

NHERI Wall of Wind Experimental Facility Safety Plan



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FIU WOW Management Commitment Statement

Health and Safety of students, faculty, staff, visitors and users is of the utmost importance at FIU and the Wall of Wind (WOW) Experimental Facility. Making safety an inherent part of the work day and culture is vital for maintaining a safe working environment. Because the WOW is at the forefront of helping the public build resilient communities through hurricane mitigation research, it emphasizes the importance of mitigating hazards in the <u>workplace</u> and aligns us with our commitment to create a 'Worlds Ahead' facility.

We strive to maintain a safe working environment for all by implementing safety protocols and training and being proactive in addressing any safety concerns through risk management assessments and periodic inspections.

Signature

(WOW Director)

Signature

(WOW Laboratory and Environmental Health and Safety Manager)

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Purpose

The Wall of Wind (WOW) Safety Plan was developed to ensure that proper Environment Health and Safety protocols are followed during the operation of the WOW and to minimize any potential risk to personnel, property, visitors, bystanders, users and the surrounding community.

1. Site Plan and Emergency Equipment Location

Figure 1 shows the WOW site plan and the location of safety devices.

- Fire extinguishers are denoted by a red icon.
- Safety devices associated with the 12-Fan WOW Control Program are denoted by green icons.



WOW Site Plan



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2. Laboratory Security and Access

- Keep <u>the front</u> door of Operations and Control Center closed (and locked) at all times.
- When opening the door with a key be aware that the door remains in locked position.
- Keep all perimeter fence gates locked during testing.
- Have keys collected and returned to FIU Key Control when personnel cease to work at the facility.
- Be familiar with everyone that has access to the facility area.
- All visitors must be escorted by lab staff.
- Limit access to lab area to when only authorized personnel and staff are present.
- Passwords to operate the WOW are only given to authorized personnel.

3. Wall of Wind Operation Procedure

Outline safety protocol for the preparation, operation and shutdown of <u>WOW</u>.

Responsibilities

- 1. The IHRC Director shall:
 - Assign adequate resources for IHRC WOW operation.
- 2. The Facility Director shall:
 - Periodically review the overall effectiveness of the WOW Safety Plan.
 - Specify the responsibility for the adherence of safety protocol.
- 3. The Laboratory and Environmental Health and Safety Manager shall:
 - Ensure that the WOW Safety Plan is adhered to.
 - Maintain responsibility for the overall effectiveness of the WOW Safety Plan.
 - Be responsible for ensuring that students and users assigned to respective projects

have completed the necessary safety training as outlined in this document.



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Required Equipment

- Appropriate Personal Protective Equipment (PPE) shall be used to protect personnel and visitors from noise and wind blow dust/sand.
- Two-way Communications devices shall be used by personnel operating the WOW to warn of potential risks to personnel or equipment.

Reagents and Chemicals

No reagents and/or chemicals are required for the operation of the 12-Fan WOW.

Precautions

- Fire extinguishers placed in designated areas and maintained by FIU Environmental Health and Safety (EH&S).
- Marked egresses kept clear.
- Emergency Power Off (EPO) hand depressed switches placed at exterior of intake and exhaust side of building and in Control Room in working order.
- Safety switches placed on each egress door in working order.
- Safety switches placed on each large rolling door at the intake and exhaust side in working order.

WOW Operation Checklist

Pre-Operation WOW Checklist

- Remove all debris from the testing area. Ensure Foreign Object Debris (FOD) removal.
- Perform a visual inspection of Wall of Wind testing apparatus.
- Perform a visual inspection of the testing structure, wiring, and securing straps if necessary.
- Confirm location of all users, coordinators, visiting personnel, bystanders and media.
- Confirm use of Personal Protective Equipment (eye guards, hearing protection, hard



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Deleted: testing

hats).

- Confirm two-way communication with WOW operating coordinators/personnel.
- Turn on VFD East and West. (Refer to Figure 1).

Starting Procedure

- Confirm wind speed profile to be used for current test.
- Confirm all <u>EPOs</u> are closed and all doors are in open (run) position.
- Confirm okay to proceed with fan start sequence. (Password Protected)
- Start system to minimum 5% capacity. (System default).

Test Sequence and Shutdown

- WOW Operator confirms with Testing Assembly Coordinator okay to begin.
- Begin testing sequence.
- Initiate Wind Driven Rain (WDR) if applicable.
- Initiate wind profile or manual throttle percentage.
- Test sequence completed.
- Confirm that <u>the test</u> is complete.
- Shut down the water injection system.
 - Shutoff water line valve if WDR testing is complete.
- WOW Operator Turns off WOW system
- Turn off VFD East and West. (Refer to Figure 1).



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4. Personnel Environmental Health & Safety Training

Emergency Contact Information and EH&S Training Records for each employee/staff, student, faulty, and user shall be kept to ensure adherence with EH&S requirements.

Researchers, users, faculty, students and staff are required to complete several online training courses before they are granted access to work at the Wall of Wind (WOW) Experimental Facility. Refer to the document entitled "WOW Training Completion Acknowledgment Form and Facility Rules."

5. Requirements Related to Personal Protective Equipment (PPE) for Visitors and Users

Note: Visitors to the WOW are always guided by International Hurricane Research Center (IHRC) and/or Department of Civil and Environmental Engineering (CEE) personnel.

	1: Requirements for various Personnel and Visitors at the WOW Experimental Facility	1	
Working at WOW	Document(s)/Requirements		
 Minors 15 years and older (High School Students) 	 Responsible for always wearing the correct Personal Protective Equipment (PPE). Not allowed to handle tools or work in the WOW building. Not permitted in any hazardous areas as shown in Figure 2. Parent(s) of each student must review the "WOW Visitor, User, Staff and Student Overview" document and complete the "Release, Waiver of Liability, and Assumption of Risk (Minors)." Must complete required WOW Training and adhere to WOW Facility Rules. 	(Deleted: wearing the correct Personal Protective Equipment (PPE) at all times
2- Minors under the age of 15 years	Not allowed to work at the WOW.		
3- FIU Students, not OPS (FIU Contract)	 Responsible for <u>always wearing the correct Personal Protective</u> <u>Equipment (PPE)</u>. Not allowed to work or handle tools in the WOW building. Must review the "WOW Visitor, User, Staff and Student Overview" document and sign on the sign-in sheet. 		Deleted: wearing the correct Personal Protective Equipment (PPE) at all times
 FIU Students under contract, OPS (Covered by FIU's Worker's Compensation Insurance) 	 Responsible for <u>always wearing the correct Personal Protective</u> <u>Equipment (PPE)</u>. Must complete required WOW Training and adhere to WOW Facility Rules. Must review the "WOW Visitor, User, Staff and Student Overview" document and sign on the sign-in sheet. 		Deleted: wearing the correct Personal Protective Equipment (PPE) at all times
5- FIU Faculty and Staff (Covered by FIU's Worker's Compensation Insurance)	 Responsible for always wearing the correct Personal Protective Equipment (PPE). INTERNAL Service Agreement (SA) must be completed for particular project. Must complete required WOW Training and adhere to WOW Facility Rules. Must review the "WOW Visitor, User, Staff and Student Overview" document and sign on the sign-in sheet. 	(Deleted: wearing the correct Personal Protective Equipment (PPE) at all times
6- Students from other universities	Responsible for always wearing the correct Personal Protective Equipment (PPE).	(Deleted: wearing the correct Personal Protective Equipment (PPE) at all times



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	 Service Agreement (SA) mus 	t be in place prior to students from	
	other universities accessing	NOW facility.	
	 Students must complete the 	"Release, Waiver of Liability, and	
	Assumption of Risk (Adults)"	form.	
		Release, Waiver of Liability, and	
	Assumption of Risk (Minors)		
	,	W Training and adhere to WOW	
		rovide first name, last name, and e-	
	mail ID to get access to the t		
	 Must review the "WOW Visit 	•	
	Overview" document and sig	· · · ·	
7- External Users: Faculty and Staff		ing the correct Personal Protective	Deleted: wearing the correct Personal Protective Equipment
from other universities / Other Users	Equipment (PPE).		(PPE) at all times
and Clients		t be in place prior to faculty/staff	
	from other universities acces		
		the "Release, Waiver of Liability,	
	and Assumption of Risk (Adu		
		Release, Waiver of Liability, and	
	Assumption of Risk (Minors)		
		W Training and adhere to WOW	
	,	ide first name, last name, and e-mail	
	ID to get access to the training	•	
	 Must review the "WOW Visi 		
	Overview" document and sig		
8- Subcontractor (Hired by Client/User)	•	ing the correct Personal Protective	Deleted: wearing the correct Personal Protective Equipment (PPE) at all times
	Equipment (PPE)		(PPE) at all times
	• • • •	t be in place prior to subcontractor	
	accessing WOW facility.		
	 <u>Subcontractors</u> must only us 		Deleted: Subcontractor
		rate or use FIU equipment. (i.e.,	
	tools, forklift, ladders)		
	 Must review the "WOW Visi 	· · ·	
	Overview" document and sig		
9- Contractor (Specimen Construction,	 Contractors who are approv 		Deleted: an
Demolition)		ted access to the Wall of Wind	
	Experimental Facility.		
	 <u>Contractors</u> must only use the 	eir equipment and tools.	Deleted: Contractor
	•	e or use FIU equipment. (i.e., tools,	
	forklift, ladders)		
	 Must review the "WOW Visit 	or, User, Staff and Student	
	Overview" document and sig	n on the sign-in sheet.	
Visitor/Touring the WOW	Document(s	/Requirements	
1- Walking around interior and exterior.	 Responsible for <u>always wear</u> 	ing the correct Personal Protective	Deleted: wearing the correct Personal Protective Equipment
(Hard Hat required)	Equipment (PPE).		(PPE) at all times
2- Walking around exterior of buildings	 No documentation required 		
only. (No PPE required)	 No training required. 		
 Low speed demonstration, if 	 Adult visitors must review th 	e "WOW Visitor, User, Staff and	
applicable, in wind less than 30mph.		t and sign on the sign-in sheet.	
	 Minor visitors must be accor 		Deleted: [Point e needs to be reviewed many minors come
			to labs during Engineering Expo].



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		_	
a.	Visitors are outside of the		
	exhaust side of the building.		
b.	Visitors are restricted to the		
	shaded areas shown in Figure 2		
	during a wind demonstration.		
с.	Visitors are required to wear		Deleted: required
	safety glasses.		
d.	Staff <u>members supervise</u> visitors		Deleted: member supervises
	and maintains 2-way		
	communication with control		
	room.		
e.	Minors under 15 years of age		
	only allowed with scheduled		Deleted: are not allowed
	tour groups and accompanied by		
	adult(s),	 	Deleted: .

6. Fire Emergency Procedures

A fire emergency is (1) an uncontrolled fire or imminent fire hazard, (2) the presence of smoke
or the odor of burning, (3) the uncontrolled release of a flammable or combustible substance or
(4) a fire alarm sounding.

In case of a fire emergency at the Wall of Wind Experimental Facility, the following guidelines should be followed.

Fire Emergency Response

If fire is discovered within or around the testing facility:

- Alert people in the area of the <u>emergency</u> and the need to evacuate.
 Deleted: emergency situation
- Activate the nearest fire alarm, if available.
- Call emergency response services at 911 or FIU Public Safety at (305) 348-5911
- If WOW is operating when <u>a fire</u> is discovered, emergency shutdown procedures should be followed.
- Close doors and windows behind you to contain fire and/or smoke.
- Assist any person in immediate danger if it can be accomplished without risk to you.
- If the fire is in <u>an incipient</u> stage, and proper training has been completed, use a nearby fire extinguisher to control and extinguish the fire. Firefighting efforts must be terminated when it becomes obvious that there is a risk of harm from smoke, heat or flames and <u>the building</u> should be immediately evacuated. If one of the following conditions exists do not attempt to fight the fire and evacuate the building: (1) source



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of fire is unknown, (2) fire is spreading rapidly, (3) lack of proper equipment, (4) cannot do so without maintaining an accessible exit, and (5) inhalation of toxic smoke possible.

- The EVACUATION PROCEDURES described in the next section MUST be followed in the event of a fire.
- Every fire emergency should be reported to the Laboratory and Environmental Health and Safety Manager.
- FIU Public Safety's "Facility Fire and Emergency Evacuation" policy must be observed. Additional information can be found at: http://ehs.fiu.edu [Programs Tab][Fire Safety][Fire Safety Guidelines].

Evacuation Procedures

In the event of a fire, safe evacuation of persons in the building is the primary concern. In order to accomplish this, all occupants must prepare in advance for a quick and orderly evacuation.

- Occupants should know primary and secondary evacuation routes and emergency exits must be clearly marked.
- All activities being conducted at the time must be concluded immediately. Procedures for emergency shutdown should precede the evacuation.
- Do not use elevators, use building stairwells instead.
- Never enter a smoke-filled room.
- Upon evacuation of the facility, all should proceed to a designated meeting area where supervisors will account for personnel and notify if any personnel are missing.
- Obtain or provide on-site first aid.
- Never reenter the facility without permission from the fire department.
- Supervisors, laboratory managers and personnel are required to assure that everyone have evacuated their area.

Fire Prevention

- Proper organization and maintenance must be observed to keep the <u>workspace</u> free of unnecessary combustible materials to prevent or reduce the risk and severity of fires.
- Electrical wiring should be maintained in good condition.
- Flammable liquids must be properly stored and handled away from potential ignition sources.



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• Fire extinguishers must be placed inside the facility in easily accessible <u>places</u>, and they must be periodically inspected and maintained.

Fire Extinguishers

The use of fire extinguishers must conform to the following guidelines which are specified by the <u>OSHA standard</u> (29 CFR 1910.157);

- Portable fire extinguishers suitable to the conditions and hazards involved shall be provided and maintained in an effective operating condition.
- Portable fire extinguishers shall be conspicuously located and mounted where they
 will be readily accessible. Extinguishers shall not be obstructed or obscured from view.
- Portable fire extinguishers shall be given maintenance service at least once a year and a written record shall be maintained. FIU EH&S is responsible for obtaining annual maintenance for the extinguishers.
- Monthly inspections which entail visually inspecting for broken seals, damage, and low gauge pressure, depending on type of extinguisher, are performed by FIU EH&S personnel. A tag affixed to the extinguisher is initialed by the inspector after each inspection.
- Employees designated to fight fires must receive training in the general principles of fire extinguisher use and the hazards involved with initial stage firefighting.

Flammable materials

The following is a list of flammable materials that may be present at the Wall of Wind Experimental Facility. A list of Material Safety Data Sheets (MSDS) is available at the facility for each of the following. <u>A flammable storage cabinet is located in the Wall of Wind Shop 105C, aka Staging Construction and Instrumentation Building.</u>

- Unleaded gasoline (Currently no unleaded gasoline is being stored 5/18/2023)
- Liquefied petroleum gas (LPG) or propane (Small tanks used for torch flame)
- Diesel fuel (90-gallon reserve tank located in bed of truck)
- Alcohol (Used for cleaning 3D printed parts)



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Deleted: places

7. Hurricane Preparedness Procedures

General items:

Backup collected test data, and store backup files in an alternate location (<u>Current</u> Deleted: EC, Cyber Infrastructure Location, EIC Server R-Drive project data is backed up daily at 1:00 AM to EIC Server).

Deleted: (EC, EIC Server R-Drive).

Deleted: <#>Anchor, secure, or relocate WOW Electric 2-Fan

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diffusers.

- Backup WOW calibration spreadsheets, velocity profiles, and store backup files in an
 alternate location (Current project data is backed up daily at 1:00 AM to EIC Server).
- Place valuable instrumentation in pelican cases or protective boxes, if applicable.
- Clean lab space, secure loose items and cabinets, and lock doors.
- Gather Foreign Object Debris (FOD) inside fenced area and dispose into dumpsters.
- Secure test structures and roof models to outdoor <u>anchors or</u> move them into WOW facility.
- Lock all perimeter and internal gates.

Operations Control Center (OCC):

- Windows and doors of the Operations Control Center (OCC) are impact resistant. Clean area around OCC from potential wind born FOD items.
- Relocate valuable equipment, computers and fragile items to safer locations and away from windows or external walls. (EC, inside VFD enclosures).
- Secure computers and other office equipment. Protect equipment from water leaks by <u>enclosing it</u> in plastic bags.
- Cover valuable electrical equipment with tarps and straps.
- <u>Confirm that</u> all network cables connected to external, outside of OCC, equipment <u>is</u> <u>connected to surge protectors</u>.
- Disconnect BNC connectors for High-Definition Cameras
- Unplug,all non-essential equipment,
- Activate alarm.

Staging Construction and Instrumentation Building (SCI):

- Cover valuable electrical equipment with tarps and straps.
- Relocate valuable equipment and fragile items to safer locations (EC, inside WOW VFD enclosures), if possible.
- Shut off all electrical utilities to SCI building. (Panel XX, Circuits #,#,#)



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- Secure roll-up door in closed position. <u>Slide locking pins into locked position.</u>
- Lock two side entrance doors.

WOW Building:

- Cover valuable electrical equipment with tarps and straps.
- Relocate valuable equipment and fragile items to safer locations (EC, VFD enclosures), if possible.
- Park dually (if not used for deployment) inside WOW facility, or alternate safe location.
- Check operation of turntable pit sump pump.
- Secure each large door with existing floor anchors. <u>There are two anchors per sliding</u> <u>door.</u>
- Shut_off power at VFD. After each VFD is shut-off proceed to shut-off the high voltage utilities to WOW facility in the switch room.
- Unplug WOW PLC located inside PLC Cabinet
- Lock the two side entrance doors.

Post-Storm Recovery Procedures

If FIU Facilities Management approves inspection of the WOW area following a storm:

- Assess any damages (wind, flood) to WOW facility and document damages.
- Report any losses to FIU Facilities Management as soon as possible.
- Repair and clean buildings and reorganize the Operations Control Center.
- Prioritize the critical functions and allocate necessary resources.
- Check operation of WOW Equipment, All Doors, HD Cameras, Security Cameras, Turntable, <u>PLC</u>, Air Compressor and electrical circuits.
- Continue the long-term recovery and returning to normal operations.
- Update Hurricane Preparedness Procedures and take appropriate actions to mitigate future losses.



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8. Emergency Contact Information

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Miami-Dade County Emergency Management	Florida Division of Emergency Management	
9300 NW 41st Street	2555 Shumard Oak Boulevard	
Miami, FL	Tallahassee, Florida 32399-2100	
305-468-5403	http://www.FloridaDisaster.org	
305-468-5401	http://www.hondabisaster.org	
http://www.miamidade.gov/oem	Florida Emergency Information Line (FEIL) 1-800-342-3557	
American Red Cross		
Greater Miami <mark>and</mark> The Keys Chapter	(Road closures/alternate routes, status of emergency	Deleted: And
335 Southwest 27th Avenue	shelters)	
Miami, FL 33135	Life safety issues: 9-1-1	
305-644-1200		
305-644-7308	FEMA Tele-registration hot-line:	
http://www.miamiredcross.org/	1-800-462-9029	
	Florida Department of Insurance:	
U Environmental Health and Safety	1-800-528-7094	
U Environmental Health and Safety 1200 SW 8 th Street, CSC 162 liami, FL 33199	1-800-528-7094	Deleted: Yenny Farinas Diaz
IU Environmental Health and Safety 1200 SW 8 th Street, CSC 162 Aiami, FL 33199 • <u>Tamece Knowles</u> , Director of Environmenta	1-800-528-7094	Deleted: Yenny Farinas Diaz
IU Environmental Health and Safety 1200 SW 8 th Street, CSC 162 Aiami, FL 33199 • <u>Tamece Knowles</u> , Director of Environmenta	1-800-528-7094	Deleted: Yenny Farinas Diaz Deleted: x72621 Deleted: Wilfredo Alvarez
IU Environmental Health and Safety 1200 SW 8 th Street, CSC 162 Niami, FL 33199 <u>Tamece Knowles</u> , Director of Environmenta <u>Enrique Badia Sosa</u> , Assistant Director of EH Julio Vidal, Industrial and General Safety Off	1-800-528-7094	Deleted: x72621
IU Environmental Health and Safety 1200 SW 8 th Street, CSC 162 liami, FL 33199 <u>Tamece Knowles</u> , Director of Environmenta <u>Enrique Badia Sosa</u> , Assistant Director of EH Julio Vidal, Industrial and General Safety Off	1-800-528-7094 I Health and Safety (EH&S), <u>x77882</u> &\$ <u>x</u> , <u>x77835</u> ficer, x78355	Deleted: x72621 Deleted: Wilfredo Alvarez
IU Environmental Health and Safety 1200 SW 8 th Street, CSC 162 Aiami, FL 33199 <u>Tamece Knowles</u> , Director of Environmenta <u>Enrique Badia Sosa</u> , Assistant Director of EH Julio Vidal, Industrial and General Safety Off enefits Administration Mary Cruz, HR Worker's Compensation Cool	1-800-528-7094 I Health and Safety (EH&S), <u>x77882</u> &\$ <u>x</u> , <u>x77835</u> ficer, x78355	Deleted: x72621 Deleted: Wilfredo Alvarez Deleted: , University Safety Officer
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IU Environmental Health and Safety 1200 SW 8 th Street, CSC 162 1iami, FL 33199 Tamece Knowles, Director of Environmenta Enrique Badia Sosa, Assistant Director of EH Julio Vidal, Industrial and General Safety Off enefits Administration Mary Cruz, HR Worker's Compensation Coor University Park Campus 11200 S.W. 8th Street	1-800-528-7094 I Health and Safety (EH&S), <u>x77882</u> I&S, <u>x77835</u> ficer, x78355 rdinator x77960/x72181 FIU Facilities Management	Deleted: x72621 Deleted: Wilfredo Alvarez Deleted: , University Safety Officer
Enrique Badia Sosa, Assistant Director of EH Julio Vidal, Industrial and General Safety Off enefits Administration	1-800-528-7094 I Health and Safety (EH&S), <u>x77882</u> t&S, <u>x77835</u> ficer, x78355 rdinator x77960/x72181 FIU Facilities Management Phone: 305-348-4000	Deleted: x72621 Deleted: Wilfredo Alvarez Deleted: , University Safety Officer
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U Environmental Health and Safety 1200 SW 8 th Street, CSC 162 1iami, FL 33199 Tamece Knowles, Director of Environmenta Enrique Badia Sosa, Assistant Director of EH Julio Vidal, Industrial and General Safety Off enefits Administration Mary Cruz, HR Worker's Compensation Coor University Park Campus 11200 S.W. 8th Street Miami, Florida 33199 General Information: (305) 348-2000 Center for Engineering & Applied Science	1-800-528-7094 I Health and Safety (EH&S), <u>x77882</u> #&S, <u>x77835</u> ficer, x78355 rdinator x77960/x72181 FIU Facilities Management Phone: 305-348-4000 Fax: 305-348-4010 http://facilities.fiu.edu/	Deleted: x72621 Deleted: Wilfredo Alvarez Deleted: , University Safety Officer
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9. References

- EH&S Website Compliance Guides link: <u>http://ehs.fiu.edu/Programs/Compliance%20Guide/Pages/default.aspx</u>
- EH&S Website Good Practices link: <u>http://ehs.fiu.edu/SiteCollectionDocuments/good%20practice%20guide.pdf</u>
- EH&S Website Fact Sheets link: <u>http://ehs.fiu.edu/Training/Pages/Risk-Management--EHS-Fact-Sheet.aspx</u>
- EH&S Website Departmental Safety Checklist link: <u>http://ehs.fiu.edu/Programs/General%20Safety/Documents/safetyquestionnaire.pdf</u>
- EH&S Laboratory Safety Manual link: <u>http://ehs.fiu.edu/SiteCollectionDocuments/Lab_Safety_Manual.pdf</u>
- EH&S Website Training link: <u>http://ehs.fiu.edu/Training/Pages/default.aspx</u>
- EH&S Website "Report a EH&S Problem" link:
- http://ehs.fiu.edu/About/Pages/Safety-Report.aspx
- HR Workers' Compensation Injury/Illness Reporting Process: <u>http://hr.fiu.edu/index.php?name=workers_compensation</u>

a. Associated FORMS and DOCUMENTS

- TRAINING COMPLETION ACKNOWLEDGEMENT FORM
- VISITOR, USER, AND CLIENT SAFETY OVERVIEW
- RELEASE, WAIVER OF LIABILITY, AND ASSUMPTION OF RISK (ADULTS)
- RELEASE, WAIVER OF LIABILITY, AND ASSUMPTION OF RISK (MINORS)
- SERVICE AGREEMENT Form [EXTERNAL]
- SERVICE AGREEMENT Form [FEDERAL]
- SERVICE AGREEMENT Form [INTERNAL]
- SAFETY NOTICE PLAQUE (& SITE PLAN PLAQUE)



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