



NHERI Wall of Wind Experimental Facility Safety Plan

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Revision History

Version	Date	Author	Comments
V1.0		Walter Conklin	Original document
V2.0	December 8, 2016	Walter Conklin	Content changes

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 work place 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.

Arindam Chowdhury
Director

Walter Conklin
Laboratory and Environmental Health and Safety Manager

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.

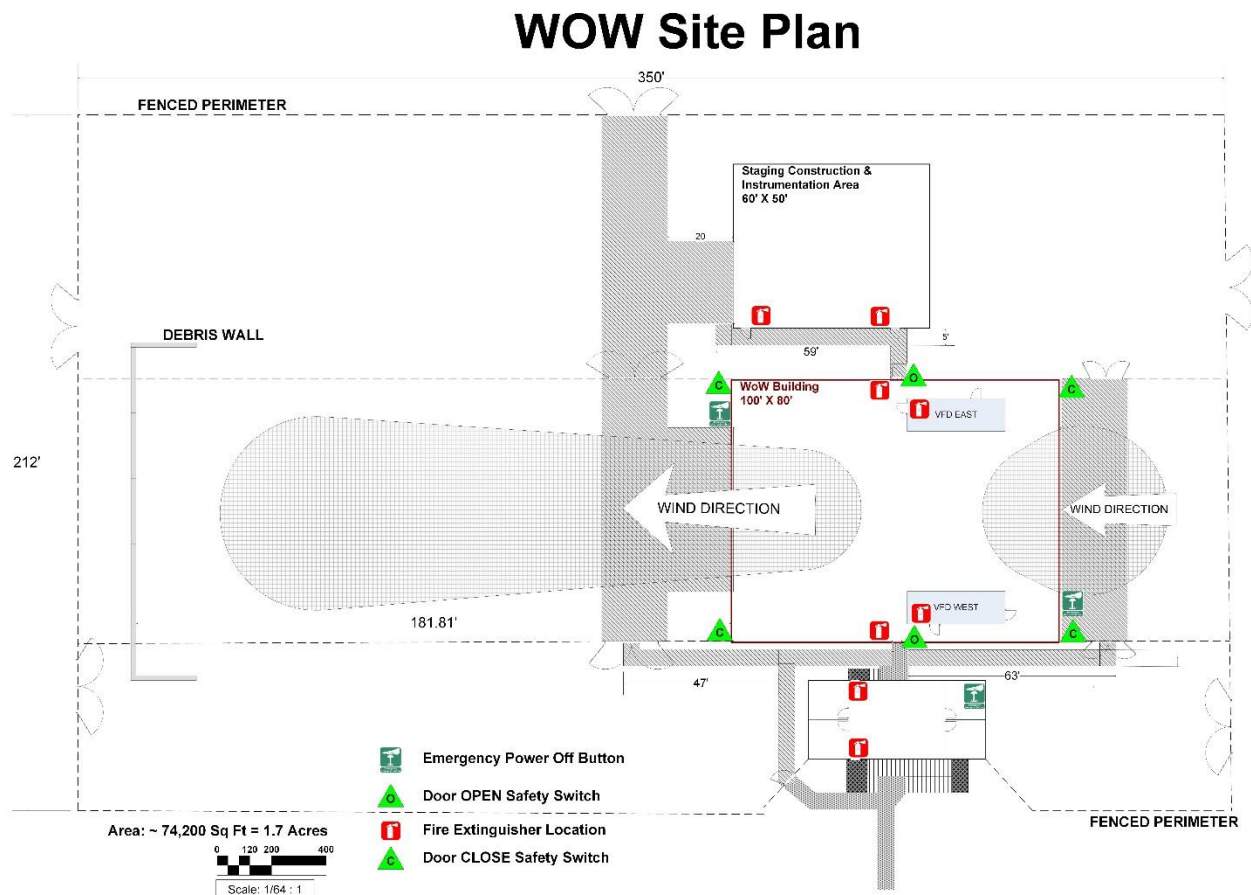


Figure 1: WOW Site Plan

2. Laboratory Security and Access

- Keep front door of Operations and Control Center closed (and locked) at all times.
- When opening the door with a key be aware that 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 the WOW.

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

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 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 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 EPO's 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 test is complete.
- Shut down 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).

4. Personnel Environmental Health & Safety Training

Emergency Contact Information and EH&S Training Records for each employee/staff, student, faculty, 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.

Table 1: Requirements for various Personnel and Visitors at the WOW Experimental Facility

Working at WOW	Document(s)/Requirements
1- Minors 15 years and older (High School Students)	<ul style="list-style-type: none"> • Responsible for wearing the correct Personal Protective Equipment (PPE) at all times. • Not allowed to handle tools or work in the WOW building. • Not permitted in any hazardous areas as shown in Figure 2. • Students must complete the “Release, Waiver of Liability, and Assumption of Risk (Minors)”. • Must complete required WOW Training and adhere to WOW Facility Rules.
2- Minors under the age of 15 years	<ul style="list-style-type: none"> • Not allowed to work at the WOW.
3- FIU Students, not OPS (FIU Contract)	<ul style="list-style-type: none"> • Responsible for wearing the correct Personal Protective Equipment (PPE) at all times. • Not allowed to work or handle tools in the WOW building.
4- FIU Students under contract, OPS (Covered by FIU’s Worker’s Compensation Insurance)	<ul style="list-style-type: none"> • Responsible for wearing the correct Personal Protective Equipment (PPE) at all times. • Must complete required WOW Training and adhere to WOW Facility Rules.
5- FIU Faculty and Staff (Covered by FIU’s Worker’s Compensation Insurance)	<ul style="list-style-type: none"> • Responsible for wearing the correct Personal Protective Equipment (PPE) at all times. • INTERNAL Service Agreement (SA) must be completed for particular project. • Must complete required WOW Training and adhere to WOW Facility Rules.
6- Students from other universities	<ul style="list-style-type: none"> • Responsible for wearing the correct Personal Protective Equipment (PPE) at all times. • Service Agreement (SA) must be in place prior to students from other universities accessing WOW facility. • Students must complete the “Release, Waiver of Liability, and Assumption of Risk (Adults)” form. • Minors must complete the “Release, Waiver of Liability, and Assumption of Risk (Minors)” form. • Must complete required WOW Training and adhere to WOW Facility Rules.
7- Faculty and Staff from other universities	<ul style="list-style-type: none"> • Responsible for wearing the correct Personal Protective Equipment (PPE) at all times. • Service Agreement (SA) must be in place prior to faculty/staff from other universities accessing WOW facility. • Faculty/staff must complete the “Release, Waiver of Liability, and Assumption of Risk (Adults)” form. • Minors must complete the “Release, Waiver of Liability, and Assumption of Risk (Minors)” form.

	<ul style="list-style-type: none"> • Must complete required WOW Training and adhere to WOW Facility Rules.
8- Subcontractor (Hired by Client/User)	<ul style="list-style-type: none"> • Responsible for wearing the correct Personal Protective Equipment (PPE) at all times. • Service Agreement (SA) must be in place prior to subcontractor accessing WOW facility. • Subcontractor must only use their equipment and tools. • Subcontractors shall not operate or use FIU equipment. (i.e., tools, forklift, ladders)
9- Contractor (Specimen Construction, Demolition)	<ul style="list-style-type: none"> • Contractors who are approved vendors and issued an FIU purchase order shall be granted access to the Wall of Wind Experimental Facility. • Contractor must only use their equipment and tools. • Contractors shall not operate or use FIU equipment. (i.e., tools, forklift, ladders)
Visitor/Touring the WOW	Document(s)/Requirements
<ol style="list-style-type: none"> 1- Walking around interior and exterior. (Hard Hat required) 2- Walking around exterior of buildings only. (No PPE required) 3- Low speed demonstration, if applicable, in wind less than 30mph. <ol style="list-style-type: none"> 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. c. Visitors required to wear safety glasses. d. Staff member supervises visitors and maintains 2-way communication with control room. e. Minors under 15 years of age are not allowed. 	<ul style="list-style-type: none"> • Responsible for wearing the correct Personal Protective Equipment (PPE) at all times. • No documentation required. • No training required. • Visitor must review the “WOW Visitor, User and Client Safety Overview” document.

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 emergency situation and the need to evacuate.
- 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 fire 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 incipient 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 building should be immediately evacuated. If one of the following conditions exists do not attempt to fight the fire and evacuate the building: (1) source of fire is unknown, (2) fire is spreading rapidly, (3) lack of proper equipment, (4) can't 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 work space 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.
- Fire extinguishers must be placed inside the facility in easily accessible places 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 [OSHA standard \(29 CFR 1910.157\)](#);

- 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.

- Unleaded gasoline
- Liquefied petroleum gas (LPG) or propane
- Diesel fuel

7. Hurricane Preparedness Procedures

General items:

- Backup collected test data, and store backup files in an alternate location (EC, Cyber Infrastructure Location, EIC Server R-Drive).
- Backup WOW calibration spreadsheets, velocity profiles, and store backup files in an alternate location (EC, EIC Server R-Drive).
- 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 anchors, or move them into WOW facility.
- Anchor, secure, or relocate WOW Electric 2-Fan diffusers.

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 enclosing in plastic bags.
- Cover valuable electrical equipment with tarps and straps.
- Disconnect all network cables connected to external, outside of OCC, equipment.
- Shut off all non-essential utilities to OCC building.
- 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.
- Secure roll-up door in closed position.
- 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.
- Shut off high voltage utilities to WOW facility. Use lockout procedure.
- 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, 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.

8. Emergency Contact Information

Local Emergency Contact Information

Miami-Dade County Emergency Management

9300 NW 41st Street
 Miami, FL
 305-468-5403
 305-468-5401
<http://www.miamidade.gov/oem>

American Red Cross

Greater Miami And The Keys Chapter
 335 Southwest 27th Avenue
 Miami, FL 33135
 305-644-1200
 305-644-7308
<http://www.miamiredcross.org/>

Florida Division of Emergency Management

2555 Shumard Oak Boulevard
 Tallahassee, Florida 32399-2100
<http://www.FloridaDisaster.org>

Florida Emergency Information Line (FEIL)

1-800-342-3557

(Road closures/alternate routes, status of emergency shelters)

Life safety issues: 9-1-1

FEMA Tele-registration hot-line:

1-800-462-9029

Florida Department of Insurance:

1-800-528-7094

FIU Contact Information

FIU Environmental Health and Safety

11200 SW 8th Street, CSC 162
 Miami, FL 33199

- **Yenny Farinas Diaz**, Director of Environmental Health and Safety (EH&S), x72621
- **Wilfredo Alvarez**, Assistant Director of EH&S, University Safety Officer, x70170
- **Julio Vidal**, Industrial and General Safety Officer, x78355

Benefits Administration

- **Mary Cruz**, HR Worker’s Compensation Coordinator x77960/x72181

<p>University Park Campus 11200 S.W. 8th Street Miami, Florida 33199 General Information: (305) 348-2000</p>	<p>FIU Facilities Management Phone: 305-348-4000 Fax: 305-348-4010 http://facilities.fiu.edu/</p>
<p>Center for Engineering & Applied Science 10555 West Flagler Street Miami, FL 33174 General Information: (305) 348-2522</p>	<p>WOW Project Manager: Ivan Macchi, x74620</p>

Wall of Wind Employee Contact Information

Richard S. Olson, Ph.D.

Director of Extreme Events Institute and International Hurricane Research Center
Phone: 305-348-0346
E-mail: Richard.olson@fiu.edu

Arindam Gan Chowdhury, Ph.D.

Director of Laboratory for Wind Engineering Research at International Hurricane Research Center (IHRC)
Associate Professor, Dept. of Civil & Environ. Engineering
Principal Investigator, NHERI
Phone: 305-348-0518
Emergency Phone: 305-801-7390
E-mail: chowdhur@fiu.edu

Walter Conklin

Laboratory and Environmental Health and Safety Manager, IHRC and NHERI
Phone: 305-348-7499
Emergency Phone: 305-282-0106
E-mail: walter.conklin@fiu.edu

Roy Liu

Project Engineer, IHRC and NHERI
Phone: 305-348-4392
Emergency Phone: 786-395-3801
E-mail: rliu001@fiu.edu

Bodhisatta Hajra, Ph.D.

Research Scientist, IHRC and NHERI
Phone: 305-348-4391
E-mail: bhajra@fiu.edu

Carolyn Robertson

Associate Director of Extreme Events Institute
Phone: 305-348-6057
E-mail: crober@fiu.edu

Ioannis Zisis, Ph.D.

Assistant Professor
Department of Civil and Environmental Engineering
Co-Principal Investigator, NHERI
Phone: 305-348-4869
Emergency Phone: 786-223-4282
E-mail: izisis@fiu.edu

Peter A. Irwin, Ph.D. P.Eng.

Professor of Practice, Wall of Wind, IHRC
Co-Principal Investigator, NHERI
Phone: 305-348-2824
E-mail: peter.irwin@fiu.edu

Raphael Greenbaum, Ph.D.

Research Scientist, IHRC and NHERI
Phone: 305-348-4410
E-mail: rgreenba@fiu.edu

Ashkan Rasouli, Ph.D.

Research Scientist, IHRC and NHERI
Phone: 305-348-7499
E-mail: arasouli@fiu.edu

Maryam Refan, Ph.D.

Site Operations Manager, IHRC and NHERI
Phone: 305-348-0546
E-mail: mrefan@fiu.edu

Erik Salna

Program Director, IHRC
Phone: 305-348-1146
E-mail: esalna@fiu.edu

9. References

- EH&S Website Compliance Guides link:
<http://ehs.fiu.edu/Programs/Compliance%20Guide/Pages/default.aspx>
- EH&S Website Good Practices link:
<http://ehs.fiu.edu/SiteCollectionDocuments/good%20practice%20guide.pdf>
- EH&S Website Fact Sheets link:
<http://ehs.fiu.edu/Training/Pages/Risk-Management--EHS-Fact-Sheet.aspx>
- EH&S Website Departmental Safety Checklist link:
<http://ehs.fiu.edu/Programs/General%20Safety/Documents/safetyquestionnaire.pdf>
- EH&S Laboratory Safety Manual link:
http://ehs.fiu.edu/SiteCollectionDocuments/Lab_Safety_Manual.pdf
- EH&S Website Training link:
<http://ehs.fiu.edu/Training/Pages/default.aspx>
- 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:
http://hr.fiu.edu/index.php?name=workers_compensation

10. 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)