September 11, 2017

Clemson University
310 Klugh Avenue
Clemson, South Carolina 29634

Attn: Mr. W. Robert Newberry, IV
E-mail: wnewber@clemson.edu

Re: Limited Indoor Air Quality Investigation Report
Physics Fabrication Shop (Daniel Annex)
Clemson, South Carolina 29631
Terracon Project No. 86127158 – Task 95

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited indoor air quality investigation in the shop located between Kinard Hall and Daniel Hall on the main campus of Clemson University in Clemson, South Carolina. Reportedly, employees working in this area have experienced respiratory issues. This service was conducted in general accordance with our Master Service Agreement with Clemson University.

PROJECT DESCRIPTION

Scope of Services

At the request of Clemson University, Terracon representative Mr. Benjamin Hestir conducted a limited indoor air quality investigation in the Physics Fabrication Shop on July 25 and 26, 2017. This investigation included the collection of air and dust wipe samples to be analyzed for welding metal fumes and hexavalent chromium in the general work area. The requested sampling did not include monitoring to meet applicable sections of the Occupational Health and Safety (OSHA) standards.

Prior to our July 25-26 sampling effort, Terracon conducted a limited mold assessment on July 11th including the collection of measurements of temperature, relative humidity, surface mold sampling, and airborne mold samples inside and outside of the shop. Those findings have been reported separately for clarity.

Standard of Care

This limited indoor air quality investigation was conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the same locale. Terracon did not attempt to identify every potential exposure or hazard present in the subject building. The results, findings, conclusions and recommendations expressed in this report are based on conditions observed during our sampling. Many factors, such as weather conditions, building occupancy, ventilation patterns and seasonal variations in fungal concentrations, can affect the conditions observed. The information contained in this report should not be relied upon to represent conditions that existed prior to or after this sampling. Terracon does not warrant the services of regulatory agencies, laboratories or other third parties supplying information that may have been used in the preparation of this report.

SAMPLING METHODS AND CRITERIA

Area air samples for welding fume metals analysis were collected using 37 millimeter (mm), 3-piece air sampling cassettes with 0.8 micrometer (mm) mixed cellulose ester (MCE) filter media and a high volume sampling pump calibrated to 10 liters of air per minute (LPM). Approximately 3,000 liters of air was collected over 300 minutes. Surface dust samples were collected using TransporterÔ sterile swabs and a 100 square centimeter (cm^2) area template. Air and dust samples were analyzed for welding fume metals by National Institute of Occupational Safety and Health (NIOSH) Method 7300 using inductively coupled plasma atomic emission spectroscopy (ICP-AES).

Area air samples for hexavalent chromium analysis were collected using 37 mm, 3-piece air sampling cassettes with 5 mm non-weighed polyvinyl chloride (PVC) filter media and a high volume sampling pump calibrated to 10 LPM. Approximately 4,800 liters of air was collected over 480 minutes. Surface dust samples were collected using a PVC filter material and a 100 square centimeter (cm^2) area template. Air and dust samples were analyzed for hexavalent chromium by Occupational Safety and Health Administration (OSHA) Method ID-215 Version 2 using ion chromatography (IC).

After collection, the samples were delivered via overnight carrier to Scientific Analytical Institute, Inc. (SAI) in Greensboro, North Carolina. SAI is accredited by the AIHA® Laboratory Accreditation Programs, LLC under the Industrial Hygiene Laboratory Accreditation Program (IHLAP), Accreditation #173190.

Although air samples were not collected on individuals performing the various tasks, employees were working in the general area sampled. Results of the air sampling were compared to OSHA occupational exposure standards under 29 CFR 1910.1026 (general industry) and 1926.1126 (construction). Both standards establish Permissible Exposure Limits (PEL) for various metals as an 8-hour TWA. Additionally, the American Conference of Governmental Industrial Hygienists

(ACGIH®) have established Threshold Limit Values (TLV®) for various metals as an 8-hour TWA exposure. TLVs® are guidelines and are not generally enforced by OSHA.[1] It should be noted that some metals have action levels, short term exposure limits, or ceiling exposure limits. Due to the nature of this investigation results for these metals cannot be compared to applicable short term or ceiling values.

Currently there are no OSHA established standards on surface dust. Sampling for surface dust may be used to determine if housekeeping measures are adequate or to assess the potential for settled dust to become airborne and potentially cause occupational exposure.

SAMPLING OVERVIEW

The building housing the shop was reportedly constructed in the late 1960's and was converted from a performing arts space to a shop for the Physics Department in 1994. The building has a footprint of approximately 4,600 square feet and contains a multi-room shop, a welding area, restrooms, and an office.

Interviews with staff members in the shop including Russ Reynolds and Barrett Barker indicated that the shop fabricates equipment for the Physics and Astronomy faculty and that the related work primarily includes metal work (cutting, grinding, drilling, machining, welding) with various forms of aluminum and stainless steel, acrylic, delrin, macor ceramic, mild steel, tool steel, carbon graphite, nylon, brass, copper, cast iron, nickel, bronze, lead, titanium, and Inconel. The shop does not apply coatings to the metal parts that they fabricate. When coatings are required for a particular application, the parts are sent out to specialty contractors. To gain an understanding of general area conditions, the following was sampled:

- Two (2) air samples for welding fume metals and hexavalent chromium were collected in the work area. A general sample was collected at the west side of the shop and a sample in the northeast corner near welding operations.
- Four (4) surface dust wipe samples for welding fume metals and hexavalent chromium at various locations.

[1] See Appendix D for ACGIH®'s Policy Statement on the Uses of TLVs® and BEIs®

FINDINGS

General Observations

- The building construction is primarily concrete masonry unit (CMU) construction with a sloped metal roof.
- The central portion of the building has a twenty-foot plus high ceiling with multiple metal HVAC ducts that are reportedly insulated on the inside.
- The shop was observed to have a significant amount of dust accumulation both in and around the HVAC system, some of which may be present on surfaces due to the regular use of metal cutting oils which provide a sticky surface for the accumulation of airborne particulates over time.
- There were a few (2-3) through the wall exhaust fans present on exterior walls.
- No local exhaust systems were observed associated with the metal machining tools present.
- A slight odor of petroleum was present, possibly from machine tool cutting oil.
- According to shop employees: "We machine a variety of materials. Aluminum 6061,7075, stainless steel 303,304,316, acrylic, delrin, macor ceramic, mild steel, tool steel, carbon graphite, nylon, brass, copper, cast iron, cast aluminum, nickel, bronze, lead, titanium, Inconel, whatever is needed."
- Photographs from the assessment are attached.

Area Air Sampling for Welding Fume Metals and Hexavalent Chromium

On July 25-26, 2017, Terracon collected four air samples inside the Physics Fabrication Shop building. The results of the welding fume metals and hexavalent chromium sample analyses are summarized in Table 1 below and are presented alongside regulatory standards from OSHA and recommended guidelines from ACGIH.

Table 1: Summary of Airborne Welding Fume Metals and Hexavalent Chromium Analyses – July 25-26, 2017

Sample #	ACGIH	OSHA	PFS-1 & PFS-15	PFS-2 & PFS-16
Location Description	**TLV**	**PEL TWA**	**West Side of Main Shop**	**Welding Room Northeast Corner**
Element	**ug/m^3**	**ug/m^3**	**ug/m^3**	**ug/m^3**
Aluminum	1,000	15,000	1.5	2.4
Beryllium	0.05	0.2 (2 STEL)	<0.00086	<0.00091
Cadmium	10	5 (2.5 AL)	<0.0086	0.012
Cobalt	20	100	0.028	<0.018
Total Chromium	500	1,000	0.13	0.40
Copper	1,000	1,000	0.13	0.99
Iron Oxide	5,000	10,000	4.0	73

Sample #	ACGIH	OSHA	PFS-1 & PFS-15	PFS-2 & PFS-16
Location Description	**TLV**	**PEL TWA**	**West Side of Main Shop**	**Welding Room Northeast Corner**
Element	**ug/m³**	**ug/m³**	**ug/m³**	**ug/m³**
Lithium	NE	NE	<0.017	<0.018
Manganese	20	5,000 ceiling	0.48	5.5
Molybdenum	10,000	15,000	<0.045	0.12
Nickel	1,500	1,000	<0.045	0.13
Phosphorus	100	100	<0.086	<0.091
Lead	50	50 (30 AL)	<0.045	<0.047
Antimony	500	500	<0.17	<0.18
Strontium	NE	NE	<0.017	<0.018
Titanium	10,000	15,000	<0.0086	0.016
Vanadium	NE	TWA - NE (100 Ceiling)	<0.045	<0.047
Zinc Oxide	NE	5,000	<0.056	0.50
Hexavalent Chromium	50	5.0 (2.5 AL)	0.016	0.015
NE = not established, TLV = Threshold Limit Values, PEL = Permissible Exposure Limit, TWA = Time Weighted Average, AL = Action Level, STEL – Short Term Exposure Limit				

The laboratory analytical reports are attached.

Surface Dust Samples for Welding Fume Metals and Hexavalent Chromium

On July 25, 2017, Terracon collected four dust wipe samples inside the Physics Fabrication Shop building. The results of the metal and hexavalent chromium sample analyses are summarized in Table 2 below:

Table 2: Summary of Metals and Hexavalent Chromium in Surface Dust Analyses – July 25, 2017

Sample #s	PFS-3 / PFS-4	PFS-6 / PFS-7	PFS-9 / PFS-10	PFS-12 / PFS-13
Element	**ug/ft²**	**ug/ft²**	**ug/ft²**	**ug/ft²**
Aluminum	7,500	8,100	3,900	790,000
Beryllium	0.093	< 0.046	< 0.046	24
Cadmium	5.7	15	7.7	310
Cobalt	39	13	10	4,600
Chromium	91	200	190	7,900
Copper	550	440	320	70,000
Iron	6,000	19,000	24,000	450,000
Lithium	1.1	1.3	< 0.93	400
Manganese	100	240	300	7,000
Molybdenum	31	30	48	4,600
Nickel	69	260	190	7,000

Sample #s	PFS-3 / PFS-4	PFS-6 / PFS-7	PFS-9 / PFS-10	PFS-12 / PFS-13
Element	**ug/ft²**	**ug/ft²**	**ug/ft²**	**ug/ft²**
Phosphorus	210	180	58	19,000
Lead	34	56	29	4,500
Antimony	11	7.3	< 6.9	1,300
Strontium	7.4	39	18	360
Titanium	56	210	59	3,000
Vanadium	10	6.8	9.3	930
Zinc	460	2,100	440	33,000
Hexavalent Chromium	0.77	0.24	4.0	1.3
Sample Locations: PFS-3 and PFS-4 – Exterior of supply duct southeast corner of main shop PFS-6 and PFS-7 – Exterior of supply duct at east entrance to shop building PFS-9 and PFS-10 – Top of cabinet in welding area northeast corner of building PFS-12 and PFS-13 – West side of building return air register				

The laboratory analytical reports are attached.

CONCLUSIONS

The following conclusions are provided based on our assessment:

- None of the air samples analyzed for welding fume metals or hexavalent chromium exceeded applicable OSHA PEL TWAs or their ACGIH recommended TLVs in the area locations sampled.

- The highest concentrations of metals in dust were on the west side of the building at the return air register. Settled dusts have the potential to become airborne within the working environment.

RECOMMENDATIONS

The following recommendations are provided based on our assessment:

- Although there are no OSHA standards for settled dust, these settled dusts could be re-distributed into the air. Cleaning of particulate accumulations observed in and around the HVAC ductwork and elsewhere in the shop should be conducted on a regular basis. Cleaning methods should be performed by trained personnel and utilizing HEPA vacuums due to the heavy metals detected in the dusts.

- Currently there are no local exhaust control measures for the work tasks being performed creating dusts and fumes. This may contribute to additional metal dust accumulation on surfaces. The use of mobile local exhaust systems could reduce particulate loading on building components and reduce potential employee exposures.

- Sampling as part of this investigation did not include employee sampling within their breathing zone during work tasks throughout the day. If occupational sampling data has not been conducted, it is recommend to establish occupational exposures for each task performed for compliance with OSHA standards. Additionally, workers should be trained to minimize exposures to the metals detected.

Terracon appreciates the opportunity to provide this service to Clemson University. If you have any questions regarding this limited mold investigation report, please contact the undersigned at 864-292-2901.

Sincerely,
Terracon Consultants, Inc.

Benjamin Hestir, P.E.
Project Industrial Hygienist

Jeffrey A. Gurrie
Senior Industrial Hygienist

Attachments: Photographs
Laboratory Results

Photographs



Photo #1 Exterior view of the Physics Fabrication Shop / Daniel Annex looking southeast



Photo #2 East side of the Physics Fabrication Shop looking west from employee parking



Photo #3 View of sample location for PFS-1 and PFS-15 in the main shop facing west



Photo #4 View of sample location for PFS-2 and PFS-15 facing east



Photo #5 View of dust sample location for sample PFS-3 facing southeast



Photo #6 View of dust sample location for sample PFS-6 facing south

Laboratory Results

Airborne Metals Concentration by Inductively-Coupled Plasma Analysis (ICP)

NIOSH Method 7300

Client:	**Terracon** **72 Pointe Circle** **Greenville, SC 29615**	**Attn:**	**Ben Hestir**	**Lab Order ID:** **Date Received:** **Date Reported:**	**1716258** **07/28/2017** **08/04/2017**
Project:	**Physics Fab Shop/86127158 Task 95**			**Page:**	**1 of 3**

Sample ID / *Lab Sample ID*	Description / Lab Notes	Volume (L)	Element	Reporting Limit	Concentration (µg)	Concentration (µg/m³)
PFS-1	MCE Cassette/W Side Main Shop	2920	Al	0.13	4.4	1.5
			Be	0.0025	< 0.0025	< 0.00086
			Cd	0.025	< 0.025	< 0.0086
			Co	0.050	0.082	0.028
			Cr	0.050	0.39	0.13
			Cu	0.13	0.37	0.13
			Fe_2O_3*	0.16	12.	4.0
			Li	0.050	< 0.050	< 0.017
			Mn	0.025	1.4	0.48
			Mo	0.13	< 0.13	< 0.045
			Ni	0.13	< 0.13	< 0.045
			P	0.25	< 0.25	< 0.086
			Pb	0.13	< 0.13	< 0.045
			Sb	0.50	< 0.50	< 0.17
			Sr	0.050	< 0.050	< 0.017
			Ti	0.025	< 0.025	< 0.0086
1716258IPA_1			V	0.13	< 0.13	< 0.045
			ZnO*	0.16	< 0.16	< 0.056

*Oxide results represent an estimate based on measurement of pure elements assuming entire contribution from oxide sources

Melissa Ferrell
Analyst

Lab Director

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Airborne Metals Concentration by Inductively-Coupled Plasma Analysis (ICP)

NIOSH Method 7300

Client:	**Terracon** **72 Pointe Circle** **Greenville, SC 29615**	**Attn:**	**Ben Hestir**	**Lab Order ID:** **Date Received:** **Date Reported:**	**1716258** **07/28/2017** **08/04/2017**
Project:	**Physics Fab Shop/86127158 Task 95**			**Page:**	**2 of 3**

Sample ID / *Lab Sample ID*	Description / Lab Notes	Volume (L)	Element	Reporting Limit	Concentration (µg)	Concentration (µg/m³)
PFS-2	MCE Cassette/Welding Rm NE Corner	2740	Al	0.13	6.5	2.4
			Be	0.0025	< 0.0025	< 0.00091
			Cd	0.025	0.034	0.012
			Co	0.050	< 0.050	< 0.018
			Cr	0.050	1.1	0.40
			Cu	0.13	2.7	0.99
			Fe_2O_3*	1.9	200	73
			Li	0.050	< 0.050	< 0.018
			Mn	0.25	15	5.5
			Mo	0.13	0.32	0.12
			Ni	0.13	0.36	0.13
			P	0.25	< 0.25	< 0.091
			Pb	0.13	< 0.13	< 0.047
			Sb	0.50	< 0.50	< 0.18
			Sr	0.050	< 0.050	< 0.018
			Ti	0.025	0.045	0.016
1716258IPA_2			V	0.13	< 0.13	< 0.047
			ZnO*	0.16	1.4	0.50

*Oxide results represent an estimate based on measurement of pure elements assuming entire contribution from oxide sources

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Analyst

Lab Director

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Airborne Metals Concentration by Inductively-Coupled Plasma Analysis (ICP)

NIOSH Method 7300

Client:	**Terracon**	**Attn:**	**Ben Hestir**	**Lab Order ID:**	**1716258**
	72 Pointe Circle			**Date Received:**	**07/28/2017**
	Greenville, SC 29615			**Date Reported:**	**08/04/2017**
Project:	**Physics Fab Shop/86127158 Task 95**			**Page:**	**3 of 3**

Sample ID / *Lab Sample ID*	Description / Lab Notes	Volume (L)	Element	Reporting Limit	Concentration (µg)	Concentration (µg/m^3)
PFS-17	MCE Cassette/Field Blank	-	Al	0.13	4.4	-
			Be	0.0025	< 0.0025	-
			Cd	0.025	< 0.025	-
			Co	0.050	0.082	-
			Cr	0.050	0.39	-
			Cu	0.13	0.37	-
			Fe_2O_3*	0.19	12.	-
			Li	0.050	< 0.050	-
			Mn	0.025	1.4	-
			Mo	0.13	< 0.13	-
			Ni	0.13	< 0.13	-
			P	0.25	< 0.25	-
			Pb	0.13	< 0.13	-
			Sb	0.50	< 0.50	-
			Sr	0.050	< 0.050	-
			Ti	0.025	< 0.025	-
1716258IPA_3			V	0.13	< 0.13	-
			ZnO*	0.16	< 0.16	-

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Analyst

Lab Director

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Dust Wipe Metals Concentration by Inductively-Coupled Plasma Analysis (ICP)

NIOSH 7300/EPA SW-846 3050B

Client:	**Terracon** **72 Pointe Circle** **Greenvile, SC 29615**	**Attn:**	**Ben Hestir**	**Lab Order ID:** **Date Received:** **Date Reported:**	**1716248** **07/28/2017** **08/04/2017**
Project:	**Physics Fab Shop/86127158 Task 95**			**Page:**	**1 of 4**

WSample ID *Lab Sample ID*	Description Lab Notes	Area (ft^2)	*Element	Reporting Limit (µg)	Concentration (µg)	Concentration (µg/ft^2)
PFS-3	PVC Wipe/Exterior of Duct SE Corner	0.108	Al	25	810	7500
			Be	0.0050	0.010	0.093
			Cd	0.050	0.62	5.7
			Co	0.10	4.2	39
			Cr	0.10	9.8	91
			Cu	2.5	59	550
			Fe	25	650	6000
			Li	0.10	0.12	1.1
			Mn	0.025	11	100
			Mo	0.25	3.3	31
			Ni	0.25	7.4	69
			P	0.50	23	210
			Pb	0.25	3.7	34
			Sb	0.75	1.2	11
			Sr	0.050	0.80	7.4
			Ti	0.050	6.1	56
1716248IPW_1			V	0.25	1.1	10.
			Zn	2.5	50	460

Melissa Ferrell

Analyst

Lab Director

** SAI is AIHA ELLAP accredited for Pb only for dust wipe metals.*

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Dust Wipe Metals Concentration by Inductively-Coupled Plasma Analysis (ICP)

NIOSH 7300/EPA SW-846 3050B

Client:	**Terracon** **72 Pointe Circle** **Greenvile, SC 29615**	**Attn:**	**Ben Hestir**	**Lab Order ID:** **Date Received:** **Date Reported:**	**1716248** **07/28/2017** **08/04/2017**
Project:	**Physics Fab Shop/86127158 Task 95**			**Page:**	**2 of 4**

Sample ID *Lab Sample ID*	Description Lab Notes	Area (ft^2)	*Element	Reporting Limit (µg)	Concentration (µg)	Concentration ($µg/ft^2$)
PFS-6	PVC Wipe/Exterior of Duct E Entrance	0.108	Al	25	880	8100
			Be	0.0050	< 0.0050	< 0.046
			Cd	0.050	1.6	15
			Co	0.10	1.4	13
			Cr	0.10	22	200
			Cu	2.5	47	440
			Fe	25	2000	19000
			Li	0.10	0.14	1.3
			Mn	0.25	26	240
			Mo	0.25	3.2	30.
			Ni	0.25	28	260
			P	0.50	19	180
			Pb	0.25	6.1	56
			Sb	0.75	0.79	7.3
			Sr	0.050	4.2	39
			Ti	0.050	23	210
1716248IPW_2			V	0.25	0.73	6.8
			Zn	2.5	230	2100

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Dust Wipe Metals Concentration by Inductively-Coupled Plasma Analysis (ICP)

NIOSH 7300/EPA SW-846 3050B

Client:	**Terracon** **72 Pointe Circle** **Greenvile, SC 29615**	**Attn:**	**Ben Hestir**	**Lab Order ID:** **Date Received:** **Date Reported:**	**1716248** **07/28/2017** **08/04/2017**
Project:	**Physics Fab Shop/86127158 Task 95**			**Page:**	**3 of 4**

Sample ID *Lab Sample ID*	Description Lab Notes	Area (ft^2)	*Element	Reporting Limit (µg)	Concentration (µg)	Concentration (µg/ft^2)
PFS-9	PVC Wipe/Top of Cabinet Welding Area	0.108	Al	25	420	3900
			Be	0.0050	< 0.0050	< 0.046
			Cd	0.050	0.83	7.7
			Co	0.10	1.1	10.
			Cr	0.10	20.	190
			Cu	2.5	35	320
			Fe	25	2600	24000
			Li	0.10	< 0.10	< 0.93
			Mn	0.25	32	300
			Mo	0.25	5.2	48
			Ni	0.25	21	190
			P	0.50	6.3	58
			Pb	0.25	3.1	29
			Sb	0.75	< 0.75	< 6.9
			Sr	0.050	1.9	18
			Ti	0.050	6.4	59
1716248IPW_3			V	0.25	1.0	9.3
			Zn	2.5	48	440

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Analyst

Lab Director

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Dust Wipe Metals Concentration by Inductively-Coupled Plasma Analysis (ICP)

NIOSH 7300/EPA SW-846 3050B

Client:	**Terracon** **72 Pointe Circle** **Greenvile, SC 29615**	**Attn:**	**Ben Hestir**	**Lab Order ID:** **Date Received:** **Date Reported:**	**1716248** **07/28/2017** **08/04/2017**
Project:	**Physics Fab Shop/86127158 Task 95**			**Page:**	**4 of 4**

Sample ID *Lab Sample ID*	Description Lab Notes	Area (ft^2)	*Element	Reporting Limit (µg)	Concentration (µg)	Concentration (µg/ft^2)
PFS-12	PVC Wipe/W Side Return Air	0.022	Al	250	17000	790000
			Be	0.0050	0.51	24
			Cd	0.050	6.6	310
			Co	1.0	100	4600
			Cr	1.0	170	7900
			Cu	25	1500	70000
			Fe	250	9700	450000
			Li	0.10	8.6	400
			Mn	0.25	150	7000
			Mo	2.5	100	4600
			Ni	2.5	150	7000
			P	5.0	410	19000
			Pb	2.5	97	4500
			Sb	7.5	29	1300
			Sr	0.050	7.8	360
			Ti	0.50	65	3000
1716248IPW_4			V	0.25	20.	930
			Zn	25	700	33000

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Analyst

Lab Director

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Analysis of Hexavalent Chromium in Airborne Samples

By Ion Chromatography
OSHA ID-215

Client:	Terracon 72 Pointe Circle Greenville, SC 29615	**Attn:**	Ben Hestir	**Lab Order ID:** **Date Received:** **Date Reported:**	1716265 07/28/2017 08/03/2017
Project:	Physics Fab Shop/86127158 Task 95			**Page:**	**1 of 1**

Sample ID *Lab Sample ID*	Description *Lab Notes*	Volume (L)	Reporting Limit (µg)	Concentration (µg)	Concentration (µg/m^3)
PFS-15	PVC Cassette/W Side Main Shop	4800	0.013	0.075	0.016
1716265CIC_1					
PFS-16	PVC Cassette/Welding RM NE Corner	4800	0.011	0.073	0.015
1716265CIC_2					
PFS-18	PVC Cassette/Field Blank	-	0.012	0.017	--
1716265CIC_3					

Daniel Olson
Analyst

Lab Director

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Analysis of Hexavalent Chromium in Wipe Samples

By Ion Chromatography
OSHA ID-215

Client:	Terracon 72 Pointe Circle Greenville, SC 29615	**Attn:**	Ben Hestir	**Lab Order ID:** **Date Received:** **Date Reported:**	1716262 07/28/2017 08/03/2017
Project:	Physics Fab Shop/86127158 Task 95			**Page:**	**1 of 1**

Sample ID *Lab Sample ID*	Description *Lab Notes*	Area (ft^2)	Reporting Limit (µg)	Concentration (µg)	Concentration ($µg/ft^2$)
PFS-4 *1716262CIW_1*	PVC Wipe/same as PFS-3	0.108	0.012	0.083	0.77
PFS-7 *1716262CIW_2*	PVS Wipe/same as PFS-6	0.108	0.016	0.026	0.24
PFS-10 *1716262CIW_3*	PVC Wipe/same as PFS-9	0.108	0.015	0.43	4.0
PFS-13 *1716262CIW_4*	PVC Wipe/same as PFS-12	0.0216	0.013	0.027	1.3

Daniel Olson
Analyst

Lab Director

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Scientific Analytical Institute, Inc. 4604 Dundas Dr. Greensboro, NC 27407 (336) 292-3888

Scientific Analytical Institute, Inc.
4604 Dundas Drive Greensboro, NC 27407
Phone: 336.292.3888 Fax: 336.292.3313
www.sailab.com lab@sailab.com

Lab Use Only
Lab Order ID: 171262
Client Code: _____

Company Contact Information

Company: Terracon	Contact: Ben Hestir
Address: 72 Ponte Circle	Phone ☑: 864-293-7348
Greenville, SC 29615	Fax ☐:
	Email ☑: ben.hestir@terracon.com

Billing/Invoice Information

SAME ☑
Company:
Contact:
Address:

Turn Around Times^

90 Min. ☐	48 Hours ☐
3 Hours ☐	72 Hours ☐
6 Hours ☐	96 Hours ☐
12 Hours ☐	120 Hours ☑
24 Hours ☐	144+Hours ☐

^TATs not available for certain test types

PO Number:
Project Name/Number: Physics Fab Shop / 86127158 Task 95

Industrial Hygiene Test Types

Silica as Alpha Quartz*	☐
Silica as Cristobalite*	☐
Silica as Tridymite*	☐
Silica as Alpha Quartz, Cristobalite, Tridymite*	☐
Include Respirable Dust	☐
Silica Bulk*	☐
Bulk Phase ID/Whole Rock SAI Method H-SOP-003	☐
Total Dust NIOSH Method 0500	☐
Respirable Dust NIOSH Method 0600	☐
PCM NIOSH 7400 (Fibers)	☐
TEM NIOSH 7402 (Asbestos)	☐
Hexavalent Chromium (OSHA ID-215) (Note if from spray paint operations)	☑
Metals (NIOSH 7300) (Specify Metals Under Comments)	☑
Other Mold - Direct Exam	☑

*Modified NIOSH 7500/OSHA ID 142

Sample ID #	Description/Location	Volume/Area	Comments (List Metals Here)
PFS-1	MCE Cassette / W side Main Shop	2,920 L	Welding Fumes
PFS-2	MCE Cassette / Welding Rm NE corner	2,740 L	Welding Fumes
PFS-3	PVC wipe / Exterior of duct SE corner	~100 cm²	Welding Fumes
PFS-4	PVC wipe / same as PFS-3	~100 cm²	Hexavalent Chromium (HexCr
PFS-5	Sterile swab / same as PFS-3	~100 cm²	Mold
PFS-6	PVC wipe / Exterior of duct E entrance	~100 cm²	Welding Fumes
PFS-7	PVC wipe / same as PFS-6	~100 cm²	Hex Chrom
PFS-8	Sterile swab / same as PFS-6	~100 cm²	Mold
PFS-9	PVC wipe / top of cabinet welding area	~100 cm²	Welding Fumes
PFS-10	PVC wipe / same as PFS-9	~100 cm²	Hex Chrom
PFS-11	Sterile swab / same as PFS-9	~100 cm²	Mold
PFS-12	PVC wipe / W side return air	~20 cm²	Welding Fumes
PFS-13	PVC wipe / same as PFS-12	~20 cm²	Hex Chrom
PFS-14	Sterile Swab / same as PFS-12	~20 cm²	Mold
PFS-15	PVC cassette / W side Main Shop	4,800 L	Hex Chrom

Total # of Samples _____

Relinquished by	Date/Time	Received by	Date/Time
Ben Hestir / Terracon	7/27/17 1200		7/28 9:30

Accepted ☑
Rejected ☐

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4604 Dundas Drive Greensboro, NC 27407
Phone: 336.292.3888 Fax: 336.292.3313
www.sailab.com lab@sailab.com

Lab Use Only
Lab Order ID: 1716262
Client Code: _____

Sample ID #	Description/Location	Volume/Area	Comments
PFS-16	PVC Cassette / Welding Rm NE corner	4,800 L	Hex Chrom
PFS-17	MCE Cassette / Field Blank	—	Welding Fumes
PFS-18	PVC Cassette / Field Blank	—	Hex Chrom

Note:

PFS 1 – PFS-14
Sample date 7/25/17

PFS 15 and PFS-16
Sample date 7/26/17

Field Blanks 7/25/17 and 7/26/17