IMPACT COMPLIANCE & TESTING

EMISSION TEST REPORT

Report Title:	Test Report for the Verification of Total Chromium Emissions from Hard Chrome Electroplating Operations
Report Date:	July 26, 2019
Test Date:	June 13-14, 2019

Facility Information	
Name:	Dart Container Corporation of Michigan, LLC Building 5
Street Address:	3120 ½ Howell Road
City, County:	Mason, Ingham
Phone:	(517) 244-2452
SRN:	D8065

Facility Permit Information	
Permit No.:	121-18
Emission Units	EU-B5CHRMPLATR

Testing Contractor	
Company:	Impact Compliance & Testing, Inc.
Mailing Address:	4180 Keller Road, Suite B Holt, MI 48842
Phone:	(517) 464-0043
Project No.:	1900162

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

IMPACT COMPLIANCE & TESTING

TEST REPORT
FOR THE
VERIFICATION OF TOTAL CHROMIUM EMISSIONS
FROM
HARD CHROME ELECTROPLATING OPERATIONS

DART CONTAINER CORPORATION OF MICHIGAN, LLC
MASON, MICHIGAN

1.0 INTRODUCTION

Dart Container Corporation of Michigan, LLC (Dart) located in Mason, Ingham County, Michigan operates a hard chrome plating process under State of Michigan Permit to Install (air permit) No. 121-18 issued August 13, 2018 by the Michigan Department of Environmental Quality – Air Quality Division (MDEQ-AQD), now known as the Michigan Department of Environment, Great Lakes, and Energy, Air Quality Division (EGLE-AQD).

The chrome plating system is used to provide a chrome finish to molds used for polystyrene product production. EU-B5CHRMPLATR consists of two chrome electroplating tanks (tanks 4A and 4B), each with a 2,000-amp rectifier and associated cleaning and rinse tanks (tanks 2, 3, 5, and 6) and evaporator. Emissions from EU-B5CHRMPLATR are controlled using three-stage composite mesh pad scrubbers with fourth stage HEPA filters. The scrubbers are located in-line with tanks 4A and 4B.

Conditions of Permit No. 121-18 require Dart to perform compliance testing within 180 days after commencement of trial operation to verify compliance with the emission rate limitations that are specified in the permit for EU-B5CHRMPLATR, and to establish allowable operating parameters. Trial operation of the chrome plating process began on January 7, 2019.

The testing was performed June 13 - 14, 2019 by Impact Compliance & Testing, Inc. (ICT) representatives Jory VanEss and Clay Gaffey. Mr. Tom Gasloli and Ms. Samantha Braman of the EGLE-AQD were on-site to observe portions of the compliance testing. The project was coordinated by Mr. Don Wiltse of Dart.

The sampling and analysis were performed using procedures specified in the test protocol documents dated April 8, 2019 and approved by the EGLE-AQD.

Appendix 1 contains a copy of the test protocol approval letter.

Questions concerning the source and test report should be addressed to:

Testing Contractor:
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Environmental Consultant
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Site Operations:
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Report Certification

This test report was prepared by Impact Compliance & Testing, Inc. based on field sampling data collected by ICT. Facility process data were collected and provided by Dart employees or representatives. This test report has been reviewed by Dart representatives and approved for submittal to the EGLE-AQD.

Test data for EU-B5CHRMPLATR is also being submitted to the USEPA using the Compliance and Emissions Data Reporting Interface (CEDRI) system.

I certify that the testing was conducted in accordance approved methods unless otherwise specified in this report. I believe the information provided in this report and its attachments are true, accurate, and complete.

Report Prepared By:

Jory VanEss
Environmental Consultant
Impact Compliance & Testing, Inc.

Reviewed By:

Andy Rusnak, QSTI
Technical Manager
Impact Compliance & Testing, Inc.

2.0 SUMMARY OF RESULTS

Exhaust gases from the hard chrome electroplating processes were sampled to determine the total chromium exhaust gas concentration. Three (3) two-hour test periods were performed for each system. Exhaust gas velocity measurements were performed during each test period to determine volumetric flowrate and pollutant mass emission rate. The average measured total chromium mass emission rates were less than the limits specified in PTI No. 121-18 and the Hard Chrome Electroplating NESHAP (Subpart N).

Table No. 2.1 presents a summary of the operating parameters measured during the testing.

Table No. 2.2 presents a summary of the total chromium test results.

The data presented in the tables below are the average for three (3) two-hour test periods. Data and measurements for each test period are presented at the end of this report in Section 6.0

Table 2.1 Summary of hard chrome electroplating line operating parameters

Operating Parameters:	Average Measured Value Pressure drop (inH_2O)			
Filter Stage	1st	2nd	3rd	Overall
EU-B5CHRMPLATR Tank No. 4A	1.0	0.8	0.8	2.3
EU-B5CHRMPLATR Tank No. 4B	1.1	0.8	0.8	2.4

Table 2.2 Summary of hard chrome electroplating process test results

Analyte	EU-B5CHRMPLATR
Total Chromium Conc. (mg/dscm)	1.03E-03
NESHAP Limit (mg/dscm)	*6.0E-03*

3.0 SOURCE DESCRIPTION

3.1 General Process Description

Dart operates a hard chrome electroplating line that contains two (2) chromium tanks; 4A and 4B. Hard chrome electroplating the surface of cup molds requires the parts to be chromic acid etched, dipped in various metal solutions, and put into the chromium plating bath. Once the parts are placed into the chromium plating system tanks, chrome is electrolytically deposited onto the coated cup mold in varying thicknesses depending on the application.

Process gas from the hard chrome electroplating processes is captured and exhausted to independent chrome separator / composite mesh pad scrubber control devices, which are used to reduce chromium emissions to the atmosphere.

3.2 Emission Control System Description

EU-B5CHRMPLATR (Tank Nos. 4A and 4B) are controlled by two 3-stage composite mesh pad scrubbers with a 4th stage HEPA filter which are routed to exhaust stack SV-CHROME/STRIP. The associated cleaning tank 2 is equipped with a wet packed bed fume scrubber.

Appendix 2 provides sampling location drawings for the scrubber exhaust.

3.3 Process Operating Conditions During the Compliance Testing

The facility typically operates <100% capacity; therefore, extra molds were prepared to ensure the testing was performed within 10% of maximum operation.

EU-B5CHRMPLATR processed an average of 66 pieces feet for each two (2) hour test period. The 3 stage local scrubbers and overall pressure drops for the chromium-containing process tanks (Tank Nos. 4A and 4B) are presented in Tables 2.1 and 6.1

Appendix 3 provides plating process and control device operating data for the test periods.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

A test protocol was prepared by ICT and submitted to the EGLE-AQD prior to performing the compliance test. This section provides a summary of the sampling and analytical procedures that were used during the tests and presented in the protocol.

Exhaust Gas Velocity and Flowrate (USEPA Methods 1 and 2)

Exhaust gas sampling was performed using stack sampling ports that satisfied USEPA Method 1 criteria. For EU-B5CHRMPLATR, these ports are located in the 17.5-inch diameter exhaust stack 58-inches (3.31 duct diameters) downstream of the nearest flow disturbance and 17.5-inches (1 duct diameters) upstream from the nearest flow disturbance.

To determine pollutant mass flow emission rates, the stack gas velocity was measured using procedures specified in USEPA Method 2 throughout each test period using the isokinetic sample probe. Gas velocity (pressure) measurements were performed at each traverse point with an S-type Pitot tube and red-oil manometer. Temperature measurements were conducted at each traverse point using a K-type thermocouple and a calibrated digital thermometer.

Appendix 4 provides copies of exhaust gas velocity field data sheets and flowrate calculations.

4.2 Exhaust Gas Molecular Weight

The exhaust gas is captured building air that has been drawn through the CMP system. A dry molecular weight of 29.0 was used as specified in Section 8.6 of USEPA Method 2.

4.3 Exhaust Gas Moisture Content (USEPA Method 4)

Moisture content of the scrubber exhaust gas was determined in accordance with the USEPA Method 4 chilled impinger method as part of the isokinetic sampling procedures for chromium (i.e., not as a separate measurement train). The amount of moisture removed from the sample stream by the chilled impingers was determined gravimetrically by weighing the impinger contents before and after the test period to determine net weight gain.

Appendix 4 provides moisture train sampling data and calculations.

4.4 Total Chromium Emission Rate (USEPA Method 306)

USEPA Method 306, Determination of Chromium Emissions from Decorative and Hard Chrome Electroplating and Chromium Anodizing Operations, was used to determine total chromium concentration in the scrubber exhaust gas. Process gas was withdrawn from the scrubber exhaust stack at an isokinetic sampling rate using a glass sampling nozzle, glass-lined probe and an impinger train containing 0.1N sodium hydroxide (NaOH) solution. Pursuant to USEPA Method 306, the sample probe was not heated, and the filter was omitted. Therefore, the glass probe liner was connected directly to the first impinger using a Teflon line.

Stack gas temperature and velocity pressure at each traverse point were monitored and recorded throughout each two-hour test period to determine volumetric flowrate.

At the conclusion of each two-hour test period the weight of each impinger was measured. The total silica gel moisture gain was determined gravimetrically and the stack gas total moisture was determined based on the total weight gain of the impingers and silica gel. The sample nozzle, probe liner, first three impingers and connective glassware were rinsed using 0.1N NaOH solution. The rinse and impinger solutions were combined and shipped to Element One, Inc. (Wilmington, North Carolina) for analysis. Prior to shipment, the pH of the recovered solutions was checked using litmus paper to verify that the pH exceeded 8.5.

The total chrome content in the recovered solutions was determined by Element One, Inc. using inductively coupled plasma mass spectrometry (ICP-MS).

Appendix 5 contains a copy of the Element One laboratory report.

The total chromium concentration was determined using the laboratory reported chromium mass and the following equation:

$C_{Cr} = M_{Cr} / V_m / (1{,}000\ \mu g/mg)$

C_{Cr} = Concentration of total Cr (mg/dscm)
M_{Cr} = Mass Cr in recovered solutions (µg)
V_m = Sample gas volume for test period (dscm)

5.0 QA/QC ACTIVITIES

5.1 Exhaust Gas Flow Measurement

Prior to arriving onsite, the instruments used during the source test to measure exhaust gas properties and velocity (barometer, pyrometer, and Pitot tube) were calibrated to specifications in the sampling methods.

The absence of cyclonic flow for each sampling location was verified using an S-type Pitot tube and oil manometer. The Pitot tube was positioned at each of the velocity traverse points with the planes of the face openings of the Pitot tube perpendicular to the stack cross-sectional plane. The Pitot tube was then rotated to determine the null angle (rotational angle as measured from the perpendicular, or reference, position at which the differential pressure is equal to zero).

5.2 Meter Box and Isokinetic Rate

The dry gas metering console, which was used for the isokinetic sampling, was calibrated prior to and after the testing program. This calibration uses the critical orifice calibration technique presented in USEPA Method 5. The metering console calibration exhibited no data outside the acceptable ranges presented in USEPA Method 5.

The digital pyrometer in the metering console was calibrated using a NIST traceable Omega® Model CL 23A temperature calibrator.

The sampling nozzle diameter was determined using the three-point calibration technique.

The sampling rate for all test periods was within 10% of the calculated isokinetic sampling rate required by USEPA Methods 306 and 5.

5.3 Total Chromium Recovery and Analysis

All recovered total chromium samples were stored and shipped in pre-rinsed polyethylene sample bottles with Teflon® lined caps. The liquid level on each bottle was marked with a permanent marker prior to shipment and the caps were secured closed with tape. Samples of the reagent used in the test event (500 milliliters of 0.1N sodium hydroxide) was sent to the laboratory for analysis to verify that the reagent used to recover the samples has low total chromium content.

The glassware used in the total chromium train was washed and rinsed prior to use in accordance with the procedures of USEPA Method 306. The glass sample nozzle, probe liner and Teflon line were washed, rinsed and soaked in acid prior to use in accordance with USEPA Method 306. Analysis of the reagent blank indicated that its chromium content was less than the method detection limit (i.e., ND, or no chromium detected).

5.4 Laboratory QA/QC Procedures

The laboratory total chromium analyses were conducted by a qualified third-party laboratory according to the appropriate QA/QC procedures specified in the associated USEPA test methods and are included in the final report provided by Element One (Wilmington, NC).

Appendix 6 presents test equipment quality assurance data (meter box calibration records, cyclonic flow determinations sheets, Pitot tube, nozzle and probe assembly calibration records).

6.0 TEST RESULTS AND DISCUSSION

6.1 Test Results and Allowable Emission Limits

Operating data and air pollutant emission measurement results for each two-hour test period are presented in Table 6.1.

The measured total chromium concentrations and emission rates for EU-B5CHRMPLATR and are less than the allowable limits specified in PTI No. 121-18 and the NESHAP (Subpart N) for the operation of the individual processes:

- 0.006 mg/dscm for EU-B5CHRMPLATR

6.2 Variations from Normal Sampling Procedures or Operating Conditions

The second run during the test event was thrown out due to a failed post leak check. The next run was named "Test 2" to replace the failed run. The field sampling sheets for the scrapped run are included at the end of Appendix 4.

Table 6.1 Measured exhaust gas conditions and total chromium emission rates for EU-B5CHRMPLATR

Date Test No.	06/13/19 1	06/13/19 2	06/14/19 3	Three Test Average
EU-B5CHRMPLATR process rate (mold/2hrs)	48	48	48	48
Tank No. 4A scrubber dP (inH_2O)	--	--	--	--
1st Stage CMP	1.0	1.0	1.0	1.0
2nd Stage CMP	0.8	0.8	0.8	0.8
3rd Stage CMP	0.7	0.7	0.7	0.7
Overall	2.3	2.2	2.3	2.3
Tank No. 4B scrubber dP (inH_2O)	--	--	--	--
1st Stage CMP	1.1	1.1	1.1	1.1
2nd Stage CMP	0.8	0.8	0.8	0.8
3rd Stage CMP	0.8	0.8	0.8	0.8
Overall	2.4	2.4	2.4	2.4
Exhaust gas flowrate (dscfm)	3,525	3,457	3,549	3,510
Sample volume (dscm)	3.18	3.12	3.11	3.14
Total chromium catch weight (µg)	3.44	3.11	3.16	3.24
EU-B5CHRMPLATR Total Chromium Emissions				
Total chromium conc. (mg/dscm)	1.08E-03	9.98E-04	1.01E-03	1.03E-03
Permitted Limit (mg/dscm)				*6.0E-03*

APPENDIX 1

- TEST PROTOCOL APPROVAL LETTER

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

May 17, 2019

Mr. Don Wiltse
Dart Container Corporation
500 Hogsback Road
Mason, Michigan 48854

Dear Mr. Wiltse:

SUBJECT: EUB5CHRMPLATR, Emission Testing, Permit: 121-18, SRN: D8065

The Air Quality Division has reviewed the protocol for the testing of EUB5CHRMPLATR at Dart Container Corporation in Mason, Michigan. The two plating tanks, 4A and 4B, are controlled by a composite mesh pad scrubber. The scrubber will be tested for total chromium emissions. This testing is required by 40 CFR, Part 63, Subpart N and permit 121-18.

Testing will be performed in accordance with Title 40 of the Code of Federal Regulations, Part 60, Appendix A, Methods 1, 2, 3, 4, and Method 306. The stack will be checked for cyclonic flow prior to testing. Three 120-minute runs will be performed.

All requirements and specifications of the above methods apply; any modifications of the test methods onsite must be approved by the Air Quality Division.

The following process data will be recorded during each run:

- Mold model numbers and material throughout;
- Rectifier settings;
- Scrubber pressure drop.

The test report will include:

- all pre-test and post-test meter box calibration, pitot tube calibration, and field data sheets;
- all laboratory data including quality control data; and
- the process data listed above.

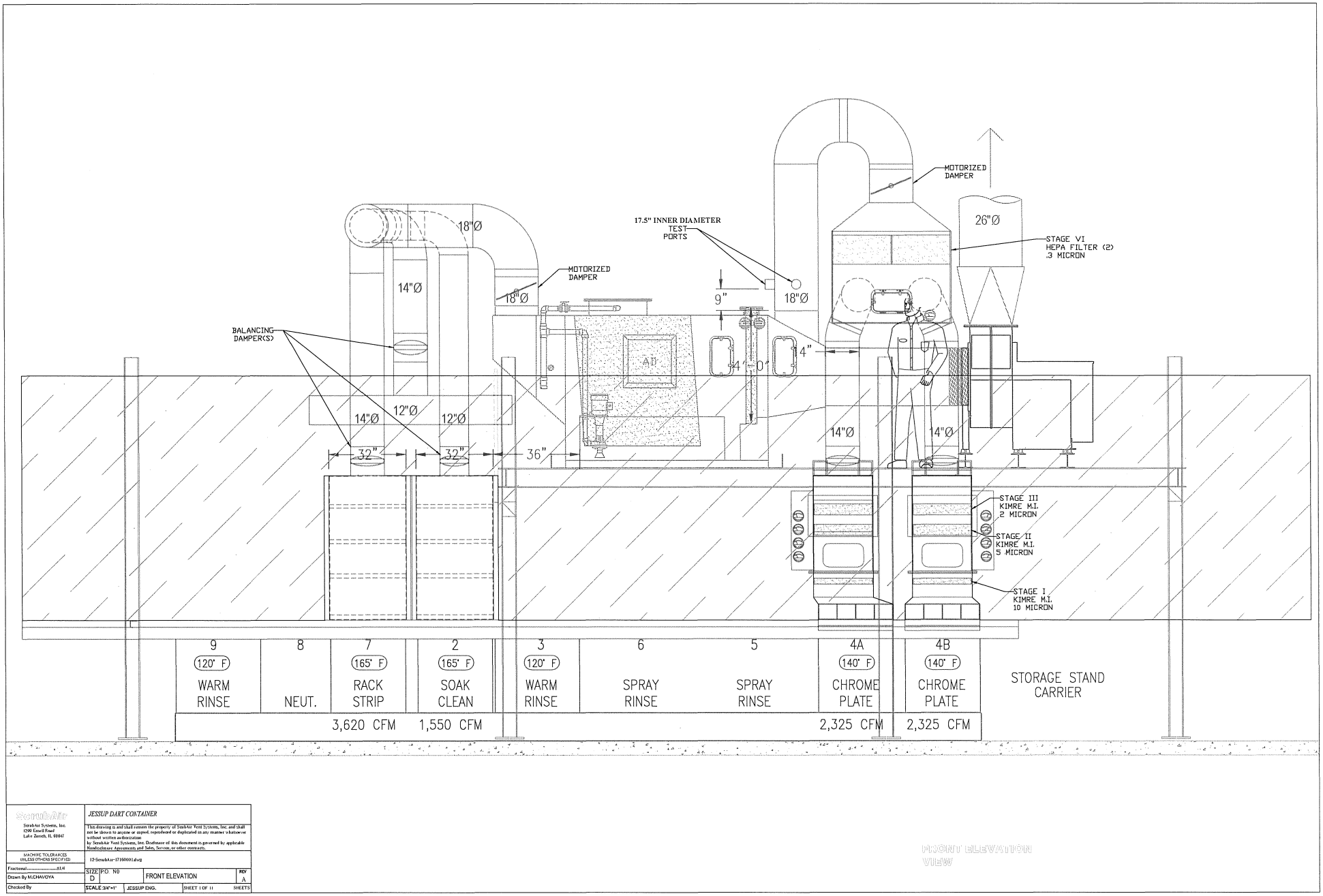
All aborted or failed runs must be included in the report. A complete copy of the test report should be sent to:

Ms. Samantha Braman
Air Quality Division
525 West Allegan St., 1st Floor South
Lansing, Michigan 48933

Ms. Karen Kajiya-Mills
Air Quality Division
525 West Allegan St., 2nd Floor South
Lansing, Michigan 48933

APPENDIX 2

- SAMPLE LOCATION DRAWING



ScrubAir ScrubAir Systems, Inc. 1200 Ezwell Road Lake Zurich, IL 60047	JESSUP DART CONTAINER This drawing is and shall remain the property of ScrubAir Vent Systems, Inc. and shall not be shown to anyone or copied, reproduced or duplicated in any manner whatsoever without written authorization by ScrubAir Vent Systems, Inc. Disclosure of this document is governed by applicable Nondisclosure Agreements and Sales, Service, or other contracts.			
MACHINE TOLERANCES UNLESS OTHERS SPECIFIED	12-ScrubAir-171600001.dwg			
Fractional.....±1/4	SIZE D	PO NO	FRONT ELEVATION	REV A
Drawn By M.CHAVOYA				
Checked By	SCALE:3/4"=1"	JESSUP ENG.	SHEET 1 OF 11	SHEETS

FRONT ELEVATION VIEW