



## HYGIENE SLUICE & GATES



Prepared by: Gary Williams, P.Eng

Oct 4, 2010

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# Executive Summary

## Executive Summary

Williams Direct Dryers™ and its predecessor have been producing dryers for industry since 1989. As part of our commitment to innovation and the manufacturing of quality products Williams has developed many specialty dryers for personal equipment that cannot be dried by a rotary style drum dryer. We have coined the concept of “direct drying” whereby drying is achieved by directing air (warmed) to the farthest and hardest part of the item being dried.

Using this technology we have developed Direct Dryers™ that dry: boots, gloves, scba face pieces, cold water rescue suits, turnout gear and many other forms of personal equipment. Our client list includes both the Canadian & US military in all branches, many major city fire departments, 5 star ski resorts, NASA, large industrial companies and a host of individual and smaller businesses.

Williams® is presently developing two new products: a bomb disposal suit dryer and a costume dryer for a large entertainment company. This continuing product innovation was the driving force behind the development of our newly patented food grade boot dryer and food grade shoe rack.

There is an ever growing awareness for the need to increase food safety standards within the Food Service Industry. The new products developed by Williams® support this drive and combined with our line of glove dryers will aid in the creation of new and improved safety procedures for the benefit of both industry and consumer.

The Hygiene Sluice and Hygiene Gate concepts are now being incorporated into the operating layout of food processing facilities. The generic “Hygiene” solution can have multiple layers of protocols whereas Williams’ primary focus is on footwear. In many instances boots worn within a production area are not isolated/changed when moving to other non production areas. At best, the worker may walk through a disinfectant bath or mechanical cleaning device. The efficacy of this procedure is open to question.

To quote the informational food services website “Practically Edible”: “It (listeria) can enter premises through soil on the soles of people's shoes...”

(Copyright 2010 Practically Edible.) <http://www.practicallyedible.com/edible.nsf/pages/listeria>

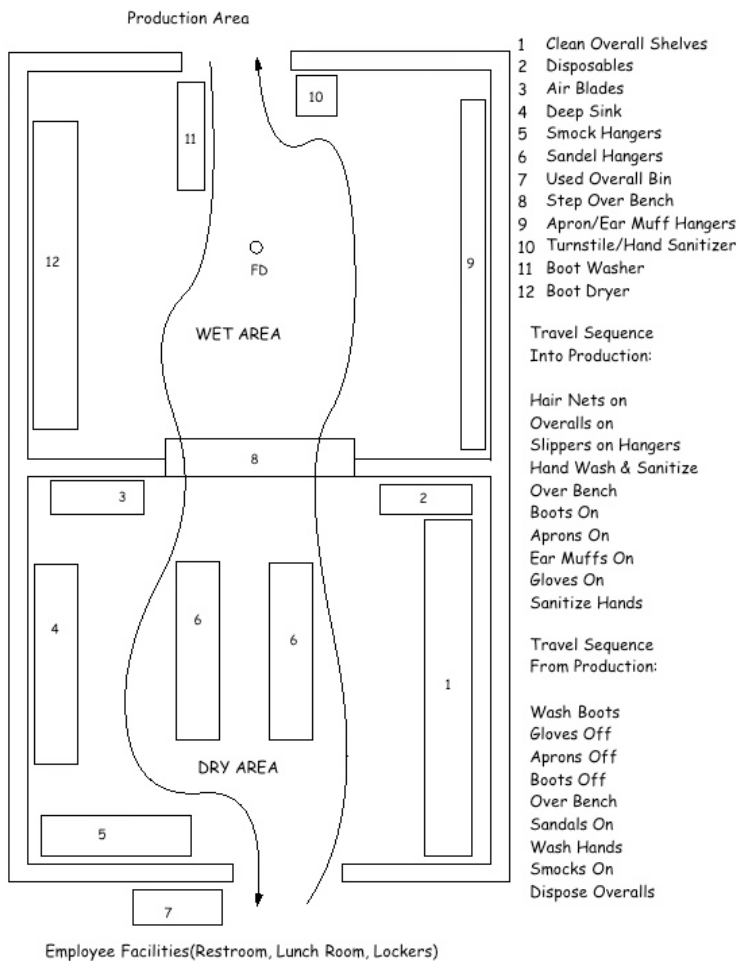
# Hygiene Sluice and Hygiene Gate

## Hygiene Sluice

Williams® recently commissioned Mr. Stein Nikolaisen of Aquatic AS to provide us with a working summary of the latest developments in production/food safety protocols. All Food Businesses must do a risk assessment plan based on GMP-GHP and HACCP. Essentially this process assesses the danger of having product polluted by: chemicals, organic matter (debris & bacteria), allergens and other foreign objects. From this information each Food Business

must take action to reduce the risks associated with each of the foregoing.

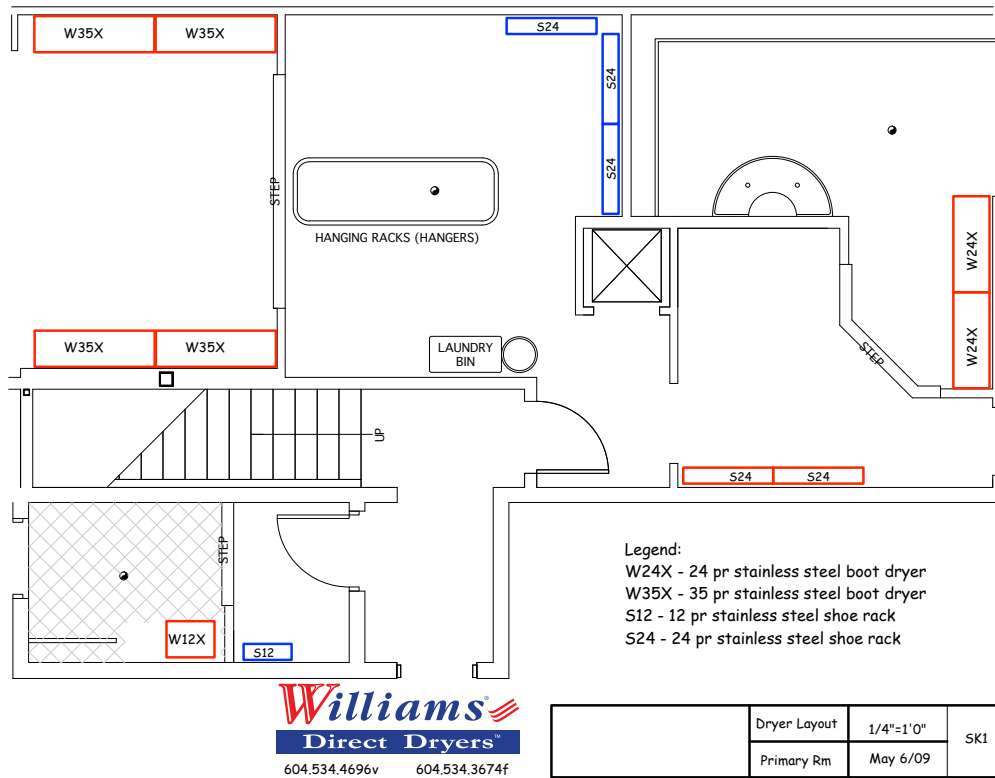
The Hygiene Sluice is a barrier that separates the Production Area from all other areas ie shipping, maintenance, office, etc. The purpose of the Hygiene Sluice is to stop cross contaminations from personnel clothing and boots from entering the fragile production environment.



Hygiene Sluice Layout courtesy of Mr. Stein Nikolaisen

## Hygiene Gate

An Hygiene Gate follows the same guidelines as the Hygiene Sluice but only as they relate to footwear and other miscellaneous items.



Hygiene Gate

The Hygiene Gate separates the footwear worn in the Production area from all other footwear. A more in depth analysis is available as “Hygiene Gate Case Study” (Appendix A).

## Food Services Boot Dryer Operation

A worker removes their boots and places them on the boot dryer during break and then again after shift. After break with the boot dryer operating in “warm” mode the worker will return to re-dress with warmed, dry boots.

After shift the boots (stored upside down) can be power washed to remove debris and then sprayed with an antiseptic solution. The cleaning/disinfectant process is accomplished without the need to physically handle the boot thus preventing possible cross contamination.

Based on chemical manufacturer’s recommendation antiseptic concentrations can be



adjusted taking into account the residual chemical which remains on the boot during the drying cycle.

Using a time control device the operation of the boot dryer can be optimized to local conditions for drying vs duration vs ambient/warmed mode. These operational characteristics ensure good practice energy management.

Hygiene Gate: Shoes & Boots separated by curbed rooms.

## Hygiene Sluice/Gate Summary

Whether the barrier employed is a Sluice or Gate a very specialized boot dryer is required to ensure the proper implementation of the regime necessary to prevent cross contamination associated with footwear. The Williams<sup>®</sup> food grade boot dryer has been designed specifically for use in either the Hygiene Sluice or Gate environment.

## Products for Use in the Food Service Industry



### **Williams® Food Service Boot Dryer**

- Food grade stainless steel construction (min 16ga).
  - All surfaces sloped & interior is self draining.
  - Boots are stored upside down and the dryer is easily dressed and undressed.
  - High volume of air (warmed) is blown into the toe of the boot initiating drying from the hardest part of the boot to dry.
  - Energy management operation allows the dryer to blow either ambient (room temperature) or air raised approximately 6°C above ambient. Blowing warmed air enhances employee comfort after returning from break and re-dressing with production boots. Also dry boots are less likely to be a sink for bacteria, fungus or other foot born pathogens.
  - Available in 2', 4', & 5' widths and sized with either 6 arms per riser for 8' ceilings or 7 arms per riser for 9' ceilings (ie 12pr to 35pr per dryer). This versatility of design increases the ability of the dryer to be utilized within existing facilities.
- 
- Pressure manifold located at ceiling level draws the cleanest and warmest air available in the room.
  - No exposed primary electrical components. Best operating procedures dictate the dryer should not be operating during boot flushing and decontamination.
  - Available in either 115V or 230V.
  - CSA reviewed.
  - Drying time study based on an equivalent 24pr boot dryer appended as Appendix 'D'

## Williams® Food Service Shoe Rack



- Food grade stainless steel construction.
- All surfaces are sloped.
- Can be either mounted on a wall or manufactured to be free standing.

## Williams® Glove Dryers

Williams® manufactures a number of different types of glove dryers depending on the style of glove being dried. Included in Appendix 'C' is a selection protocol for all types of gloves.

Rubber gloves are involved in all aspects of food production. Washing and drying rubber gloves has proven to be a difficult issue and in many cases not effectively addressed. For example our testing has shown that attempting to dry rubber gloves in a rotary style drum dryer is not only ineffective but may also shorten the operating lifespan of the glove.

Appendix 'B' includes a drying test comparing a rotary drum dryer to a Williams® Glove Dryer.



# Appendices

- Appendix A Hygiene Gate Case Study**
- Appendix B Drying Study Rubber Gloves G18P**
- Appendix C Glove Dryer Selection**
- Appendix D Boot Dryer Test Data W24**



# Hygiene Gate Case Study



Williams Direct Dryers™ Food Grade Boot Dryer



Williams Direct Dryers™ Food Grade Shoe Rack

Prepared by: Gary Williams, P.Eng

Sept 29, 2010

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# Executive Summary

## Executive Summary

As part of an ongoing commitment to product quality and safety, Marine Harvest Canada recently completed a renovation to their Port Hardy fish processing facility. One of the safety concerns addressed was the issue of potential cross contamination. Integral to their risk management strategy was the concept of a “Hygiene Gate” dedicated to footwear. Footwear was seen as a potential pathogen and debris vector requiring a more focused set of cleanliness protocols.

Marine Harvest Canada required a food grade boot dryer to serve as the basis on which the Hygiene Gate would operate. After a review of possible products available on the world market Marine Harvest Canada contacted Williams Direct Dryers™ to assess the possibility of having Williams develop a boot dryer more suitable to their stringent specifications.

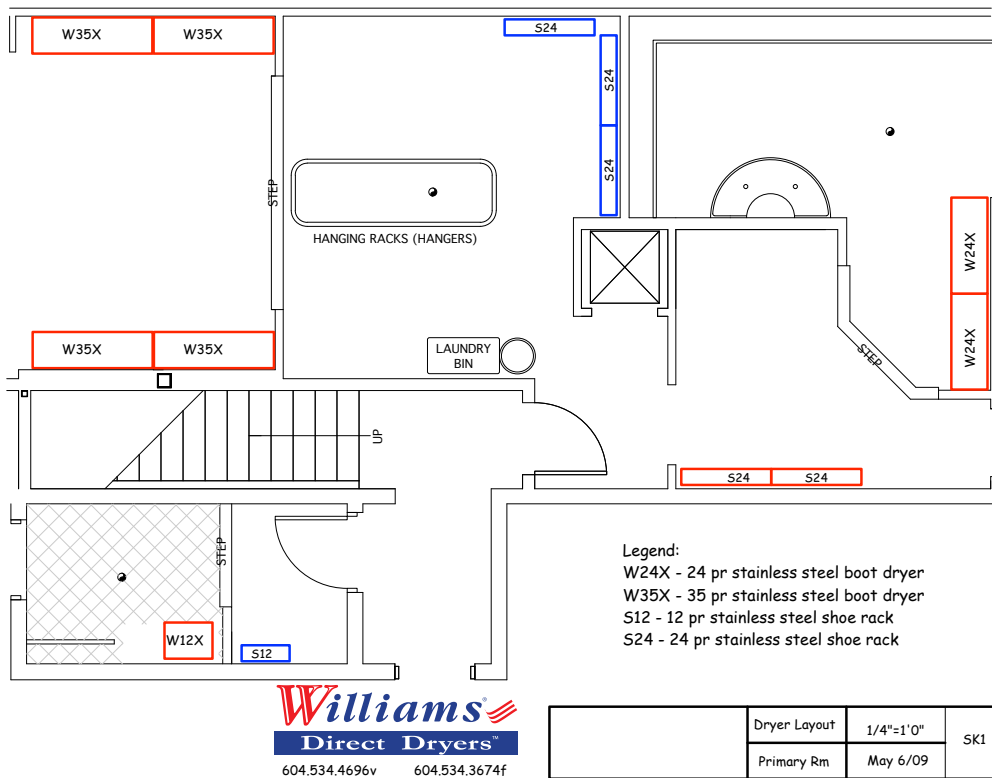
The result is the Williams Direct Dryers™ patented boot drying system.

## Boot Dryer Operating Specifications

- Food grade standards including stainless steel construction and total water shedding characteristics.
- Ability to wash and apply disinfectant to the boots without human contact.
- Capable of operating in moist conditions.
- Provide effective and economical drying of boots.
- Space efficient.

## Hygiene Gate Characteristics

The operation of a Hygiene Gate is characterized by the physical separation of footwear worn in the production area from the footwear worn in other areas. On entering the Hygiene Gate the individual removes their footwear (in this case clogs) and places them on a Williams Direct Dryers™ shoe rack. There is a physical barrier separating the boot from the shoe storage areas over which you must step to make the transition.



Plan of a Hygiene Gate (courtesy of Marine Harvest Canada)

### **Draft Cleaning Procedures (dryers off)**

- Pre flush using water at a temperature not exceeding 35°C (prevents “burning” of any surface proteins)
- Flush from top down to direct organic materials to the floor for disposal.
- Apply foam (to manufacturers specification) to loosen and emulsify fat and protein membranes that may be on the boot surface.
- Flush with high pressure water (55-65°C) to remove emulsified residues.
- Apply disinfectant (to manufacturers specifications).
- Flush or leave depending on manufacturer’s suggested procedures.

### **Williams Direct Dryers Food Grade Boot Dryer**



- All surfaces are sloped food grade stainless steel.
- Boots are stored upside down on boot arms which blow air directly to the toe of the boot. Efficient drying occurs from the toe out. Debris flushed from upper levels cannot enter the boot below.
- Energy management feature allows the dryer to blow either ambient (ie room temperature) or air raised about 6°C above room temperature.
- Self draining.
- The pressure manifold is mounted high on the wall thus drawing the warmest and cleanest air available in the room.

## Hygiene Gate Photo



Boot Dryer

Curbs

Shoe Rack

Note: no street or other type of shoes allowed in this area

### Objective

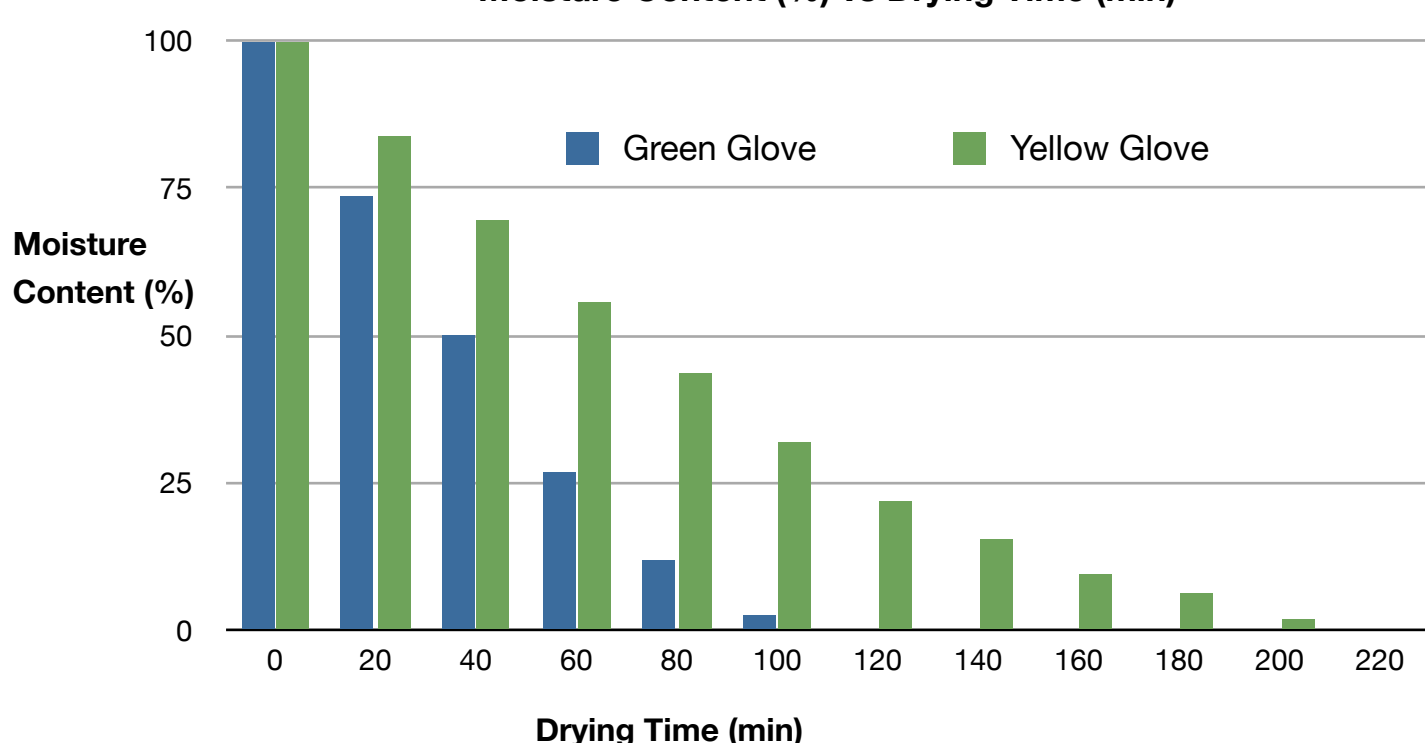
1. Provide analysis of rubber gloves supplied by Client to determine drying times and performance of a Williams® G18 glove dryer.

### Procedure

1. Weigh each glove prior to starting the test
2. Fill each glove to capacity with water and dump out.
3. Turn on the G18 and let run for 15 minutes to bring dryer to operating temperature.
4. Weigh each glove at 100% saturation.
5. Weigh each glove at measured time intervals.
6. Continue until weight of glove does not change with time.
7. Measure room temperature during testing interval.

### Result Summary

**Moisture Content (%) vs Drying Time (min)**



	0	20	40	60	80	100	120	140	160	180	200	220
Green Glove	100	73.6	50.1	26.7	11.8	2.5	0					
Yellow Glove	100	83.8	69.6	55.6	43.6	31.9	21.9	15.4	9.5	6.2	1.9	0

### Observations & Conclusions

1. The interior lining of the Yellow Gloves was thicker with a heavier style “pile” vs the Green Gloves.
2. The Gloves received from the Client had been dried according to their standards in an industrial rotary style dryer for a period of time between 120 min (Green) & 150 min (Yellow).
3. The Gloves received from the Client still contained a significant amount of moisture: Green 47%; Yellow 36%.
4. Green Gloves were 100% dry in 120 minutes at a drying rate of approx 4.5g/15 min.
5. Yellow Gloves were 100% dry in 210 minutes at a drying rate of approx 4.5g/15 min.
6. G18 operating analysis was performed under separate cover including: air temperature increase over ambient, air volume delivered at each nozzle, db rating at 3m from machine, and electrical requirements.

### Data

#### Green Gloves

Time	Temp	Wt(gr)	Content(gr)	%Wet
2:50 PM	19.6	146.3	36.3	100.0%
3:10 PM		136.7	26.7	73.6%
3:30 PM	19.8	128.2	18.2	50.1%
3:50 PM		119.7	9.7	26.7%
4:10 PM	19.8	114.3	4.3	11.8%
4:30 PM		110.9	0.90	2.5%
4:50 PM	20.2	110	0.0	0.0%
5:10 PM		110	0.0	0.0%
5:30 PM		110.0	0.0	0.0%
6:30 PM				
7:00 PM				
dry wt		110.0		
water		36.3		

#### Yellow Gloves

Time	Temp	Wt(gr)	Content (gr)	%Wet
2:50 PM	19.6	187.7	63.1	100.0%
3:10 PM		177.5	52.9	83.8%
3:30 PM	19.8	168.5	43.9	69.6%
3:50 PM		159.7	35.1	55.6%
4:10 PM	19.8	152.1	27.5	43.6%
4:30 PM		144.7	20.1	31.9%
4:50 PM	20.2	138.4	13.8	21.9%
5:10 PM		134.3	9.7	15.4%
5:30 PM		130.6	6.0	9.5%
5:50 PM		128.5	3.9	6.2%
6:30 PM		125.8	1.2	1.9%
7:00 PM		124.6	0.0	0.0%
dry wt		124.6		
water		63.1		

### Rotary Drum Results

Type	Wt	Dry	Content	MaxContent	
Green	127.1	110.0	17.1	36.3	47.11%
Yellow	147.0	124.6	22.4	63.1	35.50%

#### Test Gloves

#### Test Dryer G18P



Green Gloves Smooth “Pile”

Yellow Gloves Thick “Pile”







Direct Dryers™

www.directdryers.com

# Glove Dryer Selection Appendix C

Available in 9 & 18 pr models



**Model Shown:**

G18

G18P

G18PX

**Arm Styles:**

Standard

Palm Expanders

Palm Expanders & Air Curtain Outlets

**Applications:**

Stiff Shell

Soft Shell Gloves

Soft Shell Gloves with Integral Moisture/Heat Barriers

**Examples:**

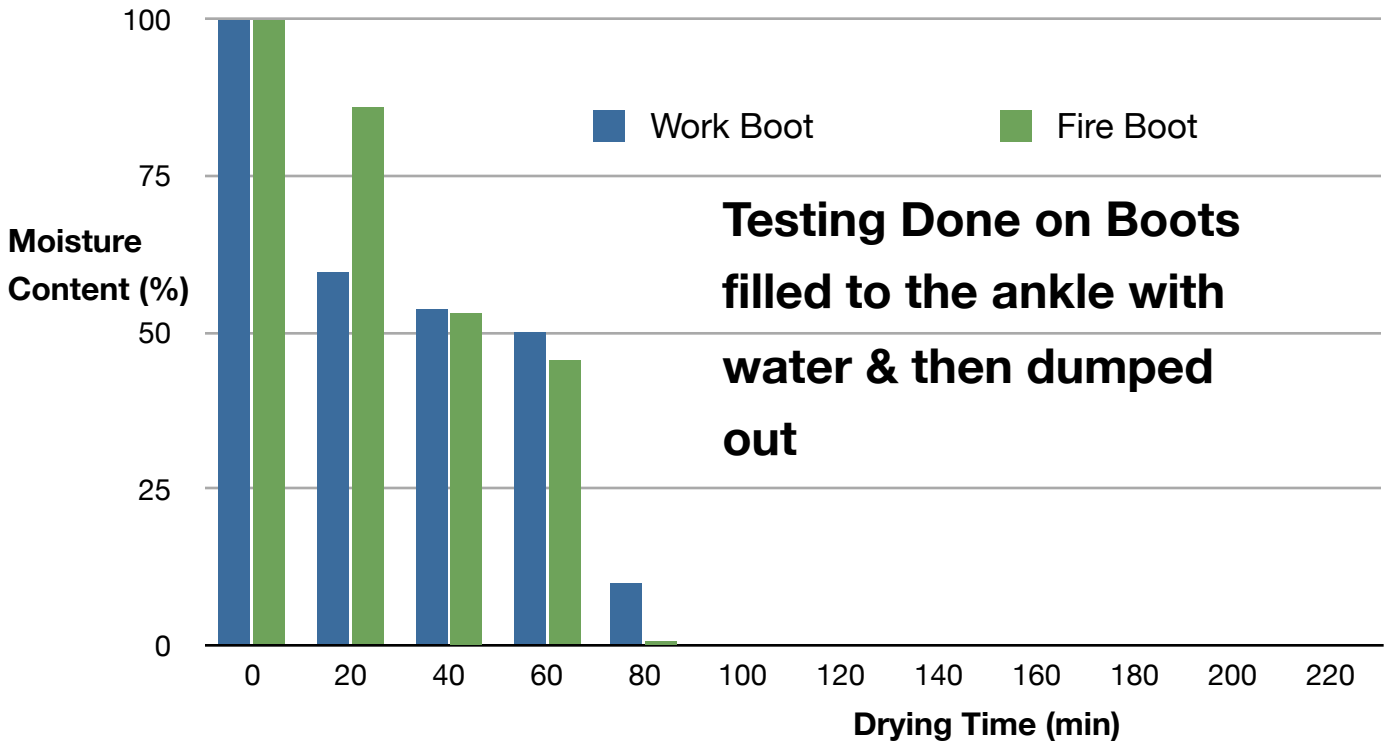
Ski Gloves  
Hockey Gloves

Rubber Gloves  
Work Gloves

Fire Fighter Gloves  
Insulated Gloves

# Appendix "D" - Boot Dryer Test Data & Results

**Moisture Content (%) vs Drying Time (min)**



## Drying Summary

	0	20	40	60	80	100	120	140	160	180	200	220
<b>Work Boot</b>	100	59.5	53.6	50	9.9	0	0					
<b>Fire Boot</b>	100	85.9	53.1	45.5	0.7	0	0	0	0	0	0	0

## Work Boot

Time	Temp	Wt(gr)	Content (gr)	%Wet
1:55 PM		1370.0	22.2	100.0%
2:15 PM		1361.0	13.2	59.5%
2:35 PM	20	1359.7	11.9	53.6%
2:55 PM		1358.9	11.1	50.0%
3:15 PM		1350.0	2.2	9.9%
3:35 PM		1347.8	0.00	0.0%
3:55 PM		1347.8	0.0	0.0%
<b>dry wt</b>		1347.8		
<b>water</b>		22.2		

## Fire Boot

Time	Temp	Wt(gr)	Content (gr)	%Wet
1:55 PM		1741.5	27.7	100.0%
2:15 PM		1737.6	23.8	85.9%
2:35 PM	20	1728.5	14.7	53.1%
2:55 PM		1726.4	12.6	45.5%
3:15 PM		1714.0	0.2	0.7%
3:35 PM		1713.8	0.0	0.0%
3:55 PM		1713.8	0.0	0.0%
<b>dry wt</b>		1713.8		
<b>water</b>		27.7		

**Test Boots**



Rubber Work Boot CSA (c&us) Class 1 ASTM  
Fire Fighter Boot



**Test Dryer W24**