

UW QNC – WIN Laboratory Inspection Form – Spring Term 2014

Supervisor: <u>C Beckhouse</u>	Department: <u>ECE</u>	Lab Location: <u>QNC - 3223508</u>
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- Inspections include all labs and associated corridor spaces.
- Inspections to be completed monthly by lab member or Supervisor.
- Use item numbers to comment on unsatisfactory items and concerns on reverse.
- If a category or item doesn't apply to your lab, label 'N' and strike through remaining terms.
- Visit www.safetyoffice.uwaterloo.ca, WIN HS&E board (3rd floor QNC) and your dept. H&S Coordinator for forms, training, responsibilities, policies & legislation and more.
- For inspection form clarification view: www.safetyoffice.uwaterloo.ca → Programs → Inspections → Inspection Checklists → Laboratory Inspection Checklist Guide

<input checked="" type="checkbox"/> Meets Requirements	<input type="checkbox"/> Item to be looked into
<input checked="" type="checkbox"/> Unsatisfactory Item	<input type="checkbox"/> Not Applicable
<input type="checkbox"/> Safety Committee (SC) Inspection (once per term)	

SC	Lab				SC	Lab				SC	Lab									
	M	J	J	A		M	J	J	A		M	J	J	A						
Signs, Labels & Posters													Natural Gas Shutoff Valves				Regular Waste Containers			
1. First Aid Emergency		✓	✓	✓	✓	38. Accessible		NA	NA	NA	NA	75. Adequate Type and Amount		✓	✓	✓	✓			
2. Fire & Evacuation		✓	✓	✓	✓	39. Identified		NA	NA	NA	NA	76. Broken Glass Container		✓	✓	✓	✓			
3. Emergency Lockdown		✓	✓	✓	✓	Electrical				Laboratory Benches										
4. Hazardous Material Spills		✓	✓	✓	✓	40. Wire Condition Good		✓	✓	✓	✓	77. Clean		✓	✓	✓	✓			
5. Phone 911 Label		✓	✓	✓	✓	41. Proper Grounding		✓	✓	✓	✓	78. Good Condition		✓	✓	✓	✓			
6. Lab Hazards Form (current/color)		✓	✓	✓	✓	42. Adequate Outlets		✓	✓	✓	✓	79. Adequate Space		✓	✓	✓	✓			
6a. Off Hour Emergency Contact		✓	✓	✓	✓	43. Extension Cord use Temporary		✓	✓	✓	✓	Fume Hoods								
7. Hazardous Waste Disposal		✓	✓	✓	✓	44. (ESA Approved) CSA		✓	✓	✓	✓	80. Adequate Number		✓	✓	✓	✓			
8. No Chemicals into Sinks		✓	✓	✓	✓	45. Electrical Panels Accessible		✓	✓	✓	✓	81. Adequate Type		✓	✓	✓	✓			
First Aid Station/Kits					46. GFI's used in Wet Areas		✓	✓	✓	✓	82. Clean		✓	✓	✓	✓				
9. Stocked		✓	✓	✓	✓	47. Lockout/Tagout Procedures		NA	NA	NA	NA	83. Good Condition		✓	✓	✓	✓			
10. Accessible		✓	✓	✓	✓	Equipment				84. Face Velocity Tested		✓	✓	✓	✓					
11. Regularly Inspected		✓	✓	✓	✓	48. Pre-use Inspection (if required)		NA	NA	NA	NA	85. Functioning Flow Alarm		✓	✓	✓	✓			
12. List of QNC/WIN First Aiders		✓	✓	✓	✓	49. Clean		✓	✓	✓	✓	85a. Sash closed when not in use		✓	✓	✓	✓			
Fire Extinguishers					50. Properly Guarded		✓	✓	✓	✓	Pressure/Vacuum Vessels (Glovebox, autoclave, etc)									
13. Seal Unbroken		✓	✓	✓	✓	51. Good Condition		✓	✓	✓	✓	86. Pressure Safety Valves		NA	NA	NA	NA			
14. Accessible		✓	✓	✓	✓	Lab Ventilation				87. Vent Lines		✓	✓	✓	✓					
15. Proper Type		✓	✓	✓	✓	52. Lab Temperature Reasonable		✓	✓	✓	✓	88. Labels & Inspection Certificates		✓	✓	✓	✓			
16. Regularly Inspected		✓	✓	✓	✓	53. Dust Control		✓	✓	✓	✓	89. Proper Guarding/Shielding		✓	✓	✓	✓			
General					54. Fume Control		✓	✓	✓	✓	90. Tubing/Clamps Secure		✓	✓	✓	✓				
17. Phone Access		✓	✓	✓	✓	55. Facilities Maintained		✓	✓	✓	✓	Centrifuges								
17a. Ladders/step stools CSA approved		NA	NA	NA	NA	56. Appropriate Guarding		✓	✓	✓	✓	91. Clean		NA	NA	NA	NA			
Floors and Aisles					Chemical Storage				92. Rotors Inspected		✓	✓	✓	✓						
18. Clean		✓	✓	✓	✓	57. Properly Identified		✓	✓	✓	✓	Refrigerator/Freezers								
19. Aisles Clear		✓	✓	✓	✓	58. Segregated By Type		✓	✓	✓	✓	93. Appropriate Type		NA	NA	NA	NA			
20. Good Condition		✓	✓	✓	✓	59. Flammable Liquids Stored Properly and <5L Containers		✓	✓	✓	✓	94. Labels		✓	✓	✓	✓			
Doors and Exits					60. MSDS Readily Available		✓	✓	✓	✓	94a. Clean and Organized		✓	✓	✓	✓				
21. Accessible		✓	✓	✓	✓	61. WHMIS Labels		✓	✓	✓	✓	Local Exhaust (ex. Vent arms, pump exhaust, etc)								
22. Signs Clear and Viewable		✓	✓	✓	✓	62. No Dated Peroxides		✓	✓	✓	✓	95. Proper Functioning		NA	NA	NA	NA			
Lighting					63. Solvents Stored in Lab and Corridor (Record Total Liters)		✓	✓	✓	✓	96. Connections Inspected		✓	✓	✓	✓				
23. Adequate		✓	✓	✓	✓	63a. Chemical Inventory (not required)		NA	NA	NA	NA	Training (cont'd on reverse)								
24. Operating Properly		✓	✓	✓	✓	63b. Hydrofluoric acid (HF) use		NA	NA	NA	NA	97. WHMIS		✓	✓	✓	✓			
Emergency Shower/Eyewash					63c. HF use and safety protocols		NA	NA	NA	NA	98. Cryogenic & Compressed Gas		✓	✓	✓	✓				
25. Easily Accessible		✓	✓	✓	✓	Hazardous Waste				99. Employee Safety Orientation		✓	✓	✓	✓					
26. Within 10 sec travel time		✓	✓	✓	✓	64. Proper Segregation		✓	✓	✓	✓	100. Laboratory Safety		✓	✓	✓	✓			
27. Clearly Identified		✓	✓	✓	✓	65. Organized Waste Procedure		✓	✓	✓	✓	Bio-Safety Lab/Hood								
28. Good Condition and Clean		✓	✓	✓	✓	66. Regular Disposal		✓	✓	✓	✓	101. Hood Certified		NA	NA	NA	NA			
28a. Regularly Tested/Inspected		✓	✓	✓	✓	67. Proper Storage		✓	✓	✓	✓	102. Valid Permit		✓	✓	✓	✓			
Personal Protection					Spills Kit				X-Ray											
29. Proper Footwear		✓	✓	✓	✓	68. Appropriate Type(s)		✓	✓	✓	✓	104. Valid Permit		NA	NA	NA	NA			
30. Eye Protection		✓	✓	✓	✓	69. Stocked		✓	✓	✓	✓	105. Warning Signs & Labels		✓	✓	✓	✓			
31. Gloves & Protective Clothing		✓	✓	✓	✓	69a. Readily Available		✓	✓	✓	✓	106. Required PPE		✓	✓	✓	✓			
32. Hearing Protection		NA	NA	NA	NA	Compressed Gas Cylinders				Lasers										
33. Fall Protection		NA	NA	NA	NA	70. Secured		✓	✓	✓	✓	107. Indicate Class		NA	NA	NA	NA			
33a. Operating Procedures in place for Lab Hazards (chemical, equipment or otherwise)		✓	✓	✓	✓	71. Properly Marked/Labelled		✓	✓	✓	✓	108. Valid Permit		✓	✓	✓	✓			
Safety Program Participation					72. Properly Stored/Segregated		✓	✓	✓	✓	109. Warning Signs & Labels		✓	✓	✓	✓				
34. X-Ray Safety		NA	NA	NA	NA	73. Proper Regulators		✓	✓	✓	✓	110. Required PPE		✓	✓	✓	✓			
35. Laser Safety		✓	✓	✓	✓	74. Cylinder Carts Available/Used		NA	NA	NA	NA	Radioactive Materials								
36. Radioactive Materials		NA	NA	NA	NA						111. Valid Permit		NA	NA	NA	NA				
37. Bio-Safety		✓	✓	✓	✓						112. Warning Signs & Labels		✓	✓	✓	✓				
											113. Required PPE		✓	✓	✓	✓				

Monthly Inspection Performed By:	May	<u>Chris Beckhouse</u>	Date	<u>2014.05.26</u>	Safety Committee Inspection Performed By:
	June	<u>Chris Beckhouse</u>		<u>2014.06.30</u>	
	July	<u>Chris Beckhouse</u>		<u>2014.07.28</u>	
	August	<u>Chris Beckhouse</u>		<u>2014.09.02</u>	



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To: Safety Office, U. of Waterloo

2014.08.29

Re: Safety issues in QNC 3508, 3506

To Whom It May Concern,

In the week of August 18, 2014, the building ventilation produced unsafe working conditions in QNC 3506 and 3508. As described below, this is a recurrent problem of excessive humidity and temperature. These conditions were at first uncomfortable and later unsafe to the extent that personnel were endangered. Ultimately these labs closed down for August 19 and 20 and several days effort was required to repair the damage caused. Some data logging was in place and although this corroborates that there was a significant problem, neither the logged temperature nor the logged humidity appear to reflect the full severity. To summarise the remainder of this report: over much of the week of August 18/2014, the ventilation of QNC caused a severe hazard for electrocution and falls, as well as damaging equipment and causing a substantial loss of time. Observations in the following report are footnoted with the initials of lab members that experienced the situation.

1 Temperature

As shown in Fig. 1, the temperature in QNC 3508 fluctuated to an excessive extent, as low as 14C and as high as 26C. Although this is not in itself a hazard, it was hazardous in combination with the fluctuations in humidity. Moreover, our experiments are temperature sensitive. These temperatures were logged with a consumer grade temperature sensor that was compared with the readings of a calibrated thermometer¹. The labs were described as ranging from bone chillingly cold to feeling like a sauna².

2 Humidity

As shown in Fig. 2, the humidity rose to uncomfortable levels ($\approx 70\%$) on August 18. On August 19 and 20 the fluctuations in humidity were in the 80 to 100% range. The readings were made with a consumer grade humidity sensor which was compared with the readings of a calibrated humidity sensor. Humidity readings from the latter were consistently 10% lower than the former (as measured in the range of 30 to 70%). We suspect that neither sensor is reliable near 100% (i.e. condensing

¹VS

²AB, LG, RC

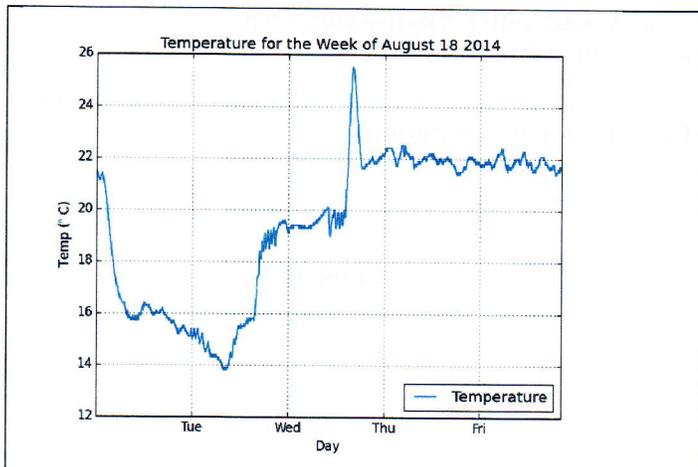


Figure 1: Temperature fluctuations in QNC 3508 in week of August 18, 2014

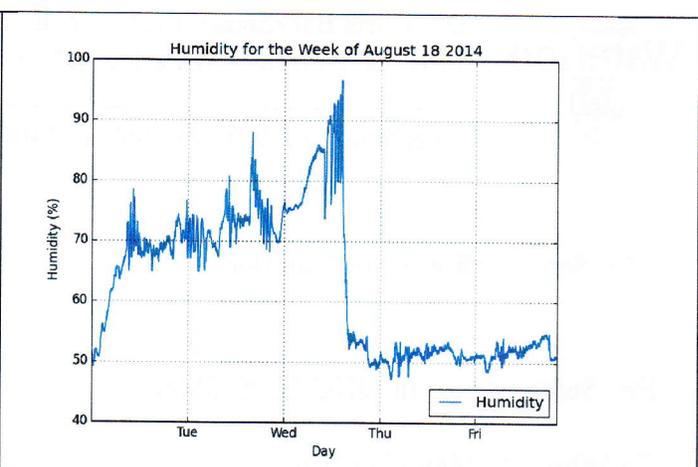


Figure 2: Humidity fluctuations in QNC 3508 in week of August 18, 2014

conditions) but this shows a clear pattern of humidity instability during this period, one that is near condensing conditions.

During this period (on Tuesday) our personnel noticed water slicks forming on tables and floors and footprints could be seen in the dew in both labs³. Papers became noticeably wet and the labs were noticeably foggy, i.e. clouds had formed in the air within the labs. The floors became slippery and it was no longer safe to operate equipment (especially electrical equipment)⁴. Several experiments were disrupted (at the cost of several person-days of labour). As much as possible our equipment was then shut down and/or moved out of the labs. Personnel were then sent home.

3 Consequences

It should first be pointed out that most equipment warranties and presumably CSA approvals, even for storage, preclude exposure to such extremes of humidity. Clearly we can expect equipment problems as a result.

We are still assessing the damage to our equipment and repairing it. So far, we have identified the following:⁵.

- One of our PCs could not be restarted.
- One of our power supplies exploded when power was again applied.
- Two of our instruments needed to be repaired due to water damage to water-sensitive components.

³RC, LG, AB

⁴RC, LG, AB, VS

⁵GH, RC, LG, AB

4 Discussion

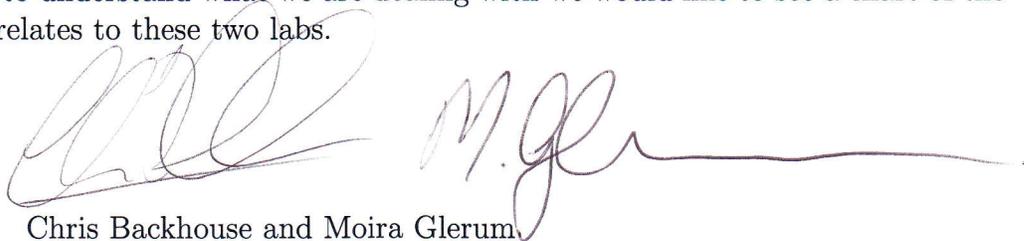
This was a nearly exact repeat of the events of almost exactly a year ago. We asked (via Cory) that Physical Plant exercise caution this year as they applied seasonal changes to the heating system. Unfortunately this did not help and the situation was, if anything, worse than last year although this year we did not note any wide-spread corrosion as we did last year (i.e. rust on tools and steel). This is probably due to protective oils being in place.

There is a possibility that this is in some way connected with the erratic pressures and occasional strong chemical/biological smells that we have previously reported. In that report, as here, QNC 3508 and to a lesser extent 3506 seems to be most susceptible. This suggests that there is something wrong with the ventilation in these labs. Our sensors have not been fully calibrated over the entire temperature and humidity ranges and we will do this for ongoing logging of this situation in terms of temperature, humidity, pressure and particulate content.

5 Needs

We request that the pressure, humidity and temperature be logged by a NIST-certified system that will alert Physical Plant when they are producing unsafe conditions in QNC 3508/3506. We need to have a plan/equipment in place to ensure that we do not endanger our personnel (or equipment) any further. In an effort to understand what we are dealing with we would like to see a chart of the ventilation system as it relates to these two labs.

Yours sincerely,

Two handwritten signatures in dark ink. The first signature is on the left and the second is on the right, both written in a cursive style.

Chris Backhouse and Moira Glerum