_____

_____ Work Title _____

Hurricane Role_____

Residence Location _____

Cell Phone _____ Residence Phone _____

Personal email_____

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Typical Hurricane Preparation Materials and Equipment

Hurricane Action Plan

Sand bags

Generators

Fuel

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Wire	
Netting	
Plastic Sheeting	
Garbage Bags	
Concrete Anchors (to secure netted items to concrete floors)	
Ground Anchors for Office Trailers and Shipping Containers and/or 55 gallon Drums filled with Concrete	
Misc. Hardware and Fasteners	
Duct Tape	

* These are only example materials and equipment and should be revised for each project.

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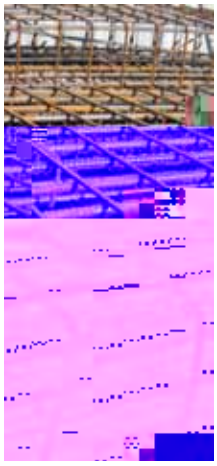

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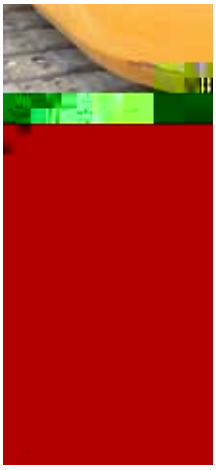

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Hurricane Watch Action Items

Hurricane Action Plan

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Hurricane Warning Act

Hurricane Action Plan

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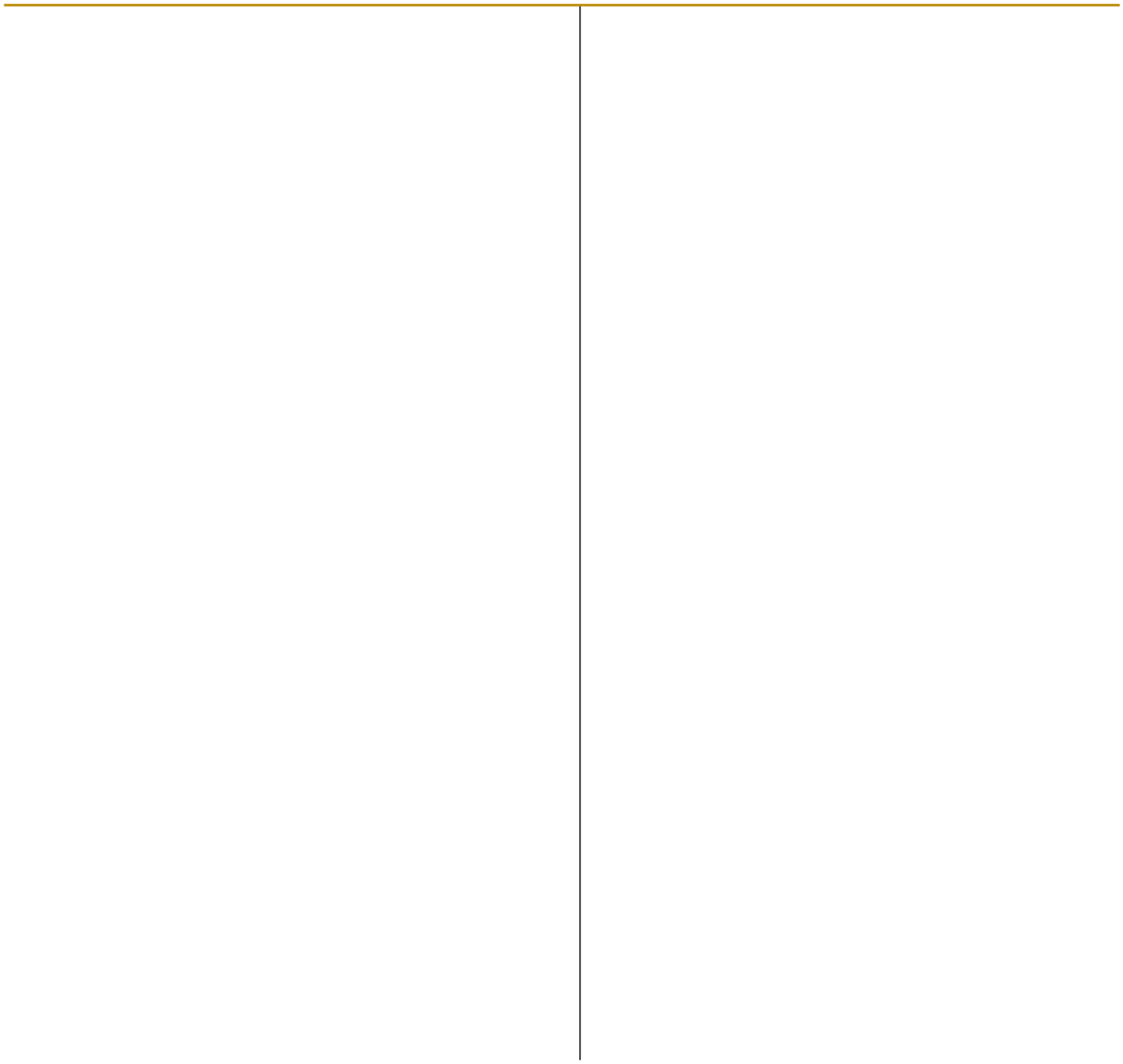


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Adequate fire extinguishers (municipal water may not be available)

Satellite phones (cell phone service may not be available)

Plastic sheeting / Tarps and temporary roof repair materials / Roofing paper

Garbage Bags

Power Cords

Temporary housing (supplied as needed)

First Aid Medical Equipment (if applicable, verify that recovery team members have an adequate supply of their prescription medication)

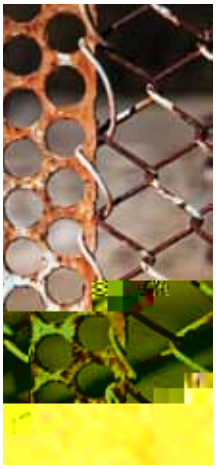
Dumpsters

Batteries

Fuel

Clorox Bleach for disinfecting

* These are only example supplies and should be revised for each project.



Protective clothing and equipment (overalls, rubber boots, gloves, steel-toed boots, hard hat, eye protection, etc.)	
Binoculars	
Lumber, screws, nails, powder actuated fastener	
Cash should be on hand for food, supplies, equipment, etc (credit and checks may not be accepted)	
Mops, brooms, squeegees and absorbents	
Temporary Housing (tents or mobile homes), Sleeping bags	

* These are only example supplies and should be revised for each project.

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