

**Non-Confidential Business Information
(Non-CBI)**

Certification Test Report

**MF Fire
Freestanding Single Burn Rate Wood Stove
Model: Catalyst**

Prepared for: MF Fire
4410 Oglethorpe St. Unit #309
Hyattsville, MD 20781

Prepared by: OMNI-Test Laboratories, Inc.
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Test Period: September 15, 2016

Report Date: November 2016

Report Number: 0552WS001E

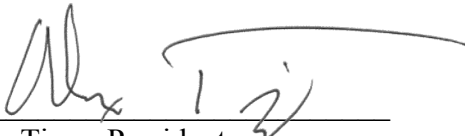
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Model: Catalyst
MF Fire
4410 Oglethorpe St. Unit #309
Hyattsville, MD 20781

AUTHORIZED SIGNATORIES


This report has been reviewed and approved by the following authorized signatories:

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OMNI-Test Laboratories, Inc.

November 3, 2016
Issue Date

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Appendix 1 – Polytests Report PI-20132

*Model: Catalyst
MF Fire
4410 Oglethorpe St. Unit #309
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Section 1

Sampling Procedures and Test Results

INTRODUCTION

MF Fire retained *OMNI* to provide EPA certification services on the Catalyst wood stove. Testing was performed by Polytests services, an EPA accredited laboratory. Upon completion of testing, Polytests services submitted a report and all relevant data to OMNI for review, this report serves as acceptance of the test report in meeting all the technical testing and reporting requirements. A copy of the Polytests Report, PI-20132, can be found in Appendix 1 of this report.

The Catalyst wood stove is a Catalytic, Free Standing single burn rate room heater. The firebox is constructed of Mild Steel. Usable firebox volume was measured to be 2.0 cubic feet and the stove is vented through 6" flue collar located on the top of the stove.

The testing was performed at Polytests Services. The altitude of the laboratory is 100 feet above sea level. Polytest representative Maxime Martin conducted the certification testing and completed all testing by September 15, 2016.

This report is organized in accordance with the EPA-recommended outline and is summarized in the Table of Contents immediately preceding this section. The results in this report are limited to the item submitted.

SAMPLING PROCEDURE

The Catalyst wood stove was tested in accordance with the U.S. EPA 40 CFR Part 60, Subpart AAA – Standards of Performance for New Residential Wood Heaters using EPA Method 28R, ASTM E2515 and ASTM E2780 as a single burn rate woodstove. Particulate emissions were measured using sampling trains consisting of two filters (front and back).

The stove model Catalyst was tested for thermal efficiency and carbon monoxide (CO) emissions in accordance with CSA B415.1-10.

SUMMARY OF RESULTS

The average emissions of the two valid test runs included in the results indicate a particulate emission rate of 1.9 grams per hour. A total of two test runs were performed as part of the certification testing program. The Catalyst results are within the emission limit of 2.0 g/hr for affected facilities manufactured on or after May 15, 2020.

The proportionality results for all test runs were acceptable. Quality check results for each test run are presented in Section 2 of this report.

Table 1 – Particulate Emissions

Run	Burn Rate (kg/hr dry)	ASTM E2515 Emissions (g/hr)
1	2.14	1.54
2	2.11	2.26
Average particulate emission rate of 2 valid test runs: 1.9 grams per hour.		

Table 2 – Particulate Emissions (First Hour)

Run	ASTM E2515 Emissions – First Hour (g/hr)
1	2.17
2	3.4

Table 3 – B415.1 Efficiency and CO Emissions

Run	Heat Output (BTU/hr)	HHV Efficiency (%)	LHV Efficiency (%)	CO Emissions (g/MJ Output)	CO Emissions (g/kg Dry Fuel)	CO Emissions (g/hr)
1	27220	67.4	72.9	3.05	40.77	87.57
2	28675	72.4	78.2	2.07	29.72	62.6
Average HHV efficiency of 2 valid test runs: 69.9%.						

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Section 2

Photographs/Appliance Description/Drawings

Model: Catalyst
MF Fire
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**MF Fire
Catalyst
Test Dates: September 15, 2016**



See Polytest report in Appendix 1 for complete appliance description.

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Engineering Drawings/Blueprints

[REDACTED]

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Section 3

Quality Assurance/Quality Control

Model: Catalyst
MF Fire
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QUALITY ASSURANCE/QUALITY CONTROL

OMNI follows the guidelines of ISO/IEC 17025, “General Requirements for the Competence of Testing and Calibration Laboratories,” and the quality assurance/quality control (QA/QC) procedures found in OMNI’s Quality Assurance Manual.

OMNI’s scope of accreditation includes, but is not limited to, the following:

- ANSI (American National Standards Institute) for certification of product to safety standards.
- To perform product safety testing by the International Accreditation Service, Inc. (formerly ICBO ES) under accreditation as a testing laboratory designated TL-130.
- To perform product safety testing as a “Certification Organization” by the Standards Council of Canada (SCC).
- Serving as a testing laboratory for the certification of wood heaters by the U.S. Environmental Protection Agency.

This report is issued within the scope of OMNI’s accreditation. Accreditation certificates are available upon request.

The manufacturing facilities and quality control system for the production of the Catalyst at MF Fire were evaluated to determine if sufficient to maintain conformance with OMNI’s requirements for product certification. OMNI has concluded that the manufacturing facilities, processes, and quality control system are adequate to produce the appliance congruous with the standards and model codes to which it was evaluated.

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Manufacturer's Quality Assurance Plan

[REDACTED]

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Section 4

Labeling & Owner's Manual

DO NOT REMOVE THIS LABEL Contact local building or fire officials about installation and restrictions in your area. Suitable for use in a conventional residential installation. For use with solid wood fuel only.

Tested & Listed By **O-TL** Portland Oregon USA
 C US
 OMNI-Test Laboratories, Inc.
 Report No. 0552WS001E
 Control No. 4000515



Catalyst
 Model #001

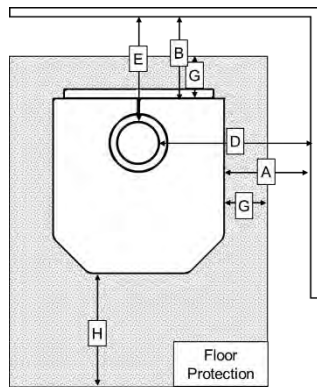
Serial Number:
 #00001

Conforms to UL STD 1482; Certified to ULC STD S627-2000

Prevent House Fires: Install and use only in accordance with the manufacturer's installation and operating instructions found in the Owner's Manual. Contact your local building or fire officials about restrictions and installation inspection in your area. Refer to local building codes and manufacturer's instructions for precautions required for passing a chimney through a combustible wall or ceiling. Do not run a chimney connector through a combustible wall or ceiling. Do not connect this unit to a chimney flue serving another appliance. Clearances may be reduced by methods specified in NFPA 211, listed wall shields, pipe shields, or other means approved by local building or fire officials. Do not overfire, if chimney connector glows, you are overfiring. Inspect and clean chimney frequently – under certain conditions of use creosote buildup may occur rapidly. Do not use grate or elevate fire – build wood directly on hearth.

This wood heater contains a catalytic combustor, which needs periodic inspection and replacement for proper operation. Consult Owner's Manual for further information. It is against the law to operate this wood heater in a manner inconsistent with operating instructions in the owner's manual, or if the catalytic element is deactivated or removed. CAUTION: the combustor used in this appliance (part no. #CAT001) is fragile and must be handled carefully. Burn only dry wood. The burning of metal foils, plastic, garbage, sulphur and diesel oil will render the catalyst in the combustor inactive. The performance and durability of the catalytic combustor has not been evaluated as part of the certification.

Free Standing Installation: Standard residential freestanding installations require a 6" diameter, minimum 24 MSG black, with listed UL-103 HT factory-built chimney, suitable for use with solid fuels or masonry chimney. If installed on a combustible floor, a noncombustible floor protector must be used, extending to at least 18" (450 mm) on the firing side and 8" (200 mm) on the other sides. Do not obstruct the space beneath the heater. Operate with doors closed.



Minimum Clearances	
A Side wall to stovetop	12" (305 mm)
B Back wall to stovetop	12" (305 mm)
D Connector to side wall	22" (559 mm)
E Connector to back wall	15" (381 mm)
G Floor protection, side/back	8" (200 mm)
H Floor protection, front	18" (450 mm)

Electrical Rating: 115V, 60 Hz, 1.8 Amps
 Exhaust Fan: #XF001
 Room Blower: #RB001
 Do not route power cord under or in front of appliance.
 Replace glass only with 5mm ceramic glass.

Manufactured by:
 MF Fire
 12921 Bikle Rd,
 Smithsburg, MD,US

www.mffire.com

U.S. ENVIRONMENTAL PROTECTION AGENCY

Certified to comply with 2020 particulate emission standards for single burn rate heaters. This single burn rate wood heater is not approved for use with a flue damper. Certified average emissions rate of 1.9 g/hr, tested to EPA Method 28R and ASTM E2515-11

Made in U.S.A

DATE OF MANUFACTURE: _____

CATALYST



WOOD STOVE OWNER'S MANUAL

Safety Notice: Please save these instructions for future reference. Please read this entire manual before you install and use your new room heater. Failure to follow instructions may result in property damage, bodily injury, or even death. Contact local building or fire officials about restrictions and installation inspection requirements in your area. Do not install in a mobile home!



UL 1482- 2011



Report # 055WS001E

INTRODUCTION

What you have in your hands is not the greatest wood burning device ever invented, it is just the manual for the greatest wood burning device ever invented.

The award-winning Catalyst (Model #001) is the world's first smart, ultra-clean wood stove. We built the Catalyst around state-of-the-art combustion techniques and using a revolutionary smart controller that lets you control the burn from your smartphone. In the 2013 Wood Stove Design Challenge, the prototype Catalyst won the Low Emissions Prize. In the 2014 Wood Stove Design Challenge, the Catalyst won the Grand Prize. In the MIT Clean Energy Prize, the Catalyst won the Energy Efficiency Prize and the People's Choice Award. Not a bad track record.

Traditional wood stoves are dirty, inefficient, and can be difficult to operate. Other home heating systems, like fuel oil, propane or natural gas, are expensive, non-renewable, or both. Catalyst was designed by fire scientists to outperform all of these: providing the natural heat of inexpensive and renewable wood without emitting health-harming emissions. Best of all – the Catalyst is made and assembled in the U.S.A.

Thank you for your purchase of the Catalyst and welcome to the MF Fire Family!

Sincerely,
The MF Fire Team

DRAFT

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DRAFT

SAFETY PRECAUTIONS

INSTALLATION

- The Catalyst must be properly installed to prevent house fires. Please strictly adhere to the installation instructions.
- The Catalyst must be connected to a listed high temperature chimney or approved masonry chimney with liner.
- Do not install in a mobile home
- We recommend you use smoke and CO detectors
- Contact your local building officials to obtain information on any local wood stove installation requirements.
- Carefully route all power cords through to avoid contact with hot stove surfaces.
- Do not connect to or use in conjunction with any air distribution ductwork unless specifically approved for such installations

OPERATION

- The viewing door and back panel of the Catalyst must be shut and latched during operation.
- Do not touch the Catalyst while hot. Young children should be supervised while the Catalyst is in use.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or "freshen up" a fire in this stove. Keep all such liquids well away from the stove while it is in use.
- This wood heater has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instructions in this manual.
- Hot while in operation. Keep children, clothing and furniture away. Contact may cause skin burns.
- Never obstruct airflow through the inlet vents or exhaust vents
- The Catalyst has been designed for the burning of cordwood only. Do not attempt to burn any other type of fuel in the Catalyst.
- Keep all flammable objects (fabrics, paper, wood, etc.) at least 1 yd (1 m) from the front of the Catalyst.
- Do not use chemicals or fluids to start the fire.
- Do not burn garbage or flammable fluids such as gasoline, naphtha or engine oil
- Never over-fire the Catalyst, as it could lead to a house fire. If the unit or chimney connector glows, you have over-fired the unit.

MAINTENANCE

- Never attempt to modify or repair the appliance beyond instructions given in this manual.
- Empty the ash regularly and dispose of it in a metal container with tight lid.
- Allow the Catalyst to cool before conducting any maintenance.
- Inspect the chimney connector at least twice monthly.

FEATURES AND SPECIFICATIONS

FEATURES

- 2.3 cubic foot (0.065 m³) firebox
- Accepts 18" (0.46 m) logs
- Push button smart control
- Durable steel construction
- Full-fire viewing window
- Classic soapstone top

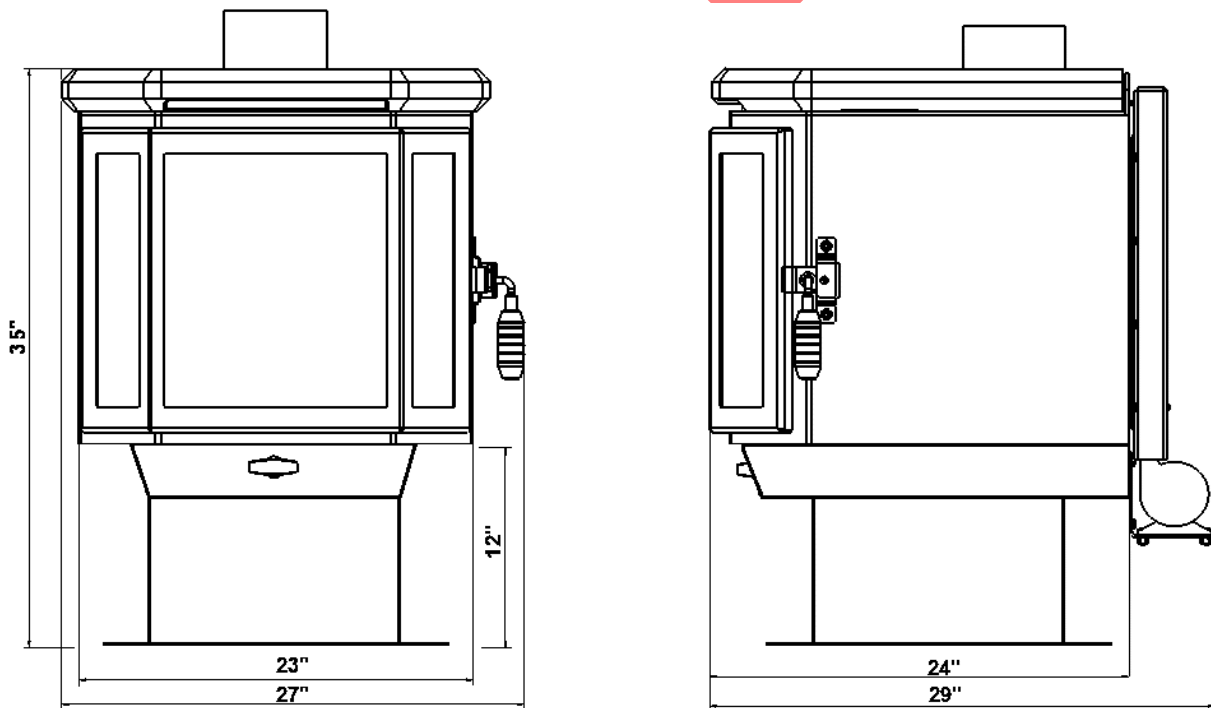
HEATING SPECIFICATIONS

2,000 sq. ft. (175 m²) approximate maximum heating capacity. Heating capacity will vary depending on the home's floor plan, degree of insulation, and the outside temperature.

28,000 BTU per hour (8 kW) heat release rate.

12 hour maximum burn time.

DIMENSIONS



All clearances, side, corner, and back, are measured from the largest dimensions.

EMISSIONS

U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards for single burn rate heaters. This single burn rate wood heater is not approved for use with a flue damper. Certified average emissions rate of 1.9 g/hr, tested to EPA Method 28R and ASTM E2515-11

STOVE INSTALLATION

Safety Notice: Please read this entire manual before you install and use your new room heater. Failure to follow instructions may result in property damage, bodily injury, or even death. Contact local building or fire officials about restrictions and installation inspection requirements in your area. Do not install in a mobile home!

PLANNING THE INSTALLATION

We suggest that you have a certified chimney sweep install your Catalyst. If you will be installing the stove yourself, we advise you consult a certified chimney sweep. Check with your local building officials and your home insurance company before installation.

If there are any major dents or other damage to your stove, please report to MF Fire prior to installation.

When this room heater is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Contact local building or fire officials about restrictions and installation inspection requirements in your area.

STOVE PLACEMENT REQUIREMENTS

The Catalyst must be placed with the following requirements:

Catalyst must be placed in a room with a source of fresh air.

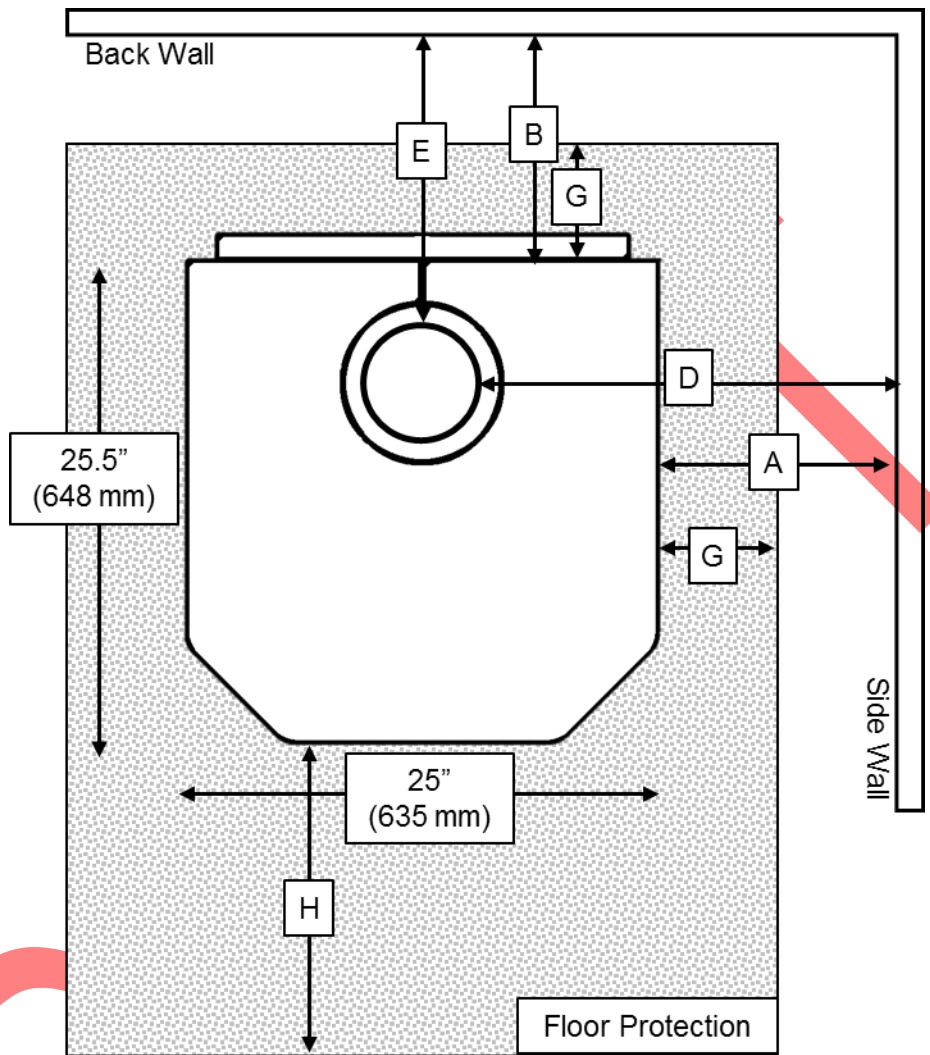
Stove must be placed so that no combustibles are within, or can swing within 36" (914mm) of the front of the stove (drapes, doors, etc.).

Floor protection must extend around the front, sides, and rear of the stove, according to listed clearance requirements below. Floor protection must be made of a non-combustible material and at least 0.018" (0.45 mm) thick with a minimum R-value of 0.41.

The Catalyst must also maintain the following minimum clearances to combustibles (drywall, furniture, etc.):

Minimum Clearance Requirements		
A	Side wall to stovetop	12" (305 mm)
B	Back wall to stovetop	12" (305 mm)
C	Corner wall to stovetop	8" (203 mm)
D	Connector to side wall	22" (559 mm)
E	Connector to back wall	15" (381 mm)
F	Connector to corner wall	18" (458 mm)
G	Floor protection, side and back	6" (153 mm)
H	Floor protection, front	16" (407 mm)

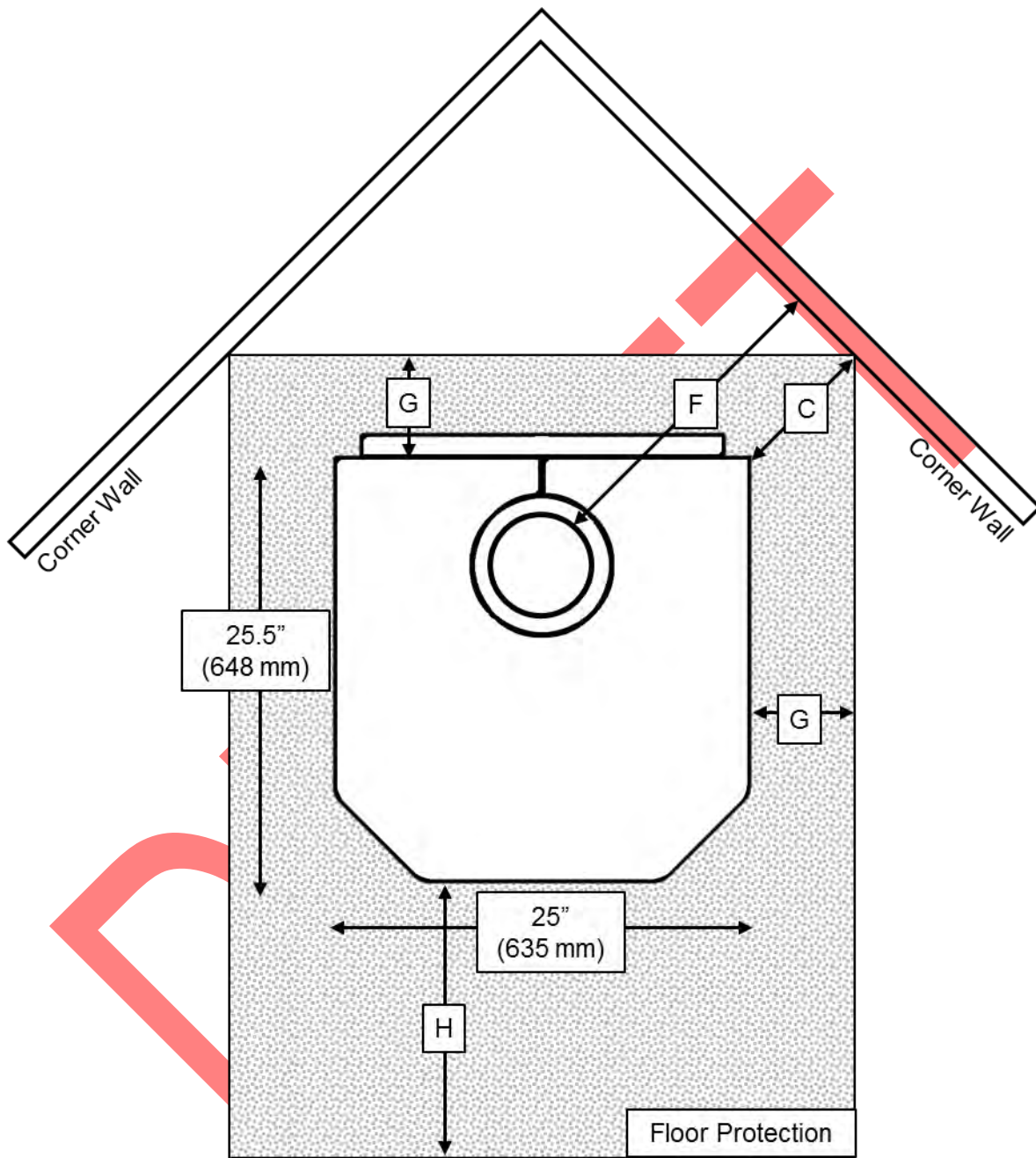
STANDARD INSTALLATION – TOP VIEW



Minimum Clearance Requirements

A	Side wall to stovetop	12" (305 mm)
B	Back wall to stovetop	12" (305 mm)
D	Connector to side wall	22" (559 mm)
E	Connector to back wall	15" (381 mm)
G	Floor protection, side and back	8" (200 mm)
H	Floor protection, front	18" (450 mm)

CORNER INSTALLATION – TOP VIEW



Minimum Clearance Requirements

C	Corner wall to stovetop	8" (203 mm)
F	Connector to corner wall	18" (458 mm)
G	Floor protection, side and back	8" (200 mm)
H	Floor protection, front	18" (450 mm)

CHIMNEY REQUIREMENTS

Do not connect Catalyst to a chimney flue serving any other appliance or use in conjunction with any air distribution ductwork, unless specifically approved. This room heater must be connected to:

1. A 6" (150 mm) diameter, UL 103 HT chimney, from a single manufacturer

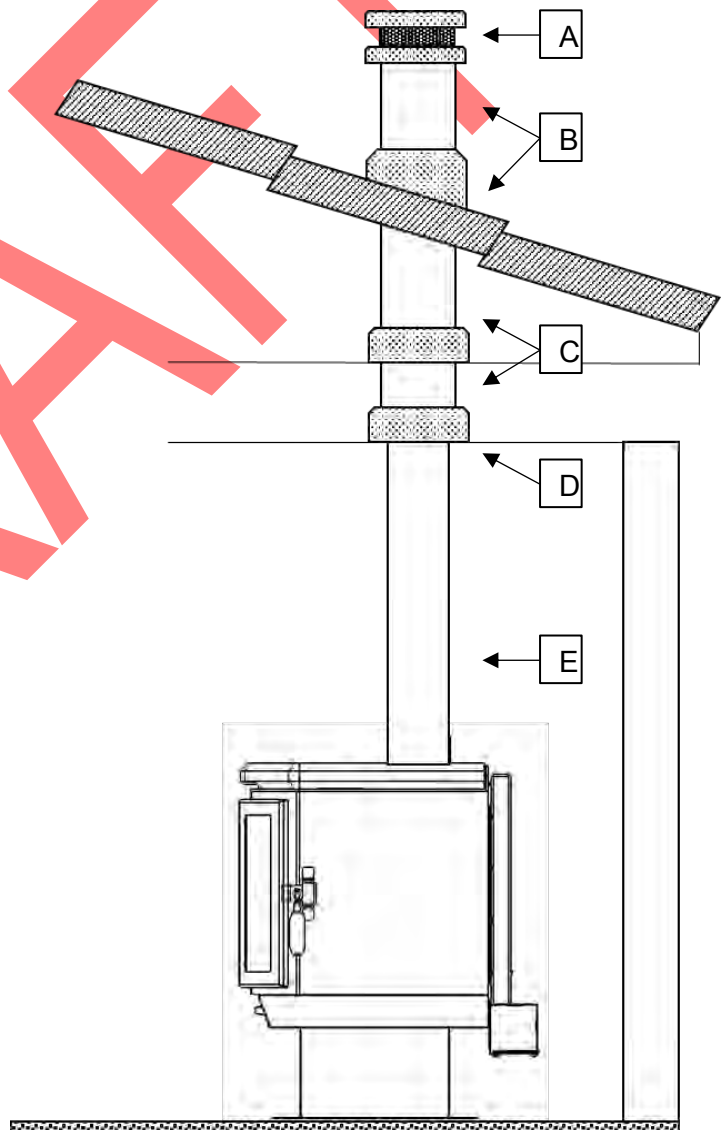
OR

2. A code approved masonry chimney with a flue liner.

In Canada, Catalyst must be connected to a factory-built chimney conforming to CAN/ULC S629, Standard for 650°C Factory-Built Chimneys.

Standard Chimney Arrangement

- A. Chimney termination
15'/33' (4.5/10m) min/max height
- B. Roof penetration
- C. Chimney sections
- D. Ceiling penetration
- E. Chimney connector



CHIMNEY CONNECTOR REQUIREMENTS

Chimney connector is required from the flue collar of the stove to the factory-built chimney or masonry chimney. The chimney connector must be 6" (152mm) diameter and a minimum 24 gauge black steel. Aluminum or galvanized steel is not allowed – these materials cannot withstand the flue temperatures and may give off toxic fumes when heated.

The chimney connector may not pass through a ceiling, attic, roof, closet, or any other concealed space (use listed UL 103 HT chimney – see "Chimney Requirements for details). DO NOT USE CONNECTOR PIPE AS CHIMNEY.

IN CANADA: Where passage through a wall or partition of combustible construction is desired, the installation shall conform to CAN/CSA-B365, Installation Code for Solid-Fuel-Burning Appliances and Equipment.

The chimney connector should be as short and direct as possible. No more than 180° of elbows (two 90° elbows, or two 45° & one 90° elbow, etc.) may be used for the entire system (connector and chimney). Horizontal runs should slope upwards 1/4" (6mm) per foot and be a maximum 36" (914mm) long.

The chimney connector must be installed with the crimped end pointing downwards. This prevents creosote from leaking to the exterior of the pipe.

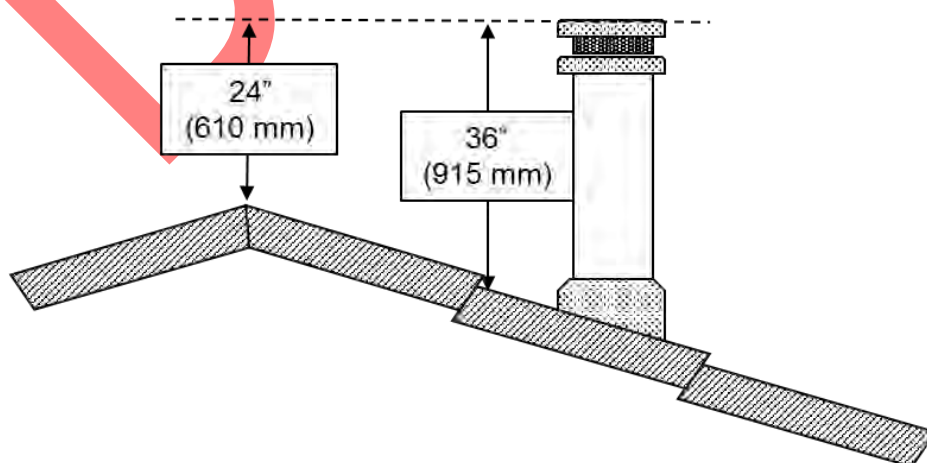
The chimney connector must be fastened to the stove and each adjoining section (and chimney) and kept clean.

CHIMNEY TERMINATION REQUIREMENTS

Must have an approved cap (to prevent water from entering)

Must not be located where it will become plugged by snow or other material

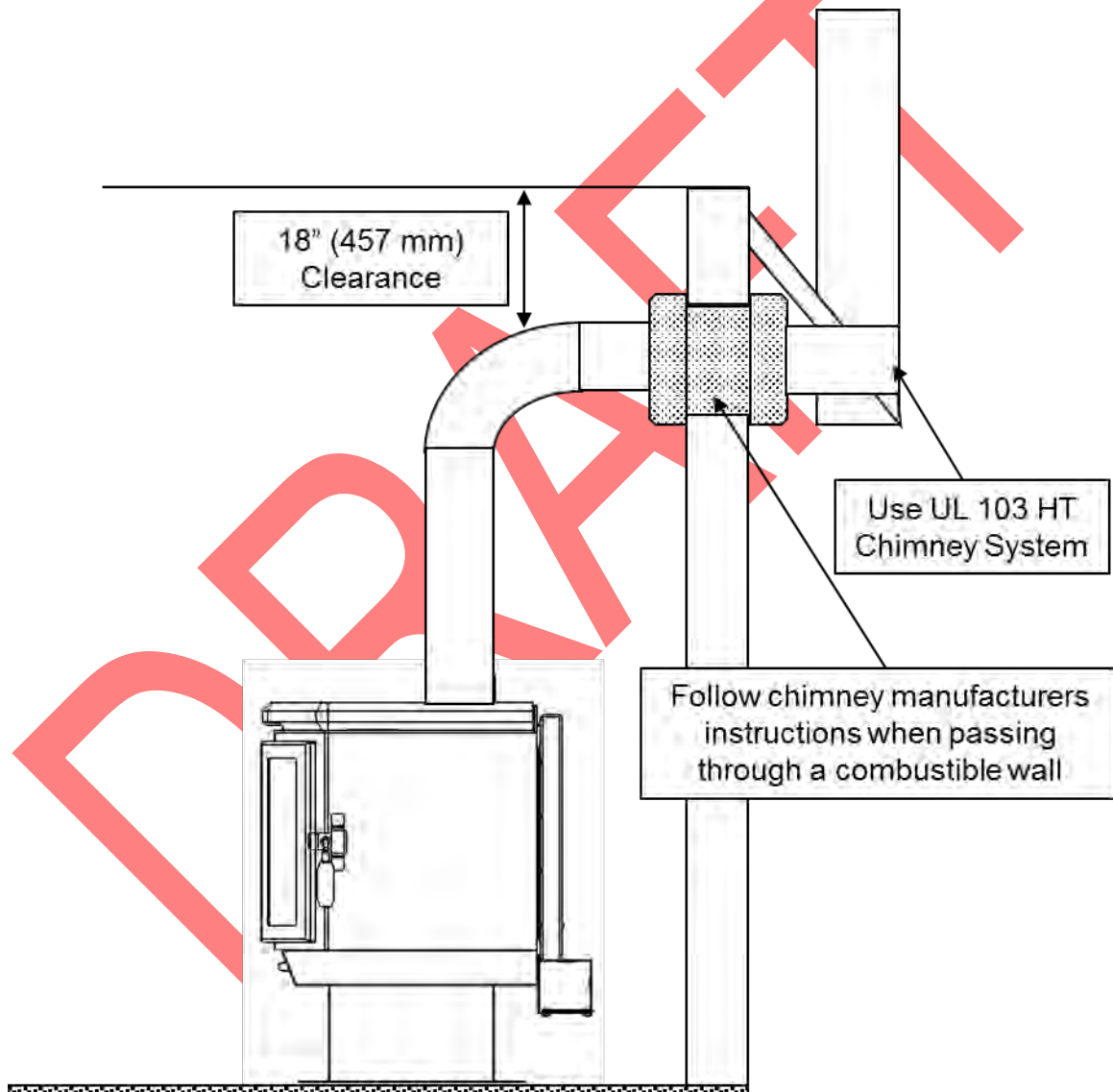
Must terminate at least 3' (914mm) above the roof and at least 2' (610mm) above any portion of the roof within 10' (3.048M)



SPECIAL INSTALLATION: EXTERIOR FACTORY-BUILT CHIMNEY

Catalyst may be used in conjunction with an exterior factory built chimney provided that the chimney meets UL 103 HT requirements.

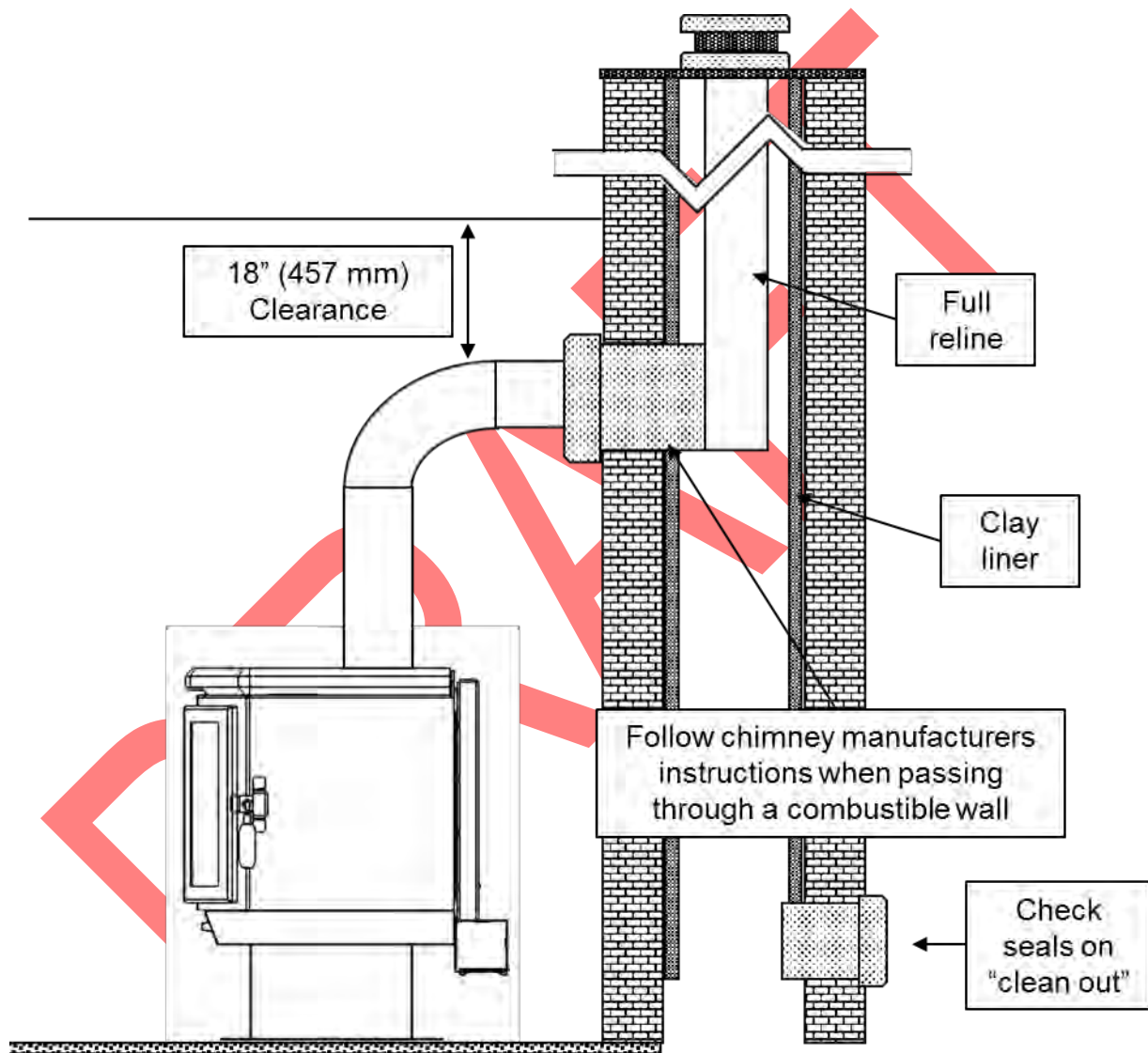
Special care must be taken regarding the wall thimble, or penetration from the chimney connector pipe to the exterior chimney, if the wall thimble must pass through an exterior wall. Here all chimney manufacturer's instructions must be followed, including guidance on spacing to combustible surfaces, piping requirements, and liner requirements. Check with local authorities before installation to ensure all requirements are met.



SPECIAL INSTALLATION: MASONRY CHIMNEY

Catalyst may be used in conjunction with a masonry chimney provided all installation instructions are followed.

We strongly recommend (required in Canada) a full reline when installing the Catalyst in a masonry chimney. If the chimney does not have a clay tile liner, a full reline is required. The chimney must be clean, undamaged, and meet all local building codes.

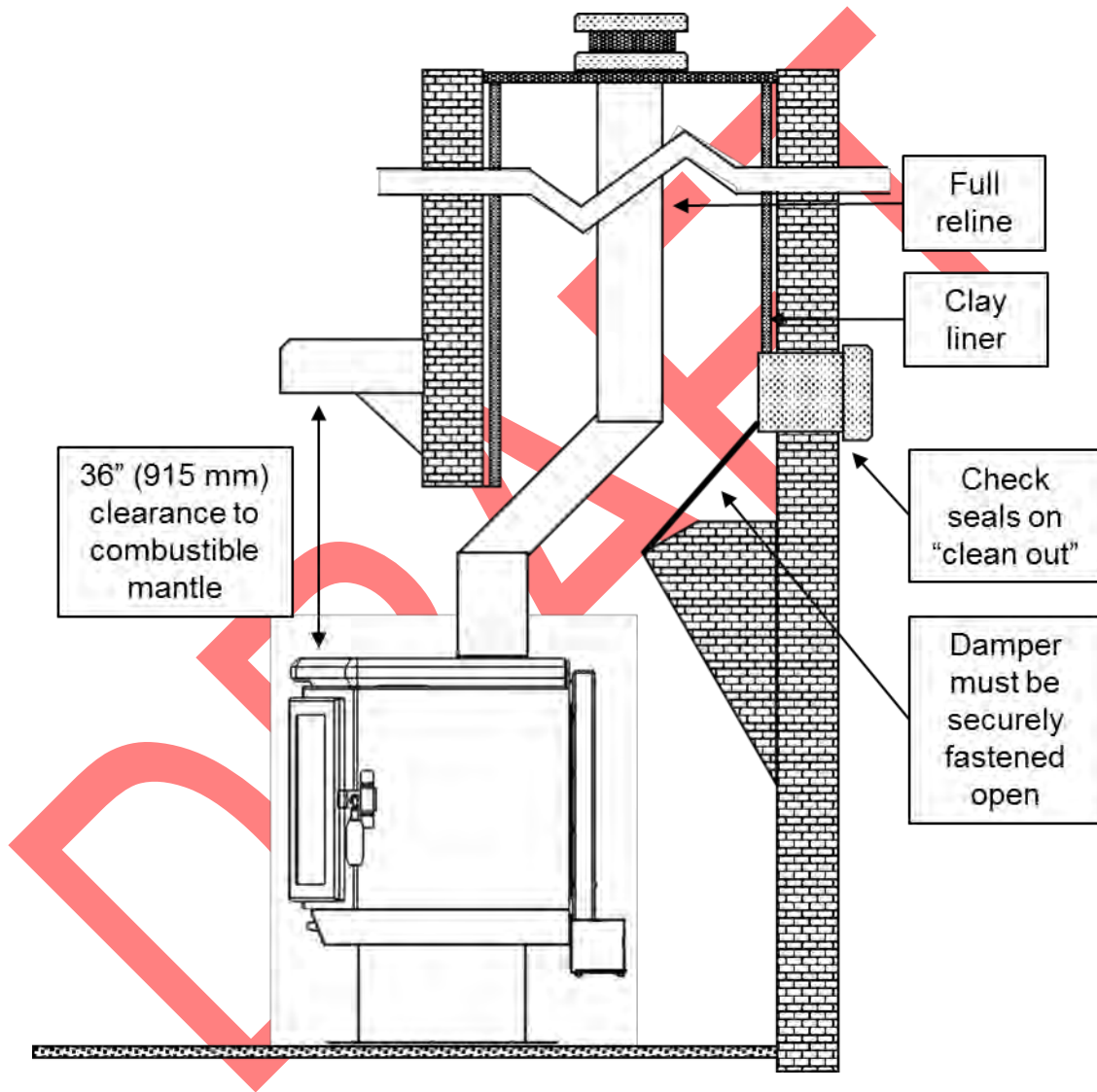


Special care must be taken regarding the wall thimble, or penetration from the chimney connector pipe to the masonry chimney, if the wall thimble must pass through an exterior wall. Here all chimney manufacturer's instructions must be followed, including guidance on spacing to combustible surfaces, piping requirements, and liner requirements. Check with local authorities before installation to ensure all requirements are met.

SPECIAL INSTALLATION: MASONRY FIREPLACE

Catalyst may be used in conjunction with a masonry fireplace provided all installation instructions are followed.

The entire fireplace must be clean, undamaged, and meet all local building codes. This installation requires a full reline. The liner must be stainless steel chimney connector or flexible vent pipe. Follow the liner manufacturer's instructions for installation and support.



CONNECTING THE ELECTRONICS

To be added.

Do not route power cord under or in front of appliance.

DRAFT

USING THE CATALYST: FROM STACK TO STAND

Catalyst is the world's first smart wood stove, which means that it is a whole lot easier to use than any wood stove you have ever used. Gone are dampers and catalytic combustor bypasses. Gone is keeping the door open to start the stove, spilling smoke into the room. Instead, Catalyst is 100% automatic, so you just build a fire and walk away, and the Catalyst goes to work automatically tending your fire and minimizing emissions.

Let's get started to see how it works.

START UP

Safety Notice: Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or "freshen up" a fire in this heater. Keep all such liquids well away from the heater while it is in use.

Before starting your Catalyst, be sure that all power cords are remote from the main firebox, to prevent burning and electrical failure.

When you open the front door of the Catalyst, your combustion fan will kick on high. It knows you are ready to start.

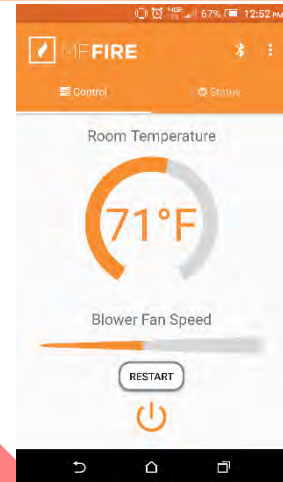
The easiest way to start a fire in a cold stove is to use newspaper to create a base, then cover the base in small kindling, and cover the kindling in logs. When placing logs atop the kindling, increase log size as you build up. One of the keys to a quick and easy start up is to ensure there is plenty of air for the fire. So, be sure to leave air gaps between kindling and logs alike. The newspaper, kindling, and log combination should be built to fill the majority of the firebox. Do not elevate the fire above the provided grate by use of additional grates, andirons, etc.

When you have stacked your wood take a match or lighter and light the newspaper in several different areas. Immediately after lighting, shut and latch the door. **There is no need to leave the front door ajar.** Catalyst's smart control system will help provide enough air flow to start the burn, and will automatically adjust to burn in the burn mode you have selected.

SETTING THE TEMPERATURE

Your Catalyst has only one burn mode – perfect. Catalyst will automatically adjust to maintain the perfect room temperature. This temperature can be chosen from the MF Fire app by moving the slider circle pictured in the center of the app.

If you don't do anything, Catalyst will automatically work to achieve a perfect 70°F.



RELOADING

Your Catalyst knows when you want to reload.

When reloading, if there is a large coal bed (glowing red coals, covering the entire bottom, at least an inch deep), there is no need to use kindling or newspaper. To reload, slowly open the door. Your exhaust fan will increase its speed to prevent smoke from spilling into the room. Fill the firebox chamber with logs, taking care not to stack the logs too close to the glass on the front door. Then simply shut the door, and walk away.

CONTROLLING THE BLOWER

The blower can be cycled on and off by pushing the right button on the controller. When the button light is lit, the blower is on. When the button light is not lit, the blower is off. The blower will not run when there is no fire in the firebox.

TYPES OF COMBUSTION

The Catalyst uses three levels of combustion: Primary, Secondary, and Catalytic. Carefully regulating these combustion types leads to clean and efficient burning.

Primary: This is the first step in the combustion process of your Catalyst. Primary combustion occurs directly surrounding the wood. Did you know that *flames are never actually on the wood?* Primary combustion occurs just off the wood surface by combusting gases that are released from the wood as it heats up. The air supply the first row of holes in the firebox walls are used to feed the primary combustion process.

Secondary: The next step in the combustion process is secondary combustion, which is any combustion distant from the wood fuel. This typically occurs for the first time just underneath of the baffle in the firebox and continues above the baffle. Secondary combustion helps to eliminate any products of incomplete combustion, like soot or carbon monoxide that are left

over from primary combustion. We need local temperatures of over 1100°F (600°C) before secondary combustion kicks in.

Catalytic: The final stage of combustion happens inside the catalytic combustor. Your Catalyst has a catalytic combustor (or catalyst, this part gets a little confusing) that scrubs the air just before the exhaust gases leave the stove. Catalyst's catalyst (see) is a fine metal honeycomb, coated in platinum. Platinum lowers the activation energy of certain chemical reactions, which means that the same chemical reactions can occur at much lower temperatures if there is a little platinum hanging around. For our particular reactions, this combustion process begins at about 550°F (300°C). With the large viewing window, you will be able to sometimes see your catalytic combustor glowing. Don't worry – that just means it is doing its job.

WOOD SELECTION

Use **ONLY** untreated wood in your Catalyst. The use of any other fuel may result in unsafe burning conditions and cause damage to the stove.

When choosing wood, please try to use dry wood, meaning wood of between 15-20% moisture content. To test the moisture content, split a piece of wood and use your wood moisture meter on the interior center of the wood. Store this wood in a dry place and remote from your Catalyst. Do not dispose of ashes where near where fuel is stored to prevent accidental fires.

Why does dry wood matter? It burns much more efficiently, increasing heat output from the stove and reducing creosote buildup in the chimney.

ORDINARY OPERATING SOUNDS

During the typical operation of your Catalyst, the wood stove will make occasional creaking noises. This is completely normal and is likely caused by the heating and cooling of the stove. Additionally, the fans will create a slight noise as they move air through the stove and the room.

REGULAR MAINTENANCE

Woodstoves, even those as clean as Catalyst, must be cleaned frequently because soot, ash, and creosote may accumulate. Please follow a routine maintenance schedule as suggested here.

GLASS

The air wash on the Catalyst is designed to help keep the front glass clean. The glass may become dirtied in some spots when using unseasoned wood (please read Wood Selection section) or when burning in the lower burn mode. To clean the glass, the unit should be allowed to cool. Use a soft cloth and a non-ammonia, non-abrasive cleaner. There are many retail options for wood stove glass cleaner.

ASH REMOVAL

Disposal of Ashes: Ashes should be placed in a steel container with a tight-fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.

DOOR GASKETS

Inspect all gaskets and door seals before each use. Catalyst should be operated with both front door and ash pan door tightly shut.

MONTHLY MAINTENANCE

CREOSOTE

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited, this creosote makes an extremely hot fire.

The chimney and chimney connector should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If creosote has accumulated, it should be removed to reduce the risk of a chimney fire.

The use of unseasoned (wet, green) wood will increase the formation of creosote.

If you are not confident in performing a creosote inspection, contact a local chimney sweep to perform an inspection. Excess creosote buildup may cause a chimney fire that may result in property damage, injury, or death.

SOAPSTONE

The soapstone top on the Catalyst can be removed of light scratches by lightly sanding the surface using a fine abrasive sandpaper or Grade 1 (medium) steel wool. Any soapstone dust created by sanding should be removed with a vacuum.

DUCT/BLOWER CLEANING

The air duct and the blower should be cleaned by using a vacuum to remove excessive dust.

GASKET

There is gasket located on the front door, on the front door glass, and on the ash pan. The gasket in these areas should be visually inspected for any signs of deterioration or smoke leakage into the room. If the gasket is deteriorating, contact MF Fire for replacement gasket.

ANNUAL MAINTENANCE

EXTERIOR PAINT

To fix areas on the exterior of the stove that have been scratched or dinged, a can of black stove spray paint was provided along with your Catalyst. If additional paint is needed, contact MF Fire. The paint should only ever be applied with the stove is cool. Allow the paint at least one hour to cool. After applying the paint, the newly painted area may appear darker than original until it is cured. When using the stove next, the curing process may give off some fumes. Windows and other ventilation means should be utilized.

GLASS

In the event of broken door glass, a new pane of glass must be installed before usage may continue. Do not operate with broken glass!

To avoid breaking the glass, avoid striking the glass, slamming the door shut, or building the fire too close to the glass.

To replace broken glass, carefully open the front door while the stove is cool. Remove large shards with gloves and dispose of appropriately. Then carefully unscrew the interior doorframe, taking care to keep all screws.

Replace the glass with official MF Fire replacement glass. The main pane is 0.1875" (5 mm) ceramic glass, 16.375" (416 mm) x 13.750" (349 mm). The side panes are 0.1875" (5 mm) ceramic glass, 16.375" (416 mm) x 4.625" (117 mm) Do not use unauthorized substitute materials.

When replacing glass, ensure that the glass is properly surrounded by graphene impregnated wood stove gasket (1" rope gasket on the exterior, 1"x1/8" flat gasket on the interior), and centered over window openings.

CATALYTIC COMBUSTOR

This wood heater contains a catalytic combustor to help achieve a clean burn. It is important to periodically monitor the operation of the catalytic combustor to ensure that it is functioning properly and to determine when it needs to be replaced. A non-functioning combustor will result in a loss of heating efficiency, and an increase in creosote and emissions. Following is a list of items that should be checked on a periodic basis:

Your catalytic combustor should be visually inspected at monthly to check its condition. Do not attempt to inspect the catalytic combustor unless the stove is cool and not currently in use. To inspect the catalytic combustor, first remove the back panel on the stove and place it to the side. Next, remove the catalytic combustor chamber panel. Remove the steel baffle in this area and then remove the catalytic combustor for inspection. If there is some ash on the catalytic combustor, use a soft bristled brush to clean off the ash.

This wood heater is equipped with a temperature probe to monitor catalytic combustor operation. A properly functioning catalytic combustor maintains temperatures in excess of 500 °F. If catalyst temperatures are not in excess of 500 °F, refer to Catalyst Troubleshooting section of this owner's manual.

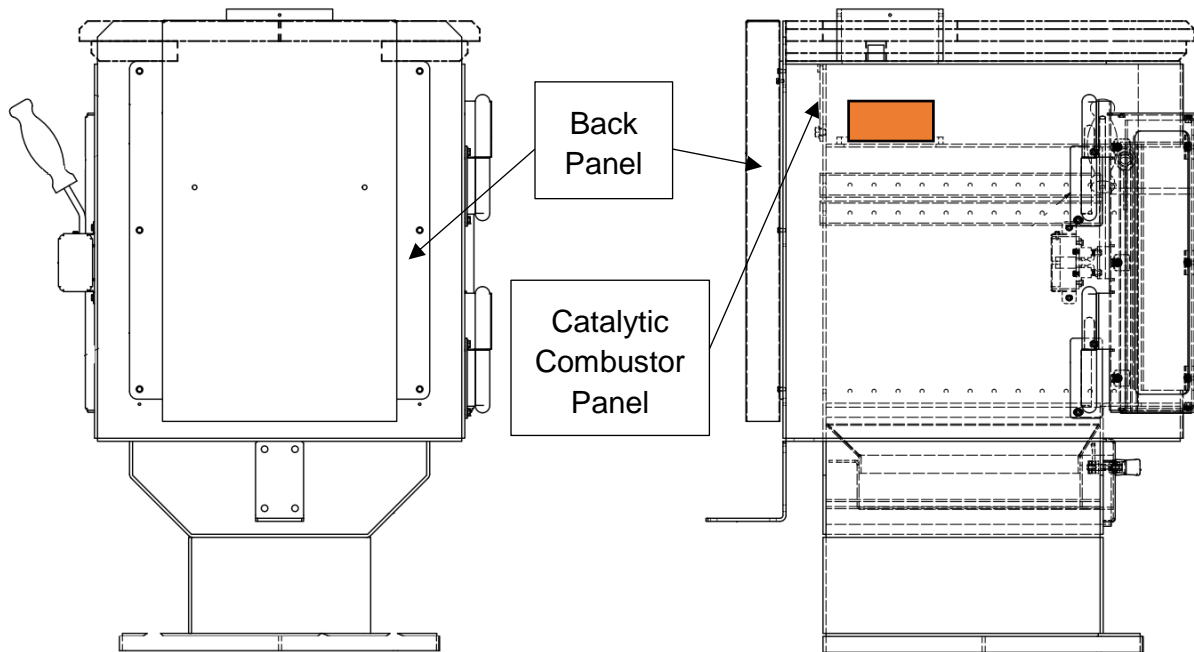
You can get an indication of whether the catalytic combustor is working by comparing the amount of smoke leaving the chimney when the smoke is going through the combustor and catalyst light-off has been achieved (temperatures above 500 °F), to the amount of smoke leaving the chimney before light off is achieved.

Burn untreated wood only. Burning materials such as treated wood, metal foil, coal, plastic, garbage, Sulphur, or oil may damage the catalytic combustor. Excessive smoking indicated the combustor has failed and requires replacement.

CATALYTIC COMBUSTOR TROUBLESHOOTING AND REPLACEMENT

If you suspect that your catalytic combustor is not working, the catalytic combustor should be removed and inspected to identify the source of the problem.

CAUTION: DO NOT OPERATE THE CATALYST WOOD HEATER WITH CATALYTIC COMBUSTOR REMOVED!



To access the catalytic combustor, first remove the back panel of the stove, using allen wrenches, then remove the catalytic combustor panel. The catalytic combustor (orange) may then be lifted up and removed from its ring holder.

If the catalytic combustor appears to be clogged, lightly brush with a soft brush to remove any debris. If any cracking or peeling is observed, the catalytic combustor must be immediately replaced. Please contact MF Fire for a replacement catalytic combustor.

To replace the catalytic combustor, simply insert the new catalytic combustor inside the ring holder pictured. Replace and tightly secure the catalytic combustor panel and the back panel before operating the heater again.

DRAFT

LIMITED 5 YEAR WARRANTY

Your Catalyst is automatically registered for MF Fire's 5 year warranty with purchase. All portions of the stove are subject to the warranty, excluding paint, gasket, glass, and fasteners. Mileage and service charges, if necessary, are not covered by this warranty.

IF WARRANTY SERVICE IS NEEDED

1. If you discover a problem that you believe is covered by this warranty, you must report it to MF Fire WITHIN 30 DAYS, indicating model name and serial number.
2. MF Fire has the option of either repairing or replacing the defective component.
3. Any appliance or part thereof that is repaired or replaced during the limited warranty period will be warranted under the terms of the original limited warranty for a period not to exceed the remaining term of the original limited warranty.

CONDITIONS AND EXCLUSIONS

1. This device must be installed, operated, and maintained at all times in accordance with the instructions in the Owner's Manual. Any alteration, willful abuse, accident, neglect, or misuse of the product shall nullify this warranty.
2. Discoloration and some minor expansion, contraction, or movement of certain parts and resulting noise, is normal and not a defect and, therefore, not covered under warranty.
3. This warranty does not cover misuse of the stove. Misuse includes over-firing or use of any fuel not recommended by the manual. Misuse of Catalyst can cause serious damage and will void the warranty.
4. Damage to the appliance while it is in transit is not covered by this warranty, but is subject to a claim against the carrier.
5. The warranty, as outlined within this document, does not apply to the chimney components or other accessories used in conjunction with the installation or use of the stove.
6. MF Fire is not responsible for inadequate performance caused by environmental conditions.
7. Exclusions to this 5 Year Warranty include: injury, loss of use, damage, failure to function due to accident, negligence, misuse, improper installation, alteration or adjustment of the manufacturer's settings of components, lack of proper and regular maintenance, damage incurred while the appliance is in transit, alteration, or act of God.
8. Damage to surfaces caused by fingerprints, scratches, melted items, or other external sources left on the surfaces from the use of abrasive cleaners is not covered in this warranty.
9. Damage to the surfaces from over-firing (operation where the steel may glow red) is not covered in this warranty.
10. MF Fire is free of liability for any damages caused by the appliance, as well as inconvenience expenses and materials. Incidental or consequential damages are not covered by this warranty.
11. This warranty does not cover any loss or damage incurred by the use or removal of any component or apparatus to or from the Catalyst.
12. Any statement or representation of products and their performance contained in MF Fire advertising, packaging literature, or printed material is not part of this 5 year warranty.
13. MF Fire will not cover the cost of the removal or re-installation of hearths, facing, mantels, venting or other components.
14. This 5 year warranty is the only warranty supplied by MF Fire, the manufacturer of the appliance. All other warranties, whether express or implied, are hereby expressly disclaimed and purchaser's recourse is expressly limited to the warranties set forth herein.

LABEL LISTING

DO NOT REMOVE THIS LABEL Contact local building or fire officials about installation and restrictions in your area. Suitable for use in a conventional residential installation. For use with solid wood fuel only.

Tested & Listed By
 **OTL**
 C US
 OMNI-Test Laboratories, Inc.
 Report No. 0552WS001E
 Control No. 4000515



Catalyst
Model #001

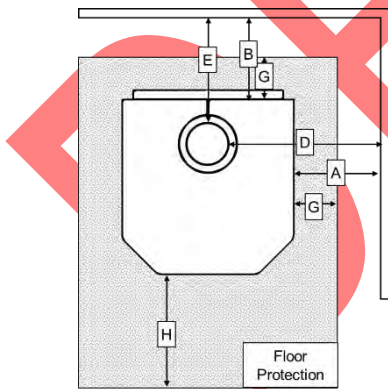
Serial Number:
#00001

Conforms to UL STD 1482; Certified to ULC STD S627-2000

Prevent House Fires: Install and use only in accordance with the manufacturer's installation and operating instructions found in the Owner's Manual. Contact your local building or fire officials about restrictions and installation inspection in your area. Refer to local building codes and manufacturer's instructions for precautions required for passing a chimney through a combustible wall or ceiling. Do not run a chimney connector through a combustible wall or ceiling. Do not connect this unit to a chimney flue serving another appliance. Clearances may be reduced by methods specified in NFPA 211, listed wall shields, pipe shields, or other means approved by local building or fire officials. Do not overfire, if chimney connector glows, you are overfiring. Inspect and clean chimney frequently – under certain conditions of use creosote buildup may occur rapidly. Do not use grate or elevate fire – build wood directly on hearth.

This wood heater contains a catalytic combustor, which needs periodic inspection and replacement for proper operation. Consult Owner's Manual for further information. It is against the law to operate this wood heater in a manner inconsistent with operating instructions in the owner's manual, or if the catalytic element is deactivated or removed. CAUTION: the combustor used in this appliance (part no. #CAT001) is fragile and must be handled carefully. Burn only dry wood. The burning of metal foils, plastic, garbage, sulphur and diesel oil will render the catalyst in the combustor inactive. The performance and durability of the catalytic combustor has not been evaluated as part of the certification.

Free Standing Installation: Standard residential freestanding installations require a 6" diameter, minimum 24 MSG black, with listed UL-103 HT factory-built chimney, suitable for use with solid fuels or masonry chimney. If installed on a combustible floor, a noncombustible floor protector must be used, extending to at least 18" (450 mm) on the firing side and 8" (200 mm) on the other sides. Do not obstruct the space beneath the heater. Operate with doors closed.



Minimum Clearances	
A Side wall to stovetop	12" (305 mm)
B Back wall to stovetop	12" (305 mm)
D Connector to side wall	22" (559 mm)
E Connector to back wall	15" (381 mm)
G Floor protection, side/back	8" (200 mm)
H Floor protection, front	18" (450 mm)

Electrical Rating: 115V, 60 Hz, 1.8 Amps
 Exhaust Fan: #XF001
 Room Blower: #RB001

Do not route power cord under or in front of appliance.
 Replace glass only with 5mm ceramic glass.

Manufactured by:
 MF Fire
 12921 Bikle Rd,
 Smithsburg, MD,US

www.mffire.com

U.S. ENVIRONMENTAL PROTECTION AGENCY

Certified to comply with 2020 particulate emission standards for single burn rate heaters. This single burn rate wood heater is not approved for use with a flue damper. Certified average emissions rate of 1.9 g/hr, tested to EPA Method 28R and ASTM E2515-11

Made in U.S.A

DATE OF MANUFACTURE: _____

INDEX

To be added

DRAFT

*Model: Catalyst
MF Fire
4410 Oglethorpe St. Unit #309
Hyattsville, MD 20781*

Appendix 1 – Polytests Report PI-20132



TEST REPORT

TEST OF A CATALYTIC SINGLE BURN RATE WOOD BURNING FOR EMISSIONS AND EFFICIENCY

PER EPA METHODS 28R AND ASTM E2515 and ASTM E2780, MAY 2015

Client:

MF Fire
4410 Oglethorpe st. Unit 309
Hyattsville, MD 20791
U.S.A.

Model name: CATALYST

Attention: Rafaël Sanchez

TESTED BY:

Services Polytests inc.
695-B Gaudette
St-jean-sur-Richelieu, QC, J3B 7S7

TEST DATES:

REPORT DATE: September 30th 2016

REV 1 : October 24th 2016

Project number: PI-20132

All services undertaken are subject to the following general policy: Reports are submitted for exclusive use of the clients to whom they are addressed. Their significance is subject to the adequacy and representative character of the samples and to the comprehensiveness of the tests, examinations or surveys made. This document may not be reproduced except in its entirety without the written permission from Services Polytests. Services Polytests have not been involved in any R&D design consulting regarding this unit as requested by the NSPS..

Tested:

A handwritten signature in black ink, appearing to read "Maxime Martin".

Maxime Martin

written by:

A handwritten signature in black ink, appearing to read "Danick Power".

Danick Power, P. Eng

Verified by third party certifier (Omni):

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1 INTRODUCTION

1.1 GENERAL

Laboratory

- Location: Services Polytests Inc., 695-B Gaudette St-jean-sur-Richelieu QC, Canada J3B 7S7
- Elevation: 100 feet above sea level

Test program

- Purpose: unit qualification NSPS 2020
- Test dates: September 15th 2016
- Test methods used:
 - Particulate emissions: ASTM E2780-10 ; methods 28R and ASMT E2515 as referred into 40 CFR Part 60 Subpart AAA
 - Efficiency: CSA B415.1-10

1.2 TEST UNIT INFORMATION

General

- Manufacturer: MF Fire
- Product type: catalytic freestanding single burn rate wood stove
- Combustion system: hybrid: secondary air tube with catalyst
- Unit tested: CATALYST

Particularities

- Draft inducer installed at the bottom of the flue pipe
- Convection fan always in operation installed at the bottom back of the stove

The unit can be turned on either by opening the door or by pressing a button on the app. The draft inducer drives fast air flow initially, and then slows down after 5 minutes. The draft inducer starts again if the door is re-opened, in the event of a reload. The convection fan can be controlled by the app or a button on the back of the stove. The controller allows the user to set desired room temperature and tells the users information about the stove (temperature, time left to burn, etc.)

1.3 RESULTS

Emission results obtained

- average emission rate: 1.9 grams/hour
- Maximum rate cap: 2.26 grams/hour at run 2

Conformity: NSPS Phase 2020

1.4 PRETEST INFORMATION

Unit condition: The unit was received by carrier in July 2016. The 50hrs of aging is made during July and august 2016.

Set up

- Venting system type: steel pipe and insulated chimney, installed with the draft inducer
- System height from floor: 15 feet
- Particularities: The unit was tested with the top flue configuration, with convection fan always on and draft inducer at on when door open and 5 minutes after

Break in period

- Duration: the unit was received from the manufacturer and run for at least 50 hours at a category 2 burn rate with adequate documentation of fuel additions and flue and unit temperatures during the July and August 2016.
- Fuel: crib wood

2 SUMMARY OF TEST RESULTS

2.1 EMISSIONS

Run Number	Test Date AAAA-MM-DD	Emission Rate (g/hr)	Burn Rate (kg/hr)	1st hour Emission Rate (g/hr)	CSA B415.1 CO emission (g/hr)	CO Emissions (g/Kg dry)	CO Emissions (g/MJ output)
1	2016-09-15	1.54	2.14	2.17	87.57	40.77	3.05
2	2016-09-15	2.26	2.11	3.4	62.6	29.72	2.07

2.2 AVERAGE CALCULATION

Test No.	Burn Rate Kg/hr	(E) Ave. Emission Rate g/hr	Overall Efficiency (%)	Heat Output (BTU/HR)
1	2,15	1,54	67	27 220
2	2,11	2,26	72	28 675
average	2,13	1,90	69.9	27947

Average Emissions Rate: 1.90g/hr

Average Overall Efficiency: 69.9%

2.3 TEST FACILITY CONDITIONS

Run Number	Room Temperature		Barometric pressure		Relative humidity		Air Velocity	
	Before (F)	After (F)	Before (in.Hg)	After (in.Hg)	Before (%)	After (%)	Before (ft/min)	After (ft/min)
1	75	79	30,298	30,209	41,4	31	19	22
2	80	82	30,298	30,268	35,2	32,4	20	24

2.4 FUEL QUALITIES

Run Number	Pre-test Load			Test Load						
	Loading Weight Wet Basis (lbs)	Moisture Content Dry Basis (%)	Coal bed Weight (lbs)	Weight Wet Basis (lbs)	Density Wet Basis (lbs/cuft)	Moisture Content Dry Basis (%)	Piece Length (in.)	Number of 2X4's	Number of 4x4's	Number of Spacers
1	13,89	20,23	2,7	12,73	6,363	19,49	17	2	2	12
2	13,91	20,00	2,7	12,78	6,388	19,63	17	2	2	12

2.5 DILUTION TUNNEL FLOW RATE MEASUREMENTS AND SAMPLING DATA (ASTM E2515)

Average dilution tunnel measurements				Sample Data			
Run Number	Burn Rate (Min)	Volumetric Flow Rate (dscf/min)	Total Temperatures (°R)	Volume sampled (DSCF)		Particulate catch (mg)	
				1	2	1	2
1	135	290,97	576,20	23,513	22,930	2,10	2,00
2	138	300,13	580,57	24,328	23,723	3,10	3,00

2.6 DILUTION TUNNEL DUAL TRAIN PRECISION

Run Number	Sample Ratio		Total Emission (g)		
	Train 1	Train 2	Train 1	Train 2	% Deviation
1	1670,60	1713,07	3,51	3,43	1,18%
2	1702,52	1745,92	5,21	5,18	0,34%

2.7 GENERAL SUMMARY OF RESULTS

Run Number	Burn Rate (kg/hr)	Average Surface Temperature (F)	Change in surface Temperature (F)	Initial Draft (in. H ² O)	static pressure tunnel (in. H ² O)	Primary Air Setting	Run Time (min)
1	2,147	589,37	-116,1	0,002	0,233	Single burn rate	135
2	2,106	567,50	-88,4	0,004	0,236	Single burn rate	138

3 PROCESS DESCRIPTION

3.1 DISCUSSION

At the reception of the unit we do preliminary test run to ensure the unit can reach the limit of the standard. We use those run for the aging of the unit

3.2 UNIT DIMENSIONS

Baffle

- Location: between top of combustion chamber and hearth
- Restriction: 3 in x 18 in. at the front of unit
- Dimensions: covers the hearth area minus the restriction at front
- Material: ¼ steel plate

Bricks

- none

Flue gas exhaust

- Location: top flue located at the top
- Dimensions: 6 in. diameter
- Material: Steel

Gasket

- Location: door (3/4 round), window (1/8 flat), ash door (1/2 round).

Overall unit dimension

- Firebox dimensions : 18 ½ in wide x 19 7/16 in. deep x 10 in. high
- Usable volume: 2 cu.ft.

Draft inducer

- Manufacturer : blower supplied with unit
- Model : Fasco LR6319
- Spec. : 110V / 60HZ ; 1.0 Amps

Draft inducer fan

- Manufacturer : blower supplied with unit
- Model : Fasco LR6319
- Spec. : 110V / 60HZ ; 1.0 Amps

Convection fan

- Manufacturer : fan supplied with unit
- Model : W&W motor co. ; YJF61/40 wh
- Spec. : 110V / 60HZ ; 1.0 Amps

Catalyst

- Round : 6 inch diameter
- 3 inch thick
- Applied Ceramics, WF-4150001014 (49), B1 Metal Monolith

3.3 AIR SUPPLY SYSTEM

Description

- Primary air: window wash design with air intake at the back of unit
- Secondary air: secondary tube design with air intake at the back of unit

Characterization

The following table shows the inlet and outlet sections of each system. The air introduction system number is referred to on a set of drawings in Appendix 6.

AIR INTRODUCTION SYSTEM		INLET (1) sq. in.		OUTLET
Identification	Type	inlet	Controlled	(sq. in.)
A *	Primary	16	None	2.5
B *	Secondary		None	6.38
C *	Pilot	none	None	none

* This section would be filled by measuring and comparing with the manufacturer's drawings included in the test report.

Legend

Identification: Tag name referred to on drawings in Appendix 14, section airflow pattern

Type: Characterization of air intake

Imin: Minimum air intake of a particular air channel

Imax: Maximum air intake of a particular air channel

Controlled: Determines if a provision for air control is present

Outlet: Total air outlet of a particular air channel

Note: surfaces are expressed in sq. Inches

3.4 OPERATION DURING TEST

Run #1

This run was performed on September 15th 2016. It lasted 135 minutes and a burn rate was obtained at 2.15kg/hr & emission at 1.54gr/hr. the blower was at on position.

Run #2

This run was performed on September 15th 2016. It lasted 138 minutes and a burn rate was obtained at 2.11kg/hr & emission at 2.26 gr/hr. the blower was at on position.

- Details: Refer to the front page of each test run data sheets found in appendix for the detailed test sequence showing air supply settings and adjustments, fuel bed adjustments and operational specifics of the test unit.

Test fuel cribs

- Type of wood: Douglas fir, grade c or better, 19 to 25% dry basis moisture content
- Description: for each test, description of the fuel crib is found on the front page of each test run data sheet together with photograph in appendix.

3.5 START-UP OPERATION

The complete manufacturer's firing procedure of each burn rate category is fully described in appendix 13.

3.6 SAMPLING LOCATIONS

Particulate samples are collected from the dilution tunnel at a point 15 feet from the tunnel entrance. The tunnel has two elbows and two mixing baffles in the system ahead of the sampling section. The sampling section is a continuous 10 foot section of 8 inch diameter pipe straight over its entire length. Tunnel velocity pressure is determined by a standard pitot tube located 48 inches from the beginning of the sampling section. Thermocouple is installed on the pitot tube to measure the dry bulb temperature. MC is assumed, as allowed, to be 4%. Tunnel samplers are located 56 inches downstream of the pitot tube and 16 inches upstream from the end of this section.

3.7 DRAWINGS

Various drawings of the stack gas sampling train and of dilution tunnel system are found in Appendix 1.

3.8 EMISSIONS EFFICIENCY TESTING EQUIPMENT LIST

The complete test equipment list together with all corresponding calibration data can be found in Appendix 3.

4 SAMPLING METHODS

4.1 PARTICULATE SAMPLING

Particulates were sampled in strict accordance with ASTM E2515. This method uses two identical sampling systems with Gelman A/E 61631 binder free (or equivalent), 47 mm diameter filters. The dryers used in the sample systems are filled with "Drierite" before each test run.

5 QUALITY ASSURANCE

5.1 INSTRUMENT CALIBRATION

5.1.1 GAS METERS

At the conclusion of each test program the gas meters are verified using the reference dry gas meter. This process involves sampling the train operation for 1 cubic foot of volume. With readings made to .01 fr', the resolution is 1 %, giving an accuracy higher than the 2% required by the standard.

5.1.2 SCALES

Before each test program, the different scales used are checked with traceable calibration weights to ensure their accuracy.

5.1.3 GAS ANALYZERS

The continuous analyzers are zeroed and spanned before each test with NBS traceable gases. A mid-scale multi-component calibration gas is then analyzed (values are recorded). At the conclusion of a test, the instruments are checked again with zero, span and calibration gases (values are recorded only). The drift in each meter is then calculated and must not exceed 5% of the scale used for the test.

5.2 TEST METHOD PROCEDURES

5.2.1 LEAK CHECK PROCEDURES

Before and after each test, each sample train is tested for leaks. Leakage rates are measured and must not exceed 0.02 CFM or 4% of the sampling rate. Leak checks are performed checking the entire sampling train. Pre-test and post-test leak checks are conducted with a vacuum of 5 inches of mercury. Vacuum is monitored during each test and the highest vacuum reached is then used for the post test vacuum value. If leakage limits are not met, the test run is rejected. During these tests, the vacuum is typically less than 2 inches of mercury. Thus, leakage rates reported are expected to be much higher than actual leakage during the tests.

5.2.2 TUNNEL VELOCITY FLOW MEASUREMENT

The tunnel velocity is calculated from a center point pitot tube signal multiplied by an adjustment factor. This factor is determined by a traverse of the tunnel as prescribed in EPA Method 1. Final tunnel velocities and flow rates are calculated from EPA Method 2, Equation 6.9 and 6.10. (Tunnel cross sectional area is the average from both lines of traverse.)

Pitot tubes are cleaned before each test and leak checks are conducted after each test.

5.2.3 PM SAMPLING PROPORTIONALITY (ASTM E2515)

Proportionalities were calculated in accordance with ASTM E2515. The data and results are found in appendix.

APPENDIX 1: Raw data, forms and results

Paramètres

Tous les facteurs de corrections et autres paramètres qui peuvent être modifiés par l'utilisateur du fichier sont regroupés ici.

Code verrouillage:

Description du test

Test standard	EPA
Run #	1
Date	15-09-2016
Technicien	m.m
Project #	pi-20132

Description de l'unité

Manufacturier	mf fire	
Modèle	Mulciber	
Combustion system	Cat	
Appliance type	wood stove	
Firebox volume	2	cu ft.
Appliance weight empty	na	lbs
Appliance weight full	na	lbs

Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	na	BTU/h Donnée fournie par le manufacturier
Targeted category	1	
Targeted output	à définir	BTU/h
Cp steel	0,1	BTU/lb-°F

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,993	Dimensionless
Equipment number (DGM #1):	EM-078	
Calibration Factor (DGM #2):	0,992	Dimensionless
Equipment number (DGM #2):	EM-079	
Calibration Factor (DGM #3):	0,993	Dimensionless
Equipment number (DGM #3):		Dimensionless

Tunnel

Targeted tunnel flow rate	140	scfm
Tunnel diameter	8	in.
Molecular weight	28,78	May be assumed to be 28,78 (EPA) Si B-415 = 29
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	pi-20132
Date	15-09-2016
Technicien	<input type="text" value="m.m"/>

Fuel data

Fuel type	Dimension	
Fuel specie	D. Fir	
HHV		19810,0 kJ/kg
%C		48,7
%H		6,9
%O		43,9
%Ash		0,5
HHV		8519,2 Btu/lb
LHV		7451,0 Btu/lb

Default Fuel Values		
	D. Fir	Oak/Maple
HHV	19 810	19 887
%C	48,73	50
%H	6,87	6,6
%O	43,9	42,9
%Ash	0,5	0,5
HHV (Btu/lb)	8519	8552
LHV (Btu/lb)	7451	7480

	Start	End
Barometer (kPa):	102,6	102,3
Barometer (in.Hg):	30,297769	30,209179
Dry Bulb (F):	68,72	79,34
Humidity (%):	41,4	31
Air velocity (ft/min)	19	22

DGM #1	Final: ##### cuft
	Initial: ##### cuft
DGM #2	Final: ##### cuft
	Initial: ##### cuft
DGM room	

	Final: 433046,980	Liter
	Initial: 432351,360	Liter
	Final: 374978,020	Liter
	Initial: 374307,320	Liter
	Final: 500,730	cuft
	Initial: 483,180	cuft

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent

163

Autres données à rentrer: dans preload data, load data, traverse et filter set weight

Project nu.	pi-20132
Date	15-09-2016
Technicien	m.m

Preload data sheet

Test Load Weight:

Lower	Ideal	Upper
12,60	14,00	15,40

Load Volume: cu. ft

Loading Density: 6,944 lbs./ft3

Number of Spaces:
 Spacer weight (lbs):

Load Density (wet): 31,167 lbs./ft3
 Dry Wood Density: 25,922357

Piece Size (in):			Weight lbs	Meter Moisture Content Dry Uncorrected %			Ave. MC x Weight	Volume Cubic Inches
Thick	Wide	x Length						
2	4	13,75	2,146	19,9	19,8	19,7	42,4908	110,00
2	4	13,75	2,22	20,3	20,9	20	45,288	110,00
2	4	13,75	2,032	20,3	20,6	20	41,2496	110,00
2	4	13,75	2,108	20,5	20,6	20,1	43,0032	110,00
2	4	13,75	1,696	21	20,5	20,3	34,9376	110,00
2	4	13,75	2,022	20,6	20,1	20,3	41,114	110,00
2	4	13,75	1,664	19,9	19,6	19,8	32,891733	110,00
								0,00
								0,00
								0,00
								0,00
								0,00
								0,00
								0,00
								0,00
								0,00
SUM MC							280,97493	

SUM MC 280,97493

PreTest Load Weight: lbs.

Dry Weight: kg.

Average Moisture Content: %

Dry:

Must be 18-28

Wet:

must be 15,2-22

Project nu.	pi-20132
Date	15-09-2016
Technicien	<input type="text" value="m.m"/>

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,19 in. H2O
 Barometer: 29,900 in. Hg

Pour un tunnel de 12" et plus, prendre 6 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center			0,0000
B center			0,0000
A1			0,0000
A2			0,0000
A3			0,0000
A4			0,0000
A5			0,0000
A6			0,0000
B1			0,0000
B2			0,0000
B3			0,0000
B4			0,0000
B5			0,0000
B6			0,0000
AVERAGE	#DIV/0!	#DIV/0!	0,0000

PITOT CONSTANT=
0,945

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,061	69,19	0,2470
B center	0,060	69,43	0,2449
A1	0,050	69,08	0,2236
A2	0,061	69,36	0,2470
A3	0,063	69,26	0,2510
A4	0,058	68,98	0,2408
B1	0,049	68,410	0,2214
B2	0,059	69,430	0,2429
B3	0,060	69,520	0,2449
B4	0,051	69,670	0,2258
AVERAGE	0,0572	69,2330	0,2389

Project nu.	pi-20132
Date	15-09-2016
Technicien	m.m

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	4	40	41	3	11	43	45	4	41	49	51	7	52		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,3832	0,1298	0,1290	10,1149	93,7276	0,1238	0,1272	10,1525	110,3640	0,1245	0,1274	10,2559	0,1284	14/09/2016	19:00
Before (6)	61,3833	0,1299	0,1289	10,1148	93,7277	0,1238	0,1272	10,1526	110,3641	0,1245	0,1274	10,2560	0,1282	15/09/2016	10:00
After (1)	61,3834	0,1309	0,1289	10,1175	93,7279	0,1239	0,1272	10,1551	110,3642	0,1253	0,1276	10,2587	0,1282	15/09/2016	15:00
After (2)	61,3834	0,1307	0,1289	10,1155	93,7279	0,1237	0,1272	10,1533	110,3642	0,1253	0,1275	10,2570	0,1282	24/09/2016	08:00
After (3)	61,3834	0,1305	0,1288	10,1155	93,7279	0,1237	0,1272	10,1533	110,3642	0,1253	0,1275	10,2570	0,1282	29/09/2016	08:00
After (4)	61,3834	0,1305	0,1288	10,1155	93,7279	0,1237	0,1272	10,1533	110,3642	0,1253	0,1275	10,2570	0,1282	30/09/2016	08:00
After (5)															
After (6)	61,3834	0,1305	0,1288	10,1155	93,7279	0,1237	0,1272	10,1533	110,3642	0,1253	0,1275	10,2570	0,1282	30/09/2016	08:00
Difference	0,0001	0,0006	-0,0001	0,0007	0,0002	-0,0001	0,0000	0,0007	0,0001	0,0008	0,0001	0,0010	0,0000		
Total (mg)		1,3				2,1				2			0		
Total ajusté (mg)		1,30				2,10				2,00					

Project nu. pi-20132
 Date 15-09-2016
 Technicien mm

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 1,54 g/hr
 Burn Rate : 2,147 Dry kg/hr

Test Duration: 135 min

PRESSURE FACTOR: DGM 1 0,97915
 DGM 2 0,99263
 DGM 3 1,01115

BAROMETRIC PRESSURE
 Average: 30,253474 in Hg
 Start: 30,297769 in Hg
 End: 30,209179 in Hg

TEMPERATURE FACTORS DGM 1 0,98443
 DGM 2 0,98316
 DGM 3 0,98519

DGM CONTROLLER VALUES

DGM 1 Final: 15292,910 Cuft
 Initial: 15268,345 Cuft

VOLUMES SAMPLED DGM 1 23,513 SCft
 DGM 2 22,930 SCft
 DGM 3 17,360 SCft

DGM 2 Final: 13242,224 Cuft
 Initial: 13218,539 Cuft

DGM #3 Final: 500,730 Cuft
 Initial: 483,180 Cuft

TOTAL TUNNEL VOLUME : 39281

TEMPERATURES

DGM 1 536,350 °R
 DGM 2 537,042 °R

SAMPLE RATIOS
 Sample Train 1: 1670,603
 Sample Train 2: 1713,067

CALIBRATION FACTORS

DGM 1 0,9930
 DGM 2 0,9920
 DGM #3 0,9930

Paticulate concentration
 Sample Train 1 **0,000089** g/dscf
 Sample Train 2 **0,000087** g/dscf
 Room **0,000000** g/dscf

TUNNEL FLOW RATE: 290,971 Dscfm

TOTAL EMISSIONS
 Sample Train 1 **3,51** g
 Sample Train 2 **3,43** g

PARTICULATE CATCH
 Total Sample Train 1: 2,10 mg
 Total Sample Train 2: 2,00 mg
 Total Sample Train 1 1st hour: 1,30 mg

EMISSION RATES
 Sample Train 1 **1,56** g/hr
 Sample Train 2 **1,52** g/hr

1st hour emission rate **2,17** g/hr

DEVIATION: 1,18%

Cs Train 1 Train 2
 8,931E-05 8,7221E-05

Manufacturer: mf fire
 Model: Mulciber

Run: 1
 Project #: pi-20132
 Test Duration: 135 min

	HHV	LHV
Eff	67,44%	72,89%
Comb Eff	97,66%	97,66%
HT Eff	69,06%	74,64%
Output	28 695	kJ/h
Burn Rate	2,15	kg/h
Grams CO	197	g
Input	42 547	kJ/h
MC wet	16,31	

Note: In the "Input data", "Calc. % O₂", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a], [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3

Ultimate CO₂
 CO_{2-ut} 19,64
 F_o
 1,061

	Air Fuel Ratio (A/F)	
Overall Heating Efficiency:	67,44%	Dry Molecular Weight (M _d) 29,82
Combustion Efficiency:	97,66%	Dry Moles Exhaust Gas (N _r): 445,98
Heat Transfer Efficiency:	69,06%	Air Fuel Ratio (A/F) 12,79

Heat Output:	27 220 Btu/h	28 695 kJ/h
Heat Input:	40 360 Btu/h	42 547 kJ/h
Burn Duration:	2,25 h	
Burn Rate:	4,73 lb/h	2,148 kg/h
Stack Temp:	406,1 Deg. F	207,9 Deg. C

Fan de
DOS ON

Date: 2016 09 15 Manufacturer: MF FIRE Model: Mulciber
Project #: PI 20132 Run: 1 Tech: MM Reviewer: DP

kindling 4,30 LBS START FIRE
FAN ON
- At 38 LBS close Door
- laisse Fan ON 5 min (close Fan 2,40 LBS)
- At 0,90 insert pre load
- At 13,10 close Door
Fan ON 5 min
- At 2,3 LBS insert load
- laisse porte ouverte 2,5 min 1 min load
1,5 min porte
ouverte

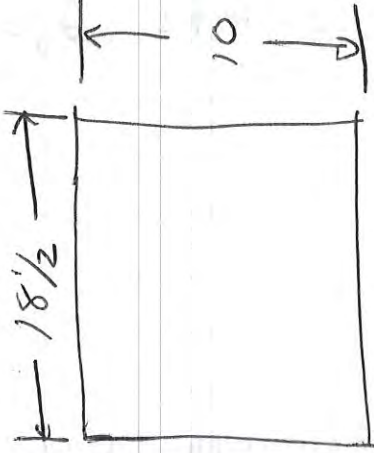
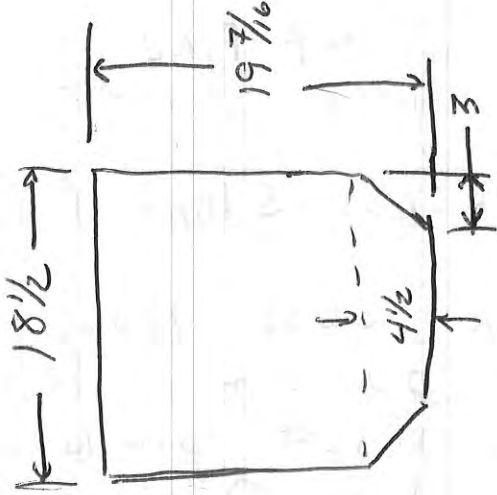
TEST LOAD CONFIGURATION

temps : 2:16

Date: Sept. 2016
Project #: P1 20132

Manufacturer: MF Inc
Run: 1 Tech: MM

Model: Molecule
Reviewer: DP

Side view	Front view	Top view
$V = \frac{18.5 \times 19.4375 \times 10}{1728} - \frac{4\frac{1}{2} \times 3 \times 10}{1728}$ $V = 2.08 \text{ cu ft} - 0.078 \text{ cu ft}$ $V = 2 \text{ cu ft}$		

Date: _____ Manufacturer: _____ Model: _____

Project #: _____ Run: _____ Tech: _____ Reviewer: _____

	ADDITION		SUBTRACTION	
	ft3	Volume	ft3	Volume
V measure				
V ashlip				
%				
V usable				
Usable Firebox: _____				
Test load weight: _____		Minimum: _____		Maximum: _____
Déviation: _____				

AP

Date: 2016-09-15 Manufacturer: MF FINE Model: Mulcahen
 Project #: PI 20132 Run: 1 Tech: MM Reviewer: DP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-191	7:00	ok	ok

Pre-Test

Post-Test

Facility Conditions:

Air Velocity from less than 2 feet

19 (max50 Fpm)	22 (max50 Fpm)
----------------	----------------

Smoke Capture Check.....

ok	ok
----	----

Picture.....

4 sides ok	ok
------------	----

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

2016-09-15

Date Dilution Tunnel Cleaned.....

2016-09-15

Induced Draft Check (max 0.005 H2O).....

ok

Traverse before ignition.....

ok

Flow Rate 140 cfm ±10%.....

ok

Temperature System:

Ambient (65°-90°F).....

ok	°F
----	----

Wood Heater Surface (±125°F).....

ok	°F
----	----

Proportional Checks:

Thermocouple check.....

ok

Pitot Clean.....

ok

Pitot verification.....

ok

Sampling Train ID Numbers:

Probe.....

Train 1 st hour	Train 1	Train 2
09	11	41
40	43	49
41	45	51
11	11	12
ok	ok	ok

Filter Front.....

Filter Back.....

Filter Thermocouple.....

Filter (<90°F).....

SAMPLING EQUIPMENT CHECK OUT

Date: 2-16-09-15 Manufacturer: MF FINE Model: Mulcher
 Project #: PI 20132 Run: 1 Tech: MM Reviewer: DP

Leakage Checks Tunnel Samplers

	System 1 st hour		System 1		System 2	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	432351,30	433047,88	432351,34	433047,95	374306,75	374978,94
Initial 1minute DGM (Liter)	432351,29	433047,88	432351,34	433047,94	374306,74	374978,94
Change © (Liter)	0,01	0	0	0,01	0,01	0
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	ok	ok	ok	ok	ok not	ok

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre Test	Post Test
Vacuum (inches Hg.)	-5	-5
Rotometer Reading (mml/min.)	0	0
Flow Rate (lpm)	1.5	1.5
Allowable (.02 x Sample Rate)	30	30
Check OK	ok	ok

Leakage Checks Pitot

Plugged Probe	Pre Test 3 H2o static	Pre Test 0.4-0.5 H2o velocity	Post Test 3 H2o Static	Post Test 0.4-0.5 H2o velocity
Vacuum (inches Hg.)	3	.5	3	.4
Check OK (no change after 15 sec.)	ok	ok	ok	ok

PRE-TEST SCALE AUDIT

Date: 2016-09-15 Manufacturer: MF FINE Model: Mulcher
 Project #: PI 20132 Run: 1 Tech: MM Reviewer: DP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM- 111 090	4.4 lbs, Class F	4.4 lbs
Wood	EM-090	4.4 lbs, Class F	4.4 lbs
Analytical	EM-128	100 mg, Class S	100 mg
Analytical	EM-129	200 g, Class S	200 g

LIMITS OF WEIGHT RANGES

ANALYTICAL SCALE: 50%-150% of dry filter weight, ± 0.1 mg
PLATFORM SCALE: 20%-80% of ideal test load weight, ± 0.1 lbs or 1%
WOOD SCALE: 20%-80% of ideal test load weight, ± 0.01 lbs or 1%

Date: PI 20132 Mr. 2016.09.15 Manufacturer: MF FINE Model: Mulcher
 Project #: PI 20132 Run: 1 Tech: MM Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 102.6 (KPa.) Static pressure (P_q) 0.19 (inches w.c.)
 Inside diameter: Port A _____ Port B _____
 Tunnel cross sectional area: .1963Ft²
 Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H ₂ O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0.061	69.19
B - Centroid	3.00	3.50	4	0.060	69.43
A-1	0.40	0.50	0.50	0.050	69.08
A-2	1.50	1.75	2	0.061	69.36
A-3	4.50	5.25	6	0.063	69.26
A-4	5.60	6.5	7.5	0.058	68.98
B-1	0.40	0.50	0.50	0.049	68.41
B-2	1.50	1.75	2	0.059	69.43
B-3	4.50	5.25	6	0.060	69.52
B-4	5.60	6.5	7.5	0.051	69.67
				AVERAGE	

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

Where,

C_p = pitot tube coefficient, dimension less = 0.99 for standard pitot.

Δ_p = manometer reading (inches H₂O)

T_s = average absolute dilution tunnel temperature (°F + 460)

P_s = absolute dilution tunnel gas pressure or $P_{bar} + P_{qg}$

P_q = static pressure in. H₂O
 { 13.6 }

M_s = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)

K_p = 85.49 pitot tube constant, (conversion factor for English units)

Δ_p .avg. = average of the square roots of the velocity heads (Δ_p) measured at each traverse point.

CONTINUOUS ANALYZERS

Date: 2016 07 15 Manufacturer: M.F. FIRE Model: Mulchen
 Project #: PI 20132 Run: 1 Tech: mm Reviewer: S.P.

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
	Actual	Should Be	Actual	Should Be	Actual	Should Be
CO	0	0	2,948	2,971	0,995	1,00
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO ₂	0	0	12,83	12,87	9,70	10,00
Tolerance CO ₂		+/- 0.02		+/- 0.5		+/- 0.5
O ₂ informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0.005	2,946	1,002	0.005	0.02	0.004	0.15	0.007	0.05	✓	
CO ₂	0	12,78	9,72	0	0.02	0.05	0.5	0.02	0.5	✓	
O ₂	na	na	na	-	na	-	na	-	na	✓	

TEST DATA LOG

Date: 2016-09-15 Manufacturer: M.F. FINE Model: Multichair
 Project #: PT 20736 Run: 1 Tech: MM Reviewer: TSP

RAW DRY GAS METER READINGS

	System 1	System 2	Blank
Final (Liter)	433046,98	374928,02	500,73
Initial (Liter)	432351,36	374307,32	483,18

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	102,6	102,3
Dry Bulb (F):	68,72	79,34
Humidity (%):	41,4	31

Flow Meter

	Start	End
Flow meter reading	N.A	N.A

Flow Meter Verification

	Before	After
Flow meter Check (liters)	N.A	N.A
Scale Weight (Kg)	N.A	N.A

FUEL DATA

Date: 2016-09-15 Manufacturer: M F FIRE Model: Mulcher
 Project #: PI 20132 Run: 1 Tech: MM Reviewer: DP

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size			Weight	Meter Moisture Content (% dry)*		
2	x 4	x 13.75 in.	2146 lbs.	199	178	197
2	x 4	x 13.75 in.	222 lbs.	203	209	200
2	x 4	x 13.75 in.	2032 lbs.	203	206	200
2	x 4	x 13.75 in.	2168 lbs.	205	206	201
2	x 4	x 13.75 in.	1696 lbs.	210	205	203
2	x 4	x 13.75 in.	2022 lbs.	206	201	203
2	x 4	x 13.75 in.	1664 lbs.	199	196	198
x	x	in.	lbs.			
x	x	in.	lbs.			
x	x	in.	lbs.			
x	x	in.	lbs.			
x	x	in.	lbs.			
x	x	in.	lbs.			
x	x	in.	lbs.			
x	x	in.	lbs.			
x	x	in.	lbs.			
x	x	in.	lbs.			
x	x	in.	lbs.			
x	x	in.	lbs.			
x	x	in.	lbs.			
x	x	in.	lbs.			
x	x	in.	lbs.			
x	x	in.	lbs.			

TEST LOAD WEIGHT: 13 89 lbs

FUEL DATA

Date: 2016-09-15 Manufacturer: MF FIRE Model: Mulcher
 Project #: PT 20132 Run: 1 Tech: MM Reviewer: RP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
1 1/4 x 3 1/4 x 17 in.	1678 lbs.	190	201	196	203	209
1 1/4 x 3 1/4 x 17 in.	1982 lbs.	196	193	196	195	200
3 1/4 x 3 1/4 x 17 in.	3978 lbs.	208	195	191	196	193
3 1/4 x 3 1/4 x 17 in.	3898 lbs.	196	193	191	201	206
1.5 x 3/4 x 5 in.	0100 lbs.			196		
1.5 x 3/4 x 5 in.	0098 lbs.			193		
1.5 x 3/4 x 5 in.	0094 lbs.			194		
1.5 x 3/4 x 5 in.	0092 lbs.			194		
1.5 x 3/4 x 5 in.	0096 lbs.			194		
1.5 x 3/4 x 5 in.	0112 lbs.			201		
1.5 x 3/4 x 5 in.	0100 lbs.			196		
1.5 x 3/4 x 5 in.	0094 lbs.			193		
1.5 x 3/4 x 5 in.	0094 lbs.			191		
1.5 x 3/4 x 5 in.	0102 lbs.			193		
1.5 x 3/4 x 5 in.	0098 lbs.			192		
1.5 x 3/4 x 5 in.	0100 lbs.			191		
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

TEST LOAD WEIGHT: 12,73 lbs Min 20%: 0.55 Max 25%: 3/4



DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2016-09-14
 Project #: 120132 Run: 1

Manufacturer: MF F, LLC
 Tech: MM
 Reviewer: SP

Model: Mulciber

Pre-test Weight Record		SYSTEM 1 - 1 st hour						SYSTEM 1						
Date	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	BlancK
		04	40	41	3	11	43	45	4					52
2016-09-14	19:00	61, 3832	0, 1298	0, 1290	10, 1149	93, 7276	0, 1238	0, 1272	10, 1525	0, 1287	0, 1285	0, 1282	10, 1526	0, 1282
2016-09-15	10:00	61, 3833	0, 1299	0, 1289	10, 1148	93, 7277	0, 1238	0, 1272	10, 1526	0, 1282	0, 1282	0, 1282	10, 1526	0, 1282

Post-test Weight Record		SYSTEM 1 - 1 st hour						SYSTEM 1						
Date	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	BlancK
		04	40	41	3	11	43	45	4					52
2016-09-15	15:00	61, 3834	0, 1309	0, 1289	10, 1175	93, 7279	0, 1239	0, 1272	10, 1551	0, 1282	0, 1282	0, 1282	10, 1551	0, 1282
2016-09-24	8:00	61, 3834	0, 1307	0, 1289	10, 1155	93, 7279	0, 1237	0, 1272	10, 1533	0, 1282	0, 1282	0, 1282	10, 1533	0, 1282
2016-09-29	8:00	61, 3834	0, 1305	0, 1288	10, 1155	93, 7279	0, 1237	0, 1272	10, 1533	0, 1282	0, 1282	0, 1282	10, 1533	0, 1282
2016-09-30	8:00	61, 3834	0, 1305	0, 1288	10, 1155	93, 7279	0, 1237	0, 1272	10, 1533	0, 1282	0, 1282	0, 1282	10, 1533	0, 1282



DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2016-09-14 Project #: PI 10132 Run: 1 Manufacturer: MF FINE Model: Mulcahey
 Tech: MM Reviewer: DP

SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	49	51	7	
2016-09-14	19:00	110, 3640	0, 1245	0, 1274	10, 2559
2016-09-15	10:00	110, 3641	0, 1245	0, 1274	10, 2560

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	41	51	7	
2016-09-15	15:00	110, 3642	0, 1253	0, 1276	10, 2587
2016-09-29	8:00	110, 3642	0, 1253	0, 1275	10, 2570
2016-09-29	8:00	110, 3642	0, 1253	0, 1275	10, 2570
2016-09-30	8:00	110, 3642	0, 1253	0, 1275	10, 2570

Paramètres

Tous les facteurs de corrections et autres paramètres qui peuvent être modifiés par l'utilisateur du fichier sont regroupés ici.

Code verrouillage:

Description du test

Test standard	EPA
Run #	1
Date	15-09-2016
Technicien	m.m
Project #	pi-20132

Description de l'unité

Manufacturier	mf fire	
Modèle	Mulciber	
Combustion system	Cat	
Appliance type	wood stove	
Firebox volume	2	cu ft.
Appliance weight empty	na	lbs
Appliance weight full	na	lbs

Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	na	BTU/h Donnée fournie par le manufacturier
Targeted category	1	
Targeted output	à définir	BTU/h
Cp steel	0,1	BTU/lb-°F

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,993	Dimensionless
Equipment number (DGM #1):	EM-078	
Calibration Factor (DGM #2):	0,992	Dimensionless
Equipment number (DGM #2):	EM-079	
Calibration Factor (DGM #3):	0,993	Dimensionless
Equipment number (DGM #3):	EM- 078	Dimensionless

Tunnel

Targeted tunnel flow rate	140	scfm
Tunnel diameter	8	in.
Molecular weight	28,78	May be assumed to be 28,78 (EPA) Si B-415 = 29
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	pi-20132
Date	15-09-2016
Technicien	<input type="text" value="m.m"/>

Fuel data

Fuel type	Dimension	
Fuel specie	D. Fir	
HHV		19810,0 kJ/kg
%C		48,7
%H		6,9
%O		43,9
%Ash		0,5
HHV		8519,2 Btu/lb
LHV		7451,0 Btu/lb

Default Fuel Values		
	D. Fir	Oak/Maple
HHV	19 810	19 887
%C	48,73	50
%H	6,87	6,6
%O	43,9	42,9
%Ash	0,5	0,5
HHV (Btu/lb)	8519	8552
LHV (Btu/lb)	7451	7480

	Start	End
Barometer (kPa):	102,6	102,5
Barometer (in.Hg):	30,297769	30,268239
Dry Bulb (F):	77,9	82,4
Humidity (%):	35,2	32,4
Air velocity (ft/min)	20	24

DGM #1	Final: ##### cuft
	Initial: ##### cuft
DGM #2	Final: ##### cuft
	Initial: ##### cuft
DGM room	

	Final: 433773,960	Liter
	Initial: 433049,220	Liter
	Final: 375679,580	Liter
	Initial: 374980,910	Liter
	Final: 518,740	cuft
	Initial: 500,720	cuft

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent

105

Autres données à rentrer: dans preload data, load data, traverse et filter set weight

Project nu.	pi-20132
Date	15-09-2016
Technicien	m.m

Preload data sheet

Test Load Weight:

Lower	Ideal	Upper
12,60	14,00	15,40

Load Volume: cu. ft

Loading Density: 6,956 lbs./ft3

Number of Spaces:
 Spacer weight (lbs):

Load Density (wet): 27,318 lbs./ft3
 Dry Wood Density: 22,76592

Thick	Piece Size (in):		Weight lbs	Meter Moisture Content			Ave. MC x Weight	Volume Cubic Inches
	Wide	x Length		Dry Uncorrected %				
2	4	13,75	1,64	19,3	19,6	19,9	32,144	110,00
2	4	13,75	1,834	19,8	20,1	20,6	36,985667	110,00
2	4	13,75	1,774	19,6	19,3	20,1	34,888667	110,00
2	4	13,75	1,706	19,8	20,9	20	34,518067	110,00
2	4	13,75	1,648	19,4	20,1	21	33,234667	110,00
2	4	13,75	1,822	19,3	19,5	19,8	35,589733	110,00
2	4	13,75	1,714	20,8	19,9	19,6	34,4514	110,00
2	4	13,75	1,774	20,6	20,3	20,6	36,367	110,00
								0,00
								0,00
								0,00
								0,00
								0,00
								0,00
								0,00
								0,00
SUM MC							278,1792	

PreTest Load Weight: lbs.

Dry Weight: kg.

Dry:

Average Moisture Content: %

Must be 18-28

Wet:

must be 15,2-22

Project nu.	pi-20132
Date	15-09-2016
Technicien	m.m

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,19 in. H2O
 Barometer: 29,900 in. Hg

Pour un tunnel de 12" et plus, prendre 6 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center			0,0000
B center			0,0000
A1			0,0000
A2			0,0000
A3			0,0000
A4			0,0000
A5			0,0000
A6			0,0000
B1			0,0000
B2			0,0000
B3			0,0000
B4			0,0000
B5			0,0000
B6			0,0000
AVERAGE	#DIV/0!	#DIV/0!	0,0000

PITOT CONSTANT=
0,950

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,060	72,08	0,2449
B center	0,059	72,81	0,2429
A1	0,049	72,12	0,2214
A2	0,062	72,26	0,2490
A3	0,062	72,24	0,2490
A4	0,058	72,46	0,2408
B1	0,049	72,820	0,2214
B2	0,058	72,890	0,2408
B3	0,059	72,860	0,2429
B4	0,049	72,560	0,2214
AVERAGE	0,0565	72,5100	0,2374

Project nu.	pi-20132
Date	15-09-2016
Technicien	m.m

Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Number	5	42	44	2	6	47	48	12	9	50	53	22	54		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,5067	0,1256	0,1256	10,1907	61,3770	0,1277	0,1295	10,2001	61,4478	0,1269	0,1261	9,9825	0,1240	14/09/2016	19:15
Before (6)	61,5068	0,1255	0,1257	10,1908	61,3771	0,1276	0,1294	10,2002	61,4479	0,1268	0,1262	9,9826	0,1241	15/09/2016	17:00
After (1)	61,5072	0,1270	0,1259	10,1931	61,3772	0,1284	0,1296	10,2015	61,4481	0,1289	0,1265	9,9844	0,1243	15/09/2016	20:15
After (2)	61,5072	0,1267	0,1258	10,1918	61,3772	0,1282	0,1295	10,2007	61,4481	0,1288	0,1264	9,9835	0,1242	24/09/2016	08:00
After (3)	61,5072	0,1267	0,1258	10,1912	61,3772	0,1282	0,1295	10,2006	61,4481	0,1288	0,1264	9,9833	0,1242	29/09/2016	08:00
After (4)	61,5072	0,1267	0,1258	10,1911	61,3772	0,1282	0,1295	10,2006	61,4481	0,1288	0,1264	9,9833	0,1242	30/09/2016	08:00
After (5)															
After (6)	61,5072	0,1267	0,1258	10,1911	61,3772	0,1282	0,1295	10,2006	61,4481	0,1288	0,1264	9,9833	0,1242	30/09/2016	08:00
Difference	0,0004	0,0012	0,0001	0,0003	0,0001	0,0006	0,0001	0,0004	0,0002	0,0020	0,0002	0,0007	0,0001		
Total (mg)	2				3,2				3,1				0,1		
Total ajusté (mg)	1,90				3,10				3,00						

Project nu. pi-20132
Date 15-09-2016
Technicien mm

SFBA EPA EMISSION RESULTS

RESULTS

Average emission rate: 2,26 g/hr
 Burn Rate : 2,106 Dry kg/hr

Test Duration: 138 min

PRESSURE FACTOR: DGM 1 0,98261
 DGM 2 0,99608
 DGM 3 1,01213

BAROMETRIC PRESSURE
 Average: 30,283004 in Hg
 Start: 30,297769 in Hg
 End: 30,268239 in Hg

TEMPERATURE FACTORS DGM 1 0,97417
 DGM 2 0,97305
 DGM 3 0,97551

DGM CONTROLLER VALUES
 DGM 1 Final: 15318,583 Cuft
 Initial: 15292,989 Cuft

VOLUMES SAMPLED DGM 1 24,328 SCft
 DGM 2 23,723 SCft
 DGM 3 17,668 SCft

DGM 2 Final: 13266,999 Cuft
 Initial: 13242,326 Cuft

DGM #3 Final: 518,740 Cuft
 Initial: 500,720 Cuft

TOTAL TUNNEL VOLUME : 41418

TEMPERATURES
 DGM 1 542,002 °R
 DGM 2 542,624 °R

SAMPLE RATIOS
 Sample Train 1: 1702,519
 Sample Train 2: 1745,920

CALIBRATION FACTORS
 DGM 1 0,9930
 DGM 2 0,9920
 DGM #3 0,9930

Paticulate concentration
 Sample Train 1 **0,000132** g/dscf
 Sample Train 2 **0,000131** g/dscf
 Room **0,000006** g/dscf

TUNNEL FLOW RATE: 300,133 Dscfm

TOTAL EMISSIONS
 Sample Train 1 **5,21** g
 Sample Train 2 **5,18** g

PARTICULATE CATCH
 Total Sample Train 1: 3,20 mg
 Total Sample Train 2: 3,10 mg
 Total Sample Train 1 1st hour: 2,00 mg

EMISSION RATES
 Sample Train 1 **2,27** g/hr
 Sample Train 2 **2,25** g/hr

1st hour emission rate **3,41** g/hr

DEVIATION: 0,34%

Cs Train 1 Train 2
 0,0001315 0,000130675

132.0	237.0	0.3	0.0	6.5	561.3	350.0	81.8	112.0	594.7	692.4	576.5	628.1	315.1	719.7 #####	679.4	0.18	83.11	82.54	86.73	0.17	83.24	83.67	84.65	0.06	0.01	-78.41885	132.00	0.18	83.11	82.54	0.17	83.238	83.673
133.0	238.0	0.2	0.0	6.5	561.1	345.8	82.2	111.5	601.6	686.7	575.4	627.4	314.3	709.2 #####	649.2	0.18	83.12	82.54	86.71	0.17	83.25	83.66	84.55	0.06	0.01	-78.66963	133.00	0.18	83.12	82.54	0.17	83.249	83.660
134.0	239.0	0.2	0.0	6.4	559.2	343.7	82.1	111.2	607.9	675.9	571.7	627.1	313.5	704.5 #####	631.6	0.18	83.10	82.55	86.69	0.17	83.23	83.69	84.45	0.06	0.01	-80.55071	134.00	0.18	83.10	82.55	0.17	83.231	83.693
135.0	240.0	0.1	0.0	6.2	557.3	342.3	82.0	110.9	611.5	667.8	566.3	628.2	312.8	700.4 #####	622.2	0.18	83.09	82.54	86.68	0.17	83.22	83.68	84.34	0.06	0.01	-82.45888	135.00	0.18	83.09	82.54	0.17	83.222	83.658
136.0	241.0	0.1	0.0	5.9	556.6	340.8	82.0	110.4	611.7	666.0	569.1	630.0	312.1	697.6 #####	616.8	0.18	83.08	82.53	86.66	0.17	83.20	83.65	84.24	0.06	0.01	-81.18388	136.00	0.18	83.08	82.53	0.17	83.199	83.654
137.0	242.0	0.1	0.0	5.9	554.3	340.3	82.0	110.4	610.9	653.6	567.0	628.8	311.4	696.0 #####	613.7	0.18	83.09	82.54	86.63	0.17	83.20	83.67	84.13	0.06	0.01	-85.42927	137.00	0.18	83.09	82.54	0.17	83.201	83.669
138.0	243.0	0.0	0.0	6.0	551.4	340.3	82.0	110.0	607.5	650.2	561.4	627.0	310.7	696.8 #####	612.6	0.18	83.06	82.54	86.61	0.17	83.20	83.68	84.08	0.06	0.01	-88.39961	138.00	0.18	83.06	82.54	0.17	83.201	83.683

Manufacturer: mf fire
 Model: Mulciber

Run: 1
 Project #: pi-20132
 Test Duration: 138 min

	HHV	LHV
Eff	72,43%	78,28%
Comb Eff	98,28%	98,28%
HT Eff	73,70%	79,65%
Output	30 228	kJ/h
Burn Rate	2,11	kg/h
Grams CO	144	g
Input	41 735	kJ/h
MC wet	16,41	

Note: In the "Input data", "Calc. % O₂", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a], [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3

Ultimate CO₂
 CO_{2-ut} 19,64
 F_o
 1,061

	Air Fuel Ratio (A/F)
Overall Heating Efficiency: 72,43%	Dry Molecular Weight (M _d) 29,79
Combustion Efficiency: 98,28%	Dry Moles Exhaust Gas (N _r): 458,35
Heat Transfer Efficiency: 73,70%	Air Fuel Ratio (A/F) 13,15

Heat Output:	28 675 Btu/h	30 228 kJ/h
Heat Input:	39 590 Btu/h	41 735 kJ/h
Burn Duration:	2,30 h	
Burn Rate:	4,64 lb/h	2,107 kg/h
Stack Temp:	398,4 Deg. F	203,6 Deg. C

Fan de Dos ON

Date: date 07 15 Manufacturer: MF FIRE Model: Mulciber
 Project #: pt 2012 Run: 2 Tech: MM Reviewer: DP

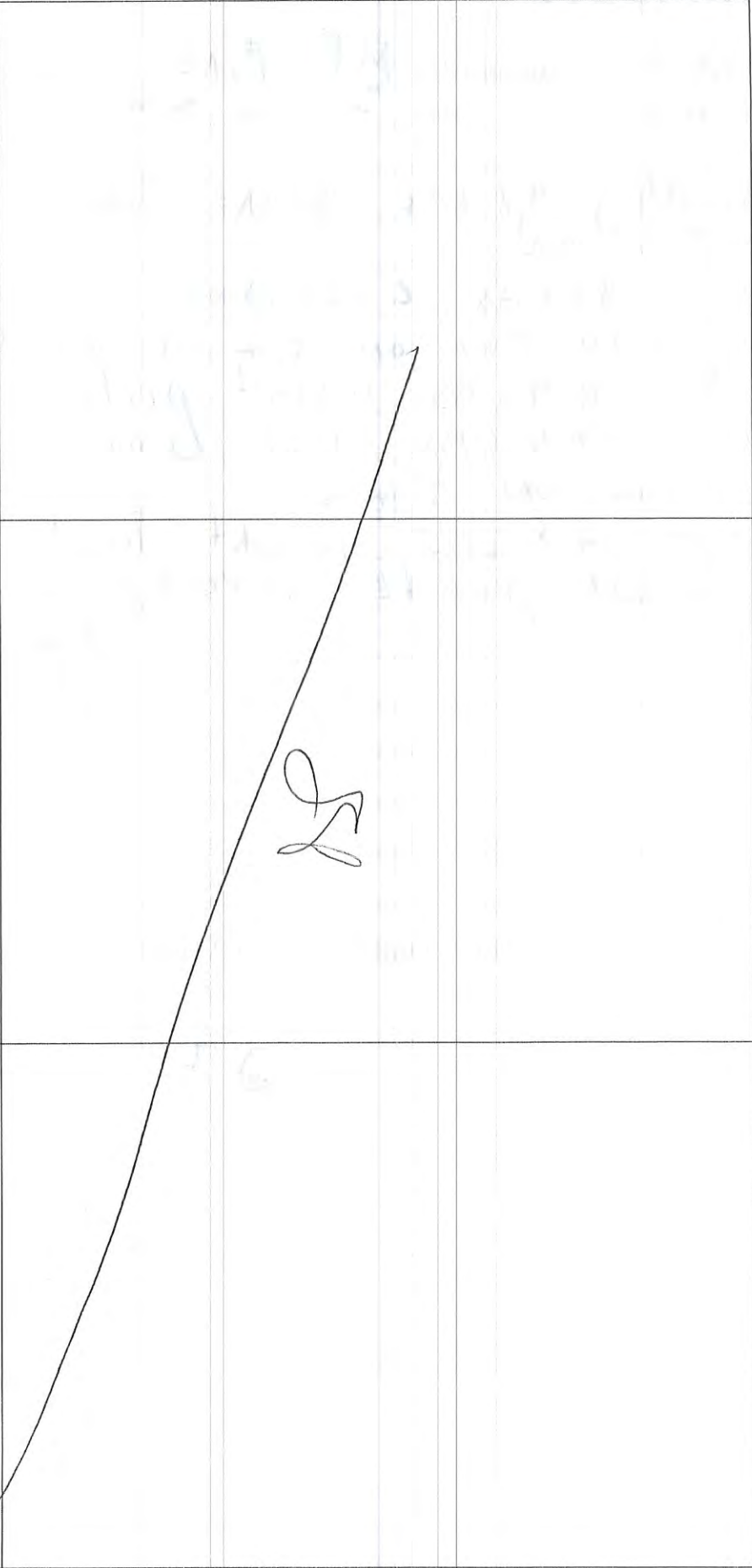
- Kindling 4,2 LBS START FIRE
- Fan ON
- At 3,8 LBS close DOOR
- laisse Fan ON 5 minute (close Fan 2,2 LBS)
- At 0,9 LBS in shift pre load
- At 13,10 LBS close DOOR
- Fan ON 5 min
- At 2,8 LBS in shift load
- laisse porte ouverte 2,5 min (2 min 30s)
- 1 min load
- 1,5 min porte ouverte

TEST LOAD CONFIGURATION

2:20



Date: _____ Manufacturer: _____ Model: _____
Project #: _____ Run: _____ Tech: _____ Reviewer: _____

Side view	Front view	Top view
		

Date: _____ Manufacturer: _____ Model: _____

Project #: _____ Run: _____ Tech: _____ Reviewer: _____

	ADDITION		SUBSTRACTION	
	ft3	Volume	ft3	Volume
V measure				
V ashlip				
%				
V usable				
Usable Firebox: _____				
Test load weight: _____		Minimum: _____		Maximum: _____
Déviation: _____				

DP

PRE / POST CHECKS

Date: 2016-09-15 Manufacturer: M F Fine Model: Melcher
 Project #: PI 2013c Run: 2 Tech: MM Reviewer: DP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-191	7:00	ok	ok

Pre-Test

Post-Test

Facility Conditions:

Air Velocity from less than 2 feet

20 (max50 Fpm)	24 (max50 Fpm)
----------------	----------------

Smoke Capture Check

ok	ok
----	----

Picture

4 sides ok	ok
------------	----

Wood Heater Conditions:

Date Wood Heater Stack Cleaned

2016-09-15

Date Dilution Tunnel Cleaned

2016-09-15

Induced Draft Check (max 0.005 H₂O)

ok

Traverse before ignition

ok

Flow Rate 140 cfm ±10%

ok

Temperature System:

Ambient (65°-90°F)

ok	°F
----	----

Wood Heater Surface (±125°F)

ok	°F
----	----

Proportional Checks:

Thermocouple check

ok

Pitot Clean

ok

Pitot verification

ok

Sampling Train ID Numbers:

Probe

Train 1 st hour	Train 1	Train 2
5	6	9
42	47	50
44	48	53
11	11	12
ok	ok	ok

Filter Front

Filter Back

Filter Thermocouple

Filter (<90°F)

SAMPLING EQUIPMENT CHECK OUT

Date: 2016-09-15 Manufacturer: MF FIRE Model: Muliben
 Project #: PI 20132 Run: 2 Tech: MM Reviewer: DP

Leakage Checks Tunnel Samplers

	System 1 st hour		System 1		System 2	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Unplugged Flow Rate = .25cfm						
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	433048.52	433274.85	433048.59	433274.89	374980.15	375680.54
Initial 1minute DGM (Liter)	433048.52	433274.84	433048.59	433274.89	374980.05	375680.48
Change © (Liter)	0	0.01	0	0	0.10	0.06
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	OK	OK	OK	OK	OK	OK

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre Test	Post Test
Vacuum (inches Hg.)	-5	-5
Rotometer Reading (mm/min.)	0	0
Flow Rate (lpm)	1.5	1.5
Allowable (.02 x Sample Rate)	30	30
Check OK	OK	OK

Leakage Checks Pitot

Plugged Probe	Pre Test 3 H2o static	Pre Test 0.4-0.5 H2o velocity	Post Test 3 H2o Static	Post Test 0.4-0.5 H2o velocity
Vacuum (inches Hg.)	3	.4	3	.5
Check OK (no change after 15 sec.)	OK	OK	OK	OK

Date: 2016-09-15 Manufacturer: MF FIRE Model: Mulcher
 Project #: PI 20132 Run: 2 Tech: MM Reviewer: BP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	4.4 lbs, Class F	4.4 lbs
Wood	EM-090	4.4 lbs, Class F	4.4 lbs
Analytical	EM-128	100mg, Class S	100mg
Analytical	EM-129	200 g, Class S	200 g

LIMITS OF WEIGHT RANGES

ANALYTICAL SCALE: 50%-150% of dry filter weight, ± 0.1 mg
PLATFORM SCALE: 20%-80% of ideal test load weight, ± 0.1 lbs or 1%
WOOD SCALE: 20%-80% of ideal test load weight, ± 0.01 lbs or 1%

Date: 2016-09-15 Manufacturer: M F F, Inc Model: Muliber
 Project #: PT 20132 Run: 2 Tech: MM Reviewer: BP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 102.6 (KPa.) Static pressure (P_q) 0.19 (inches w.c.)
 Inside diameter: Port A _____ Port B _____
 Tunnel cross sectional area: .1963Ft²
 Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H ₂ O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0.060 <u>0.060 mm</u>	72.08
B - Centroid	3.00	3.50	4	0.059	72.81
A-1	0.40	0.50	0.50	0.049	72.12
A-2	1.50	1.75	2	0.062	72.26
A-3	4.50	5.25	6	0.062	72.24
A-4	5.60	6.5	7.5	0.058	72.46
B-1	0.40	0.50	0.50	0.049	72.82
B-2	1.50	1.75	2	0.058	72.89
B-3	4.50	5.25	6	0.059	72.86
B-4	5.60	6.5	7.5	0.049	72.56
				AVERAGE	

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

Where,

C_p = pitot tube coefficient, dimension less = 0.99 for standard pitot.

Δ_p = manometer reading (inches H₂O)

T_s = average absolute dilution tunnel temperature (°F + 460)

P_s = absolute dilution tunnel gas pressure or $P_{bar} + P_{qg}$

P_q = static pressure in. H₂O
 { 13.6 }

M_s = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)

K_p = 85.49 pitot tube constant, (conversion factor for English units)

$\Delta_{p,avg}$ = average of the square roots of the velocity heads (Δ_p) measured at each traverse point.

Date: 2016-09-15 Manufacturer: M F FINE Model: Moltech
 Project #: PT 20132 Run: 2 Tech: MM Reviewer: DP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
	Actual	Should Be	Actual	Should Be	Actual	Should Be
CO	0	0	2,951	2,971	0,996	1,00
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO ₂	0	0	17,81	17,87	9,73	10,00
Tolerance CO ₂		+/- 0.02		+/- 0.5		+/- 0.5
O ₂ informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0,002	2,948	1,004	0,002	0.02	0,003	0.15	0,008	0.05	✓	
CO ₂	0	17,84	9,78	0	0.02	0,03	0.5	0,05	0.5	✓	
O ₂	na	na	na	-	na	-	na	-	na	✓	

TEST DATA LOG

Date: 20 Nov 09 15 Manufacturer: M F F I L E Model: Molecular
 Project #: PT 20132 Run: 2 Tech: MM Reviewer: SP

RAW DRY GAS METER READINGS

	System 1	System 2	Blank
Final (Liter)	433 773, 96	375 679, 58	518 74
Initial (Liter)	433 049, 22	374 980, 91	500, 72

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	102,6	102,5
Dry Bulb (F):	77,9	82,4
Humidity (%):	35,2	32,4

Flow Meter

	Start	End
Flow meter reading	N.D	N.D

Flow Meter Verification

	Before	After
Flow meter Check (liters)	N.D	N.D
Scale Weight (Kg)	N.D	N.D

FUEL DATA

Date: 2016-09-15

Manufacturer: M F F, A E

Model: Mulcahen

Project #: PI 20132

Run: 2

Tech: MM

Reviewer: SP

FUEL DESCRIPTION:

Type of wood:

PRE-TEST LOAD

Piece Size		Weight		Meter Moisture Content (% dry)*			
2	x 4 x 13 7/8 in.	164	lbs.	19.3		19.6	19.9
2	x 4 x 13 7/8 in.	1834	lbs.	19.8		20.1	20.6
2	x 4 x 13 7/8 in.	1779	lbs.	19.6		19.3	20.1
2	x 4 x 13 7/8 in.	1706	lbs.	19.8		20.9	20.0
2	x 4 x 13 7/8 in.	1648	lbs.	19.4		20.1	21.0
2	x 4 x 13 7/8 in.	1822	lbs.	19.3		19.5	19.8
2	x 4 x 13 7/8 in.	1714	lbs.	20.8		19.9	19.6
2	x 4 x 13 7/8 in.	1774	lbs.	20.6		20.3	20.6
x	x in.		lbs.				
x	x in.		lbs.				
x	x in.		lbs.				
x	x in.		lbs.				
x	x in.		lbs.				
x	x in.		lbs.				
x	x in.		lbs.				
x	x in.		lbs.				
x	x in.		lbs.				
x	x in.		lbs.				
x	x in.		lbs.				
x	x in.		lbs.				
x	x in.		lbs.				
x	x in.		lbs.				
x	x in.		lbs.				

TEST LOAD WEIGHT: 13,91 lbs

FUEL DATA

Date: 2016-09-15 Manufacturer: MF FINE Model: Mulechun
 Project #: PT 20132 Run: 2 Tech: MM Reviewer: SP

FUEL DESCRIPTION:

Type of wood :

TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*						
1 1/2 x 3/4 x 12 in.	1,96 lbs.	26.6	20.3	20.6	19.1	19.2		
1 1/2 x 3/4 x 12 in.	1,69 lbs.	20.9	19.9	19.6	20.1	19.6		
3 3/4 x 3/4 x 12 in.	4,036 lbs.	19.6	19.4	19.3	21.0	20.9		
3 1/2 x 3/4 x 12 in.	3,904 lbs.	19.1	19.6	19.5	20.1	20.6		
1 1/2 x 3/4 x 5 in.	0,094 lbs.			19.6				
1 1/2 x 3/4 x 5 in.	0,098 lbs.			19.3				
1 1/2 x 3/4 x 5 in.	0,094 lbs.			19.2				
1 1/2 x 3/4 x 5 in.	0,106 lbs.			20.1				
1 1/2 x 3/4 x 5 in.	0,092 lbs.			19.3				
1 1/2 x 3/4 x 5 in.	0,100 lbs.			19.4				
1 1/2 x 3/4 x 5 in.	0,100 lbs.			20.1				
1 1/2 x 3/4 x 5 in.	0,100 lbs.			19.3				
1 1/2 x 3/4 x 5 in.	0,090 lbs.			19.6				
1 1/2 x 3/4 x 5 in.	0,096 lbs.			19.5				
1 1/2 x 3/4 x 5 in.	0,096 lbs.			19.5				
1 1/2 x 3/4 x 5 in.	0,098 lbs.			19.4				
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							
x x in.	lbs.							

TEST LOAD WEIGHT: 12,78 lbs Min 20%: 2,56 Max 25%: 3,20

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2016-09-14 Manufacturer: MF P, LLC Model: Mulcahan

Project #: PI 132 Run: 2 Tech: MM Reviewer: DO

Pre-test Weight Record		SYSTEM 1 - 1 st hour						SYSTEM 1						
Date	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank
2016-09-14	19:15	61,5067	0,1256	0,1256	10,1907	61,3770	0,1277	0,1295	10,2001	61,3771	0,1276	0,1294	10,2002	0,1241
2016-09-15	17:00	61,5068	0,1255	0,1257	10,1908	61,3771	0,1276	0,1294	10,2002	61,3771	0,1276	0,1294	10,2002	0,1241

Post-test Weight Record		SYSTEM 1 - 1 st hour						SYSTEM 1						
Date	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank
2016-09-15	20:15	61,5072	0,1270	0,1259	10,1931	61,3772	0,1284	0,1296	20,2015 ^{MM}	61,3772	0,1284	0,1296	10,2015 ^{MM}	0,1243
2016-09-24	8:00	61,5072	0,1267	0,1258	10,1918	61,3772	0,1282	0,1295	10,2007	61,3772	0,1282	0,1295	10,2006	0,1242
2016-09-28	8:00	61,5072	0,1267	0,1258	10,1912	61,3772	0,1282	0,1295	10,2006	61,3772	0,1282	0,1295	10,2006	0,1242
2016-09-30	8:00	61,5072	0,1267	0,1259	10,1911	61,3772	0,1282	0,1295	10,2006	61,3772	0,1282	0,1295	10,2006	0,1242

Date: 2016-09-15 Manufacturer: MF FALC Model: Muleibar
 Project #: PI10132 Run: 2 Tech: MR Reviewer: BP

SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2016-09-14	19:15	61,4478	0,1269	0,1261	9,9825
2016-09-15	17:00	61,4479	0,1268	0,1262	9,9826

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2016-09-15	20:15	61,4481	0,1289	0,1265	9,9844
		61,4481	0,1288	0,1264	9,9835
		61,4481	0,1288	0,1264	

APPENDIX 2: Proportionality results

Average	Average	Average						Average
15,29	Inlet +	Inlet +						0,235
	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	99,69	100,51	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
			PR1	PR2			Time	
Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
15,588	534,2	535,0			0,172	0,170	0	0,2327831
15,647	534,5	535,1	104,37	105,12	0,172	0,169	1	0,2326743
15,430	534,6	535,1	105,77	106,69	0,172	0,169	2	0,2293809
15,496	534,6	535,2	104,09	105,15	0,172	0,169	3	0,2315805
15,499	534,7	535,2	104,24	105,44	0,172	0,169	4	0,2315808
15,543	534,8	535,3	104,21	105,13	0,172	0,169	5	0,2320191
15,395	534,8	535,3	105,66	106,62	0,172	0,169	6	0,2293799
15,355	534,9	535,4	105,09	106,23	0,172	0,169	7	0,2293796
15,243	534,9	535,5	103,00	103,84	0,172	0,169	8	0,231143
15,299	534,9	535,5	101,34	102,31	0,172	0,169	9	0,2331013
15,319	534,9	535,5	100,44	101,65	0,172	0,169	10	0,2341954
15,189	534,9	535,5	101,27	102,07	0,172	0,169	11	0,2326745
15,310	534,9	535,6	100,10	101,31	0,172	0,169	12	0,2348448
15,393	534,9	535,6	99,58	100,66	0,172	0,169	13	0,2363532
15,075	534,9	535,6	101,46	102,35	0,172	0,169	14	0,2316156
15,236	534,9	535,6	100,33	100,98	0,172	0,169	15	0,2341963
15,374	535,0	535,6	99,17	99,81	0,172	0,169	16	0,2363536
15,201	535,0	535,6	100,41	101,11	0,172	0,169	17	0,2337626
15,197	535,0	535,7	100,22	101,15	0,172	0,169	18	0,2337638
15,484	535,0	535,7	98,45	99,57	0,172	0,169	19	0,238199
15,264	535,0	535,7	99,92	100,91	0,172	0,169	20	0,2348452
15,334	535,0	535,7	99,13	100,06	0,172	0,169	21	0,2359248
15,200	535,0	535,7	100,22	101,13	0,172	0,169	22	0,233757
15,335	535,0	535,7	99,28	100,22	0,172	0,169	23	0,2357081
15,402	535,0	535,7	98,95	99,98	0,172	0,169	24	0,2367821
15,162	535,0	535,8	100,74	101,59	0,172	0,169	25	0,2331107
15,382	535,1	535,8	99,31	100,31	0,172	0,169	26	0,236354
15,350	535,1	535,8	99,70	100,83	0,172	0,169	27	0,2357192
15,193	535,2	535,9	100,73	101,77	0,172	0,169	28	0,2331104
15,075	535,2	535,9	101,76	102,60	0,172	0,169	29	0,2311443
15,281	535,2	536,0	100,35	101,17	0,172	0,169	30	0,2341974
15,213	535,2	536,0	100,74	101,56	0,172	0,168	31	0,2331107
15,197	535,3	536,0	101,24	102,03	0,172	0,169	32	0,2328164
15,263	535,3	536,0	100,77	101,48	0,172	0,169	33	0,2337509
15,202	535,3	536,0	101,57	102,21	0,172	0,169	34	0,2326754
15,407	535,3	536,1	99,79	100,94	0,172	0,169	35	0,2357076
15,002	535,3	536,1	102,71	103,74	0,172	0,169	36	0,229381
15,319	535,3	536,1	100,40	101,47	0,172	0,169	37	0,2341963
15,250	535,3	536,1	101,25	102,14	0,172	0,169	38	0,2331106
15,299	535,3	536,2	101,33	101,74	0,172	0,169	39	0,2337481
15,200	535,4	536,2	101,68	102,79	0,172	0,169	40	0,2320202
15,353	535,4	536,2	100,96	102,00	0,172	0,169	41	0,2341966
15,407	535,5	536,3	100,72	101,58	0,172	0,169	42	0,2348459
15,189	535,6	536,3	101,89	102,96	0,172	0,169	43	0,2315825
15,108	535,6	536,4	102,13	103,22	0,171	0,169	44	0,2304186
15,249	535,6	536,4	101,51	101,99	0,172	0,168	45	0,2326754
15,338	535,7	536,5	100,72	101,33	0,172	0,168	46	0,2341971
15,461	535,7	536,5	99,99	100,60	0,172	0,168	47	0,2363543
15,467	535,8	536,5	99,72	100,17	0,172	0,169	48	0,2367824
15,395	535,8	536,6	99,63	100,49	0,172	0,169	49	0,2358898
15,247	535,8	536,6	100,42	101,47	0,172	0,169	50	0,2337643
15,305	535,8	536,6	99,73	100,55	0,172	0,169	51	0,2348459
15,186	535,9	536,6	100,35	101,55	0,171	0,168	52	0,233111
15,148	535,9	536,7	100,55	101,67	0,171	0,169	53	0,2326754

15,364	535,9	536,7	99,18	99,86	0,172	0,168	54	0,2360869
15,336	536,0	536,7	99,75	100,24	0,172	0,168	55	0,2357086
15,240	536,0	536,7	99,91	100,95	0,172	0,169	56	0,2341972
15,338	536,0	536,7	99,46	100,07	0,172	0,168	57	0,2357086
15,345	536,0	536,8	99,19	100,30	0,172	0,168	58	0,2357087
15,144	536,1	536,8	100,71	101,38	0,172	0,168	59	0,2326764
15,382	536,1	536,8	99,04	99,71	0,172	0,168	60	0,2363544
15,339	536,1	536,8	99,19	99,93	0,171	0,168	61	0,23571
15,154	536,1	536,8	100,45	101,46	0,172	0,168	62	0,2329636
15,232	536,2	536,9	99,97	100,75	0,172	0,169	63	0,2341974
15,193	536,2	536,9	100,14	100,94	0,172	0,168	64	0,2337647
15,218	536,2	537,0	99,64	100,52	0,172	0,168	65	0,2342044
15,188	536,3	537,0	100,09	100,83	0,172	0,168	66	0,2337644
15,252	536,3	537,0	99,28	100,09	0,172	0,168	67	0,2348467
15,305	536,3	537,0	98,82	99,89	0,171	0,168	68	0,2357098
15,345	536,3	537,0	98,90	99,61	0,171	0,168	69	0,2363554
15,109	536,4	537,1	100,37	101,19	0,172	0,168	70	0,2326764
15,115	536,4	537,1	100,61	101,25	0,172	0,168	71	0,232677
15,383	536,5	537,2	98,77	99,36	0,172	0,168	72	0,2367831
15,426	536,5	537,2	98,54	99,07	0,172	0,168	73	0,2374259
15,214	536,6	537,3	99,65	100,15	0,172	0,168	74	0,2341982
15,112	536,6	537,3	100,44	100,80	0,172	0,168	75	0,232692
15,105	536,6	537,3	100,24	101,06	0,172	0,168	76	0,2326779
15,303	536,6	537,3	99,05	99,92	0,171	0,168	77	0,2357098
15,374	536,7	537,4	98,68	99,54	0,172	0,168	78	0,2367844
15,246	536,7	537,3	99,15	100,21	0,171	0,168	79	0,2348474
15,437	536,7	537,4	97,99	98,82	0,171	0,168	80	0,2378522
15,125	536,7	537,4	99,79	100,66	0,171	0,168	81	0,2331126
15,194	536,8	537,5	99,45	100,16	0,171	0,168	82	0,2341988
15,358	536,8	537,5	98,57	99,18	0,171	0,168	83	0,2367844
15,230	536,9	537,5	99,26	99,88	0,172	0,168	84	0,234848
15,355	536,9	537,6	98,51	99,17	0,172	0,168	85	0,2367844
15,090	536,9	537,6	100,09	100,94	0,171	0,168	86	0,2326794
15,229	537,0	537,6	99,26	99,85	0,171	0,168	87	0,2348473
15,353	537,0	537,7	98,31	98,89	0,171	0,168	88	0,2367845
15,186	537,0	537,7	99,30	100,00	0,171	0,168	89	0,234199
15,040	537,0	537,7	100,56	100,96	0,171	0,168	90	0,2320228
15,415	537,1	537,7	97,96	98,90	0,172	0,168	91	0,2378545
15,112	537,1	537,7	100,24	100,77	0,172	0,168	92	0,2331128
15,282	537,2	537,8	98,63	99,41	0,172	0,168	93	0,2357118
15,347	537,2	537,8	98,26	99,02	0,171	0,168	94	0,236785
15,320	537,2	537,8	98,24	99,46	0,171	0,168	95	0,236357
15,275	537,2	537,8	98,84	99,48	0,171	0,168	96	0,2357112
15,388	537,3	537,9	98,43	98,70	0,172	0,168	97	0,2374273
15,230	537,3	537,9	98,90	99,64	0,172	0,168	98	0,2350827
15,163	537,3	537,9	99,37	99,96	0,171	0,168	99	0,2342026
15,135	537,2	537,9	99,56	100,24	0,172	0,168	100	0,2337657
15,334	537,1	537,9	98,10	99,15	0,171	0,168	101	0,2367848
15,372	537,1	537,9	97,60	98,76	0,171	0,168	102	0,2374267
15,136	537,2	537,9	99,55	100,28	0,171	0,168	103	0,2337656
15,167	537,2	537,9	99,31	100,27	0,171	0,168	104	0,2342013
15,266	537,2	537,9	98,99	99,37	0,172	0,168	105	0,2357107
15,213	537,3	538,0	99,42	99,88	0,172	0,168	106	0,2348482
15,269	537,4	538,0	98,67	99,31	0,172	0,168	107	0,2357076
15,171	537,5	538,1	99,24	99,86	0,171	0,168	108	0,2341997
15,327	537,6	538,2	98,09	98,96	0,171	0,168	109	0,2365713
15,474	537,7	538,3	97,02	97,78	0,171	0,168	110	0,2389179
15,538	537,7	538,3	96,63	97,41	0,171	0,168	111	0,239979
15,660	537,8	538,4	96,07	96,79	0,171	0,168	112	0,2418746
15,349	537,8	538,4	98,06	98,96	0,171	0,168	113	0,2371431
15,423	537,8	538,5	97,52	98,24	0,171	0,168	114	0,2382809

15,322	537,9	538,5	97,97	98,79	0,171	0,168	115	0,2367855
15,155	537,9	538,5	99,06	99,85	0,171	0,168	116	0,2342003
15,292	537,9	538,6	98,13	98,81	0,171	0,168	117	0,2363574
15,391	537,9	538,6	97,51	98,03	0,171	0,167	118	0,2378556
15,415	538,0	538,7	97,75	98,11	0,171	0,168	119	0,2382809
15,313	538,0	538,7	97,83	98,85	0,171	0,168	120	0,2367895
15,287	538,0	538,7	98,24	99,15	0,171	0,168	121	0,2363446
15,283	538,0	538,7	97,93	99,08	0,171	0,168	122	0,2363093
15,382	538,0	538,8	97,53	98,17	0,171	0,168	123	0,237856
15,188	538,0	538,8	98,68	99,43	0,171	0,168	124	0,2348496
15,352	538,0	538,8	97,49	98,33	0,171	0,168	125	0,237428
15,378	538,1	538,8	97,44	98,29	0,171	0,168	126	0,2378559
15,306	538,1	538,8	97,93	98,92	0,171	0,168	127	0,2367861
15,444	538,1	538,8	97,11	97,77	0,171	0,168	128	0,2389205
15,277	538,1	538,8	97,88	98,93	0,171	0,168	129	0,236358
15,273	538,1	538,8	98,12	98,59	0,171	0,168	130	0,2363578
15,297	538,1	538,8	97,60	98,57	0,171	0,168	131	0,2367867
15,131	538,1	538,8	98,62	99,60	0,171	0,168	132	0,2342009
15,339	538,1	538,8	97,63	98,38	0,171	0,168	133	0,2374288
15,297	538,1	538,9	97,80	98,69	0,171	0,168	134	0,2367858
15,298	538,2	538,9	98,00	98,69	0,171	0,168	135	0,2367866

Average	Average	Average						Average
15,88	Inlet +	Inlet +						0,242
	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	99,98	100,96	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
			PR1	PR2			Time	
Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
15,951	540,5	541,3			0,174	0,170	0	0,2363608
16,195	540,6	541,3	104,82	105,85	0,173	0,170	1	0,2389238
16,286	540,7	541,3	104,66	105,20	0,173	0,170	2	0,2400075
15,943	540,7	541,4	105,31	106,45	0,173	0,170	3	0,2363649
16,119	540,7	541,4	104,47	105,44	0,173	0,170	4	0,2389235
15,991	540,7	541,4	105,41	106,40	0,173	0,170	5	0,2367896
16,081	540,7	541,4	104,94	105,97	0,173	0,170	6	0,2378597
15,788	540,7	541,4	106,41	107,06	0,173	0,169	7	0,2342043
16,088	540,8	541,5	101,20	101,91	0,173	0,169	8	0,242508
15,804	540,8	541,5	102,11	102,71	0,173	0,170	9	0,2393484
16,071	540,9	541,5	99,64	100,70	0,173	0,170	10	0,2439694
15,807	540,9	541,6	101,20	102,13	0,173	0,170	11	0,2404068
15,792	541,0	541,6	100,78	101,98	0,173	0,170	12	0,2404068
15,781	541,0	541,6	100,64	101,75	0,172	0,170	13	0,240407
15,940	541,0	541,7	99,89	100,78	0,173	0,170	14	0,2429618
16,069	541,0	541,7	98,94	99,57	0,173	0,170	15	0,2449876
15,953	541,0	541,7	99,76	100,61	0,173	0,170	16	0,243344
15,952	541,0	541,7	99,67	100,30	0,173	0,170	17	0,2433439
16,018	541,1	541,7	99,26	99,86	0,173	0,169	18	0,2443849
15,886	541,1	541,8	99,83	100,88	0,173	0,170	19	0,2424099
16,143	541,1	541,8	98,30	99,30	0,173	0,170	20	0,2464539
15,931	541,1	541,8	99,35	100,10	0,173	0,170	21	0,2433441
15,767	541,1	541,8	100,48	101,14	0,173	0,169	22	0,24083
15,831	541,2	541,8	100,09	100,86	0,173	0,170	23	0,2418805
15,732	541,2	541,8	100,35	101,49	0,173	0,170	24	0,2404064
16,084	541,2	541,8	98,24	99,36	0,173	0,170	25	0,2458349
15,894	541,2	541,8	99,24	100,57	0,173	0,170	26	0,242951
15,993	541,2	541,9	98,83	99,55	0,173	0,170	27	0,2443859
15,930	541,2	541,9	99,53	100,20	0,173	0,169	28	0,2433446
15,982	541,2	541,9	99,24	99,98	0,173	0,170	29	0,2439713
15,594	541,2	541,9	101,86	102,55	0,173	0,169	30	0,2379432
15,899	541,3	541,9	99,81	100,74	0,173	0,170	31	0,2425093
15,900	541,3	541,9	99,93	100,62	0,173	0,170	32	0,2425095
15,855	541,3	542,0	100,04	101,12	0,173	0,170	33	0,2418801
15,893	541,3	542,0	99,66	101,03	0,173	0,170	34	0,242509
15,816	541,3	542,0	100,59	101,34	0,173	0,170	35	0,2412213
15,757	541,4	542,0	100,78	101,49	0,173	0,170	36	0,2404077
15,945	541,4	542,0	99,84	100,17	0,173	0,169	37	0,2433029
15,948	541,4	542,0	99,31	100,53	0,173	0,170	38	0,2433449
15,732	541,4	542,1	100,83	101,90	0,173	0,170	39	0,2399844
15,895	541,5	542,1	99,56	100,95	0,172	0,170	40	0,2425099
15,895	541,5	542,1	99,91	100,84	0,173	0,170	41	0,242509
15,697	541,5	542,2	101,58	102,03	0,173	0,170	42	0,2393581
15,967	541,6	542,2	99,50	100,45	0,173	0,170	43	0,2433448
15,953	541,6	542,2	99,91	100,66	0,173	0,170	44	0,2429274
15,959	541,6	542,2	99,93	100,53	0,173	0,169	45	0,2429278
15,971	541,6	542,3	99,78	101,15	0,173	0,170	46	0,2429288
15,734	541,6	542,3	101,17	102,59	0,172	0,170	47	0,2391904
16,053	541,6	542,3	99,63	100,31	0,172	0,170	48	0,2439707
15,758	541,7	542,3	101,50	102,52	0,173	0,170	49	0,2394051
15,833	541,7	542,3	101,45	101,88	0,173	0,169	50	0,2404075
15,767	541,8	542,4	101,97	102,37	0,173	0,169	51	0,2393496
16,028	541,8	542,4	99,90	100,68	0,173	0,169	52	0,243345
16,026	541,8	542,5	99,84	100,72	0,173	0,169	53	0,2433447

15,996	541,9	542,5	99,83	101,07	0,172	0,170	54	0,2429282
15,802	541,9	542,5	100,98	102,44	0,172	0,170	55	0,2399845
15,859	541,9	542,5	100,73	102,04	0,172	0,170	56	0,2408294
15,973	541,9	542,5	100,17	101,07	0,172	0,170	57	0,2425095
15,934	541,9	542,6	100,88	101,60	0,173	0,170	58	0,2418817
15,974	542,0	542,6	100,11	101,00	0,173	0,170	59	0,2425097
15,970	542,0	542,6	100,28	101,07	0,173	0,169	60	0,2425102
16,016	542,0	542,6	99,57	100,97	0,172	0,170	61	0,2433456
15,840	542,0	542,6	100,72	101,60	0,172	0,170	62	0,24091
15,725	542,1	542,6	101,19	102,36	0,173	0,170	63	0,2393499
15,810	542,1	542,7	100,38	101,37	0,172	0,169	64	0,2408297
16,038	542,1	542,7	99,03	100,02	0,172	0,169	65	0,2443858
15,900	542,1	542,7	99,77	100,47	0,173	0,169	66	0,2425099
15,949	542,2	542,8	99,44	100,31	0,173	0,169	67	0,2433458
16,052	542,1	542,8	98,46	99,50	0,172	0,169	68	0,2450085
15,934	542,2	542,8	99,33	100,28	0,172	0,169	69	0,2433457
15,769	542,2	542,8	100,06	101,22	0,172	0,170	70	0,240832
15,833	542,2	542,8	99,52	100,81	0,172	0,170	71	0,2418806
15,737	542,2	542,9	100,49	101,55	0,172	0,170	72	0,2404096
15,899	542,3	542,9	99,32	100,39	0,173	0,170	73	0,242929
15,702	542,3	542,9	100,73	101,43	0,173	0,169	74	0,2399719
15,924	542,3	542,9	99,26	99,96	0,173	0,169	75	0,2433455
15,579	542,3	542,9	101,50	102,35	0,173	0,169	76	0,2380658
15,967	542,3	542,9	98,83	99,91	0,173	0,169	77	0,2439714
15,757	542,4	542,9	100,25	101,08	0,172	0,169	78	0,24083
15,867	542,4	543,0	99,40	100,30	0,172	0,169	79	0,2425099
15,728	542,4	543,0	100,35	101,28	0,172	0,169	80	0,2404087
15,724	542,4	543,0	100,40	101,05	0,173	0,169	81	0,2404084
15,752	542,4	543,0	99,90	100,90	0,172	0,169	82	0,2408296
15,922	542,4	543,0	98,99	99,99	0,172	0,169	83	0,2433803
15,959	542,5	543,0	98,58	100,03	0,172	0,170	84	0,2439713
15,730	542,4	543,0	100,17	101,56	0,172	0,170	85	0,2404647
15,657	542,4	543,0	100,88	101,70	0,172	0,170	86	0,23935
15,862	542,5	543,1	99,45	100,30	0,173	0,169	87	0,2425097
15,985	542,5	543,1	98,75	99,48	0,173	0,169	88	0,2443992
15,823	542,5	543,0	99,63	100,67	0,172	0,169	89	0,2418809
15,961	542,5	543,1	98,90	99,72	0,172	0,169	90	0,2439709
15,962	542,5	543,1	98,77	99,94	0,172	0,169	91	0,2439708
15,828	542,5	543,1	99,54	100,98	0,172	0,170	92	0,2418819
15,899	542,6	543,1	99,48	100,40	0,172	0,170	93	0,2429288
15,763	542,6	543,2	100,24	101,15	0,173	0,170	94	0,2408296
15,994	542,6	543,2	99,03	99,59	0,173	0,169	95	0,2443858
15,897	542,6	543,2	99,11	100,41	0,173	0,169	96	0,242929
15,660	542,6	543,2	100,68	101,56	0,172	0,169	97	0,2393499
15,963	542,6	543,2	98,58	99,87	0,172	0,169	98	0,2439712
15,631	542,7	543,2	101,01	101,93	0,172	0,169	99	0,2389261
15,626	542,7	543,2	101,28	101,99	0,173	0,170	100	0,2389264
15,984	542,7	543,2	98,55	99,49	0,173	0,169	101	0,2443867
15,949	542,7	543,2	98,84	99,68	0,172	0,169	102	0,2439713
15,901	542,7	543,3	99,02	99,78	0,173	0,169	103	0,2433458
15,704	542,7	543,3	99,98	101,29	0,172	0,169	104	0,2404082
15,678	542,7	543,3	99,95	101,33	0,172	0,170	105	0,2399858
15,799	542,7	543,3	99,56	100,54	0,172	0,169	106	0,2418818
15,901	542,7	543,3	98,95	100,17	0,172	0,170	107	0,2433454
15,616	542,7	543,3	101,12	101,95	0,173	0,170	108	0,2389268
15,743	542,7	543,3	100,39	100,87	0,173	0,169	109	0,2408293
15,980	542,7	543,3	98,58	99,35	0,173	0,169	110	0,2443868
15,543	542,7	543,3	101,27	102,41	0,172	0,169	111	0,2377489
15,691	542,7	543,3	100,19	101,59	0,172	0,170	112	0,2399857
15,908	542,7	543,3	98,72	100,10	0,172	0,170	113	0,2433461
15,870	542,7	543,4	98,90	100,25	0,172	0,170	114	0,2429296

15,922	542,8	543,4	98,72	99,71	0,172	0,170	115	0,2438076
15,863	542,8	543,4	99,19	99,85	0,173	0,169	116	0,2429164
15,795	542,8	543,4	99,54	100,42	0,173	0,169	117	0,2418818
16,026	542,8	543,4	97,95	99,15	0,172	0,169	118	0,245438
15,929	542,8	543,4	98,54	99,32	0,172	0,169	119	0,2439717
15,717	542,8	543,4	99,78	101,00	0,172	0,169	120	0,24083
15,986	542,8	543,4	98,06	99,29	0,172	0,170	121	0,245009
15,545	542,8	543,4	101,25	102,31	0,173	0,170	122	0,2382874
15,877	542,8	543,4	98,63	99,83	0,173	0,170	123	0,24339
15,818	542,8	543,4	99,18	99,98	0,172	0,169	124	0,2425105
15,942	542,8	543,4	98,13	99,29	0,172	0,169	125	0,2443847
15,919	542,8	543,4	98,56	99,57	0,172	0,169	126	0,2439716
15,850	542,8	543,4	98,88	100,35	0,172	0,170	127	0,2429287
15,917	542,8	543,4	98,34	99,82	0,172	0,170	128	0,243971
15,872	542,8	543,4	98,71	99,73	0,172	0,170	129	0,2433458
15,982	542,8	543,4	98,12	99,57	0,172	0,170	130	0,2450082
16,000	542,8	543,5	97,96	98,71	0,172	0,170	131	0,245423
15,847	542,8	543,5	98,41	99,50	0,172	0,169	132	0,2433461
15,909	542,8	543,5	98,22	99,08	0,172	0,169	133	0,244386
15,782	542,8	543,5	98,64	99,99	0,172	0,169	134	0,24251
15,805	542,8	543,4	98,37	99,58	0,172	0,169	135	0,2429286
15,634	542,8	543,4	99,73	100,97	0,172	0,170	136	0,2404088
15,866	542,8	543,4	98,18	99,45	0,172	0,170	137	0,2439711
15,955	542,8	543,4	97,78	98,75	0,172	0,170	138	0,2454231

APPENDIX 3: Calibration data



CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-001 24/02/16

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9101
Précision requise:	+/- 2.0°C
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	Type d'entrée:	Temp
Manufacturier:	Fluke	Type de sortie:	Digitale
No. Model:	52-II	Type de mesure:	Température
No. Série:	90630037	Gamme:	Divers
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	No. du certificat d'étalonnage:	AC15061429-7798010
No. Série:	7798010	Dernière date d'étalonnage:	22-Jun-15
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	22-Jun-16
Commentaire:			

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.0 °C	0.0 °C	0.0 °C	0.0 °C	0.00 °C	1.0 °C	T1 typeJ
125.0 °C	125.0 °C	125.0 °C	0.0 °C	125.0 °C	1.0 °C	T1 typeJ
250.0 °C	250.0 °C	250.0 °C	0.0 °C	250.0 °C	1.0 °C	T1 typeJ
375.0 °C	375.0 °C	375.0 °C	0.0 °C	375.0 °C	1.0 °C	T1 typeJ
500.0 °C	500.0 °C	500.0 °C	0.0 °C	500.0 °C	1.0 °C	T1 typeJ
0.0 °C	0.0 °C	0.0 °C	0.0 °C	0.0 °C	1.0 °C	T2 typeJ
125.0 °C	125.0 °C	125.0 °C	0.0 °C	125.0 °C	1.0 °C	T2 typeJ
250.0 °C	250.0 °C	250.0 °C	0.0 °C	250.0 °C	1.0 °C	T2 typeJ
375.0 °C	375.0 °C	375.0 °C	0.0 °C	375.0 °C	1.0 °C	T2 typeJ
500.0 °C	500.0 °C	500.0 °C	0.0 °C	500.0 °C	1.0 °C	T2 typeJ
0.0 °C	0.0 °C	0.1 °C	0.1 °C	0.1 °C	1.0 °C	T1 typeK
125.0 °C	125.0 °C	125.2 °C	0.2 °C	125.2 °C	1.0 °C	T1 typeK
250.0 °C	250.0 °C	250.2 °C	0.2 °C	250.2 °C	1.0 °C	T1 typeK
375.0 °C	375.0 °C	375.2 °C	0.2 °C	375.2 °C	1.0 °C	T1 typeK
500.0 °C	500.0 °C	500.2 °C	0.2 °C	500.2 °C	1.0 °C	T1 typeK
0.0 °C	0.0 °C	0.2 °C	0.2 °C	0.2 °C	1.0 °C	T2 typeK
125.0 °C	125.0 °C	125.3 °C	0.3 °C	125.3 °C	1.0 °C	T2 typeK
250.0 °C	250.0 °C	250.2 °C	0.2 °C	250.2 °C	1.0 °C	T2 typeK
375.0 °C	375.0 °C	375.2 °C	0.2 °C	375.2 °C	1.0 °C	T2 typeK
500.0 °C	500.0 °C	500.2 °C	0.2 °C	500.2 °C	1.0 °C	T2 typeK

Conditions Environnementales: Température: 23 °C Humidité: 24 %RH

Type d'Étalonnage:

[Signature]
2016-03-01

5F09101



CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-001 24/02/16

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9101
Précision requise:	+/- 2.0°C
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	Type d'entrée:	Temp
Manufacturier:	Fluke	Type de sortie:	Digitale
No. Model:	52-II	Type de mesure:	Température
No. Série:	90630037	Gamme:	Divers
Emplacement:	N.A.	Conditions Enviro:	Normale

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	24 Février 2016
Date du prochain Étalonnage:	24 Février 2017
Date d'émission du certificat:	24 Février 2016

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien



CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-006 24/02/16

CLIENT		SPÉCIFICATION DE CALIBRATION	
Compagnie:	Services Polytests Inc	Procédure de service:	4IN9106
Adresse:	695 B rue Gaudette	Précision requise:	+/-0.25"H2O
	St-Jean-sur-Richelieu, Québec, J3B 7S7	Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Indicateur	Type d'entrée:	Pression
Manufacturier:	Dwyer	Type de sortie:	Digitale
No. Model:	MS-321-LCD	Type de mesure:	Pression
No. Série:	E47U020014	Gamme:	0-0.5"H2O
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Setra	No. du certificat d'étalonnage:	AC16021060-2784759
No. Série:	2784759	Dernière date d'étalonnage:	3-Feb-16
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	3-Feb-17
Commentaire:			

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.0000 "H2O	0.000 "H2O	0.000 "H2O	0.000 "H2O	0.000 "H2O	0.25 "H2O	
0.1500 "H2O	0.150 "H2O	0.151 "H2O	0.001 "H2O	0.151 "H2O	0.25 "H2O	
0.2500 "H2O	0.250 "H2O	0.251 "H2O	0.001 "H2O	0.251 "H2O	0.25 "H2O	
0.3500 "H2O	0.350 "H2O	0.349 "H2O	-0.001 "H2O	0.349 "H2O	0.25 "H2O	
0.5000 "H2O	0.500 "H2O	0.493 "H2O	-0.007 "H2O	0.493 "H2O	0.25 "H2O	
Conditions Environnementales: Température: 23 °C Humidité: 24 %RH						
Type d'Étalonnage:						

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	24 Février 2016
Date du prochain Étalonnage:	24 Février 2017
Date d'émission du certificat:	24 Février 2016

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système International d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien



CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-007 24/02/16

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9106
Précision requise:	+/- 0.25"H2O
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Indicateur	Type d'entrée:	Pression
Manufacturier:	Dwyer	Type de sortie:	Digitale
No. Model:	MS-321-LCD	Type de mesure:	Pression
No. Série:	E23S020111/12	Gamme:	0-0.5"H2O
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Setra	No. du certificat d'étalonnage:	AC16021060-2784759
No. Série:	2784759	Dernière date d'étalonnage:	3-Feb-16
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	3-Feb-17
Commentaire:			

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.0000 "H2O	0.0000 "H2O	0.0000 "H2O	0.0000 "H2O	0.0000 "H2O	0.25 "H2O	
0.1500 "H2O	0.1500 "H2O	0.1521 "H2O	0.0021 "H2O	0.1521 "H2O	0.25 "H2O	
0.2500 "H2O	0.2500 "H2O	0.2520 "H2O	0.0020 "H2O	0.2520 "H2O	0.25 "H2O	
0.3500 "H2O	0.3500 "H2O	0.3528 "H2O	0.0028 "H2O	0.3528 "H2O	0.25 "H2O	
0.5000 "H2O	0.5000 "H2O	0.5063 "H2O	0.0063 "H2O	0.5063 "H2O	0.25 "H2O	
Conditions Environnementales: Température: 23 °C Humidité: 24 %RH						
Type d'Étalonnage:						

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	24 Février 2016
Date du prochain Étalonnage:	24 Février 2017
Date d'émission du certificat:	24 Février 2016

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exacritude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien

5F09106



CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-015 24/02/16

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9101
Précision requise:	+/- 2°C
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	Type d'entrée:	Temp
Manufacturier:	Keithley	Type de sortie:	Digitale
No. Model:	7700	Type de mesure:	Température
No. Série:	1213648	Gamme:	Divers
Emplacement:	EM-047	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	No. du certificat d'étalonnage:	AC15061429-7798010
No. Série:	7798010	Dernière date d'étalonnage:	22-Jun-15
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	22-Jun-16
Commentaire:			

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
-190.0 °C	-190.0 °C	-190.6 °C	-0.6 °C	-190.6 °C	1.0 °C	Input#1TypeK
0.0 °C	0.0 °C	-0.3 °C	-0.3 °C	-0.3 °C	1.0 °C	Input#1TypeK
750.0 °C	750.0 °C	749.7 °C	-0.3 °C	749.7 °C	1.0 °C	Input#1TypeK
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	1.0 °C	Input#2 TypeK
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	1.0 °C	Input#3 TypeK
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	1.0 °C	Input#4 TypeK
100.0 °C	100.0 °C	99.5 °C	-0.5 °C	99.5 °C	1.0 °C	Input#5TypeK
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	1.0 °C	Input#6TypeK
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	1.0 °C	Input#7TypeK
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	1.0 °C	Input#8TypeK
100.0 °C	100.0 °C	99.5 °C	-0.5 °C	99.5 °C	1.0 °C	Input#9TypeK
100.0 °C	100.0 °C	99.8 °C	-0.2 °C	99.8 °C	1.0 °C	Input#10TypeJ
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#11TypeJ
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#12TypeJ
100.0 °C	100.0 °C	99.8 °C	-0.2 °C	99.8 °C	1.0 °C	Input#13 TypeJ
100.0 °C	100.0 °C	99.8 °C	-0.2 °C	99.8 °C	1.0 °C	Input#14TypeJ
100.0 °C	100.0 °C	99.8 °C	-0.2 °C	99.8 °C	1.0 °C	Input#15 TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#16TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#17TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#18TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#19TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#20TypeJ
12.000 mA	12.000 mA	12.001 mA	0.001 mA	12.001 mA	1.00 mA	Input#21
12.000 mA	12.000 mA	12.002 mA	0.002 mA	12.002 mA	1.00 mA	Input#22
Conditions Environnementales: Température: 21 °C Humidité: 21 %RH						



CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-015 24/02/16

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9101
Précision requise:	+/- 2°C
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	Type d'entrée:	Temp
Manufacturier:	Keithley	Type de sortie:	Digitale
No. Model:	7700	Type de mesure:	Température
No. Série:	1213648	Gamme:	Divers
Emplacement:	EM-047	Conditions Enviro:	Normale
Type d'Étalonnage:		Test avec EM-047	

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	24 Février 2016
Date du prochain Étalonnage:	24 Février 2017
Date d'émission du certificat:	24 Février 2016

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien

2016-03-01



CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-047 05/02/15

CLIENT		SPÉCIFICATION DE CALIBRATION	
Compagnie:	Services Polytests Inc	Procédure de service:	4IN9101
Adresse:	695 B rue Gaudette	Précision requise:	+/-2°C
	St-Jean-sur-Richelieu, Québec, J3B 7S7	Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	Type d'entrée:	Temp
Manufacturier:	Keithley	Type de sortie:	Digitale
No. Model:	2700	Type de mesure:	Température
No. Série:	1217093	Gamme:	Divers
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	No. du certificat d'étalonnage:	AC15011147-8180008
No. Série:	8180008	Dernière date d'étalonnage:	15-Jan-15
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	15-Apr-15

Commentaire:

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
Voir Commentaire						
Conditions Environnementales:			Température: 20 °C	Humidité: 24 %RH		
Type d'Étalonnage: Data Acquisition system Conforme						
Carte1: EM-154						
Carte2: EM-015						

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabriquant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	5 Février 2015
Date du prochain Étalonnage:	5 Février 2016
Date d'émission du certificat:	5 Février 2015

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien

2015-02-15

CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

Client :	Polytests	No. du Certificat :	122-3A7009-161-1649
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	Date d'étalonnage :	22-09-2016

Technicien:
Auclair, François



David Llorens, Responsable Qualité

DESCRIPTION DU SERVICE:

Modèle de Balance :	AR2140	Méthode :	ISO 17025
Manufacturier :	Ohaus	Date d'approbation :	22-09-2016
Numéro de Série :	M3658329010091	Date prochain étalonnage :	22-09-2017
Numéro d'identification :	EM-051	accréditation CCN n. :	668
Capacité :	210g	Certification CLAS n. :	2010-01
Résolution:	0.0001g		

Condition d'essai : Temp °C: 25.1 Pression kPa: 101.9 Humidité %: 45.5

Note: Les conditions environnementales ne sont pas utilisées dans le calcul de l'incertitude.

CETTE BALANCE RENCONTRE LES SPÉCIFICATIONS SUIVANTES:

Type de test :	Manufacturier
Excentricité:	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non
Linéarité:	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non
Sensibilité:	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non
Répétabilité:	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non

NOTES:

Cette balance a été certifiée selon la procédure de travail PDL-09-MG-010 (certification de balance analytique et à plateau) et la et la procédure PDL-09-MG-012 (détermination des incertitudes de pesées). Nos étalons sont certifiés à chaque année. Le droit d'auteur du présent certificat appartient au laboratoire délivreur et doit être reproduit intégralement, à moins d'une autorisation écrite du laboratoire délivreur.



2016.09.28

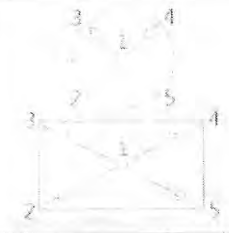
CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

Client :	Polytests	No. du Certificat :	122-3A7009-161-1649
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	Accréditation CCN n. :	668
Méthode :	ISO 17025	Certification CLAS n. :	2010-01
		Modèle de Balance :	AR2140
		Date d'étalonnage :	22-09-2016
		Date du prochain étalonnage :	22-09-2017

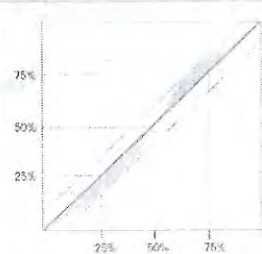
TEST D'EXCENTRICITÉ:

Poids Test: 100 g Tolérance 0.0004 g
(Note: Le Poids Test est taré au centre du plateau de pesée)

Position	Avant Ajustement	Après Ajustement	
1: Centre:	0.0000 g	---	
2: Avant Gauche:	0.0000 g	---	
3: Arrière Gauche:	0.0000 g	---	
4: Arrière Droit:	0.0000 g	---	
5: Avant Droit:	0.0000 g	---	
Résultats	0.0000 g	---	
STATUT	CONFORME	N/A	

TEST DE LINÉARITÉ:

Méthode: Substitution Plage: 210 g Poids Test: 50 g Tolérance: 0.0002 g

Pré-Charge	Avant Ajustement	Après Ajustement	
0.0000 g	50.0002 g	---	
50.0000 g	49.9998 g	---	
100.0000 g	49.9998 g	---	
150.0000 g	50.0002 g	---	
---	---	---	
---	---	---	
Résultats	0.00020 g	---	
STATUT	CONFORME	N/A	

TEST DE SENSIBILITÉ:

Valeur de masse conventionnelle: 200.0000 g Tolérance: 0.0004 g

	Avant Ajustement	Après Ajustement	
Lecture:	199.9998 g	---	$S = \frac{\Delta W}{\Delta m}$
Résultats:	0.0002 g	---	
STATUT	CONFORME	N/A	

CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

Client :	Polytests	No. du Certificat :	122-3A7009-161-1649
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	Accréditation CCN n. :	668
Méthode :	ISO 17025	Certification CLAS n. :	2010-01
		Modèle de Balance :	AR2140
		Date d'étalonnage :	22-09-2016
		Date du prochain étalonnage :	22-09-2017

TEST DE RÉPÉTABILITÉ:

AVANT AJUSTEMENT:

Charge Utilisée:
100.0000 gTolérance:
0.00010 gRésolution d'affichage:
0.0001 gMoyenne:
99.99979 gÉcart-type:
0.00006 g

#	Vide	Chargé	Différence
1	0.0000 g	99.9997 g	99.9997 g
2	0.0000 g	99.9998 g	99.9998 g
3	0.0000 g	99.9998 g	99.9998 g
4	0.0000 g	99.9997 g	99.9997 g
5	0.0000 g	99.9998 g	99.9998 g
6	0.0000 g	99.9998 g	99.9998 g
7	0.0000 g	99.9998 g	99.9998 g
8	0.0000 g	99.9999 g	99.9999 g
9	0.0000 g	99.9998 g	99.9998 g
10	0.0000 g	99.9998 g	99.9998 g

Statut : **CONFORME**

APRÈS AJUSTEMENT:

Charge Utilisée:
---Tolérance:
0.00010 gRésolution d'affichage:
0.0001 gMoyenne:
---Écart-type:

#	Vide	Chargé	Différence
1	---	---	---
2	---	---	---
3	---	---	---
4	---	---	---
5	---	---	---
6	---	---	---
7	---	---	---
8	---	---	---
9	---	---	---
10	---	---	---

Statut : **N/A**

2016-09-28

CERTIFICAT D'ÉTALONNAGE

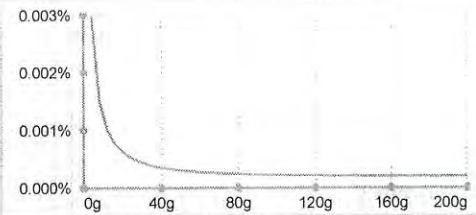
108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

INCERTITUDE AVANT AJUSTEMENT :

$$Uc = \sqrt{(u_{(cr)})^2 + s_p^2 + u_{(l)}^2 + u_{(dr)}^2 + u_{(s)}^2}$$

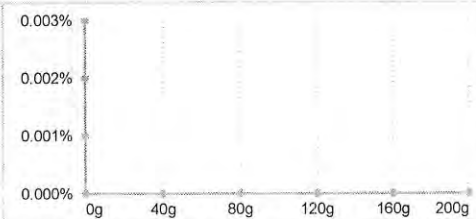
- u(cr)** = Incertitude reliée à l'étalon utilisé
- Sp** = Incertitude de l'écart-type
- u(l)** = Incertitude associée à la linéarité
- u(dr)** = Incertitude associée à résolution si Sp = 0
- u(s)** = Incertitude liée à la sensibilité (span)

Valeur	Incertitude	Incertitude (%)
12.5000 g	0.00016 g	0.001300 %
25.0000 g	0.00017 g	0.000673 %
50.0000 g	0.00019 g	0.000378 %
100.0000 g	0.00026 g	0.000256 %
200.0000 g	0.00059 g	0.000294 %



INCERTITUDE APRÈS AJUSTEMENT :

Valeur	Incertitude	Incertitude (%)
---	---	---
---	---	---
---	---	---
---	---	---



NOTES :

De ces valeurs d'incertitudes, seule la valeur surlignée est calculée selon ISO17025:2005, les autres étant estimées jusqu'au résultat de l'incertitude minimale. Dans le calcul de cette l'incertitude, l'écart-type utilisé est de 0,577d (où d est la précision d'affichage de la balance) lorsque cet écart-type est plus inférieur à 0,577d.

CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

RÉFÉRENCE

ENSEMBLE DE RÉFÉRENCE:

Référence	No de série	Fabricant	Date d'étalonnage
1mg - 5kg	DK000A161	Dispersion Laboratoire	29-08-2016

INCERTITUDES:

Les incertitudes que nous retrouvons comprennent :

3. *L'incertitude associée à l'étalon utilisé.*
2. *L'incertitude associée à l'écart-type.*
1. *L'incertitude associée à l'opération de pesage.*
4. *L'incertitude associée à la résolution de l'appareil.*

L'incertitude de l'opération de pesage comprend la reproductibilité à long terme.

Les incertitudes précisées dans ce rapport sont des incertitudes élargies représentant un niveau de confiance d'approximativement 95 %, obtenu en multipliant ensemble l'incertitude-type composée par un facteur de couverture de $k = 2$. Pour de plus amples renseignements, veuillez consulter la publication GUM (Guide pour l'expression de l'incertitude de mesure, édition de 1995).

TRAÇABILITÉ

Le Service d'évaluation de laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et a certifié des capacités d'étalonnage spécifiques de ce laboratoire et leur traçabilité à des étalons nationaux de mesure reconnus et au Système international d'unités (SI). Ce certificat d'étalonnage est émis conformément aux conditions de certification accordées par CLAS et aux conditions d'accréditation accordées par le Conseil canadien des normes (CCN). Le CLAS pas plus que le CCN ne peut garantir l'exactitude des étalonnages individuels effectués par des laboratoires accrédités.

REMARQUES:



2016-09-28


CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

Client :	Polytests	No. du Certificat :	123-259410-142
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	Date d'étalonnage :	30-10-2014

Technicien :
Simard, Catherine

Technicienne Métrologie



Pierre Trépanier, Directeur laboratoire

DESCRIPTION DU SERVICE:

Description des masses :	ASTM E617	Date d'approbation :	03-11-2014
Classe de précision :	ASTM 6	Date prochain étalonnage :	03-11-2015
Densité :	7.95g/cm ³	Accréditation CCN n. :	668
Identification (si unique) :	EM-090	Certification CLAS n. :	2010-01

Condition d'essai :	Temp °C: 20.605	Pression kPa: 101.2	Humidité: 46.785
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NOTES:

Pour l'étalonnage des masses, nous utilisons la procédure "Comparaison individuelle" PDL-09-MG-001 et la procédure "Détermination des incertitudes" PDL-09-MG-002. Le droit d'auteur du présent certificat appartient au laboratoire délivreur et doit être reproduit intégralement, à moins d'une autorisation écrite du laboratoire délivreur.

REMARQUES:



CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

Client : Polytests	No. du Certificat : 123-259410-142
Adresse : 695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	Accréditation CCN n. : 668
Masse : 2 kg	Certification CLAS n. : 2010-01
	Classe d'exactitude : ASTM 6
	Date d'étalonnage : 30-10-2014
	Date du prochain étalonnage : 03-11-2015

RÉSULTAT DE L'ÉTALONNAGE, MASSE CONVENTIONNELLE:

Valeur Nominale	No de série	No d'inventaire	Masse conventionnelle	Masse conventionnelle après ajustement	Tolérance ± (mg)	Incertitudes ± (mg)
2 kg		EM-090	2.0001350 kg		200 mg	2.0 mg

S'applique seulement pour les masses qui ont été ajustées

Hors-tolérance pour la classe spécifiée

CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
 www.dispersion.ca 1.866.390.5066

Client :	Polytests	No. du Certificat :	123-259410-142
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	Accréditation CCN n. :	668
		Certification CLAS n. :	2010-01
		Classe d'exactitude :	ASTM 6
Masse :	2 kg	Date d'étalonnage :	30-10-2014
		Date du prochain étalonnage :	03-11-2015

RÉSULTAT DE L'ÉTALONNAGE DES POIDS, CORRECTIONS:

Valeur Nominale	No de série	No d'inventaire	Masse conventionnelle Correction	Masse conventionnelle Correction après ajustement	Tolérance ± (mg)	Incertitudes ± (mg)
2 kg		EM-090	135.0 mg		200 mg	2.0 mg

S'applique seulement pour les masses qui ont été ajustées **Hors-tolérance pour la classe spécifiée**



CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

BALANCES UTILISÉES

Pour l'étalonnage manuel :

> 5 kg à 25 kg :	Mettler Toledo XP32003L, SNR 1123271214, max. 32100 g, d = 0.005 g
> 1 kg à 5 kg :	Mettler Toledo PR5003, SNR 1115311634, max. 5100 g, d = 0.001 g
> 300 g à 2 kg :	Mettler Toledo XP2004S, SNR B131185222, max. 2100 g, d = 0.1 mg
> 100 g à 200 g :	Mettler Toledo AT201 SNR BA1115230146, max. 205 g, d = 0.01 mg
> 5 g à 100 g :	Mettler Toledo AX106 SNR 1127063924, max. 111 g, d = 1 µg
1 mg à 5 g :	Mettler UMX5, SNR 1121103055, max. 5.1 g, d = 0.1 µg

Pour l'étalonnage automatisé :

> 200 g à 1 kg :	Mettler Toledo AX1005 SNR 1127063210, max. 1109 g, d = 0.01 mg
> 5 g à 100 g :	Mettler Toledo AX106 SNR 1120143015, max. 111 g, d = 1 µg
1 mg à 5 g :	Mettler UMX5, SNR 1125140561, max. 5.1 g, d = 0.1 µg

Les balances sont vérifiées selon notre procédure de contrôle périodique PDL-11-MG-001.

INCERTITUDES:

Les incertitudes que nous retrouvons comprennent :

1. *L'incertitude associée à l'opération de pesage.*
2. *L'incertitude associée à la densité de l'air.*
3. *L'incertitude associée à l'étalon utilisé.*
4. *L'incertitude associée à la densité de la masse à être étalonnée.*

L'incertitude de l'opération de pesage comprend la reproductibilité à long terme.

Les incertitudes précisées dans ce rapport sont des incertitudes élargies représentant un niveau de confiance d'approximativement 95 %, obtenu en multipliant ensemble l'incertitude-type composée par un facteur de couverture de $k = 2$. Pour de plus amples renseignements, veuillez consulter la publication GUM (Guide pour l'expression de l'incertitude de mesure, édition de 1995).

TRAÇABILITÉ

Le Service d'évaluation de laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et a certifié des capacités d'étalonnage spécifiques de ce laboratoire et leur traçabilité à des étalons nationaux de mesure reconnus et au Système international d'unités (SI). Ce certificat d'étalonnage est émis conformément aux conditions de certification accordées par CLAS et aux conditions d'accréditation accordées par le Conseil canadien des normes (CCN). Le CLAS pas plus que le CCN ne peut garantir l'exactitude des étalonnages individuels effectués par des laboratoires accrédités.

CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

RÉFÉRENCES UTILISÉES

Poids	No de série	Fabricant	Date d'étalonnage
20kg	69976	Troemner	18-03-2014
1kg - 1mg	MT-01	Mettler Toledo	04-09-2014
300g	96-0888-50-2	Denver Instrument Company	04-09-2014
2kg	96-0888-50-3	Denver Instrument Company	04-09-2014
2kg	129098	Mettler Toledo	04-09-2014
5kg	96-0888-50-3	Denver Instrument Company	04-09-2014
5kg	129099	Mettler Toledo	04-09-2014
10kg	129100	Mettler Toledo	14-08-2014

ÉTALONS CERTIFIÉS PAR LE CNRC:

Poids	No de série	Fabricant	Date d'étalonnage
100g	95170	Mettler Toledo	19-08-2014
1kg	95171	Mettler Toledo	02-05-2014

RÉFÉRENCES DE LA STATION ROBOTISÉE:

Poids	No de série	Fabricant	Date d'étalonnage
1kg - 1mg	DK000A133	Laboratoire Dispersion	04-09-2014
1kg - 1mg	DK000A132	Laboratoire Dispersion	01-02-2013



**Instrumentation
Saint-Laurent** inc.
Accrédité ISO 17025



80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Tél: (450) 473-6169
Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-126 24/02/16

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9106
Précision requise:	+/- 1"Hg
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Manomètre	Type d'entrée:	Pression
Manufacturier:	Dwyer	Type de sortie:	Digitale
No. Model:	DPG200	Type de mesure:	Pression
No. Série:	N.A.	Gamme:	0-28"Hg
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Crystal XP2i 300	No. du certificat d'étalonnage:	AC15061148-864490
No. Série:	864490	Dernière date d'étalonnage:	10-Jun-15
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	10-Jun-16
Commentaire:			

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	1 "Hg	
-7.50 "Hg	-7.50 "Hg	-7.60 "Hg	-0.10 "Hg	-7.60 "Hg	1 "Hg	
-15.00 "Hg	-15.00 "Hg	-15.20 "Hg	-0.20 "Hg	-15.20 "Hg	1 "Hg	
-22.50 "Hg	-22.50 "Hg	-22.80 "Hg	-0.30 "Hg	-22.80 "Hg	1 "Hg	
-28.00 "Hg	-28.00 "Hg	-28.37 "Hg	-0.37 "Hg	-28.37 "Hg	1 "Hg	
Conditions Environnementales: Température: 23 °C Humidité: 24 %RH						
Type d'Étalonnage:						

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabriquant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	24 Février 2016
Date du prochain Étalonnage:	24 Février 2017
Date d'émission du certificat:	24 Février 2016

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien



CERTIFICAT D'ÉTALONNAGE

No. Certificat: CE-EM-127 24/02/16

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9106
Précision requise:	+/- 1"Hg
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Manomètre	Type d'entrée:	Pression
Manufacturier:	Dwyer	Type de sortie:	Digitale
No. Model:	DPG200	Type de mesure:	Pression
No. Série:	N.A.	Gamme:	0-28"Hg
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Crystal XP2i 300	No. du certificat d'étalonnage:	AC15061148-864490
No. Série:	864490	Dernière date d'étalonnage:	10-Jun-15
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	10-Jun-16
Commentaire:			

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	1 "Hg	
-7.50 "Hg	-7.50 "Hg	-7.51 "Hg	-0.01 "Hg	-7.51 "Hg	1 "Hg	
-15.00 "Hg	-15.00 "Hg	-15.01 "Hg	-0.01 "Hg	-15.01 "Hg	1 "Hg	
-22.50 "Hg	-22.50 "Hg	-22.54 "Hg	-0.04 "Hg	-22.54 "Hg	1 "Hg	
-28.00 "Hg	-28.00 "Hg	-28.08 "Hg	-0.08 "Hg	-28.08 "Hg	1 "Hg	
Conditions Environnementales: Température: 23 °C Humidité: 24 %RH						
Type d'Étalonnage:						

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	24 Février 2016
Date du prochain Étalonnage:	24 Février 2017
Date d'émission du certificat:	24 Février 2016

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien

5F09106

CERTIFICAT D'ÉTALONNAGE


108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

Client :	Polytests	No. du Certificat :	900-259410-141
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	Date d'étalonnage :	03-11-2014

Technicien :

CB001,

Station d'étalonnage automatisée



Pierre Trépanier, Directeur laboratoire

DESCRIPTION DU SERVICE:

Description des masses :	ASTM E617	Date d'approbation :	03-11-2014
Classe de précision :	ASTM 1	Date prochain étalonnage :	03-11-2015
Densité :	7.95g/cm ³	Accréditation CCN n. :	668
Identification (si unique) :	(items multiples)	Certification CLAS n. :	2010-01

Condition d'essai :	Temp °C: 20.51	Pression kPa: 101.195	Humidité: 48.615
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NOTES:

Pour l'étalonnage des masses, nous utilisons la procédure "Comparaison individuelle" PDL-09-MG-001 et la procédure "Détermination des incertitudes" PDL-09-MG-002. Le droit d'auteur du présent certificat appartient au laboratoire délivreur et doit être reproduit intégralement, à moins d'une autorisation écrite du laboratoire délivreur.

REMARQUES:

CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

Client :	Polytests	No. du Certificat :	900-259410-141
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	Accréditation CCN n. :	668
Masse :	100 mg - 200 g	Certification CLAS n. :	2010-01
		Classe d'exactitude :	ASTM 1
		Date d'étalonnage :	03-11-2014
		Date du prochain étalonnage :	03-11-2015

RÉSULTAT DE L'ÉTALONNAGE, MASSE CONVENTIONNELLE:

Valeur Nominale	No de série	No d'inventaire	Masse conventionnelle	Masse conventionnelle après ajustement	Tolérance ± (mg)	Incertitudes ± (mg)
100 mg	1000014200	EM-128	99.9996 mg		0.010 mg	0.002 mg
200 g	1000026013	EM-129	200.00023 g		0.50 mg	0.11 mg

S'applique seulement pour les masses qui ont été ajustées

Hors-tolérance pour la classe spécifiées

CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

Client :	Polytests	No. du Certificat :	900-259410-141
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	Accréditation CCN n. :	668
Masse :	100 mg - 200 g	Certification CLAS n. :	2010-01
		Classe d'exactitude :	ASTM 1
		Date d'étalonnage :	03-11-2014
		Date du prochain étalonnage :	03-11-2015

RÉSULTAT DE L'ÉTALONNAGE DES POIDS, CORRECTIONS:

Valeur Nominale	No de série	No d'inventaire	Masse conventionnelle Correction	Masse conventionnelle Correction après ajustement	Tolérance ± (mg)	Incertitudes ± (mg)
100 mg	1000014200	EM-128	-0.0004 mg		0.010 mg	0.002 mg
200 g	1000026013	EM-129	0.23 mg		0.50 mg	0.11 mg

S'applique seulement pour les masses qui ont été ajustées

Hors-tolérance pour la classe spécifiée



2014-11-05

BALANCES UTILISÉES

Pour l'étalonnage manuel :

> 5 kg à 25 kg :	Mettler Toledo XP32003L, SNR 1123271214, max. 32100 g, d = 0.005 g
> 1 kg à 5 kg	Mettler Toledo PR5003, SNR 1115311634, max. 5100 g, d = 0.001 g
> 300 g à 2 kg :	Mettler Toledo XP2004S, SNR B131185222, max. 2100 g, d = 0.1 mg
> 100 g à 200 g :	Mettler Toledo AT201 SNR BA1115230146, max. 205 g, d = 0.01 mg
> 5 g à 100 g :	Mettler Toledo AX106 SNR 1127063924, max. 111 g, d = 1 µg
1 mg à 5 g :	Mettler UMX5, SNR 1121103055, max. 5.1 g, d = 0.1 µg

Pour l'étalonnage automatisé :

> 200 g à 1 kg :	Mettler Toledo AX1005 SNR 1127063210, max. 1109 g, d = 0.01 mg
> 5 g à 100 g :	Mettler Toledo AX106 SNR 1120143015, max. 111 g, d = 1 µg
1 mg à 5 g :	Mettler UMX5, SNR 1125140561, max. 5.1 g, d = 0.1 µg

Les balances sont vérifiées selon notre procédure de contrôle périodique PDL-11-MG-001.

INCERTITUDES:

Les incertitudes que nous retrouvons comprennent :

1. *L'incertitude associée à l'opération de pesage.*
2. *L'incertitude associée à la densité de l'air.*
3. *L'incertitude associée à l'étalon utilisé.*
4. *L'incertitude associée à la densité de la masse à être étalonnée.*

L'incertitude de l'opération de pesage comprend la reproductibilité à long terme.

Les incertitudes précisées dans ce rapport sont des incertitudes élargies représentant un niveau de confiance d'approximativement 95 %, obtenu en multipliant ensemble l'incertitude-type composée par un facteur de couverture de $k = 2$. Pour de plus amples renseignements, veuillez consulter la publication GUM (Guide pour l'expression de l'incertitude de mesure, édition de 1995).

TRAÇABILITÉ

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CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

RÉFÉRENCES UTILISÉES

Poids	No de série	Fabricant	Date d'étalonnage
20kg	69976	Troemner	18-03-2014
1kg - 1mg	MT-01	Mettler Toledo	04-09-2014
300g	96-0888-50-2	Denver Instrument Company	04-09-2014
2kg	96-0888-50-3	Denver Instrument Company	04-09-2014
2kg	129098	Mettler Toledo	04-09-2014
5kg	96-0888-50-3	Denver Instrument Company	04-09-2014
5kg	129099	Mettler Toledo	04-09-2014
10kg	129100	Mettler Toledo	14-08-2014

ÉTALONS CERTIFIÉS PAR LE CNRC:

Poids	No de série	Fabricant	Date d'étalonnage
100g	95170	Mettler Toledo	19-08-2014
1kg	95171	Mettler Toledo	02-05-2014

RÉFÉRENCES DE LA STATION ROBOTISÉE:

Poids	No de série	Fabricant	Date d'étalonnage
1kg - 1mg	DK000A133	Laboratoire Dispersion	04-09-2014
1kg - 1mg	DK000A132	Laboratoire Dispersion	01-02-2013



2014-11-05

CERTIFICAT D'ÉTALONNAGE # 5138

Date d'étalonnage : 2015/09/18

Date d'émission du certificat : 2015/09/18

Services Polytests
695 B Gaudette street
St-Jean-sur-Richelieu, Québec, Canada
J3B 7S7

Étalonnage d'un
Débitmètre volumétrique American Meter Company DTM-200A S/N : 99A274209

CONFORMITÉ AU PROGRAMME DE QUALITÉ

Tous les étalonnages sont effectués conformément au manuel d'assurance qualité de Polycontrols et sont conformes à la norme ISO/IEC 17025 – 2005, à la norme ISO 9001 – 2008 ainsi qu'à tout autre exigences de qualité définies dans la description d'achat des clients.

TRAÇABILITÉ

La traçabilité des étalons de débit au National Institute of Standards and Technology, NIST, est maintenue par les laboratoires de Fluke Corporation de Phoenix, Arizona et est conforme aux normes ISO/IEC 17025, AINSI/NCSL Z540-1-1994, ISO-10012-1, MIL-STD 45662A.

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

APTITUDE EN MATIÈRE DE MESURE ET D'ÉTALONNAGE - CMC

Les références utilisées pour l'étalonnage de débit ont une incertitude de $\pm 0.2\%$ de la lecture pour les mesures entre 5 SCCM à 10 SLPM, $\pm 0.3\%$ de la lecture pour les mesures entre 10 SLPM à 30 SLPM, $\pm 0.2\%$ de la lecture pour les mesures entre 30 SLPM à 3000 SLPM, $\pm 0.3\%$ de la lecture pour les mesures supérieures à 3000 SLPM jusqu'à 6000 SLPM et $\pm 0.5\%$ pour les mesures inférieures à 5 SCCM jusqu'à concurrence de 1 SCCM, équivalent air ou azote. Les incertitudes exprimées sont élargies avec un facteur d'élargissement $k = 2$, et ce, pour un niveau de confiance d'environ 95 %, dans l'hypothèse d'une distribution normale. Le rapport d'incertitude des essais (RIE) de cet étalonnage respecte un ratio de 4:1 à moins d'indication contraire.

SOMMAIRE DES CONDITIONS DE L'INSTRUMENT EN TEST

Conditions initiales	En bon état
Travail Effectué	Étalonnage de l'instrument
Résultats	Lectures finales dans les tolérances
Remarques	Fréquence d'étalonnage aux 12 mois


Métrologiste


Responsable du laboratoire

Certificat d'étalonnage # 5138

Numéro de série:	99A274209	Station de mesure:	3
Date d'étalonnage:	2015/09/18	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-130		

Instrument de mesure de référence utilisé pour l'étalonnage final

Description	Modèle	# Série	Traçabilité	Date dû
DHI molbloc (30 slpm)	3E4-VCR-V-Q	2359	1500173210	2015/11/12
DHI molbloc (120 slpm)	2E2-S	237	1500173211	2015/11/12
DHI molbox1	Molbox1	881	1500181338	2016/05/13
RTD Mist	M22	1871501	AC15021633-1871501	2016/03/27
Module 44.5 PSI avec Baro 163671	Module 30	160659	AC15041466-160659	2016/05/06

Spécifications finales de l'appareil

Condition d'étalonnage

Spécifications finales de l'appareil		Condition d'étalonnage	
Gaz	Air	Gaz	Air
Température d'opération		Température ambiante	23 °C
Pression à l'entrée		Pression ambiante	1010 mbar
Pression à la sortie		Orientation	Verticale
Température de référence		Élastomère	Viton
Pression de référence		Valve	Viton
Étendue d'échelle	0-200 ACFH		
Signaux Entrée/Sortie	-		
Alimentation			
Tolérance	±1 %O.R.		

Lectures finales

Débit du test ACFH	Instrument en test ft3	Valeurs mesurées			Référence calculée ft3	Erreur calculée ft3	Tolérance acceptable ft3	TUR
		Pression PSIA	Température °C	Référence ft3				
40.5223	13.535	14.687	23.73	13.367	13.494	0.041	0.135	2.98
70.6538	11.800	14.712	23.67	11.674	11.763	0.037	0.118	3.98
161.3162	26.875	14.818	23.61	26.851	26.856	0.019	0.269	>4

conversion factor
0,9968

Bernard Poirier
Métrologue

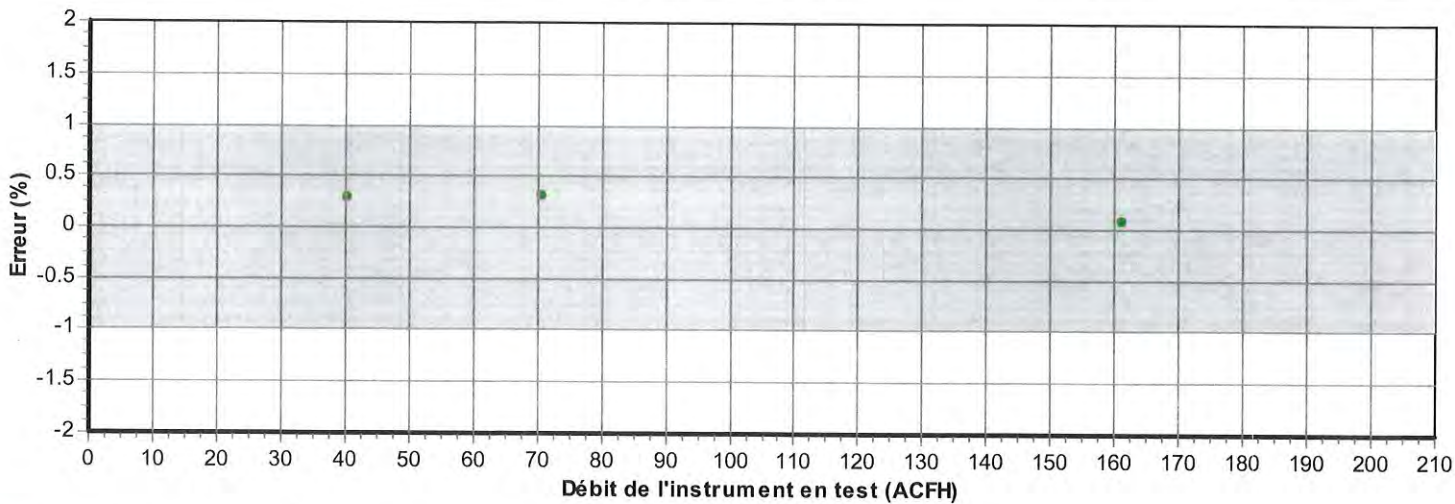
[Signature]
2015-09-25
Signature

Certificat d'étalonnage # 5138

Numéro de série: 99A274209
Date d'étalonnage: 2015/09/18
Identification de l'instrument: EM-130

Station de mesure: 3
Procédure: POS-CAL-005

Résultats finaux



- La mesure (et son incertitude) se situe dans les tolérances
- La mesure (et son incertitude) se situe hors tolérance
- La mesure (et son incertitude) ne rencontre pas la marge de sécurité tel que spécifié dans le document G-8 de l'ILAC


2015-09-25

Bernard Poirier
Métrologue


Signature

CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-136 07/03/16

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	ISL-004
Précision requise:	+/-2°C +/-3%RH
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Hygromètre	Type d'entrée:	Temp/%RH
Manufacturier:	Fluke	Type de sortie:	Digitale
No. Model:	971	Type de mesure:	Temp/humidité
No. Série:	10610850	Gamme:	5-95%RH -20a60°C
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Vaisala Portable 1	No. du certificat d'étalonnage:	AC15071230-U4840010
No. Série:	U4840010/U4920031	Dernière date d'étalonnage:	17-Jul-15
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	17-Jul-16
Commentaire:			

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
25.0 °C	25.0 °C	25.2 °C	0.2 °C	25.2 °C	1.0 °C	
40.0 °C	40.0 °C	40.0 °C	0.0 °C	40.0 °C	1.0 °C	
33.0 %RH	33.0 %RH	33.2 %RH	+0.2 %RH	33.2 %RH	3.0 %RH	
50.0 %RH	50.0 %RH	50.9 %RH	+0.9 %RH	50.9 %RH	3.0 %RH	
80.0 %RH	80.0 %RH	79.6 %RH	-0.4 %RH	79.6 %RH	3.0 %RH	
Conditions Environnementales: Température: N.A. Humidité: N.A.						
Type d'Étalonnage:						

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraceable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	7 Mars 2016
Date du prochain Étalonnage:	7 Mars 2017
Date d'émission du certificat:	7 Mars 2016

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.



Martin Langlais - Technicien




CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

Client : Polytests	No. du Certificat : 122-3A7009-161-1648
Adresse : 695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	Date d'étalonnage : 22-09-2016

Technicien:
Auclair, François


David Llorens, Responsable Qualité

DESCRIPTION DU SERVICE:

Modèle de la Base : 4X4HP-10K	Capacité : 400kg
Numéro de Série Base: C18395	Méthode: ISO 17025 / Class III
Modèle de Terminal: IQ355	Résolution: 0.05kg
Numéro de Série Terminal: 164851	Date d'approbation : 22-09-2016
Numéro d'identification : EM-137 <i>et EM-114</i> <i>D.P. 2016-09-22</i>	Date prochain étalonnage : 22-09-2017

Condition d'essai :	Temp °C: 21.1	Pression kPa: 101.9	Humidité %: 60.9
----------------------------	----------------------	----------------------------	-------------------------

Note: Les conditions environnementales ne sont pas utilisées dans le calcul de l'incertitude.

CETTE BALANCE RENCONTRE LES SPÉCIFICATIONS SUIVANTES:

Type de test :	Manufacturier	
Excentricité:	Pré: <input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non	Post: <input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non
Linéarité:	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non
Sensibilité:	<input type="checkbox"/> Oui <input checked="" type="checkbox"/> Non	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non
Répétabilité:	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non

NOTES:

Cette balance a été certifiée selon la procédure de travail PDL-09-MG-010 (certification de balance analytique et à plateau) et la et la procédure PDL-09-MG-012 (détermination des incertitudes de pesées). Nos étalons sont certifiés à chaque année. Le droit d'auteur du présent certificat appartient au laboratoire délivreur et doit être reproduit intégralement, à moins d'une autorisation écrite du laboratoire délivreur.


2016.09.28

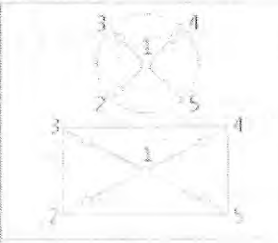
CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

Client :	Polytests	No. du Certificat :	122-3A7009-161-1648
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	Accréditation CCN n. :	668
Méthode :	ISO 17025	Certification CLAS n. :	2010-01
		Modèle de la Base :	4X4HP-10K
		Date d'étalonnage :	22-09-2016
		Date du prochain étalonnage :	22-09-2017

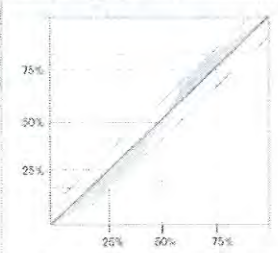
TEST D'EXCENTRICITÉ:

Poids Test: 200 kg Tolérance 0.15 kg
(Note: Le Poids Test est taré au centre du plateau de pesée)

Position	Avant Ajustement	Après Ajustement	
1: Centre:	0.00 kg	0.00 kg	
2: Avant Gauche:	0.00 kg	0.00 kg	
3: Arrière Gauche:	0.05 kg	0.05 kg	
4: Arrière Droit:	0.00 kg	0.00 kg	
5: Avant Droit:	0.15 kg	0.15 kg	
Résultats	0.15 kg	0.15 kg	
STATUT	CONFORME	CONFORME	

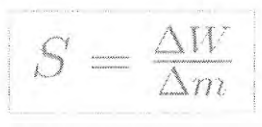
TEST DE LINÉARITÉ:

Méthode: Accumulation Plage: 400 kg Poids Test: 100 kg Tolérance: 0.10 kg

Pré-Charge	Avant Ajustement	Après Ajustement	
0.00 kg	99.90 kg	100.00 kg	
0.00 kg	199.80 kg	199.95 kg	
0.00 kg	299.75 kg	299.95 kg	
0.00 kg	399.70 kg	400.00 kg	
----	----	----	
Résultats	0.050 kg	0.050 kg	
STATUT	CONFORME	CONFORME	

TEST DE SENSIBILITÉ:

Valeur de masse conventionnelle: 400.00 kg Tolérance: 0.25 kg

	Avant Ajustement	Après Ajustement	
Lecture:	399.70 kg	400.00 kg	
Résultats:	0.30 kg	0.00 kg	
STATUT	NON-CONFORME	CONFORME	

CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

Client :	Polytests	No. du Certificat :	122-3A7009-161-1648
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	Accréditation CCN n. :	668
Méthode :	ISO 17025	Certification CLAS n. :	2010-01
		Modèle de la Base :	4X4HP-10K
		Date d'étalonnage :	22-09-2016
		Date du prochain étalonnage :	22-09-2017

TEST DE RÉPÉTABILITÉ:

AVANT AJUSTEMENT:

Charge Utilisée:
100.00 kgTolérance:
0.100 kgRésolution d'affichage:
0.05 kgMoyenne:
99.900 kgÉcart-type:
0.000 kg

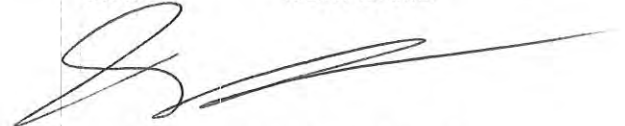
#	Vide	Chargé	Différence
1	0.00 kg	99.90 kg	99.90 kg
2	0.00 kg	99.90 kg	99.90 kg
3	0.00 kg	99.90 kg	99.90 kg
4	0.00 kg	99.90 kg	99.90 kg
5	0.00 kg	99.90 kg	99.90 kg
6	0.00 kg	99.90 kg	99.90 kg
7	0.00 kg	99.90 kg	99.90 kg
8	0.00 kg	99.90 kg	99.90 kg
9	0.00 kg	99.90 kg	99.90 kg
10	0.00 kg	99.90 kg	99.90 kg

Statut : **CONFORME**

APRÈS AJUSTEMENT:

Charge Utilisée:
100.00 kgTolérance:
0.100 kgRésolution d'affichage:
0.05 kgMoyenne:
99.920 kgÉcart-type:
0.026 kg

#	Vide	Chargé	Différence
1	0.00 kg	99.95 kg	99.95 kg
2	0.00 kg	99.90 kg	99.90 kg
3	0.00 kg	99.95 kg	99.95 kg
4	0.00 kg	99.90 kg	99.90 kg
5	0.00 kg	99.95 kg	99.95 kg
6	0.00 kg	99.90 kg	99.90 kg
7	0.00 kg	99.95 kg	99.95 kg
8	0.00 kg	99.90 kg	99.90 kg
9	0.00 kg	99.90 kg	99.90 kg
10	0.00 kg	99.90 kg	99.90 kg

Statut : **CONFORME**

2016-09-28

CERTIFICAT D'ÉTALONNAGE

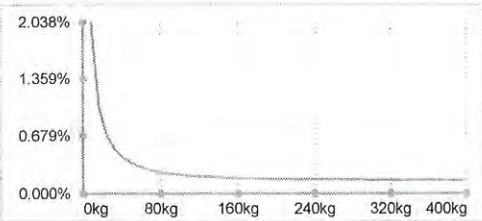
108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

INCERTITUDE AVANT AJUSTEMENT :

$$Uc = \sqrt{(u_{(cr)})^2 + s_p^2 + u_{(l)}^2 + u_{(dr)}^2 + u_{(s)}^2}$$

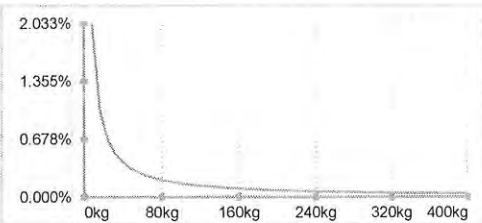
- $u_{(cr)}$ = Incertitude reliée à l'étalon utilisé
- s_p = Incertitude de l'écart-type
- $u_{(l)}$ = Incertitude associée à la linéarité
- $u_{(dr)}$ = Incertitude associée à résolution si $S_p = 0$
- $u_{(s)}$ = Incertitude liée à la sensibilité (span)

Valeur	Incertitude	Incertitude (%)
25.00 kg	0.0731641 kg	0.292656 %
50.00 kg	0.0978352 kg	0.195670 %
100.00 kg	0.1626245 kg	0.162625 %
200.00 kg	0.3065073 kg	0.153254 %
400.00 kg	0.612 kg	0.152924 %



INCERTITUDE APRÈS AJUSTEMENT :

Valeur	Incertitude	Incertitude (%)
25.00 kg	0.0628230 kg	0.251292 %
50.00 kg	0.0628230 kg	0.125646 %
100.00 kg	0.0628230 kg	0.062823 %
200.00 kg	0.0628230 kg	0.031412 %
400.00 kg	0.1190526 kg	0.029763 %



NOTES :

De ces valeurs d'incertitudes, seule la valeur surlignée est calculée selon ISO17025:2005, les autres étant estimées jusqu'au résultat de l'incertitude minimale. Dans le calcul de cette l'incertitude, l'écart-type utilisé est de 0,577d (où d est la précision d'affichage de la balance) lorsque cet écart-type est plus inférieur à 0,577d.

CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
www.dispersion.ca 1.866.390.5066

RÉFÉRENCE

ENSEMBLE DE RÉFÉRENCE:

Référence	No de série	Fabricant	Date d'étalonnage
20kg	LT-PHM01	Poids & Mesure Canada	09-09-2015

INCERTITUDES:

Les incertitudes que nous retrouvons comprennent :

3. *L'incertitude associée à l'étalon utilisé.*
2. *L'incertitude associée à l'écart-type.*
1. *L'incertitude associée à l'opération de pesage.*
4. *L'incertitude associée à la résolution de l'appareil.*

L'incertitude de l'opération de pesage comprend la reproductibilité à long terme.

Les incertitudes précisées dans ce rapport sont des incertitudes élargies représentant un niveau de confiance d'approximativement 95 %, obtenu en multipliant ensemble l'incertitude-type composée par un facteur de couverture de $k = 2$. Pour de plus amples renseignements, veuillez consulter la publication GUM (Guide pour l'expression de l'incertitude de mesure, édition de 1995).

TRAÇABILITÉ

Le Service d'évaluation de laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et a certifié des capacités d'étalonnage spécifiques de ce laboratoire et leur traçabilité à des étalons nationaux de mesure reconnus et au Système international d'unités (SI). Ce certificat d'étalonnage est émis conformément aux conditions de certification accordées par CLAS et aux conditions d'accréditation accordées par le Conseil canadien des normes (CCN). Le CLAS pas plus que le CCN ne peut garantir l'exactitude des étalonnages individuels effectués par des laboratoires accrédités.

REMARQUES:

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2016.09.28

CERTIFICATE OF NIST TRACEABLE CALIBRATION

Calibration Certificate No: 56849

Customer Information

Customer: Services Polytests, Inc.
Address : 695-B Gaudette
St-Jean-sur-richelieu
J3B 7S7

Customer PO #: 100396



LABORATORY ACCREDITATION BUREAU a division of A5-B
ACCREDITED ISO/IEC 17025
Certificate # L2115-1 Calibration

Calibration Procedure Information

Procedure ID: GTP AIRVEL

Revision #: 6

Revision Date: 1/6/2013

Calibration Standards Information

<u>Graffel ID</u>	<u>Manufacturer</u>	<u>Model #</u>	<u>Description</u>	<u>CAL Due</u>
10017	Hart Scientific/Burn:	1502A/3925	Thermometer	9/7/2016
10086	Furness Controls	FC0332	DP Transmitter	6/6/2017
10100	Graffel	n/a	Temperature	10/29/2016
10155	HOBO	UX100-011	RH/Temp logger	11/17/2016
10171	Furness	FC0332-2W	0 - .4" H2O	11/10/2016
10187	Vaisala	PTB210	Barometric Pressure Gauge	12/6/2017

Sensor Information

Manufacturer: Omega

Description: Anemometer

Method Used: Pitot Tube

Model #: HHF143

Rated Accuracy: ± See Attachment

Accuracy Specified By: Omega

Instrument ID#: EM153

Range: 40 to 7800 fpm

Condition: Failed

Serial #: 1015949

Comments: Calibration Date: 08/12/2016
Failed Calibration

Pass below 5200 FPM

August 22nd 2016

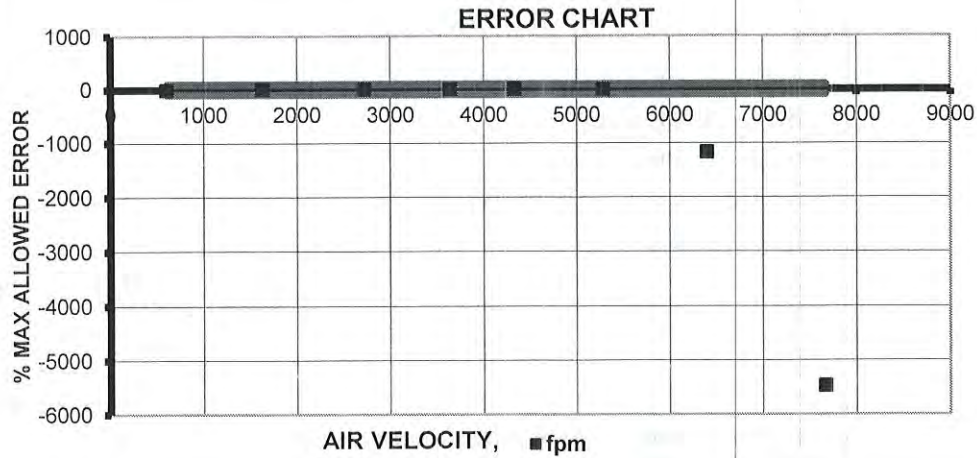
The instruments(s) listed on this certificate have been calibrated against standards traceable to the National Institute of Standards & Technology (NIST) or compared to nationally or internationally recognized consensus standards. The reported calibration uncertainty has a confidence level of 95% (k=2). A calibration uncertainty ratio of 4:1 was maintained unless required uncertainty is supported by analysis. Graffel, LLC. Quality Assurance System complies with applicable requirements of ISO/IEC-17025-2005, ANSI/NCCL Z540-1-1994 and ISO 9001: 2008. All results contained within this certificate relate only to item(s) calibrated. This certificate shall not be reproduced except in full and with the written consent of Graffel, LLC. Acceptance Criteria per Simple Acceptance Rule: Measurement Uncertainty is not applied to the measured value when in/out of tolerance statement is made.

Performed By:
J. Cortez
Calibration Technician

Date: 8/12/2016

**ATTACHMENT TO CALIBRATION CERTIFICATE 56849
AS FOUND/AS LEFT DATA
Page 2 of 2**

Reading From Standard,	Lower Limit of Meter Reading,	Measured Reading From Meter,	Upper Limit of Meter Reading,	Error,	Measurement Uncertainty,	STATUS
Actual Air Velocity						
fpm	fpm	fpm	fpm	fpm	fpm	
609	602	608	616	-1	3.05	Pass
1634	1617	1634	1651	0	8.17	Pass
2720	2692	2722	2748	2	13.60	Pass
3639	3602	3638	3676	-1	18.20	Pass
4333	4289	4334	4377	1	21.67	Pass
5285	5231	5282	5339	-3	26.43	Pass
6402	6337	5640	6467	-762	32.01	Fail
7669	7591	3416	7747	-4253	38.35	Fail



INSTRUMENT SPECIFICATIONS		
Test Fluid	Air	
Lower Range	40	fpm
Upper Range	7800	fpm
Rated Accuracy	+/- 1% reading +/- 1 digit	
LABORATORY AMBIENT CONDITIONS		
Pressure	14.30	psia
Humidity	48.40	% RH
Temperature	78.83	F



Flow - Humidity - Temperature - Pressure - Design - Consulting - Engineering
NIST Traceable Calibration Data Sheet

Graftel, LLC. 870 Cambridge Drive, Elk Grove Village, IL 60007
P. 847-364-2600 F. 847-364-2899

www.graftel.com



CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-154 24/02/16

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9101
Précision requise:	+/- 2°C
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	Type d'entrée:	Temp
Manufacturier:	Keithley	Type de sortie:	Digitale
No. Model:	7700	Type de mesure:	Température
No. Série:	1306774	Gamme:	Divers
Emplacement:	EM-047	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	No. du certificat d'étalonnage:	AC15061429-7798010
No. Série:	7798010	Dernière date d'étalonnage:	22-Jun-15
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	22-Jun-16
Commentaire:			

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
-17.000 mV	-17.000 mV	-17.000 mV	-0.000 mV	-17.000 mV	0.1 mV	Input#1
0.000 mV	0.000 mV	-0.001 mV	-0.001 mV	-0.001 mV	0.1 mV	Input#1
20.000 mV	20.000 mV	19.999 mV	-0.001 mV	19.999 mV	0.1 mV	Input#1
30.000 mV	30.000 mV	30.001 mV	0.001 mV	30.001 mV	0.1 mV	Input#2
Input#3 Non-Conforme						
100.0 °C	100.0 °C	99.4 °C	-0.6 °C	99.4 °C	1.0 °C	Input#4 TypeJ
30.000 mV	30.000 mV	30.000 mV	0.000 mV	30.000 mV	0.1 mV	Input#5
30.000 mV	30.000 mV	29.993 mV	-0.007 mV	29.993 mV	0.1 mV	Input#6
100.0 Ohms	100.0 Ohms	100.0 Ohms	0.0 Ohms	100.0 Ohms	1.0 Ohms	Input#7
100.0 Ohms	100.0 Ohms	100.0 Ohms	0.0 Ohms	100.0 Ohms	1.0 Ohms	Input#8
100.0 Ohms	100.0 Ohms	99.9 Ohms	-0.1 Ohms	99.9 Ohms	1.0 Ohms	Input#9
100.0 Ohms	100.0 Ohms	99.9 Ohms	-0.1 Ohms	99.9 Ohms	1.0 Ohms	Input#10
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#11 TypeT
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	1.0 °C	Input#12 TypeT
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	1.0 °C	Input#13 TypeJ
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	1.0 °C	Input#14 TypeJ
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	1.0 °C	Input#15 TypeJ
100.0 °C	100.0 °C	99.5 °C	-0.5 °C	99.5 °C	1.0 °C	Input#16 TypeJ
100.0 Ohms	100.0 Ohms	99.9 Ohms	-0.1 Ohms	99.9 Ohms	1.0 Ohms	Input#17
100.0 Ohms	100.0 Ohms	99.9 Ohms	-0.1 Ohms	99.9 Ohms	1.0 Ohms	Input#18
100.0 Ohms	100.0 Ohms	100.0 Ohms	0.0 Ohms	100.0 Ohms	1.0 Ohms	Input#19
100.0 Ohms	100.0 Ohms	99.9 Ohms	-0.1 Ohms	99.9 Ohms	1.0 Ohms	Input#20
12.000 mA	12.000 mA	12.001 mA	0.001 mA	12.001 mA	1.00 mA	Input#21
12.000 mA	12.000 mA	12.001 mA	0.001 mA	12.001 mA	1.00 mA	Input#22
Conditions Environnementales: Température: 21 °C Humidité: 21 %RH						



CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-154 24/02/16

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9101
Précision requise:	+/- 2°C
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	Type d'entrée:	Temp
Manufacturier:	Keithley	Type de sortie:	Digitale
No. Model:	7700	Type de mesure:	Température
No. Série:	1306774	Gamme:	Divers
Emplacement:	EM-047	Conditions Enviro:	Normale

Type d'Étalonnage: Test avec EM-047

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	24 Février 2016
Date du prochain Étalonnage:	24 Février 2017
Date d'émission du certificat:	24 Février 2016

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien

[Signature]
2016.03.07

Certificat d'Étalonnage / Certificate of Calibration

CLIENT :
SERVICES POLYTESTS INC.
695-B GAUDETTE
ST-JEAN-SUR-RICHELIEU, QUEBEC

Description: CHRONOMÈTRE / STOPWATCH TIMER
Fabriquant/ Manufacturer: EXTECH
Modèle/ Model : 365510
No série / Serial no : 131636
Inventaire / Asset # : EM-175

CERTIFICAT No / Certificate No: 179909

PROCÉDURE / Procedure :
PRIMO_CHRONOMÈTRE_DIGIT_REV.3

Certificat émis/ Certificate issued : 2015-12-21

yyyy-mm-dd

Echéance/ Due Date : 2016-12-21

Type de résultat / Results type : **Tel que trouvé / As Found**

Conditions de mesure / Measurement conditions

Résultats d'essais / Test results : **Ok Pass**

TEMPÉRATURE / Temp. : **22°C**

Usage restreint/ *Restricted use* :

HUMIDITÉ / Humidity : **27%RH**

Réparation effectuée / *Repair performed* :

Ajustement effectué / *Adjustment performed* :

ÉTALONS UTILISÉS/ Standards Used:


Identification	Fabricant / Manufacturer	Modèle / Model	Description	Ser. #	Echéance/ Due Date
PR0283	H-P	53131 A	FREQUENCY COUNTER	3736A24271	2016-04-27
PR0377	AGILENT	33250A	ARBITRARY FUNCTION WAVEFORM GEN.	MY40003210	2016-06-29

Les spécifications mentionnées comme limites de tolérances d'essai sont celles établies par le fabricant, sauf indication contraire.

Test tolerance limits are based on manufacturers specifications unless stated otherwise.

NOTES :

Technicien :
Technician


M. ZAIDI

Le système qualité de la société est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour le processus d'étalonnage sont retracables au CNRC et/ou au NIST.
Our quality system complies with the requirements of ISO 17025 and the standards used for the calibration are traceable to NRC and/or NIST.

LE DROIT D'AUTEUR DE CE CERTIFICAT APPARTIEN À PRIMO INSTRUMENT INC. CE CERTIFICAT NE PEUT ÊTRE REPRODUIT AUTREMENT QU'EN ENTIER ET AVEC LE CONSENTEMENT PRÉALABLE ÉCRIT DE PRIMO INSTRUMENT INC.
PRIMO INSTRUMENT INC. OWNS COPYRIGHT OF THIS CERTIFICATE. THE CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN CONSENT OF PRIMO INSTRUMENT INC.

INSTRUMENT

CERTIFICAT No / Certificate No :

179909

CLIENT / Customer :

SERVICES POLYTESTS INC.

DESCRIPTION / Description :

CHRONOMÈTRE / STOPWATCH TIMER

MANUFACTURIER / Manufacturer :

EXTECH

MODÈLE / Model :

365510

DESCRIPTION Description	LIMITES Limits	LECTURES Readings	LIMITES Limits
----------------------------	-------------------	----------------------	-------------------

Temps écoulé / elapsed time

Minutes	Seconds	1/100 sec
33	45	19

Total au compteur: **202517,3** comptes/counts

Comptes / Counts

Chronomètre/timer

202519

(Δt) Deviation (1/100sec): 2

Deviation Par jour/ Per day (%): 0.0008 %

Deviation Par jour/ Per day (sec): 1 sec

* **Secondes**

-3.00

Deviation 24hrs

0.73

* **Secondes**

3.00

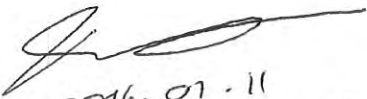
* Tolérances basées sur une déviation maximale de 3 sec/jour

* Tolerances based on a 3 sec/day maximum deviation

Incertitude/ Uncertainty: ± 37 ms

Lorsque fournies dans le rapport, les incertitudes de mesure sont des incertitudes élargies représentant un niveau de confiance d'approximativement 95% , obtenu en multipliant l'incertitude-type composée par un facteur de couverture de k=2.

When supplied in the report, the measurement uncertainties are expanded uncertainties representing a confidence level of approximately 95% , obtain by multiplying the combined standard uncertainty by a coverage factor of k=2.


 2016-01-11

CERTIFICAT D'ÉTALONNAGE # 5753

Date d'étalonnage : 2016/04/05

Date d'émission du certificat : 2016/04/05

Services Polytests
695 B Gaudette street
St-Jean-sur-Richelieu, Québec, Canada
J3B 7S7

Étalonnage d'un
Shinigawa DCDA-2c S/N : 23544

CONFORMITÉ AU PROGRAMME DE QUALITÉ

Tous les étalonnages sont effectués conformément au manuel d'assurance qualité de Polycontrols et sont conformes à la norme ISO/IEC 17025 – 2005, à la norme ISO 9001 – 2008 ainsi qu'à tout autre exigences de qualité définies dans la description d'achat des clients.

TRAÇABILITÉ

La traçabilité des étalons de débit au National Institute of Standards and Technology, NIST, est maintenue par les laboratoires de Fluke Corporation de Phoenix, Arizona et est conforme aux normes ISO/IEC 17025, AINSI/NCSL Z540-1-1994, ISO-10012-1, MIL-STD 45662A.


Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

APTITUDE EN MATIÈRE DE MESURE ET D'ÉTALONNAGE - CMC


Les références utilisées pour l'étalonnage de débit ont une incertitude de $\pm 0.2\%$ de la lecture pour les mesures entre 5 SCCM à 10 SLPM, $\pm 0.3\%$ de la lecture pour les mesures entre 10 SLPM à 30 SLPM, $\pm 0.2\%$ de la lecture pour les mesures entre 30 SLPM à 3000 SLPM, $\pm 0.3\%$ de la lecture pour les mesures supérieures à 3000 SLPM jusqu'à 6000 SLPM et $\pm 0.5\%$ pour les mesures inférieures à 5 SCCM jusqu'à concurrence de 1 SCCM, équivalent air ou azote. Les incertitudes exprimées sont élargies avec un facteur d'élargissement $k = 2$, et ce, pour un niveau de confiance d'environ 95 %, dans l'hypothèse d'une distribution normale. Le rapport d'incertitude des essais (RIE) de cet étalonnage respecte un ratio de 4:1 à moins d'indication contraire.

SOMMAIRE DES CONDITIONS DE L'INSTRUMENT EN TEST

Conditions initiales	En bon état
Travail Effectué	Étalonnage de l'instrument
Résultats	Aucun ajustement requis
	Lectures finales dans les tolérances
Remarques	Tolérance placée à 2% OR à la demande du client


Métrologue


Responsable du laboratoire


2016.04.18

Certificat d'étalonnage # 5753

Numéro de série:	23544	Station de mesure:	3
Date d'étalonnage:	2016/04/05	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-178		

Instrument de mesure de référence utilisé pour l'étalonnage final

Description	Modèle	# Série	Traçabilité	Date dû
DHI molbloc (30 slpm)	3E4-VCR-V-Q	2359	1500192068	2016/12/12
DHI molbox1	Molbox1	881	1500181338	2016/05/13
RTD Mist	M22	1871501	AC15021633-1871501	2016/12/02
Module 44.5 PSI avec Baro 163671	Module 30	160659	AC15041466-160659	2016/05/06

Spécifications finales de l'appareil

Condition d'étalonnage

Spécifications finales de l'appareil		Condition d'étalonnage	
Gaz	Air	Gaz	Air
Température d'opération		Température ambiante	21 °C
Pression à l'entrée		Pression ambiante	1027 mbar
Pression à la sortie		Orientation	Horizontale
Température de référence		Élastomère	Viton
Pression de référence		Valve	
Étendue d'échelle	10-2000 ALH		
Signaux Entrée/Sortie	-		
Alimentation			
Tolérance	±2 %O.R.		

Lectures finales

Débit du test ALH	Instrument en test L	Valeurs mesurées			Référence calculée L	Erreur calculée L	Tolérance acceptable L	TUR
		Pression PSIA	Température °C	Référence L				
357.7138	59.9700	14.9094	20.73	60.4941	59.5506	0.4194	1.1910	>4
595.5628	100.1050	14.9094	20.68	100.7247	99.1352	0.9698	1.9827	>4
1602.1776	268.9300	14.9337	20.59	272.0405	267.2323	1.6977	5.3446	>4

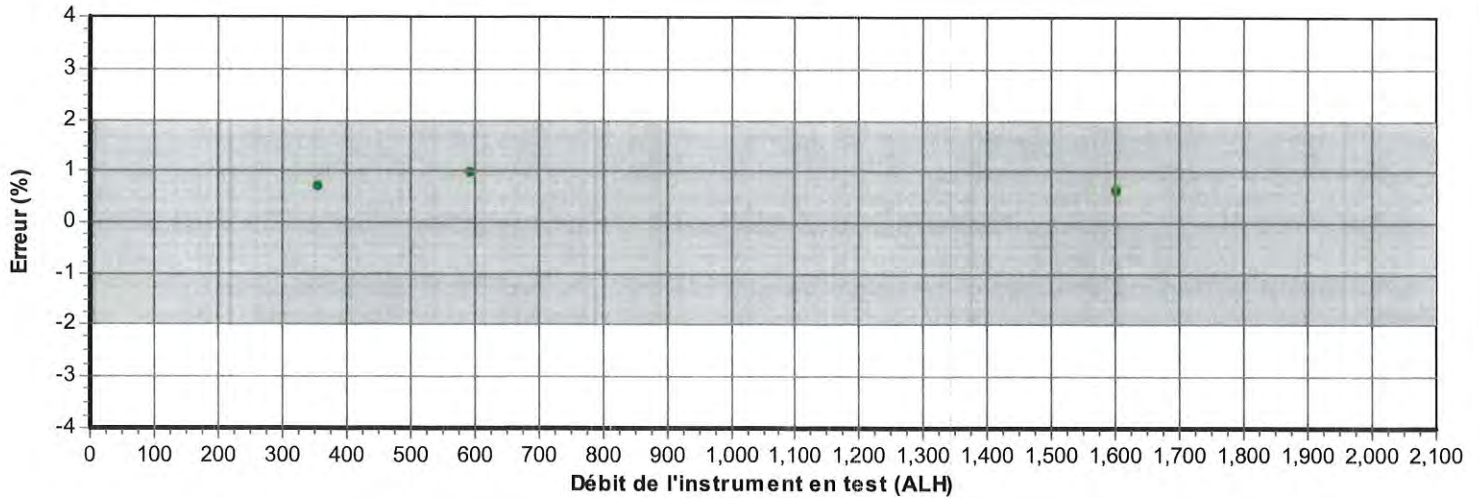
Bernard Poirier
Métrologue


Signature

Certificat d'étalonnage # 5753

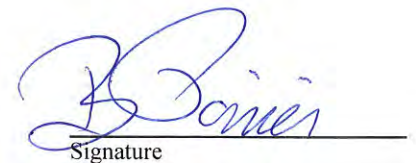
Numéro de série: 23544	Station de mesure: 3
Date d'étalonnage: 2016/04/05	Procédure: POS-CAL-005
Identification de l'instrument: EM-178	

Résultats finaux



- La mesure (et son incertitude) se situe dans les tolérances
- La mesure (et son incertitude) se situe hors tolérance
- La mesure (et son incertitude) ne rencontre pas la marge de sécurité tel que spécifié dans le document G-8 de l'ILAC

Bernard Poirier
Métrologue


Signature



CERTIFICAT D'ÉTALONNAGE # 5750

Date d'étalonnage : 2016/04/05

Date d'émission du certificat : 2016/04/05

Services Polytests
695 B Gaudette street
St-Jean-sur-Richelieu, Québec, Canada
J3B 7S7

Étalonnage d'un
Shinigawa DCDA-2c S/N : 23543

CONFORMITÉ AU PROGRAMME DE QUALITÉ

Tous les étalonnages sont effectués conformément au manuel d'assurance qualité de Polycontrols et sont conformes à la norme ISO/IEC 17025 – 2005, à la norme ISO 9001 – 2008 ainsi qu'à tout autre exigences de qualité définies dans la description d'achat des clients.

TRAÇABILITÉ

La traçabilité des étalons de débit au National Institute of Standards and Technology, NIST, est maintenue par les laboratoires de Fluke Corporation de Phoenix, Arizona et est conforme aux normes ISO/IEC 17025, AINSI/NCSL Z540-1-1994, ISO-10012-1, MIL-STD 45662A.

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APTITUDE EN MATIÈRE DE MESURE ET D'ÉTALONNAGE - CMC

Les références utilisées pour l'étalonnage de débit ont une incertitude de $\pm 0.2\%$ de la lecture pour les mesures entre 5 SCCM à 10 SLPM, $\pm 0.3\%$ de la lecture pour les mesures entre 10 SLPM à 30 SLPM, $\pm 0.2\%$ de la lecture pour les mesures entre 30 SLPM à 3000 SLPM, $\pm 0.3\%$ de la lecture pour les mesures supérieures à 3000 SLPM jusqu'à 6000 SLPM et $\pm 0.5\%$ pour les mesures inférieures à 5 SCCM jusqu'à concurrence de 1 SCCM, équivalent air ou azote. Les incertitudes exprimées sont élargies avec un facteur d'élargissement $k = 2$, et ce, pour un niveau de confiance d'environ 95 %, dans l'hypothèse d'une distribution normale. Le rapport d'incertitude des essais (RIE) de cet étalonnage respecte un ratio de 4:1 à moins d'indication contraire.

SOMMAIRE DES CONDITIONS DE L'INSTRUMENT EN TEST

Conditions initiales	En bon état
Travail Effectué	Étalonnage de l'instrument
Résultats	Aucun ajustement requis Lectures finales dans les tolérances
Remarques	Tolérance placée à 2% OR à la demande du client


Métrologiste


Responsable du laboratoire



Certificat d'étalonnage # 5750

Numéro de série: 23543	Station de mesure: 3
Date d'étalonnage: 2016/04/05	Procédure: POS-CAL-005
Identification de l'instrument: EM-179	

Instrument de mesure de référence utilisé pour l'étalonnage final

Description	Modèle	# Série	Traçabilité	Date dû
DHI molbloc (30 slpm)	3E4-VCR-V-Q	2359	1500192068	2016/12/12
DHI molbox1	Molbox1	881	1500181338	2016/05/13
RTD Mist	M22	1871501	AC15021633-1871501	2016/12/02
Module 44.5 PSI avec Baro 163671	Module 30	160659	AC15041466-160659	2016/05/06

Spécifications finales de l'appareil

Gaz	Air
Température d'opération	
Pression à l'entrée	
Pression à la sortie	
Température de référence	
Pression de référence	
Étendue d'échelle	10-2000 ALH
Signaux Entrée/Sortie	-
Alimentation	
Tolérance	±2 %O.R.

Condition d'étalonnage

Gaz	Air
Température ambiante	20 °C
Pression ambiante	1028 mbar
Orientation	Horizontale
Élastomère	Viton
Valve	

Lectures finales

Débit du test ALH	Instrument en test L	Valeurs mesurées			Référence calculée L	Erreur calculée L	Tolérance acceptable L	TUR
		Pression PSIA	Température °C	Référence L				
356.9425	59.9000	14.9107	20.62	60.3925	59.4228	0.4772	1.1885	>4
599.9584	100.8750	14.9323	20.65	101.6412	99.8738	1.0012	1.9975	>4
1585.9473	265.6850	14.9417	20.56	268.3634	263.4557	2.2293	5.2691	>4

Bernard Poirier
Métrologue

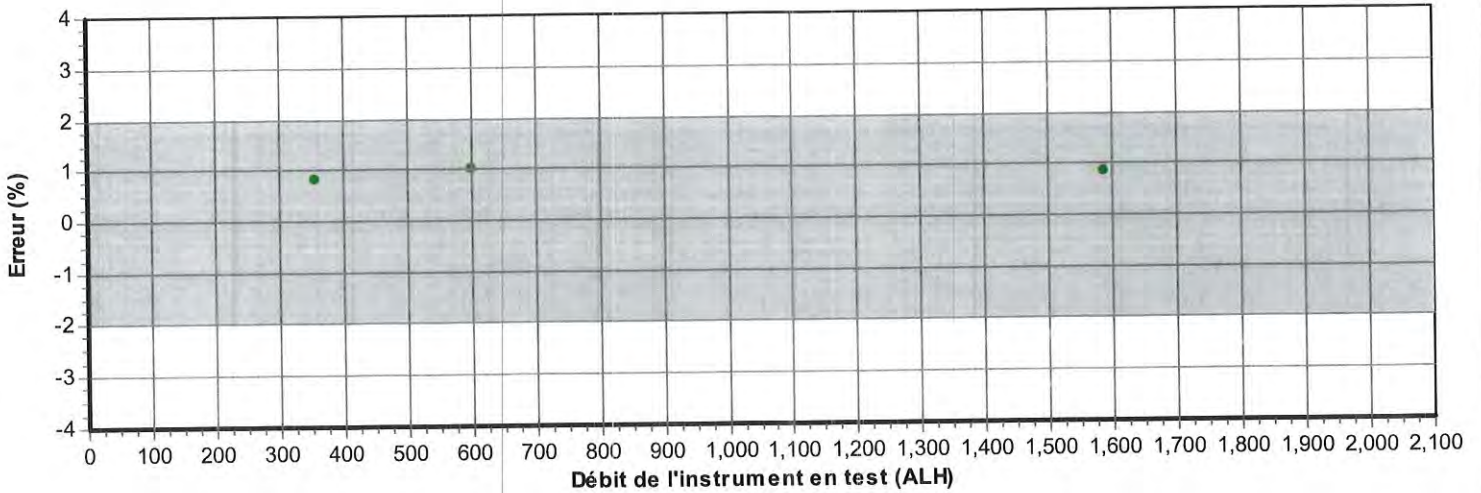

Signature

Certificat d'étalonnage # 5750

Numéro de série: 23543
Date d'étalonnage: 2016/04/05
Identification de l'instrument: EM-179

Station de mesure: 3
Procédure: POS-CAL-005

Résultats finaux



- La mesure (et son incertitude) se situe dans les tolérances
- La mesure (et son incertitude) se situe hors tolérance
- La mesure (et son incertitude) ne rencontre pas la marge de sécurité tel que spécifié dans le document G-8 de l'ILAC

Bernard Poirier
Métrologue


Signature



EM-183

Airgas USA, LLC
325 McCausland Court
Cheshire, CT 06410
(203) 250-6820
(203) 272-1584 (FAX)

CERTIFICATE OF ANALYSIS

Grade of Product: CERTIFIED STANDARD-SPEC

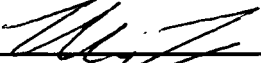
Part Number:	X04NI79C15A2VF3	Reference Number:	37-400238139-1
Cylinder Number:	SG9140147	Cylinder Volume:	151.0 CF
Laboratory:	ANE - Cheshire (SAP) - CT	Cylinder Pressure:	2015 PSIG
Analysis Date:	Aug 16, 2013	Valve Outlet:	590
Lot Number:	37-400238139-1		

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration (Mole %)	Analytical Uncertainty
CARBON MONOXIDE	1.000 %	1.031 %	+/- 2%
CARBON DIOXIDE	10.00 %	9.968 %	+/- 2%
OXYGEN	10.00 %	9.995 %	+/- 2%
NITROGEN	Balance		

Notes:



 Approved for Release

Certificat d'Étalonnage / Certificate of Calibration

CLIENT :
SERVICES POLYTESTS INC.
695-B GAUDETTE
ST-JEAN-SUR-RICHELIEU, QUEBEC

Description: STANDARD D'HUMIDITÉ / MOISTURE STANDARD
Fabriquant/ Manufacturer: DELMHORST
Modèle/ Model : MCS-1 REFERENCE STANDARD
No série / Serial no : N/A
Inventaire / Asset # : EM-191

CERTIFICAT No / Certificate No: 179908

PROCÉDURE / Procedure :
PRIMO - DELMHORST_MCS-1 REFERENCE STANDARD

Certificat émis/ Certificate issued : 2015-12-23

yyyy-mm-dd

Echéance/ Due Date : 2016-12-23

Type de résultat / *Results type* : **Tel que trouvé / As Found**

Conditions de mesure / Measurement conditions

Résultats d'essais / Test results : **Ok Pass**

TEMPÉRATURE / Temp. : 22°C

Usage restreint/ *Restricted use* :

HUMIDITÉ / Humidity : 28%RH

Réparation effectuée / *Repair performed* :

Ajustement effectué / *Adjustment performed* :

ÉTALONS UTILISÉS/ Standards Used:

Identification	Fabricant / Manufacturer	Modèle / Model	Description	Ser. #	Echéance/ Due Date
PR0520	FLUKE	8846A	MULTIMETER	1141021	2016-10-02

Les spécifications mentionnées comme limites de tolérances d'essai sont celles établies par le manufacturier, sauf indication contraire.

Test tolerance limits are based on manufacturers specifications unless stated otherwise.

NOTES :

Technicien :
Technician


H. AMRI

Le système qualité de la société est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour le processus d'étalonnage sont retracables au CNRC et/ou au NIST.

Our quality system complies with the requirements of ISO 17025 and the standards used for the calibration are traceable to NRC and/or NIST.

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 Fax : 514 329-3750 • 514 329-5869 (service)
 Courriels : service@primoinc.com • ventes@primoinc.com
 www.primoinc.com

Certificat d'Étalonnage
Certificate of Calibration

INSTRUMENT

CERTIFICAT No / Certificate No :

179908

CLIENT / Customer :

SERVICES POLYTESTS INC.

DESCRIPTION / Description :

STANDARD D'HUMIDITÉ / MOISTURE STANDARD

MANUFACTURIER / Manufacturer :

DELMHORST

MODÈLE / Model :

MCS-1 REFERENCE STANDARD

DESCRIPTION Description		LIMITES Limits	LECTURES Readings	LIMITES Limits
DOUGLAS-FIR @ 80°F				Déviaton MΩ
	Nominal			
12 %	120 MΩ		120.9	-0.9
22 %	1.10 MΩ		1.096	0.004


 2016-01-11



Airgas USA, LLC
325 McCausland Court
Cheshire, CT 06410
(203) 250-6820
(203) 272-1584 (FAX)

CERTIFICATE OF ANALYSIS

Grade of Product: CERTIFIED STANDARD-SPEC

Part Number:	X04NI77C15A0004	Reference Number:	37-400429255-1
Cylinder Number:	CC46789	Cylinder Volume:	144.0 CF
Laboratory:	ANE - Cheshire (SAP) - CT	Cylinder Pressure:	1862 PSIG
Analysis Date:	Sep 29, 2014	Valve Outlet:	350
Lot Number:	37-400429255-1		

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration (Mole %)	Analytical Uncertainty
OXYGEN	2.000 %	1.989 %	+/- 2%
CARBON MONOXIDE	3.000 %	2.971 %	+/- 2%
CARBON DIOXIDE	18.00 %	17.87 %	+/- 2%
NITROGEN	Balance		



Approved for Release



CalSource, Inc.
 1005 West Fayette St
 Suite 4D
 Syracuse, NY 13204
 866-895-8648
 calsource.com

CERTIFICATE OF CALIBRATION

ISSUED TO	EQUIPMENT INFORMATION										
POLYTEST SERVICES INC 411 ST-JACQUES NAPIERVILLE JEBEJOJ 1 L0 CUSTOMER PO NUMBER: 100325	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">ASSET NUMBER</td> <td>EM-224</td> </tr> <tr> <td>MANUFACTURER</td> <td>STANLEY</td> </tr> <tr> <td>MODEL NUMBER</td> <td>STHT30810</td> </tr> <tr> <td>DESCRIPTION</td> <td>TAPE MEASURE, 0-12 FT</td> </tr> <tr> <td>SERIAL NUMBER</td> <td>N/A</td> </tr> </table>	ASSET NUMBER	EM-224	MANUFACTURER	STANLEY	MODEL NUMBER	STHT30810	DESCRIPTION	TAPE MEASURE, 0-12 FT	SERIAL NUMBER	N/A
ASSET NUMBER	EM-224										
MANUFACTURER	STANLEY										
MODEL NUMBER	STHT30810										
DESCRIPTION	TAPE MEASURE, 0-12 FT										
SERIAL NUMBER	N/A										

TEST RESULTS			
CERTIFICATE NUMBER	467997	PROCEDURE	CS TAPE MEASURE REV-3
AS RECEIVED	IN TOLERANCE	INTERVAL	12 MONTHS
AS RETURNED	PASS	CALIBRATION DATE	12/22/2015
LAB TEMPERATURE	68.0 F	CALIBRATION DUE DATE	12/22/2016
LAB HUMIDITY	44.0 %	TECHNICIAN	JOHN W SAGER

COMMENTS
See data

CALIBRATION STANDARDS

ASSET NUMBER	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	DESCRIPTION	CAL DATE	CAL DUE
CAL-00232	STANLEY	33-425	NA	TAPE MEASURE	4/8/2015	4/8/2016
CAL-00259	WEBBER	SCS81A	111076.4	GAGE BLOCK SET	7/16/2015	7/16/2016
CAL-00490	NEWPORT	ITHX-M	MEC	TEMP/HUMIDITY METER	10/7/2015	10/7/2016

CalSource certifies this instrument to have been calibrated using standards with accuracies traceable to the National Institute of Standards and Technology, derived from natural physical constants, derived from ratio measurements, or compared to consensus standards. CalSources' calibration system complies to the requirements of ISO-9001, ISO/IEC 17025, ISO/TS 16949 and MIL-STD-45662A Unless otherwise indicated, the confidence level each calibrated parameter is 95%, utilizing expanded measurement uncertainty k=2. The results contained are valid only for the unit listed above. Any calibration due date/ interval has been chosen by the customer and any number of factors may cause the item listed above to drift out of calibration before the interval has expired.



CERTIFIED BY 12/22/2015
 JOHN W SAGER

2016-01-22



Tape Measure

ID Number EM-224
 Certificate Number 467997
 Technician John W. Sager
 Date December 22, 2015

Tape Measure

Length, English Scale 1/16"

Range: 0-12' Accuracy: ± 1 div

Nominal (in)	Minimum	As Found	As Left	Maximum	M/U
1	31/32	1		1 1/32	0.048
36	35 15/16	36		36 1/16	0.12
72	71 15/16	72		72 1/16	0.12
108	107 15/16	108		108 1/16	0.12
144	143 15/16	144		144 1/16	0.12

Length, English Scale 1/16"

Range: 0-12' Accuracy: ± 1 div

Nominal (in)	Minimum	As Found	As Left	Maximum	M/U
1	15/16	1		1 1/16	0.096
36	35 15/16	36		36 1/16	0.12
72	71 15/16	72		72 1/16	0.12
108	107 15/16	108		108 1/16	0.12
144	143 15/16	144		144 1/16	0.12

Notes: Out of Tolerance Readings Highlighted
 All Transferred Values Reviewed for Accuracy
 Unless otherwise stated, As Left = As Found
 Measurement Uncertainty calculated at 95%, k=2
 English Scale 1/32" for First Foot

22-10-910



Posttest dry gas meter calibration data

Date : 2016-09-21		Barometric pressure: 102		Tech/Eng. Maxime Martin	
Manufacturer. : MF Fire Model : Mulciber		Calibration factor : 0.993 DGM 1 : EM-178		Calibration factor 0.992 DGM 2 : EM-179	
		Calibration factor : 0.9928 DGM 3 : EM-070		Calibration factor 0.9968 Standardized DGM : EM-130	

Standard meter							Dry gas meter #1					
Trail #	Press drop	Final ft3	Initial ft3	Change ft3	Temp F	STD ft3	Final Liter	Initial Liter	Change ft3	Temp F	STD ft3	Cal Factor
1	0	582,2	581,2	1,000	72,3	0,989	433808,700	433779,850	1,019	75,38	1,0048	1,0162
2	0	583,2	582,2	1,000	71,9	0,989	433837,410	433808,700	1,014	74,66	1,0013	1,0119
3	0	584,5	583,2	1,300	71,8	1,287	433874,790	433837,410	1,320	74,3	1,3045	1,0139
Average calibration factor : 1.014												

Previous cal factor	minus	Average cal factor	Divided by	Previous cal. factor	Multiplied * 100	Equals	Deviation percent Max5%
0.993	-	1.014	/	0.993	*100	=	2.1 %

Standard meter							Dry gas meter #2					
Trail #	Press drop	Final ft3	Initial ft3	Change ft3	Temp F	STD ft3	Final Liter	Initial Liter	Change ft3	Temp F	STD ft3	Cal Factor
1	0	582,2	581,2	1,000	72,3	0,989	375714,76	375686,7	0,991	75,56	0,977	0,9881
2	0	583,2	582,2	1,000	71,9	0,989	375742,58	375714,76	0,982	75,2	0,969	0,9795
3	0	584,5	583,2	1,300	71,8	1,287	375772,12	375734,58	1,326	74,66	1,309	1,0176
Average calibration factor : 0.9951												

Previous cal factor	minus	Average cal factor	Divided by	Previous cal. factor	Multiplied * 100	Equals	Deviation percent Max5%
0.992	-	0.9951	/	0.992	*100	=	0.31 %



Posttest dry gas meter calibration data

Date : 2016-09-21		Barometric pressure: 102		Tech/Eng. Maxime Martin	
Manufacturer. : MF Fire Model : Mulciber		Calibration factor : 0.993 DGM 1 : EM-178		Calibration factor 0.992 DGM 2 : EM-179	
		Calibration factor : 0.9928 DGM 3 : EM-070		Calibration factor 0.9968 Standardized DGM : EM-130	

Standard meter							Dry gas meter #3					
Trail #	Press drop	Final ft3	Initial ft3	Change ft3	Temp F	STD ft3	Final Liter	Initial Liter	Change ft3	Temp F	STD ft3	Cal Factor
1	0	582,2	581,2	1,000	72,3	0,989	519,86	518,86	1,000	72,3	0,992	1,0032
2	0	583,2	582,2	1,000	71,9	0,989	520,96	519,86	1,100	71,9	1,092	1,1035
3	0	584,5	583,2	1,300	71,8	1,287	522,2	520,96	1,240	71,8	1,231	0,9569
Average calibration factor : 1.021												

Previous cal factor	minus	Average cal factor	Divided by	Previous cal. factor	Multiplied * 100	Equals	Deviation percent Max5%
0.9928	-	1.021	/	0.9928	*100	=	2.84 %

APPENDIX 4: Unit pre burn

Temps	Flue	Room	Tunnel	Catalyst down	Catalyst up	Right	Back	bottom	Top	Left
acquisition	temp	temp	dry bulb							
de données	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F
0	74,88	73,19	75,38	75,06	75,20	75,69	74,86	75,70	76,33	75,92
1	75,02	73,11	75,38	75,05	75,16	75,58	74,74	75,64	76,13	75,63
2	74,99	73,18	75,36	75,00	75,04	75,71	74,62	75,59	76,17	75,62
3	74,95	73,17	75,36	74,90	74,98	75,36	74,43	75,53	75,83	75,39
4	74,30	73,23	75,15	74,44	74,36	75,35	74,39	75,54	75,77	75,39
5	74,10	73,28	74,93	73,74	73,83	75,40	74,26	75,46	75,52	75,32
6	73,79	73,04	74,71	73,28	73,39	75,03	74,14	75,46	75,14	75,12
7	73,84	73,17	74,63	73,07	73,18	75,47	74,04	75,42	75,13	75,07
8	73,75	73,18	74,56	72,94	73,05	74,86	73,93	75,30	74,74	74,81
9	75,28	73,13	74,79	73,52	74,11	76,06	75,63	75,32	74,91	77,13
10	81,71	73,08	78,44	86,04	83,41	80,30	83,15	75,24	77,10	83,50
11	84,41	73,01	78,16	97,24	91,27	83,96	89,88	75,33	81,27	85,58
12	93,46	73,05	80,16	113,61	106,89	91,73	103,61	75,29	91,06	93,55
13	118,06	72,93	85,89	148,26	147,86	136,96	134,60	75,35	115,11	123,10
14	149,72	72,86	93,68	209,14	207,20	178,58	178,19	75,38	143,21	162,13
15	179,64	72,83	101,66	322,39	284,05	221,67	250,60	75,53	161,27	214,68
16	210,11	72,96	109,72	461,51	384,02	275,36	337,99	75,70	194,62	283,70
17	240,27	72,92	117,91	573,53	469,41	335,10	393,11	75,94	233,37	343,43
18	258,94	73,17	123,89	636,46	534,12	396,01	443,18	76,24	275,75	389,43
19	279,95	73,32	129,95	692,16	624,23	455,33	483,46	76,66	318,32	427,74
20	294,99	73,29	135,16	755,29	687,86	502,82	512,95	77,23	361,38	458,17
21	294,68	73,32	136,81	756,30	672,86	538,83	535,10	77,90	400,60	474,48
22	293,28	73,41	137,73	706,65	650,34	579,83	539,72	78,75	437,95	480,39
23	332,52	73,61	160,76	660,35	626,82	613,77	559,18	79,75	464,64	498,55
24	269,44	73,81	167,87	553,73	529,09	571,50	552,74	81,02	461,45	472,51
25	251,08	73,85	137,29	479,83	512,85	539,21	540,23	82,48	465,01	452,30
26	256,77	73,57	133,29	493,41	521,36	525,19	539,18	84,18	464,06	434,55
27	258,27	73,69	132,48	515,05	521,29	507,75	546,20	86,00	459,44	416,77
28	259,60	73,63	132,69	529,77	522,98	493,23	561,76	88,16	458,13	405,11
29	260,79	73,75	133,05	538,03	525,21	479,33	558,06	90,45	457,52	404,76
30	263,95	73,71	133,71	537,43	527,28	472,82	546,46	93,03	460,82	406,18
31	284,66	73,82	142,40	541,34	521,10	473,01	546,29	95,77	457,36	404,93
32	302,02	73,75	162,94	532,74	510,48	516,65	554,99	98,77	444,17	399,41
33	304,73	73,82	168,90	523,28	515,29	555,78	565,29	102,02	436,72	400,11
34	306,23	73,69	171,13	513,39	514,48	595,36	561,16	105,28	429,67	402,27
35	307,38	73,78	172,93	511,76	515,83	604,65	546,25	108,80	424,35	401,85
36	287,47	73,74	149,62	527,58	547,27	622,62	522,11	112,35	443,92	416,14
37	291,93	73,84	146,03	558,55	573,54	636,53	512,10	116,08	468,11	415,79
38	292,84	73,85	145,22	577,36	584,57	634,68	512,62	119,83	488,04	416,60
39	293,26	73,88	144,79	582,31	597,05	630,02	508,44	123,88	509,48	418,04
40	299,10	74,08	145,90	592,99	610,71	628,45	499,63	127,88	530,20	419,97
41	304,69	74,23	147,35	608,33	627,62	628,41	496,25	132,09	555,36	425,38
42	315,75	74,11	150,01	640,35	650,44	629,28	498,86	136,31	587,20	435,28
43	320,70	74,21	151,71	658,25	664,63	630,97	506,73	140,52	610,68	447,48
44	319,71	74,07	152,04	653,83	671,10	635,21	518,89	144,72	625,68	457,96
45	318,39	74,28	152,40	643,97	681,39	639,11	534,53	148,85	639,11	469,55
46	318,98	74,12	152,21	639,58	692,29	647,73	552,00	152,82	651,71	489,13
47	321,37	74,07	153,31	642,68	703,98	655,88	569,22	156,72	663,49	505,70

48	329,12	74,00	154,82	650,30	733,97	668,82	578,68	160,59	686,21	525,84
49	335,18	73,80	156,44	666,72	756,52	680,56	582,53	164,35	705,40	542,20
50	341,36	73,72	158,12	686,91	781,41	689,49	583,27	168,03	726,39	550,03
51	338,33	73,85	158,45	690,68	776,82	696,85	584,61	171,50	735,23	550,49
52	339,86	73,72	158,70	684,47	780,32	702,12	589,22	174,97	740,14	547,10
53	347,65	74,06	160,58	691,85	793,51	712,29	598,55	178,32	753,72	544,63
54	345,38	74,27	160,69	691,34	791,71	726,16	611,60	181,61	758,39	541,60
55	402,89	74,71	199,81	674,34	758,28	730,91	637,01	184,92	747,10	555,60
56	396,35	74,13	174,76	735,89	904,24	757,51	636,11	188,01	769,07	568,04
57	409,96	74,46	139,93	802,24	991,65	747,33	627,81	191,20	765,38	567,48
58	395,37	74,30	131,25	816,48	918,65	722,29	612,28	194,20	758,54	560,06
59	378,12	74,12	126,35	781,15	871,10	698,75	598,25	197,05	745,51	551,78
60	370,31	73,94	123,67	754,50	859,44	677,59	586,32	199,60	730,62	542,99
61	387,81	74,32	152,55	748,67	826,33	658,23	579,29	201,94	708,39	534,02
62	362,26	74,27	191,74	672,09	717,06	680,34	600,87	204,14	677,85	552,69
63	353,65	74,45	175,30	630,20	763,98	705,91	619,27	206,15	686,23	584,67
64	361,69	74,44	168,39	673,63	811,20	723,64	637,55	208,02	707,26	591,48
65	365,55	74,34	167,89	707,20	832,20	747,81	652,30	209,96	728,59	596,00
66	373,09	74,27	169,48	729,37	871,71	768,18	669,10	211,95	749,62	601,32
67	391,33	74,92	154,81	756,94	938,78	777,95	682,31	214,00	762,41	609,16
68	410,87	74,84	136,39	803,13	1063,36	768,85	675,67	216,23	756,42	609,91
69	406,97	75,17	131,84	853,95	1053,57	754,16	668,76	218,34	750,80	605,93
70	399,63	74,68	129,45	853,57	991,31	736,76	664,44	220,29	745,92	603,13
71	390,84	74,74	127,45	823,46	931,37	723,83	662,96	222,16	742,01	599,05
72	380,13	74,49	125,10	783,88	892,82	713,11	662,34	223,84	739,32	600,70
73	379,41	74,73	124,24	760,63	887,31	703,64	662,36	225,49	737,87	600,67
74	380,38	74,64	123,83	760,21	889,55	697,43	666,81	227,04	735,63	604,95
75	383,43	74,72	123,76	771,01	919,96	692,29	672,63	228,50	732,89	611,23
76	388,17	74,66	124,11	796,20	960,74	686,37	677,54	229,92	732,04	614,59
77	393,73	74,63	124,81	826,32	994,87	682,54	683,55	231,21	730,23	620,13
78	397,47	74,72	125,10	852,58	1039,91	682,22	687,84	232,59	729,21	623,26
79	399,12	74,87	126,22	872,11	1054,39	682,49	693,70	233,76	728,92	629,03
80	402,42	74,90	126,41	880,67	1095,89	681,34	698,68	234,99	729,09	635,93
81	405,71	75,13	126,65	894,07	1123,04	678,55	703,56	236,16	728,73	638,89
82	405,86	74,91	126,82	901,98	1121,56	676,42	708,64	237,23	728,28	643,29
83	404,86	74,71	126,64	900,56	1109,97	674,03	711,23	238,35	728,18	644,27
84	404,77	74,96	126,83	893,45	1090,00	673,99	712,34	239,41	727,96	646,21
85	402,48	75,02	126,30	883,56	1080,54	674,60	715,79	240,46	728,67	647,13
86	402,00	75,02	126,29	876,87	1065,54	674,79	718,66	241,45	729,36	652,06
87	401,25	74,96	125,90	868,05	1044,09	673,33	722,02	242,44	731,64	649,82
88	398,39	74,96	125,71	855,19	1034,27	674,12	722,75	243,47	733,75	656,46
89	397,70	74,74	125,52	846,53	1027,51	674,58	723,56	244,49	735,99	656,69
90	397,56	74,61	125,65	841,05	1022,84	674,28	724,33	245,41	738,01	659,92
91	395,16	74,97	125,26	832,14	1006,88	675,27	725,42	246,37	739,86	659,98
92	390,93	74,40	124,86	817,25	973,02	676,72	723,98	247,31	742,27	667,65
93	386,78	74,75	123,84	793,82	939,61	677,49	724,19	248,31	745,50	673,64
94	382,96	75,07	123,31	770,30	906,32	681,06	722,02	249,29	749,72	677,07
95	374,92	75,07	122,25	743,39	871,25	684,83	720,16	250,25	753,25	679,61
96	377,76	75,12	126,65	715,57	841,25	688,25	722,02	251,26	752,98	685,35
97	358,14	75,22	190,11	663,19	730,22	686,23	720,59	252,72	725,93	671,91
98	359,44	75,24	170,02	643,07	755,39	673,53	657,59	253,95	708,66	613,61
99	373,67	75,12	169,82	720,70	792,46	672,48	613,27	255,17	691,26	584,43
100	374,76	75,39	170,55	761,36	787,91	685,74	579,23	256,38	674,07	559,61

101	375,01	75,45	171,17	778,90	778,69	692,25	553,78	257,69	657,87	543,86
102	369,00	75,81	170,88	774,08	763,31	700,95	532,82	259,06	644,42	527,74
103	386,64	75,70	140,31	750,82	790,62	687,19	521,37	260,49	634,72	521,38
104	393,10	75,30	131,19	777,22	810,43	668,85	509,25	261,99	623,66	511,69
105	384,63	75,36	127,79	796,89	791,71	652,91	498,83	263,47	613,05	502,37
106	376,60	75,31	125,60	789,73	775,61	638,49	489,42	264,77	602,37	493,35
107	370,15	75,63	123,73	776,67	767,35	626,37	480,76	265,94	591,70	484,23
108	368,56	75,72	122,73	775,01	775,85	616,64	473,43	267,07	582,31	475,53
109	369,11	75,76	122,46	786,57	785,01	606,59	466,82	268,06	573,80	467,13
110	368,89	75,53	122,15	796,86	803,02	599,87	461,06	268,99	566,35	459,31
111	370,13	75,70	122,01	808,84	829,66	594,38	456,09	269,83	559,98	452,06
112	369,09	75,86	121,98	820,53	833,81	587,98	450,81	270,56	555,08	445,46
113	367,40	75,66	121,82	823,11	828,98	581,56	446,32	271,29	551,25	439,39
114	366,88	76,09	121,46	820,17	819,54	574,50	441,66	271,89	548,03	433,87
115	364,59	75,55	120,64	811,76	799,96	566,70	436,52	272,30	545,95	426,63
116	360,54	75,19	120,13	797,66	780,35	560,38	432,68	272,71	545,02	420,44
117	358,98	75,40	119,60	786,31	768,97	555,79	429,08	273,10	543,86	417,00
118	357,22	75,58	119,26	779,44	761,10	550,97	425,61	273,41	543,25	413,52
119	355,91	75,77	118,91	775,43	759,17	546,98	422,33	273,67	543,23	410,78
120	354,67	75,70	118,90	774,28	762,61	543,18	419,19	273,89	545,44	407,99
121	354,85	75,51	118,69	777,21	763,90	540,30	417,59	274,04	551,47	405,42
122	352,92	75,24	118,28	775,48	765,96	536,99	415,00	274,21	556,99	402,93
123	352,48	75,29	117,96	775,73	771,88	534,94	413,53	274,19	558,80	400,97
124	352,90	75,24	118,00	778,99	778,11	533,17	412,17	274,24	559,08	398,78
125	352,63	75,53	118,03	785,20	783,67	530,92	410,95	274,18	556,10	397,03
126	353,83	75,62	118,10	791,16	790,27	529,85	410,10	274,10	553,75	395,68
127	354,46	75,95	118,19	797,77	803,72	529,38	410,21	273,97	551,90	394,99
128	355,03	75,56	118,33	805,06	817,09	530,01	411,64	273,75	551,68	394,76
129	356,58	75,32	118,30	813,02	848,31	531,30	412,70	273,69	552,36	394,85
130	358,39	74,96	118,37	826,63	886,26	532,77	414,09	273,37	553,35	394,51
131	360,17	75,13	118,81	837,33	891,48	533,37	414,25	273,07	555,88	392,27
132	360,15	75,36	118,96	837,69	882,72	535,75	415,33	272,79	558,09	392,31
133	359,02	75,65	119,01	830,96	860,38	539,68	417,31	272,60	561,22	394,32
134	357,70	75,67	118,94	815,96	828,13	543,14	419,42	272,08	562,64	395,29
135	356,22	75,41	118,87	796,52	818,10	547,67	421,29	271,71	566,27	395,91
136	356,86	75,68	118,61	784,80	789,86	553,43	422,61	271,30	572,39	396,98
137	354,99	75,64	118,35	767,09	772,53	559,39	424,74	270,95	579,77	399,33
138	355,71	75,64	118,44	754,19	776,14	566,96	427,30	270,46	598,91	401,56
139	356,50	75,35	118,59	751,63	803,58	577,80	430,44	270,04	604,99	403,99
140	364,34	75,45	119,17	778,22	863,05	587,85	433,42	269,77	608,49	407,14
141	370,42	75,97	120,25	821,27	909,07	594,75	435,85	269,29	611,48	408,54
142	379,75	75,78	120,75	865,23	1116,23	598,48	438,74	268,96	611,20	409,07
143	387,45	75,57	122,45	919,32	1097,47	604,60	442,44	268,67	612,26	411,23
144	388,59	75,78	122,80	927,78	1146,02	613,54	446,44	268,36	609,78	412,61
145	397,84	75,77	123,64	940,90	1294,86	611,79	448,96	268,00	606,03	413,62
146	405,00	75,82	125,47	959,25	1236,74	610,96	455,02	267,84	605,96	415,65
147	398,84	75,33	125,23	948,66	1169,69	616,93	460,50	267,46	605,41	417,27
148	392,22	75,48	124,62	929,70	1147,63	623,49	466,00	267,18	606,04	421,93
149	392,76	75,75	124,60	921,51	1165,23	620,97	470,32	267,07	608,00	424,54
150	393,25	75,67	124,87	921,14	1173,74	617,39	475,06	266,75	610,90	427,48
151	394,01	75,47	125,05	920,88	1135,59	617,84	482,62	266,52	613,59	432,62
152	389,81	75,66	124,70	910,97	1130,81	618,90	488,99	266,34	617,17	437,30
153	389,85	75,93	124,72	904,11	1113,28	619,42	495,32	266,20	620,87	443,00

154	389,02	75,58	124,72	897,67	1104,03	621,30	501,33	266,14	624,64	447,99
155	388,08	75,98	124,85	894,07	1104,79	623,77	509,59	266,04	628,37	453,41
156	388,41	75,50	124,77	893,06	1092,00	626,59	516,92	265,99	632,22	460,01
157	389,09	76,10	124,74	891,35	1096,85	629,11	521,90	265,90	635,71	464,78
158	389,85	75,76	124,73	891,62	1098,19	632,24	527,65	265,89	639,66	469,38
159	390,27	75,94	124,95	892,83	1096,23	635,28	534,03	265,89	644,14	476,31
160	390,00	76,22	124,86	892,90	1100,34	638,73	539,53	265,94	648,63	479,87
161	390,92	76,13	125,15	892,99	1090,14	642,37	548,08	265,89	652,41	487,70
162	390,44	75,94	125,04	891,22	1089,03	646,07	555,31	265,98	656,53	495,55
163	390,67	76,09	124,90	891,59	1088,10	648,43	560,50	266,04	659,95	500,86
164	390,53	76,34	124,87	892,48	1101,38	650,25	566,26	266,09	662,96	506,73
165	391,33	76,25	124,88	895,51	1109,72	650,09	570,01	266,33	667,96	510,97
166	391,80	76,48	124,91	897,20	1116,47	649,56	572,49	266,38	671,65	517,33
167	392,50	75,78	124,93	901,61	1123,45	649,98	575,23	266,61	675,63	524,49
168	393,89	75,73	124,76	905,28	1138,21	651,34	579,58	266,88	679,26	529,75
169	398,68	76,30	125,58	913,87	1114,64	651,89	584,59	267,04	682,44	533,01
170	395,60	75,77	124,91	912,04	1140,40	651,97	587,72	267,31	686,13	537,82
171	396,15	76,23	125,10	915,51	1157,83	651,55	592,38	267,66	688,96	542,95
172	397,79	76,04	125,16	921,17	1168,99	651,90	597,89	267,90	689,84	549,33
173	397,70	75,71	125,32	924,65	1168,15	652,83	602,97	268,18	690,35	554,93
174	397,51	75,51	125,01	923,41	1154,21	652,28	607,94	268,51	691,00	558,35
175	397,30	76,16	125,04	920,04	1143,38	652,72	613,08	268,83	691,13	563,34
176	397,17	75,80	125,08	917,09	1130,19	652,83	617,55	269,25	690,94	567,93
177	395,63	75,86	124,81	910,35	1120,83	652,96	621,43	269,56	690,22	569,60
178	394,93	76,11	124,66	906,37	1119,60	653,09	626,06	270,06	687,83	572,99
179	394,19	75,71	124,57	904,30	1104,96	652,10	629,15	270,35	684,88	574,66
180	395,25	76,32	124,62	901,73	1107,98	653,02	636,42	270,81	679,45	576,06
181	394,49	76,22	124,50	900,53	1094,98	653,99	641,04	271,20	673,88	578,65
182	394,43	76,09	124,45	899,21	1086,51	654,05	646,67	271,72	669,13	580,57
183	393,93	75,99	124,53	895,98	1070,62	654,41	652,73	272,10	664,89	582,95
184	392,34	75,72	124,20	890,04	1052,08	655,54	658,07	272,66	661,46	584,42
185	391,98	75,69	123,91	886,27	1068,93	656,67	663,98	273,22	657,93	585,27
186	392,10	76,03	124,16	887,33	1062,29	658,00	669,29	273,70	654,43	589,23
187	392,52	75,89	124,26	887,11	1032,80	658,52	675,07	274,31	651,12	592,11
188	392,61	76,16	124,54	883,27	1013,50	660,28	679,70	275,01	648,12	597,29
189	392,06	76,03	124,11	877,25	1002,70	661,84	684,90	275,63	645,25	599,85
190	391,51	76,10	124,20	873,53	988,23	662,59	687,38	276,32	642,79	602,13
191	391,87	75,98	124,13	871,99	981,80	663,30	691,88	277,02	640,01	604,87
192	391,10	76,12	124,08	868,96	966,88	664,30	695,55	277,71	637,92	606,98
193	389,80	76,23	124,08	860,68	944,69	666,19	700,28	278,44	636,19	610,83
194	386,41	76,11	123,69	845,62	926,16	667,20	704,84	279,11	634,47	615,09
195	383,16	76,29	123,12	827,33	912,78	668,59	710,31	279,90	633,10	618,49
196	379,96	76,04	122,57	812,18	899,91	669,87	713,98	280,58	632,13	620,51
197	377,19	75,94	122,20	801,30	889,21	671,56	717,96	281,48	631,45	624,43
198	376,09	76,17	121,84	793,38	884,03	671,75	719,39	282,09	630,84	625,98
199	375,39	76,17	121,55	788,69	881,60	672,71	721,67	282,88	630,71	630,19
200	374,48	76,11	121,03	787,04	883,16	672,56	724,67	283,61	631,05	633,03
201	372,80	76,40	120,71	784,64	898,06	671,81	728,37	284,40	630,99	633,48
202	373,20	76,40	121,00	794,74	913,84	672,09	731,57	285,08	629,76	641,22
203	375,85	76,28	121,20	805,84	917,25	673,48	731,44	285,91	628,58	643,10
204	375,98	76,73	121,09	810,30	925,86	674,77	731,29	286,60	627,24	644,51
205	374,97	76,27	120,91	812,46	927,88	677,02	729,98	287,39	626,10	647,44
206	374,09	76,42	120,94	813,19	920,69	678,11	729,04	288,05	625,24	646,90

207	373,24	76,18	121,00	808,98	916,07	680,24	728,44	288,78	624,57	650,46
208	373,70	76,28	120,77	804,66	903,52	680,77	727,28	289,46	624,55	650,58
209	371,82	76,46	120,71	796,64	884,82	682,26	724,74	290,15	625,51	650,05
210	370,41	75,95	120,45	787,47	878,02	682,80	723,36	290,79	626,50	651,21
211	369,99	76,74	120,40	782,49	873,30	681,86	723,05	291,36	626,72	652,97
212	370,02	76,42	120,14	779,51	860,24	683,05	722,47	291,99	627,54	655,47
213	369,63	75,70	119,89	773,69	852,46	682,24	722,53	292,47	627,68	658,07
214	368,34	76,22	119,79	767,46	846,53	681,61	721,90	293,05	627,83	658,41
215	367,30	76,30	119,64	761,80	835,84	681,38	722,18	293,61	628,11	657,54
216	366,03	76,23	119,70	757,57	832,54	681,28	723,13	294,10	627,87	661,09
217	365,19	76,64	119,38	756,27	835,07	680,19	722,70	294,58	628,08	662,56
218	366,27	76,28	119,21	757,81	830,10	677,33	720,56	295,03	628,09	663,01
219	366,08	75,92	118,98	757,41	826,78	676,40	719,13	295,45	627,89	664,33
220	365,33	76,90	119,02	753,42	829,89	675,03	716,87	295,79	627,65	662,17
221	364,31	75,53	118,98	753,01	833,72	673,83	713,13	296,21	626,59	663,82
222	363,67	76,36	118,93	754,82	825,42	671,18	707,96	296,49	625,17	661,47
223	360,23	76,36	118,40	748,54	801,00	665,95	702,02	296,85	624,45	660,00
224	357,72	76,70	117,86	733,10	791,71	661,21	695,77	297,05	623,39	656,75
225	357,32	76,81	117,88	726,13	782,09	657,82	690,16	297,28	627,30	655,81
226	349,26	76,74	116,88	707,40	763,85	654,32	684,62	297,44	631,01	652,74
227	343,15	76,72	116,12	681,31	748,50	650,79	678,22	297,54	633,29	652,29
228	339,22	77,12	115,30	661,08	734,47	647,60	672,65	297,57	635,72	649,49
229	338,53	77,25	114,94	647,56	740,01	645,05	668,64	297,62	637,11	649,60
230	340,99	76,62	114,96	649,89	748,75	642,32	662,92	297,54	638,19	648,50
231	342,14	77,20	114,94	657,37	747,85	638,96	658,26	297,57	637,09	648,50
232	339,14	76,39	114,54	657,84	743,59	636,90	654,67	297,51	635,77	647,05
233	338,55	76,64	114,04	654,12	737,66	633,58	650,30	297,34	633,77	644,40
234	338,89	76,30	113,96	652,72	736,07	630,54	645,20	297,10	629,77	638,29
235	337,44	75,84	113,53	651,98	730,04	628,76	641,68	296,95	625,92	638,34
236	334,84	76,27	113,33	647,56	724,78	626,42	636,87	296,64	621,84	635,48
237	333,61	76,26	113,07	643,72	722,44	624,21	634,51	296,30	618,03	634,81
238	331,78	76,72	112,70	641,10	719,44	621,04	630,19	295,99	614,59	633,80
239	331,25	76,71	112,59	638,90	716,60	618,31	626,41	295,63	610,56	631,17
240	330,59	76,97	112,62	637,38	716,66	615,43	622,52	295,18	605,94	628,82
241	330,04	77,00	112,62	637,85	715,16	611,51	617,45	294,75	601,63	625,98
242	329,88	76,84	112,40	639,52	714,35	608,67	613,53	294,23	597,06	624,19
243	329,10	77,07	112,28	640,14	717,85	606,39	609,55	293,86	592,97	621,83
244	328,23	76,95	112,21	642,56	715,83	603,07	605,34	293,26	588,64	619,55
245	327,89	77,36	111,98	644,04	716,22	600,20	598,67	292,68	584,35	616,34
246	326,35	77,54	111,97	643,98	708,24	596,33	585,48	292,06	580,37	607,67
247	325,44	77,03	111,50	642,14	705,41	593,39	578,32	291,47	576,27	605,29
248	324,58	76,59	111,03	639,54	705,81	591,12	572,64	290,99	572,72	601,01
249	323,95	76,04	110,81	638,80	702,56	589,13	568,66	290,41	568,88	596,77
250	322,59	76,01	110,64	638,21	703,50	586,83	566,53	289,87	565,55	594,39
251	322,00	76,41	110,54	637,75	701,87	584,96	564,78	289,31	562,02	591,13
252	321,23	76,05	110,44	639,73	698,43	582,31	562,45	288,82	557,93	588,50
253	320,95	76,18	110,23	639,88	693,37	581,22	560,46	288,24	553,91	585,03
254	320,44	75,51	109,95	639,39	690,24	579,63	557,98	287,68	550,74	581,67
255	320,45	76,51	110,10	639,91	689,79	578,50	555,84	287,13	547,59	579,15
256	319,30	76,71	110,02	640,48	684,61	577,07	552,92	286,60	544,14	575,64
257	317,66	76,28	109,60	637,21	679,12	575,82	549,82	285,83	541,05	572,85
258	316,37	75,66	109,10	633,10	676,02	574,02	546,89	285,17	538,05	569,96
259	314,38	75,83	109,01	628,25	672,05	573,43	545,04	284,54	535,49	567,94

260	312,64	76,45	108,85	623,42	671,87	572,77	543,14	283,82	532,89	565,33
261	311,60	76,36	108,63	621,36	671,76	571,08	542,16	283,15	530,58	562,52
262	311,82	76,06	108,61	621,63	670,71	569,87	540,28	282,48	528,14	559,06
263	311,61	76,39	108,66	624,34	666,64	568,16	539,57	281,82	525,12	558,28
264	311,31	76,42	108,51	624,54	664,11	565,90	537,34	281,17	522,55	555,80
265	310,43	76,56	108,23	625,56	664,94	563,42	535,44	280,42	519,97	554,28
266	309,17	76,60	108,18	624,59	659,44	562,24	530,96	279,72	517,10	549,09
267	307,98	76,53	107,98	622,73	653,32	561,04	527,71	278,96	514,37	544,73
268	307,35	76,53	107,61	618,81	651,06	559,35	525,59	278,26	511,76	541,83
269	306,64	76,25	107,56	617,54	651,27	558,63	524,53	277,62	509,29	537,79
270	306,05	76,22	107,38	618,32	649,76	556,22	523,85	276,94	506,40	535,17
271	305,62	76,50	107,33	618,19	651,71	554,34	523,81	276,38	504,03	533,34
272	305,33	77,05	107,54	618,24	650,21	552,34	524,02	275,84	501,84	529,33
273	304,35	77,75	107,61	617,09	648,41	550,08	523,49	275,30	499,56	527,61
274	303,19	77,14	107,46	615,43	647,46	547,69	523,04	274,88	497,44	526,30
275	79,62	74,05	76,38	84,60	81,92	78,17	81,70	75,41	77,67	80,61
276	87,65	74,03	78,43	97,52	96,28	81,23	107,22	75,40	82,28	86,58
277	92,82	74,16	80,06	108,61	109,50	84,74	113,57	75,38	88,47	92,36
278	101,24	74,10	82,43	124,55	124,78	92,46	124,37	75,41	99,55	103,72
279	115,47	74,06	86,40	150,53	148,23	108,34	142,10	75,43	114,05	121,28
280	135,76	73,92	90,76	187,54	182,21	125,89	169,83	75,48	133,23	148,95
281	164,19	74,04	80,81	249,36	234,28	161,71	215,27	75,52	154,05	189,45
282	193,47	73,92	77,36	322,34	312,75	211,35	267,38	75,62	190,50	226,16
283	204,50	74,02	101,95	368,88	378,77	249,07	303,73	75,72	227,03	256,80
284	215,62	74,16	114,99	406,28	422,15	290,83	334,91	75,89	265,47	284,86
285	228,46	74,22	120,14	447,69	461,66	332,61	364,06	76,08	309,08	308,33
286	241,78	74,25	115,44	490,31	501,42	365,24	384,65	76,34	356,92	331,18
287	245,44	74,31	96,98	520,15	519,05	392,42	402,55	76,61	404,12	351,66
288	250,56	74,49	127,86	543,38	525,97	419,08	419,13	76,96	452,78	371,42
289	254,22	74,24	130,53	553,42	533,78	437,72	435,14	77,35	484,85	386,79
290	256,86	74,39	131,74	557,94	535,70	459,35	449,41	77,79	512,63	402,21
291	261,26	74,44	133,72	576,92	539,91	472,53	461,32	78,29	545,06	413,29
292	265,23	74,43	135,23	580,96	546,29	484,24	473,93	78,83	567,30	425,29
293	269,90	74,47	136,67	582,32	552,51	495,92	483,78	79,46	582,37	435,34
294	297,98	74,53	151,89	575,09	557,86	521,60	500,01	80,16	584,38	464,24
295	274,28	74,84	151,60	537,26	533,09	524,67	488,57	80,95	569,11	454,25
296	284,13	74,81	118,30	556,94	529,62	544,56	457,18	81,80	557,54	430,43
297	282,96	74,75	140,49	554,64	575,45	560,34	422,04	82,76	541,21	399,16
298	283,95	74,85	143,08	564,61	600,98	592,73	401,39	83,78	532,62	386,05
299	289,23	74,97	145,19	566,25	619,92	609,16	388,26	84,86	543,36	373,34
300	287,85	74,88	144,99	556,82	620,42	611,87	378,64	86,03	542,29	366,74
301	285,41	74,85	144,73	558,43	618,42	609,69	377,16	87,31	538,55	360,98
302	293,67	75,07	147,37	569,85	633,85	596,43	389,91	88,63	534,19	363,85
303	297,56	75,16	148,49	572,87	647,24	571,46	411,26	90,02	534,97	368,83
304	301,13	74,98	149,58	578,94	651,49	550,19	433,61	91,50	537,26	380,41
305	303,96	74,80	151,17	593,39	654,46	530,35	449,54	93,03	543,11	403,05
306	301,36	75,32	150,67	599,21	651,25	511,10	459,40	94,66	548,54	423,01
307	298,60	75,30	150,62	598,62	643,12	495,29	487,61	96,35	552,98	435,02
308	297,87	75,37	150,09	599,89	632,68	483,23	490,15	98,07	560,23	449,48
309	310,72	75,46	153,65	617,36	643,55	480,82	518,01	99,90	572,87	462,98
310	322,24	75,46	156,83	646,34	679,28	484,20	553,01	101,79	581,57	480,66
311	329,74	75,37	159,31	672,76	706,84	494,99	584,08	103,72	588,04	487,35
312	334,67	75,69	161,87	678,91	724,81	505,90	632,30	105,72	593,36	495,42

313	342,13	75,53	164,06	685,05	745,75	513,50	671,28	107,81	599,16	505,84
314	348,03	75,57	165,69	697,86	763,43	524,70	700,14	109,91	603,28	514,74
315	349,81	75,31	166,81	706,18	773,07	535,71	721,16	112,07	606,79	527,07
316	342,49	75,41	165,64	705,04	752,30	548,45	738,54	114,26	612,36	549,92
317	343,06	75,74	165,07	711,34	736,34	556,27	758,71	116,48	617,27	566,30
318	342,55	75,34	166,14	717,94	732,91	561,76	773,05	118,76	624,80	575,76
319	370,04	75,60	178,39	725,36	739,55	566,57	789,11	121,06	634,61	585,48
320	380,71	75,79	179,78	827,67	777,46	576,51	788,86	123,43	659,96	589,85
321	385,69	75,96	179,49	840,54	865,22	583,32	778,94	125,76	670,67	588,97
322	383,72	76,03	179,27	847,49	870,02	588,03	759,94	128,17	681,15	596,63
323	384,88	76,03	180,11	859,92	860,16	597,42	757,11	130,60	691,41	596,80
324	391,92	75,61	180,60	872,51	880,76	607,03	765,04	133,01	702,24	598,24
325	397,66	75,69	182,77	892,98	901,70	613,89	782,45	135,49	709,89	599,93
326	398,90	75,85	183,65	895,21	897,34	626,34	799,39	138,00	718,14	598,61
327	401,36	75,47	185,45	904,28	901,66	630,33	803,13	140,52	724,92	604,39
328	404,13	76,04	185,44	926,99	909,48	640,41	802,10	143,09	733,89	607,47
329	406,81	75,35	186,70	940,55	922,33	647,76	808,99	145,64	740,85	615,26
330	407,11	75,75	186,30	942,89	913,91	656,89	817,96	148,22	750,01	617,65
331	407,28	75,74	185,78	948,71	902,82	668,88	824,39	150,76	759,46	623,51
332	410,82	76,16	187,96	950,36	897,32	677,15	830,73	153,30	769,50	628,63
333	409,92	76,65	188,02	962,58	890,53	690,06	836,77	155,88	779,13	638,97
334	414,60	76,38	189,73	973,90	907,05	697,29	844,84	158,44	786,99	643,70
335	423,60	76,36	191,82	1025,20	933,79	711,65	855,25	161,06	795,95	651,03
336	425,49	76,87	192,38	1051,72	953,76	724,49	866,51	163,67	803,17	665,46
337	424,75	77,25	192,91	1057,78	950,69	733,97	875,10	166,30	811,06	670,75
338	426,45	76,88	193,60	1050,70	946,04	744,61	881,32	168,94	820,04	678,23
339	426,81	77,02	192,99	1047,49	944,31	752,51	885,53	171,61	826,97	689,06
340	428,71	76,96	193,38	1057,71	940,31	761,71	892,52	174,32	831,15	695,89
341	429,83	77,59	195,42	1067,28	942,92	771,13	887,21	177,07	835,36	712,71
342	434,11	76,57	196,20	1096,02	953,71	780,87	883,07	179,88	841,21	707,73
343	441,04	77,38	197,82	1109,29	983,19	783,99	876,78	182,74	844,33	717,79
344	438,26	77,43	196,92	1078,67	987,43	787,92	872,33	185,68	851,08	720,27
345	433,81	76,70	195,61	1062,32	967,60	795,38	869,13	188,71	858,99	725,12
346	435,14	77,64	196,97	1055,43	954,01	803,12	863,27	191,79	867,92	733,72
347	434,92	77,98	196,49	1030,22	952,35	815,54	855,06	195,02	871,84	736,47
348	429,26	78,44	195,70	1007,82	939,02	828,51	848,90	198,24	873,76	742,31
349	469,93	78,82	226,55	922,67	900,25	856,84	863,27	201,89	864,13	762,76
350	425,60	78,75	233,55	763,68	773,45	838,18	820,87	206,02	834,74	749,72
351	407,32	78,29	195,07	870,87	731,68	773,84	728,36	209,55	819,47	708,08
352	417,33	78,85	194,06	905,10	816,96	736,84	667,53	212,84	802,80	685,45
353	418,33	78,09	193,24	912,73	864,84	723,46	622,45	215,95	790,66	675,51
354	420,56	77,71	192,89	914,93	894,75	697,28	588,09	218,95	783,09	677,82
355	413,24	77,87	190,84	894,04	892,08	666,28	560,24	221,85	784,17	693,40
356	412,70	78,27	190,80	878,97	881,98	641,20	538,98	224,72	783,44	703,15
357	412,65	77,38	190,62	882,44	886,43	622,63	522,08	227,59	770,59	715,48
358	405,45	77,24	189,03	861,41	870,02	609,56	506,79	230,50	763,76	725,78
359	402,52	77,32	187,43	849,85	857,67	603,20	493,46	233,47	760,24	731,62
360	404,85	77,71	188,07	858,81	860,69	596,77	479,83	236,44	756,44	739,49
361	410,63	77,77	189,48	875,33	887,19	593,69	467,90	239,55	755,54	738,26
362	410,72	78,31	189,70	898,89	911,29	592,00	457,09	242,68	754,84	740,27
363	416,58	78,52	191,69	913,17	935,91	588,74	450,40	245,85	756,83	729,19
364	417,48	78,25	191,01	903,56	942,01	584,35	443,81	249,01	766,44	723,34
365	411,23	77,34	190,80	890,03	914,90	573,58	438,51	252,20	775,21	723,33

366	409,03	77,17	189,24	881,10	899,05	569,69	434,07	255,32	782,25	726,26
367	407,79	78,99	189,57	891,42	900,40	564,19	439,01	258,39	788,37	734,77
368	411,73	78,36	189,21	896,37	915,71	557,93	453,63	261,47	792,72	738,48
369	415,97	78,75	190,61	905,06	929,68	551,99	463,20	264,44	795,84	735,37
370	430,09	77,92	194,59	934,78	956,69	549,44	458,61	267,34	794,72	726,76
371	446,96	78,71	199,01	969,26	1004,61	557,36	449,04	270,21	792,60	717,33
372	451,64	77,90	202,28	968,02	1022,44	577,56	441,90	272,97	793,16	704,47
373	439,33	78,28	199,35	946,74	1017,88	589,02	436,69	275,57	797,18	696,74
374	418,41	79,48	194,89	906,80	961,94	587,53	430,74	278,02	803,08	695,12
375	402,74	79,03	190,15	878,33	884,53	590,66	426,20	280,36	811,82	692,80
376	396,14	78,70	187,54	865,38	849,04	594,14	423,18	282,57	820,19	690,46
377	396,12	78,65	186,33	862,59	844,85	598,80	421,09	284,66	827,37	690,04
378	398,27	78,94	186,35	870,74	855,89	603,77	419,38	286,64	834,17	688,55
379	399,48	78,91	185,67	882,14	864,57	612,54	418,36	288,51	840,44	689,13
380	413,85	79,09	188,95	916,93	899,61	628,03	418,11	290,27	844,48	687,52
381	423,70	79,29	192,22	939,15	943,71	639,51	418,96	291,95	849,26	684,66
382	424,14	78,03	193,00	950,68	961,02	646,64	420,86	293,53	853,02	676,69
383	423,37	78,32	192,90	954,89	968,64	651,00	422,73	295,01	856,17	674,22
384	425,25	78,59	193,27	960,71	967,11	656,13	425,36	296,37	860,23	672,70
385	426,08	78,07	193,43	976,54	967,54	662,10	427,87	297,65	865,44	670,56
386	426,90	79,43	193,27	974,30	965,42	668,99	430,05	298,86	871,95	676,65
387	426,05	78,35	193,73	982,41	967,27	681,09	433,15	300,01	877,36	683,62
388	421,57	77,97	191,74	975,72	951,46	700,57	435,68	301,07	884,09	690,37
389	419,03	77,95	191,67	963,59	933,68	708,97	439,22	302,08	890,48	689,99
390	418,77	77,82	191,69	951,70	921,60	725,50	443,15	303,06	894,39	691,58
391	414,69	79,67	189,86	944,59	909,41	739,33	446,75	304,01	896,47	692,80
392	413,27	77,71	189,14	939,24	891,98	764,31	450,66	304,88	897,97	696,88
393	410,47	78,14	188,42	933,94	880,98	783,07	454,17	305,71	899,64	701,41
394	410,22	78,52	188,40	922,83	873,48	788,62	457,95	306,54	898,49	705,79
395	406,12	78,46	187,43	922,83	857,10	802,09	466,33	307,30	896,61	710,90
396	408,49	78,63	187,49	916,11	856,36	821,18	485,09	308,07	896,82	721,33
397	409,24	78,49	187,09	923,14	855,31	833,34	506,59	308,91	897,25	721,42
398	406,14	79,05	187,42	911,45	839,82	848,49	527,61	309,70	897,19	728,03
399	401,97	78,89	186,17	900,21	823,02	866,38	528,19	310,46	896,38	735,34
400	397,22	78,80	184,61	887,58	802,15	882,84	526,32	311,27	895,42	739,93
401	393,70	78,77	182,99	879,03	783,57	891,38	525,27	312,05	894,74	744,50
402	394,73	79,15	183,33	893,00	777,09	893,41	525,23	312,90	895,07	756,52
403	396,54	78,91	183,67	900,64	782,24	893,02	535,58	313,71	897,19	764,70
404	400,76	78,62	183,94	943,86	795,93	897,06	551,52	314,54	901,20	774,46
405	403,75	79,24	185,74	957,46	808,52	900,57	564,80	315,43	901,92	780,68
406	400,02	78,63	184,64	936,82	811,32	904,06	571,10	316,32	902,98	788,61
407	396,05	78,66	183,48	906,30	796,93	904,39	580,63	317,20	901,41	787,30
408	392,53	78,58	183,38	888,33	779,66	902,17	602,76	318,12	897,95	787,27
409	389,21	80,22	180,43	879,46	769,08	896,85	623,77	319,03	895,86	788,83
410	387,60	79,75	181,16	873,88	760,36	897,78	642,37	319,90	892,36	794,22
411	387,71	79,54	181,39	874,38	754,85	904,21	658,91	320,89	887,85	792,85
412	386,40	79,54	181,06	872,40	753,67	897,52	674,56	321,88	883,50	796,18
413	386,19	79,16	179,84	868,55	753,94	890,75	682,47	322,86	876,85	794,40
414	384,78	79,91	180,13	865,95	750,48	902,50	694,61	323,91	870,96	795,33
415	383,13	79,68	179,37	856,98	748,81	897,95	707,37	324,99	865,22	797,01
416	383,00	79,56	179,12	852,23	748,31	895,14	715,97	326,07	860,82	793,26
417	382,46	80,11	179,10	850,40	745,75	899,50	719,61	327,19	855,17	794,96
418	380,59	79,38	178,63	845,75	744,39	895,63	724,55	328,37	852,40	792,37

419	380,22	79,13	178,31	842,89	740,97	895,53	732,31	329,62	848,77	790,54
420	379,02	79,21	178,17	842,11	736,51	892,30	738,71	330,88	845,56	793,95
421	378,27	79,34	177,26	840,41	733,95	889,59	748,05	332,28	841,27	793,48
422	376,64	79,01	177,39	836,21	731,03	888,48	757,39	333,71	837,08	791,56
423	375,24	78,88	176,79	831,68	728,96	883,48	762,04	335,17	834,39	792,85
424	374,11	79,31	176,18	829,45	726,09	880,31	768,91	336,72	830,20	795,47
425	373,25	80,30	176,55	826,67	722,63	882,03	774,97	338,31	827,41	792,04
426	371,16	79,71	175,66	821,72	718,10	879,86	777,64	339,94	824,67	789,06
427	369,62	78,76	175,43	817,91	713,85	878,38	781,34	341,63	821,97	787,26
428	368,30	78,79	174,10	813,12	710,14	875,63	784,64	343,33	819,13	785,75
429	368,01	79,45	174,26	811,88	707,94	871,78	790,19	345,10	817,65	786,82
430	367,17	79,73	173,68	811,32	706,15	868,05	791,85	346,86	817,05	790,47
431	366,11	80,03	173,05	806,74	705,49	862,65	793,39	348,68	816,12	792,17
432	364,90	78,79	173,05	804,77	703,18	858,00	793,47	350,50	812,38	791,30
433	363,63	78,63	172,10	799,59	699,25	852,39	794,84	352,33	808,47	789,95
434	362,15	78,96	171,58	795,08	695,21	849,22	796,63	354,21	804,85	787,12
435	360,79	79,21	170,96	789,47	693,17	845,04	793,56	356,11	799,29	788,26
436	359,89	80,23	170,70	783,84	690,50	839,95	791,36	357,99	789,99	787,02
437	357,36	79,10	170,05	775,43	687,24	834,50	792,18	359,86	780,33	786,50
438	355,79	79,10	169,95	770,28	684,65	831,50	793,05	361,68	771,05	786,79
439	354,12	79,94	169,43	765,86	680,41	825,33	796,38	363,50	763,19	784,62
440	352,90	78,97	168,50	760,75	676,97	820,90	801,80	365,26	756,02	782,61
441	79,09	76,55	77,80	81,70	79,15	77,08	77,15	77,07	78,05	77,91
442	83,44	76,44	78,86	88,49	88,86	79,21	78,68	77,05	81,81	79,42
443	85,88	76,54	79,64	94,47	95,85	81,79	79,66	77,07	85,54	80,19
444	92,17	76,58	81,03	105,79	105,32	87,65	81,64	77,07	95,15	81,88
445	99,32	76,70	83,05	117,39	119,11	94,21	84,30	77,05	104,78	83,97
446	111,33	76,76	86,08	150,91	141,72	105,63	88,84	77,10	117,18	87,96
447	122,93	76,73	92,54	155,14	164,22	117,66	95,83	77,10	125,54	92,79
448	121,07	76,86	92,91	165,36	171,58	132,02	101,42	77,11	136,65	99,73
449	126,62	76,90	91,46	187,73	188,18	141,93	105,79	77,20	159,70	103,01
450	132,95	76,94	92,93	207,87	205,75	152,89	110,22	77,26	177,05	109,53
451	141,98	76,95	95,33	229,50	226,00	164,19	116,43	77,29	195,75	115,30
452	152,43	76,98	98,27	253,55	253,87	178,36	122,71	77,37	214,62	122,13
453	162,03	76,65	100,70	276,53	281,61	194,76	128,16	77,42	236,50	128,95
454	168,37	76,93	103,00	295,58	312,38	213,34	135,57	77,49	259,18	136,69
455	171,01	77,02	104,26	302,18	337,58	233,57	143,37	77,58	278,74	145,04
456	173,02	77,09	105,23	305,60	353,87	251,89	151,74	77,66	293,33	152,85
457	177,04	77,06	106,46	316,72	364,19	267,18	159,95	77,81	310,51	162,21
458	183,13	77,10	108,07	341,98	378,11	281,43	168,09	77,92	327,47	170,56
459	196,32	77,15	111,85	377,55	407,25	302,04	180,67	78,08	346,05	185,85
460	205,96	77,19	115,16	402,63	446,40	327,25	195,31	78,27	364,32	201,14
461	215,21	77,14	117,67	429,95	483,91	348,27	210,71	78,43	379,34	217,88
462	225,86	77,21	120,59	457,86	521,77	379,52	234,40	78,63	397,60	235,05
463	226,00	77,09	121,29	460,10	526,02	405,50	257,63	78,87	414,62	251,68
464	228,74	77,34	122,54	469,79	521,53	425,08	283,45	79,11	437,83	266,96
465	231,56	77,20	123,33	474,22	518,96	438,20	301,40	79,41	461,26	281,26
466	231,13	77,32	124,02	467,65	515,83	447,09	314,65	79,73	473,69	293,06
467	232,39	77,50	125,05	470,73	513,57	456,28	333,60	80,08	488,30	309,54
468	238,15	77,55	126,54	482,50	521,10	466,65	354,76	80,46	506,31	329,41
469	261,71	77,62	139,82	484,01	524,60	480,94	383,06	80,86	507,02	350,56
470	249,62	77,76	159,92	412,59	484,51	483,19	409,67	81,29	483,35	352,88
471	222,40	77,69	150,81	345,31	390,76	477,59	426,08	81,80	454,57	334,39

472	255,00	77,80	161,35	385,17	366,20	516,49	422,93	82,36	433,12	325,55
473	274,55	78,45	166,06	447,20	412,81	547,66	429,61	83,02	425,84	327,40
474	277,05	78,51	144,04	523,39	500,29	556,18	446,97	83,76	435,40	322,29
475	298,69	79,32	166,64	508,81	584,99	572,50	455,71	84,57	429,90	322,09
476	303,74	78,59	173,70	542,38	570,92	600,19	454,44	85,45	423,77	319,41
477	326,05	78,17	189,42	567,83	564,87	635,80	473,14	86,42	425,82	329,48
478	349,48	78,68	198,16	605,99	592,00	664,41	497,08	87,43	435,28	350,65
479	335,91	78,51	180,19	685,11	621,74	676,41	515,38	88,62	454,05	357,69
480	356,77	78,84	170,24	796,44	779,88	672,03	521,47	89,95	475,90	356,25
481	369,10	79,24	171,85	859,77	921,25	663,26	529,89	91,34	494,81	357,90
482	373,20	79,23	173,33	873,73	969,51	656,55	554,08	92,85	511,37	366,18
483	378,92	79,10	174,60	938,68	986,94	652,86	577,72	94,44	528,04	378,89
484	381,13	79,45	176,25	955,46	994,76	649,96	590,96	96,09	545,67	389,65
485	384,62	79,16	176,38	982,93	996,81	649,17	592,41	97,79	563,48	395,24
486	391,63	79,19	177,95	987,61	1010,28	642,17	601,50	99,56	579,97	406,32
487	394,02	79,53	180,41	996,71	1009,84	643,60	620,57	101,39	592,50	417,11
488	397,83	79,14	181,49	996,62	1010,12	639,63	636,34	103,28	606,48	430,06
489	400,72	79,53	182,42	1010,36	1012,99	635,63	650,43	105,25	618,78	440,71
490	398,92	79,83	182,75	990,88	1003,28	634,39	664,91	107,25	632,23	457,35
491	398,56	80,18	183,30	990,91	987,48	641,57	676,72	109,32	645,67	467,60
492	401,78	80,20	183,83	992,32	991,63	650,00	689,67	111,42	658,20	478,99
493	404,00	79,98	184,15	1000,58	992,09	660,74	701,92	113,61	671,39	488,78
494	402,46	79,97	184,74	988,78	980,21	675,42	710,84	115,87	684,20	501,90
495	400,37	79,76	184,84	1004,57	963,72	695,22	718,94	118,21	698,08	512,01
496	399,65	80,06	184,60	1017,32	959,03	706,78	724,46	120,65	709,82	523,66
497	402,02	80,16	185,32	1013,89	959,17	722,09	730,62	123,10	721,09	533,95
498	402,17	80,20	185,49	1028,40	961,02	733,66	734,89	125,67	733,78	545,18
499	402,74	79,96	186,03	1011,91	955,90	748,05	736,27	128,28	745,45	552,82
500	406,13	80,74	187,06	1017,34	959,09	760,28	737,77	130,96	757,17	561,69
501	404,88	80,90	186,65	1011,81	955,35	778,34	738,69	133,70	770,35	569,29
502	403,85	80,71	186,00	994,53	943,86	792,09	741,27	136,49	781,36	580,10
503	404,87	80,32	186,64	1007,95	934,77	807,62	747,19	139,29	792,46	585,71
504	406,07	81,03	187,45	1028,19	938,13	817,90	752,40	142,21	802,90	595,73
505	409,74	81,13	188,06	1046,55	952,74	820,98	757,64	145,08	809,43	603,15
506	411,69	82,27	189,14	1053,68	964,19	823,90	763,87	147,99	816,21	611,00
507	413,82	81,19	189,21	1066,64	970,34	829,25	770,59	150,94	822,77	620,60
508	414,67	81,23	189,84	1080,83	970,27	834,60	780,47	153,82	829,39	626,17
509	418,00	81,08	191,12	1093,68	977,89	837,71	789,01	156,74	830,83	630,05
510	420,17	81,89	191,46	1094,07	984,96	843,34	793,14	159,66	831,34	633,10
511	421,20	81,94	192,06	1106,97	985,05	846,11	796,72	162,52	832,38	636,67
512	423,18	81,46	192,75	1112,28	988,61	849,43	807,64	165,36	835,20	641,90
513	421,42	81,11	192,10	1118,98	984,27	857,94	812,88	168,09	843,37	645,53
514	422,81	81,70	192,38	1133,41	984,97	861,55	814,80	170,88	854,43	651,62
515	423,03	82,99	191,96	1120,35	984,04	863,95	821,12	173,61	860,77	660,62
516	418,34	82,59	191,83	1117,54	966,73	863,31	825,24	176,29	868,53	669,40
517	415,67	82,48	191,02	1090,50	952,00	866,91	829,00	178,89	874,64	673,23
518	413,80	81,82	190,40	1090,00	938,64	873,12	837,57	181,53	879,00	676,20
519	412,13	81,47	189,76	1083,63	932,26	877,24	842,92	184,15	883,13	683,20
520	410,29	83,24	187,72	1078,29	924,93	877,79	849,33	186,73	885,06	689,48
521	412,51	82,63	188,67	1089,86	921,93	885,01	850,36	189,29	885,00	699,84
522	411,18	81,88	189,70	1100,10	926,76	891,93	839,50	191,88	881,87	723,26
523	408,97	83,07	187,56	1098,23	924,38	890,41	824,69	194,48	882,12	745,36
524	404,51	83,55	186,94	1067,56	911,60	885,78	812,07	197,14	884,06	765,56

525	399,65	83,57	185,69	1034,60	887,94	881,20	800,62	199,85	889,24	780,48
526	395,62	83,73	185,31	1016,30	862,58	876,50	793,21	202,59	894,57	792,81
527	391,96	83,46	183,84	1000,15	844,98	873,04	789,10	205,38	900,02	797,73
528	390,01	82,68	182,21	988,50	830,58	869,93	787,12	208,25	905,95	803,67
529	387,08	83,26	181,89	968,83	816,69	865,48	788,05	211,25	910,48	809,73
530	383,83	83,71	180,38	954,71	807,66	858,71	789,91	214,34	911,87	814,20
531	449,10	84,08	233,05	840,55	787,35	862,39	814,53	218,28	888,26	852,91
532	392,35	83,90	198,30	855,15	715,52	786,04	755,48	221,90	854,25	798,63
533	415,70	83,61	190,97	942,29	821,22	729,08	712,91	225,18	827,93	760,56
534	420,95	83,50	190,96	947,08	933,02	686,41	678,36	228,31	801,05	709,96
535	418,17	83,87	190,29	916,53	956,39	657,56	657,04	231,25	775,44	669,02
536	409,63	84,05	188,93	873,98	933,22	632,79	630,87	234,12	750,59	647,89
537	402,64	84,15	186,56	842,19	904,44	615,52	604,45	236,99	727,44	635,66
538	396,07	83,95	184,69	811,89	882,06	598,64	583,28	239,80	705,43	620,75
539	390,34	83,81	183,04	784,70	864,25	587,95	566,56	242,60	685,43	606,43
540	384,81	83,67	182,19	766,25	852,24	579,60	556,23	245,56	666,98	597,72
541	382,93	83,62	180,52	760,76	845,46	575,22	544,73	248,54	650,36	593,49
542	382,68	83,88	180,80	757,36	851,79	578,04	537,14	251,61	638,37	592,34
543	384,61	83,12	181,24	762,44	862,31	587,91	531,46	254,70	628,69	593,05
544	383,41	83,32	181,64	760,79	865,33	596,28	523,76	257,92	620,62	597,70
545	384,99	82,79	180,88	761,88	871,54	604,71	517,45	261,15	615,21	591,49
546	386,94	83,45	181,66	776,33	884,24	614,50	511,70	264,45	611,66	592,08
547	386,33	83,86	181,97	766,29	897,83	618,93	505,99	267,80	612,87	588,75
548	384,77	83,33	182,66	760,95	890,52	624,69	501,76	271,10	622,50	590,84
549	384,48	82,85	182,23	774,75	875,34	628,23	497,58	274,44	635,23	596,88
550	382,99	84,21	181,50	776,82	860,50	631,59	494,00	277,78	656,32	601,06
551	386,10	84,46	181,89	795,11	858,10	637,32	491,43	281,12	676,54	604,46
552	392,59	83,72	183,72	813,12	883,81	643,28	488,78	284,36	693,92	606,05
553	400,26	84,11	186,32	828,41	923,41	645,63	485,59	287,59	706,48	606,31
554	402,65	83,83	187,01	841,86	943,91	648,60	483,30	290,80	720,50	606,55
555	402,50	83,63	188,32	845,45	942,33	654,04	480,24	293,87	736,65	607,20
556	405,61	83,61	188,92	881,56	928,63	663,10	477,73	296,90	750,55	612,73
557	408,64	83,18	188,65	886,87	929,86	669,03	476,43	299,84	765,39	613,21
558	407,92	83,55	188,62	897,19	926,92	690,20	475,40	302,66	776,25	617,05
559	414,26	83,53	190,02	945,60	931,30	720,64	476,66	305,37	780,26	621,63
560	420,83	83,46	192,59	959,35	951,82	747,54	480,47	308,01	784,82	625,97
561	424,97	83,88	193,15	953,21	962,67	760,22	481,81	310,53	789,23	629,43
562	430,15	82,96	195,90	953,52	971,34	767,52	484,11	312,89	787,32	635,04
563	430,25	83,29	196,56	952,55	973,35	761,96	486,05	315,18	787,07	645,00
564	430,92	83,58	195,61	940,95	972,32	759,46	489,40	317,29	791,83	650,69
565	428,26	84,25	194,77	935,42	966,44	760,81	492,96	319,43	795,30	658,43
566	425,86	84,03	196,12	929,31	964,19	773,33	495,74	321,37	797,88	666,94
567	426,05	83,64	196,82	933,98	961,19	784,01	499,12	323,21	801,92	670,74
568	429,04	84,21	196,88	942,51	963,82	787,78	502,89	324,93	802,50	674,86
569	429,11	83,88	196,19	938,47	967,40	792,44	507,59	326,63	807,45	679,12
570	431,57	84,63	198,35	950,69	962,23	802,22	511,90	328,27	812,18	685,17
571	432,85	84,49	196,64	949,80	963,76	813,51	516,47	329,75	814,72	688,76
572	433,43	84,66	196,80	963,28	959,66	815,92	521,16	331,16	816,54	695,18
573	431,44	85,00	196,47	965,36	962,83	815,48	526,04	332,53	820,29	700,71
574	429,17	84,91	194,85	960,06	961,12	823,41	532,44	333,85	824,27	708,94
575	429,22	83,60	196,49	962,04	956,37	825,98	540,36	335,05	828,68	713,26
576	428,31	84,28	197,25	966,90	954,22	831,87	548,11	336,25	834,17	723,29
577	425,94	84,06	195,37	971,99	953,71	837,46	554,61	337,42	839,94	730,01

578	425,05	84,97	195,97	969,87	955,78	843,61	560,85	338,49	845,14	735,30
579	421,89	84,17	194,16	984,42	949,66	848,89	568,80	339,61	847,90	739,86
580	421,50	84,90	194,15	974,78	952,84	856,76	577,58	340,68	852,35	744,59
581	422,46	85,07	194,20	965,04	957,10	860,10	585,61	341,75	858,86	746,71
582	422,23	84,72	194,43	975,93	953,63	862,76	592,85	342,77	861,79	753,69
583	422,20	84,49	192,90	996,04	952,54	870,04	599,67	343,84	863,31	753,35
584	419,09	85,05	192,61	978,11	946,44	872,98	605,48	344,85	868,41	757,03
585	417,34	83,92	192,24	968,68	934,58	876,56	612,11	345,86	870,68	759,11
586	413,10	85,37	191,69	963,53	918,39	875,45	618,85	346,88	873,00	763,37
587	409,88	85,09	189,69	942,85	902,61	879,79	628,18	347,93	873,49	761,77
588	407,60	85,43	189,65	929,28	889,23	882,32	635,93	348,94	872,59	763,94
589	402,70	85,33	188,25	905,31	872,65	885,45	646,41	350,01	869,97	771,49
590	400,18	85,25	187,19	911,47	851,66	886,89	656,78	351,14	867,44	774,29
591	395,85	86,41	186,05	888,26	838,88	890,95	666,93	352,33	865,54	777,96
592	393,47	85,33	184,96	878,91	826,27	894,26	676,32	353,51	863,38	780,77
593	391,15	85,58	184,30	876,24	813,56	895,40	685,84	354,70	862,16	781,51
594	388,44	85,25	183,31	869,56	804,75	891,43	694,90	355,94	859,75	781,37
595	386,06	85,42	182,56	863,96	796,87	888,44	704,36	357,18	858,72	780,92
596	385,05	84,22	182,75	861,39	791,45	883,43	712,79	358,41	856,63	780,95
597	383,31	84,39	181,70	859,68	787,94	876,94	720,94	359,75	853,30	784,77
598	382,65	85,28	181,21	861,19	782,62	878,88	727,28	361,07	850,94	782,66
599	381,24	85,30	180,53	852,26	776,80	877,18	733,45	362,39	849,09	782,12
600	380,82	85,45	180,30	855,10	772,07	873,48	738,65	363,69	845,91	776,11
601	380,00	85,98	179,25	847,24	769,90	871,49	753,90	365,01	842,45	776,19
602	378,98	85,66	179,00	844,02	768,30	870,57	755,62	366,37	837,49	771,40
603	377,68	85,22	178,97	841,90	767,11	871,91	754,50	367,69	832,94	768,16
604	376,59	84,55	178,88	834,48	765,41	871,77	756,06	368,94	829,87	765,83
605	376,10	85,02	178,38	830,42	763,36	874,10	759,19	370,24	827,13	760,72
606	375,48	85,39	178,43	826,74	759,49	871,76	759,61	371,52	824,55	759,29
607	374,02	85,66	176,74	822,41	754,29	876,89	759,34	372,75	820,95	760,30
608	372,64	86,14	176,46	817,69	750,01	873,98	760,76	373,91	817,83	755,45
609	370,58	86,43	176,18	812,50	746,93	871,50	760,75	375,03	814,22	753,03
610	369,36	85,94	177,00	807,92	742,84	868,03	761,00	376,10	811,78	751,18
611	369,25	86,68	176,24	804,58	739,61	869,72	761,92	377,11	809,90	746,58
612	367,69	86,09	174,91	799,54	737,13	864,78	762,01	377,95	807,37	745,86
613	366,74	85,93	175,45	797,14	734,01	863,96	762,73	378,72	805,88	746,00
614	365,96	86,46	174,45	795,21	732,46	863,31	765,55	379,45	806,47	744,99
615	365,21	85,91	174,84	793,07	732,17	860,39	765,41	380,02	805,79	741,06
616	363,91	85,55	173,62	790,10	729,88	857,19	764,59	380,58	803,52	740,97
617	362,85	85,31	174,52	784,18	727,24	855,59	763,54	381,03	798,43	739,54
618	361,37	86,04	172,64	782,15	723,69	856,09	765,73	381,38	791,99	739,62
619	359,85	86,34	173,00	780,74	720,17	854,10	765,86	381,65	784,55	736,25
620	79,28	79,32	81,43	78,93	78,99	78,38	78,36	78,57	78,45	78,62
621	82,97	79,39	82,97	82,83	88,71	80,47	79,44	78,60	80,43	80,36
622	97,90	79,54	87,60	105,51	118,35	90,86	84,93	78,61	91,62	87,80
623	121,30	79,67	94,04	141,96	168,31	112,60	98,96	78,67	111,41	102,57
624	155,44	79,69	103,58	202,90	236,71	143,51	119,92	78,74	135,35	123,67
625	194,16	79,74	114,79	298,66	312,41	176,53	144,97	78,82	161,61	#####
626	226,75	79,88	125,02	419,47	384,71	228,07	167,33	78,95	198,05	#####
627	254,03	79,90	134,12	561,76	443,28	307,67	200,32	79,13	236,31	#####
628	281,67	79,97	142,78	683,21	503,64	374,58	234,65	79,35	278,05	#####
629	301,74	79,65	149,85	767,07	540,94	427,19	266,08	79,56	320,74	#####
630	313,26	79,66	155,07	808,19	571,79	474,40	304,46	79,85	364,29	#####

631	318,39	79,83	158,06	815,37	602,93	507,20	349,03	80,17	407,51	#####
632	319,66	79,69	159,57	807,44	619,41	545,45	383,07	80,62	444,59	#####
633	313,18	79,88	158,64	769,50	624,01	576,65	404,06	81,11	475,07	#####
634	319,01	80,11	188,78	685,45	526,53	589,11	436,13	81,64	485,09	365,07
635	263,59	80,48	169,09	525,63	434,75	540,56	428,05	82,30	470,60	350,05
636	263,46	80,66	168,98	444,35	429,99	505,05	435,60	83,04	454,00	339,48
637	273,65	80,78	172,16	423,78	444,29	482,47	440,14	83,84	438,16	#####
638	276,97	80,79	173,89	433,38	443,28	474,44	454,77	84,72	424,16	#####
639	275,55	80,67	173,25	439,55	439,01	464,05	440,68	85,78	411,38	#####
640	268,33	80,74	171,25	428,74	421,14	453,54	423,97	86,94	398,66	#####
641	260,86	80,35	168,20	407,98	409,41	443,12	411,02	88,28	386,45	#####
642	266,34	80,01	170,45	402,61	421,68	444,19	425,06	89,75	377,99	#####
643	267,03	80,77	170,01	403,61	426,71	470,12	461,84	91,43	369,79	#####
644	287,68	80,29	175,93	425,77	462,40	535,71	523,35	93,23	364,83	#####
645	347,40	80,53	194,82	506,22	571,17	584,02	586,56	95,26	375,09	#####
646	435,06	80,94	224,74	678,10	718,33	627,19	643,51	97,46	410,95	#####
647	397,12	81,12	191,73	814,62	756,40	635,64	659,17	100,01	433,41	#####
648	371,73	80,57	184,21	828,89	696,78	648,19	672,65	102,68	452,28	#####
649	358,18	80,56	179,74	777,31	674,56	664,43	677,01	105,53	471,93	#####
650	353,85	80,87	178,59	746,72	682,07	672,88	676,92	108,51	491,04	#####
651	357,56	81,06	179,16	745,04	706,14	668,80	678,01	111,59	511,95	#####
652	365,35	81,19	180,72	765,97	730,88	667,97	677,89	114,83	537,87	#####
653	373,11	81,13	182,96	785,14	750,19	668,73	677,93	118,11	567,84	#####
654	379,70	81,37	184,60	798,01	774,36	670,74	679,61	121,54	596,70	#####
655	382,24	81,81	186,34	809,18	785,72	669,79	679,75	125,07	620,59	#####
656	380,54	82,04	185,22	803,19	811,92	676,11	678,15	128,69	642,88	#####
657	393,28	82,09	189,62	834,41	885,94	682,57	674,08	132,31	664,53	#####
658	399,27	81,68	191,35	878,76	889,21	687,99	667,24	135,98	687,09	#####
659	398,50	82,24	191,44	874,99	864,86	693,35	662,63	139,66	703,44	#####
660	396,57	81,37	191,71	857,99	843,32	695,41	657,85	143,39	719,72	#####
661	393,64	81,62	191,63	838,08	829,32	700,53	648,94	147,05	733,01	#####
662	402,84	82,14	172,36	821,48	848,71	712,60	642,38	150,67	742,82	#####
663	408,62	82,17	148,55	829,14	975,81	708,21	633,99	154,33	735,78	#####
664	404,28	82,20	144,07	871,26	946,85	699,91	626,11	157,91	728,45	#####
665	392,37	82,56	140,96	860,07	885,38	693,05	617,40	161,37	722,28	#####
666	381,94	82,74	138,38	821,45	848,02	686,72	610,21	164,70	716,77	#####
667	375,36	82,83	136,70	789,31	826,44	683,27	605,09	167,87	711,93	#####
668	371,28	83,08	135,75	769,78	819,86	683,69	601,47	170,86	708,06	#####
669	369,92	82,78	134,93	764,03	824,64	683,17	600,59	173,70	704,95	#####
670	368,74	82,96	134,05	761,56	811,38	684,08	600,37	176,36	703,90	#####
671	364,22	82,15	133,49	750,66	811,71	686,11	600,68	178,83	702,71	#####
672	364,87	82,52	132,72	747,78	827,50	687,40	600,74	181,14	702,51	#####
673	367,21	81,96	132,87	756,87	846,32	686,28	601,52	183,29	703,34	#####
674	372,45	81,82	132,79	775,98	877,38	688,97	603,32	185,29	704,45	560,93
675	381,45	82,16	134,44	815,42	946,56	691,66	605,14	187,13	704,77	563,50
676	388,47	82,26	135,69	864,85	991,52	694,25	608,60	188,83	704,62	564,86
677	392,84	82,57	136,72	893,59	1001,89	696,98	612,19	190,39	704,78	#####
678	394,95	82,68	136,89	904,01	1006,94	700,29	616,25	191,85	705,34	570,07
679	395,96	82,57	136,90	907,07	1024,13	706,54	622,60	193,18	705,79	573,48
680	396,69	81,66	137,29	909,25	1036,40	713,59	631,87	194,40	706,47	574,70
681	397,24	82,59	137,61	910,54	1047,61	720,01	639,22	195,49	706,93	579,32
682	396,87	82,03	137,80	911,45	1055,91	726,80	645,99	196,55	707,11	581,21
683	398,64	83,08	137,97	911,91	1061,58	731,41	656,59	197,50	707,41	583,06

684	400,72	81,47	137,85	911,42	1040,71	736,79	670,81	198,30	707,87	587,39
685	398,10	81,06	137,31	902,23	1020,58	741,26	680,54	199,10	708,85	589,31
686	395,60	82,35	136,91	886,93	998,78	747,84	688,01	199,75	709,79	593,81
687	392,90	83,01	136,36	870,88	982,09	753,56	692,90	200,40	711,32	598,81
688	390,92	82,99	136,43	857,43	961,95	763,28	696,85	200,93	712,78	600,33
689	390,11	83,17	136,43	844,18	940,36	768,71	700,75	201,44	714,17	603,16
690	386,74	83,23	136,31	825,15	912,98	774,69	706,82	201,88	715,45	#####
691	381,41	83,63	135,87	800,44	897,32	778,07	713,85	202,31	717,22	#####
692	380,22	83,81	135,80	785,25	895,98	781,76	720,99	202,66	718,97	#####
693	379,96	83,91	135,69	781,61	898,38	785,65	724,75	202,98	720,56	#####
694	381,43	84,76	135,92	784,80	905,82	788,04	729,18	203,33	722,20	618,27
695	382,94	84,27	136,17	791,75	912,06	789,46	732,62	203,61	723,14	622,41
696	383,76	84,50	136,49	798,03	913,59	792,26	733,40	203,97	723,98	625,31
697	384,63	83,84	136,31	801,65	908,88	793,05	729,35	204,30	724,33	628,92
698	382,88	84,08	136,18	796,39	892,54	791,56	724,62	204,66	726,14	630,87
699	378,77	83,93	135,95	781,67	880,83	791,26	721,11	204,96	728,37	632,79
700	376,69	84,68	135,23	768,96	870,29	790,20	717,31	205,28	730,44	635,72
701	376,07	84,87	135,44	761,74	863,39	789,73	712,06	205,66	731,90	643,06
702	375,42	85,39	135,61	758,67	861,68	788,46	708,94	206,04	733,51	648,27
703	376,29	85,39	135,58	759,43	863,23	788,02	705,80	206,46	734,77	651,24
704	376,09	85,70	135,64	759,57	858,70	788,48	700,61	206,86	735,83	655,06
705	373,97	86,21	135,56	754,58	845,18	786,90	696,51	207,26	737,11	659,38
706	370,52	85,97	135,15	742,27	834,94	783,59	691,93	207,73	740,81	666,06
707	369,98	86,46	135,15	731,93	836,20	781,05	687,74	208,20	745,59	669,73
708	370,50	86,29	135,25	731,33	837,64	778,13	683,40	208,73	750,62	673,67
709	369,54	86,65	135,21	731,69	832,91	774,84	680,11	209,26	753,17	676,70
710	368,04	86,70	134,90	726,40	829,36	771,41	676,38	209,80	752,84	677,68
711	366,61	86,99	134,91	719,96	824,30	767,60	673,04	210,36	753,71	678,60
712	365,20	87,34	134,64	712,99	819,59	763,43	671,69	210,99	754,24	676,99
713	376,17	87,63	137,98	706,32	814,26	759,25	670,98	211,63	755,79	685,58
714	407,27	87,74	150,95	707,28	812,69	729,80	664,48	212,64	753,20	701,65
715	394,63	87,15	181,63	786,68	896,73	669,64	624,10	213,30	747,46	647,62
716	399,55	87,74	191,04	836,10	862,85	625,57	596,40	214,05	747,89	616,75
717	398,21	87,51	192,95	821,27	843,09	594,53	578,36	214,96	751,70	596,63
718	397,48	87,43	194,70	807,85	828,82	571,12	561,87	216,11	760,07	584,20
719	395,94	87,97	194,95	793,88	817,12	555,33	550,50	217,42	762,51	578,77
720	414,08	88,21	154,34	791,98	902,44	547,31	540,27	219,28	746,28	579,50
721	421,55	87,97	150,73	869,39	954,46	536,93	527,39	221,36	725,88	578,37
722	418,63	88,28	149,21	921,36	951,49	527,14	516,42	223,69	709,16	576,74
723	415,80	88,36	147,93	937,09	956,37	517,79	507,69	226,18	694,94	574,99
724	414,57	88,06	147,59	943,62	960,79	510,06	501,29	228,81	682,84	572,90
725	414,65	87,08	147,65	948,41	991,64	502,34	495,95	231,58	672,27	569,47
726	414,31	86,49	147,26	957,07	1040,09	495,47	490,72	234,41	662,43	568,14
727	415,52	87,37	147,19	967,56	1045,07	488,43	485,94	237,28	654,13	564,87
728	415,24	87,61	147,47	969,23	1047,47	483,64	482,12	240,27	646,60	560,27
729	415,04	87,41	148,01	968,44	1063,10	479,09	478,63	243,18	640,53	552,07
730	416,56	88,15	148,32	968,55	1086,92	474,85	476,12	246,02	635,62	543,21
731	415,84	88,27	148,11	968,36	1093,21	471,73	474,32	248,84	631,72	534,07
732	415,86	87,53	148,16	966,51	1099,55	468,88	471,51	251,55	629,69	525,59
733	412,78	87,69	147,84	964,47	1100,35	466,86	469,13	254,20	628,61	518,26
734	410,19	87,83	147,66	960,40	1091,37	465,91	466,55	256,73	628,30	511,09
735	408,00	87,96	147,07	957,87	1085,97	465,39	465,68	259,12	629,50	504,38
736	405,75	88,09	146,86	953,28	1070,15	465,31	463,89	261,38	633,19	498,07

737	403,37	87,75	146,69	944,70	1061,16	465,28	462,70	263,49	637,23	492,76
738	401,69	87,62	146,36	936,46	1038,03	465,98	461,83	265,53	642,40	488,34
739	400,01	87,83	146,16	924,11	998,58	467,25	460,79	267,39	652,69	484,54
740	397,53	88,00	146,17	905,77	970,14	469,22	459,68	269,10	662,26	483,49
741	397,75	88,07	146,56	890,56	947,60	472,88	457,92	270,66	666,00	481,82
742	396,25	87,82	146,73	875,83	897,56	478,16	455,77	272,10	667,75	483,77
743	390,97	88,02	145,78	853,45	871,34	484,49	454,53	273,38	671,68	486,33
744	388,53	88,01	145,30	837,03	859,26	490,88	452,82	274,48	677,30	490,98
745	387,37	88,40	145,03	824,85	853,19	497,72	452,10	275,37	684,24	493,11
746	385,12	88,05	144,59	816,44	850,29	504,64	452,83	276,11	690,53	495,75
747	385,16	88,02	144,65	811,83	850,74	511,98	452,65	276,70	697,22	500,21
748	385,05	88,07	143,91	810,06	853,99	518,28	452,56	277,17	704,27	504,00
749	385,86	88,32	143,82	808,89	858,88	525,76	453,46	277,36	712,17	505,48
750	386,13	88,54	143,75	807,79	863,32	533,23	452,53	277,50	719,66	509,13
751	386,20	88,26	143,68	807,57	867,32	540,11	452,81	277,46	727,68	511,92
752	386,72	88,25	143,74	806,94	874,81	546,52	453,32	277,32	733,77	515,72
753	388,09	87,88	143,95	808,91	879,06	553,20	454,53	277,12	739,24	517,44
754	388,52	88,85	143,78	811,02	881,45	560,20	456,46	276,80	744,07	520,90
755	389,94	88,47	144,11	811,87	883,60	566,15	458,09	276,42	749,03	523,21
756	391,15	88,21	144,44	815,12	882,10	571,58	461,69	275,90	753,74	525,13
757	393,76	88,11	144,63	818,13	875,32	576,91	464,14	275,41	756,67	527,92
758	395,04	87,54	144,74	820,25	871,18	583,16	465,92	274,86	758,15	531,85
759	395,47	87,31	144,83	821,82	873,05	589,59	468,48	274,18	760,51	533,61
760	396,39	87,99	144,56	824,83	877,98	597,36	472,86	273,52	762,79	535,06
761	397,25	87,57	144,37	828,95	885,13	604,28	474,98	272,84	764,80	539,69
762	397,56	87,95	144,17	834,23	885,48	611,43	478,80	272,12	767,55	539,87
763	398,40	88,00	144,40	837,19	888,03	619,36	481,11	271,48	769,55	543,76
764	399,45	87,95	144,61	841,20	896,52	625,74	484,11	270,78	770,89	544,58
765	400,92	88,55	144,63	849,73	917,51	632,12	488,17	270,09	769,16	545,43
766	403,64	88,39	144,99	863,29	925,38	638,21	492,31	269,43	766,76	545,34
767	405,40	88,56	145,60	872,65	936,31	643,97	497,20	268,76	763,83	545,68
768	405,70	88,72	145,21	878,14	940,66	649,97	500,86	268,15	762,20	546,73
769	407,32	88,28	145,46	881,79	943,19	655,33	502,91	267,52	760,41	548,58
770	408,35	89,12	145,71	883,51	941,30	661,26	505,54	267,00	759,12	551,37
771	408,71	87,92	146,07	882,79	934,63	666,13	508,47	266,45	758,78	554,27
772	408,52	88,24	145,62	880,25	941,36	670,94	512,54	265,96	756,93	555,75
773	408,57	88,67	145,80	881,80	947,32	674,50	515,49	265,53	755,55	557,54
774	409,61	88,72	146,27	881,39	930,37	679,65	518,81	265,16	758,40	559,19
775	407,73	89,25	145,73	870,54	925,21	687,80	522,52	264,81	757,04	561,74
776	407,12	88,39	145,66	863,49	922,49	698,70	526,13	264,58	755,50	564,34
777	407,19	88,53	145,67	861,69	920,23	710,65	529,34	264,40	754,01	566,34
778	406,03	89,54	145,23	858,71	917,77	719,80	533,44	264,25	752,32	568,67
779	405,45	88,81	145,30	853,68	913,96	726,89	535,40	264,18	751,10	571,11
780	404,45	89,06	145,32	850,01	914,09	733,35	539,82	264,12	750,04	572,40
781	402,82	89,39	145,03	847,87	916,88	741,05	542,15	264,20	747,51	575,17
782	403,54	89,28	144,69	850,50	925,31	749,10	544,40	264,26	745,50	576,70
783	403,38	88,87	144,92	855,96	932,03	757,36	546,09	264,43	743,03	578,69
784	403,62	89,03	144,49	862,32	944,27	763,33	547,46	264,61	740,95	581,44
785	404,77	88,25	144,61	871,72	956,18	769,16	550,14	264,84	739,94	583,05
786	404,39	88,90	144,55	877,04	954,70	771,27	552,04	265,01	738,83	585,41
787	403,43	89,66	144,32	876,15	947,13	773,27	555,26	265,37	738,64	586,93
788	403,16	89,01	144,56	872,36	938,93	774,05	558,84	265,64	738,06	589,86
789	401,59	89,49	144,39	867,71	937,00	773,91	561,89	265,93	736,26	591,81

790	400,80	89,72	144,38	864,53	927,48	774,96	565,26	266,32	734,67	593,34
791	399,05	89,71	143,96	860,96	927,08	774,22	568,92	266,71	734,26	596,02
792	398,97	88,19	144,00	858,33	925,40	774,35	572,02	267,10	733,46	598,68
793	398,03	88,41	143,76	857,78	930,31	775,07	575,06	267,48	733,76	600,01
794	398,00	88,68	143,90	858,66	927,94	773,58	579,39	267,93	734,59	603,60
795	397,56	89,10	143,70	857,28	925,69	772,71	582,65	268,42	735,48	606,00
796	398,30	88,26	143,46	857,11	924,99	772,54	587,25	268,86	736,16	606,65
797	398,23	88,89	143,19	858,09	932,66	771,11	591,75	269,34	735,81	606,66
798	398,55	89,03	142,61	861,51	934,36	770,25	594,07	269,90	736,37	608,92
799	397,95	88,46	142,36	862,21	927,63	769,72	596,29	270,37	736,83	609,26
800	397,33	89,06	141,79	858,83	931,90	770,12	598,46	270,93	736,38	611,99
801	395,53	89,11	141,86	856,35	932,10	770,75	603,12	271,40	731,82	611,54
802	394,00	88,87	141,35	854,71	934,79	771,91	607,02	271,92	727,99	611,30
803	393,54	88,59	140,75	853,17	923,94	771,05	610,79	272,53	721,60	612,60
804	391,82	88,48	141,02	847,88	899,04	772,52	615,50	273,08	715,16	613,48
805	388,85	88,42	139,69	830,28	864,20	773,30	620,46	273,62	709,46	614,25
806	380,98	88,45	138,76	800,39	835,01	772,19	625,73	274,20	705,09	614,93
807	375,87	88,33	137,92	774,70	821,06	770,31	631,35	274,80	700,78	617,21
808	372,68	88,03	137,23	760,47	811,94	767,33	635,90	275,44	696,36	619,69
809	370,60	87,89	136,56	751,85	804,70	765,08	640,62	276,10	692,57	620,69
810	368,15	87,99	136,54	746,74	798,09	763,07	644,42	276,84	688,13	622,77
811	367,27	88,21	135,45	742,54	791,53	760,59	647,99	277,55	684,13	624,88
812	366,47	87,90	134,92	738,46	783,79	759,00	651,49	278,35	680,54	627,54
813	364,48	87,67	134,63	734,21	778,37	758,00	656,16	279,14	677,26	629,50
814	363,46	87,34	134,03	730,20	773,21	754,85	660,45	279,95	674,42	632,08
815	361,86	87,55	134,00	726,26	768,96	753,56	664,98	280,75	671,55	636,00
816	361,09	86,55	133,25	723,39	765,88	750,28	669,28	281,66	669,05	638,02
817	359,64	86,38	133,44	721,10	761,84	748,62	672,69	282,56	666,82	641,62
818	358,61	86,33	132,51	718,28	757,52	744,98	676,39	283,50	664,46	643,09
819	357,70	87,12	132,33	715,14	753,29	743,99	680,09	284,41	662,85	643,92
820	357,14	87,25	132,63	713,29	751,24	741,82	684,29	285,40	661,18	646,93
821	356,57	86,87	132,50	712,72	750,12	739,06	689,45	286,39	659,43	647,05
822	356,06	87,10	132,30	711,35	749,29	735,81	690,02	287,37	657,31	648,87
823	357,31	86,37	132,43	713,44	750,89	732,24	692,99	288,40	654,41	646,11
824	357,50	86,47	132,61	716,33	747,56	733,60	697,90	289,37	650,95	644,41
825	356,12	86,83	132,61	714,29	743,24	734,96	702,63	290,38	647,63	645,44
826	354,18	87,06	132,14	709,14	739,79	736,48	708,66	291,33	644,81	646,08
827	353,20	87,11	131,65	704,58	736,82	736,22	715,18	292,37	642,29	646,96
828	351,61	87,09	131,04	700,46	728,57	736,60	722,94	293,41	639,89	648,60
829	348,46	86,86	130,54	692,21	718,80	737,03	728,97	294,42	637,81	651,19
830	345,82	87,24	130,36	680,57	713,05	736,96	735,20	295,43	635,75	651,47
831	343,51	87,82	129,93	671,14	709,29	737,45	741,97	296,39	633,60	651,76
832	340,97	88,01	129,68	663,59	707,91	736,94	748,70	297,34	631,47	650,66
833	339,74	87,88	129,49	658,75	705,28	737,14	750,94	298,21	629,49	651,04
834	338,21	87,68	128,78	654,08	701,74	737,34	753,53	299,07	627,50	650,76
835	337,53	87,46	128,78	649,52	697,84	737,12	756,29	299,92	625,66	651,34
836	335,14	87,74	128,39	644,73	693,07	736,23	758,84	300,73	624,62	653,05
837	332,92	87,40	127,90	637,91	686,81	736,39	760,59	301,55	623,81	654,48
838	330,80	87,09	127,61	629,96	684,51	735,28	762,70	302,30	622,87	656,25
839	330,00	87,74	127,51	625,53	690,62	734,13	760,13	303,04	621,91	655,34
840	334,04	88,19	128,30	631,64	697,35	732,41	759,51	303,72	620,22	654,79
841	334,93	88,22	128,37	641,87	693,79	731,60	752,99	304,40	618,46	651,93
842	332,26	87,68	127,24	642,15	687,41	729,85	751,74	305,04	616,44	651,29

843	330,88	87,60	126,91	635,86	682,68	728,25	750,49	305,57	614,63	648,94
844	329,81	86,85	126,77	630,88	679,88	726,45	748,31	306,10	612,45	648,23
845	392,44	133,61	79,20	833,55	911,35	712,17	695,55	154,89	749,12	615,15
846	382,11	79,39	131,18	813,29	877,53	698,42	673,55	158,32	742,92	607,98
847	374,63	78,94	129,76	789,65	863,71	687,50	658,30	161,65	736,13	602,08
848	372,09	79,48	128,86	780,07	853,70	680,25	650,50	164,74	729,00	597,93
849	369,49	79,33	127,44	773,22	843,18	676,32	643,58	167,71	721,07	595,46
850	367,42	78,62	127,24	767,18	842,60	672,26	640,49	170,52	714,00	595,11
851	368,73	78,93	127,49	769,71	848,52	672,06	640,99	173,16	707,87	593,12
852	370,72	79,30	127,33	783,09	863,70	671,80	645,00	175,59	702,58	593,56
853	373,32	79,39	126,93	796,77	870,64	671,10	649,76	177,84	699,37	593,92
854	374,44	78,96	127,89	805,33	881,39	671,97	654,29	179,98	696,92	594,69
855	376,06	79,30	127,62	812,37	895,72	673,62	657,45	181,89	695,43	595,11
856	378,11	79,56	127,46	823,16	918,90	675,37	661,13	183,60	694,21	599,17
857	381,53	78,91	128,39	838,54	933,06	676,77	664,95	185,22	695,19	601,24
858	382,52	78,74	128,97	846,50	943,29	678,97	668,16	186,66	698,11	603,30
859	382,86	78,80	129,31	850,05	971,44	682,62	670,89	188,00	701,53	605,25
860	384,50	79,18	129,57	861,67	1002,66	685,65	674,43	189,21	703,59	606,94
861	387,55	78,96	130,19	879,26	1036,70	688,89	676,63	190,30	705,56	608,41
862	388,87	78,42	130,00	894,43	1053,44	690,25	678,97	191,28	707,39	609,90
863	391,24	79,34	130,63	902,84	1054,48	695,24	683,04	192,15	709,13	612,82
864	392,10	79,08	131,60	908,26	1075,76	698,21	690,68	192,97	709,74	616,06
865	394,57	79,66	131,94	913,63	1073,68	701,14	700,41	193,64	709,12	620,61
866	395,52	79,94	132,40	913,88	1071,32	704,80	709,39	194,33	709,67	623,77
867	395,62	79,78	131,61	913,30	1077,51	709,52	718,74	194,90	710,08	625,96
868	396,29	79,89	132,66	913,86	1057,95	714,01	728,81	195,42	710,19	631,44
869	395,47	79,98	132,74	908,52	1049,64	719,46	737,17	195,93	710,49	634,07
870	393,59	80,50	132,55	904,13	1064,88	721,45	745,13	196,37	711,01	636,93
871	394,32	80,10	132,55	904,82	1066,76	722,09	750,74	196,80	711,61	640,21
872	393,67	80,18	132,05	903,35	1049,79	723,41	760,90	197,17	713,08	643,85
873	393,34	80,24	132,08	898,37	1052,68	724,56	772,57	197,55	714,20	648,64
874	394,10	80,22	132,12	897,66	1054,39	721,70	782,04	197,85	714,84	653,78
875	394,42	80,16	132,40	898,92	1064,90	716,06	785,57	198,11	716,13	663,30
876	396,12	79,98	132,48	906,16	1051,39	709,01	801,23	198,45	717,27	674,52
877	394,97	80,73	132,56	902,61	1021,12	706,03	811,47	198,76	718,39	685,34
878	392,84	80,26	132,12	887,27	991,31	705,33	806,32	199,07	720,56	692,31
879	386,95	80,39	131,26	860,77	967,40	705,10	799,55	199,37	722,65	701,61
880	382,76	80,63	130,14	833,69	955,86	705,15	793,01	199,65	724,16	709,51
881	379,51	80,36	129,49	816,50	949,90	705,77	788,11	199,96	725,71	715,50
882	377,95	79,77	129,22	807,90	955,94	703,80	784,65	200,29	727,24	722,57
883	375,93	80,29	128,80	803,32	956,53	702,29	778,89	200,59	729,23	733,45
884	375,01	80,23	128,37	801,13	961,13	700,75	771,74	200,97	731,57	742,50
885	374,75	80,05	127,33	802,36	962,58	700,83	765,33	201,33	734,75	747,43
886	376,11	79,88	127,85	806,69	957,85	701,71	758,56	201,72	737,62	748,96
887	378,04	79,81	127,91	811,67	948,27	706,78	753,19	202,10	740,11	751,24
888	379,33	80,42	128,22	814,93	941,92	708,11	748,43	202,50	742,02	755,21
889	379,77	80,81	128,83	813,48	953,28	708,30	742,58	202,97	743,26	758,18
890	421,91	80,67	143,05	817,41	918,06	721,82	753,76	203,66	748,48	782,15
891	410,10	79,92	161,28	775,04	823,06	683,25	701,42	204,48	743,86	751,70
892	368,07	80,27	174,44	726,57	847,30	556,47	630,14	204,97	745,47	692,87
893	380,19	80,02	178,72	740,95	882,62	566,76	580,50	205,51	764,01	652,60
894	386,88	81,10	180,13	765,47	879,95	564,24	541,70	206,17	783,29	626,15
895	387,29	80,83	181,97	770,73	865,14	533,47	512,49	206,98	796,88	608,28

896	388,56	80,66	182,09	768,85	862,08	546,05	490,62	207,98	810,03	596,38
897	401,28	80,92	153,82	762,31	890,91	532,61	477,29	209,27	811,96	594,95
898	410,26	80,67	141,00	796,79	931,30	513,02	465,76	210,91	797,22	590,56
899	408,29	80,42	138,77	844,88	925,53	487,22	455,99	212,78	781,91	584,16
900	402,19	80,61	136,89	855,18	910,59	526,18	447,93	214,86	766,36	577,77
901	396,30	80,61	135,59	848,49	888,17	522,45	441,77	217,09	751,71	570,33
902	391,82	81,11	134,01	835,94	876,73	513,19	436,42	219,49	739,65	564,36
903	388,33	81,46	133,14	829,82	880,30	509,84	431,75	221,97	728,93	558,89
904	389,20	81,25	133,04	841,00	888,62	504,39	427,78	224,57	717,32	552,95
905	388,89	81,53	132,98	855,69	908,45	498,83	424,48	227,26	705,07	548,11
906	390,15	81,43	133,16	872,49	920,52	494,20	420,78	229,95	693,69	542,01
907	391,26	81,37	133,07	886,88	914,80	489,77	417,93	232,62	684,60	537,87
908	390,15	81,62	133,05	888,31	903,79	485,30	415,66	235,29	676,45	533,71
909	388,63	81,74	132,85	884,33	898,12	481,26	413,92	237,95	667,90	529,64
910	387,48	81,74	132,71	882,32	882,97	477,39	412,77	240,56	660,71	525,44
911	386,12	81,50	132,21	877,64	876,69	473,71	411,41	243,09	654,15	522,30
912	384,27	81,73	132,06	874,23	869,98	470,77	409,95	245,49	649,02	520,44
913	383,14	81,76	131,72	872,99	865,88	468,62	408,77	247,89	645,09	517,85
914	382,72	81,93	131,62	874,45	865,89	465,49	407,99	250,16	641,65	517,08
915	381,81	82,16	131,62	875,53	870,43	464,66	407,19	252,37	638,64	515,83
916	381,78	81,93	131,61	877,62	870,81	462,26	407,08	254,47	636,31	514,23
917	380,77	81,88	131,18	879,19	871,59	460,53	406,90	256,43	634,96	512,92
918	380,78	82,07	131,23	881,32	868,45	458,96	406,87	258,29	637,57	513,17
919	378,58	81,86	131,17	880,31	875,58	457,02	407,43	260,04	640,17	511,03
920	380,49	81,51	131,13	884,71	873,15	456,62	407,05	261,68	649,93	509,51
921	378,51	81,19	131,20	884,56	876,70	455,83	407,42	263,17	658,51	508,68
922	378,56	81,36	130,70	889,91	896,30	453,63	407,83	264,58	664,19	508,95
923	378,60	81,43	130,15	903,44	947,93	455,23	408,45	265,89	658,79	508,90
924	381,43	81,48	131,40	924,36	973,14	454,69	408,89	267,07	655,31	508,51
925	383,77	81,47	131,97	935,12	959,58	454,28	410,38	268,23	659,65	509,28
926	382,71	81,09	131,85	933,43	973,10	455,89	412,29	269,23	664,64	510,56
927	383,17	81,30	131,11	935,87	998,07	456,91	413,55	270,19	669,78	510,94
928	383,50	80,56	131,95	940,92	1018,20	458,21	415,28	271,03	674,44	511,96
929	385,52	80,21	132,29	947,36	1036,09	459,41	416,68	271,84	678,12	513,41
930	386,52	80,85	132,65	952,00	1053,61	460,08	418,64	272,48	682,18	515,85
931	386,46	81,11	132,34	950,90	1050,91	461,22	420,82	273,04	687,09	518,31
932	386,69	81,38	132,95	946,32	1052,43	463,11	423,36	273,59	688,31	520,89
933	385,49	81,37	132,49	942,30	1076,53	464,76	426,21	274,07	683,36	524,58
934	387,46	81,62	133,02	944,36	1079,38	467,65	428,70	274,44	680,49	527,57
935	387,54	81,93	133,20	942,74	1061,55	468,80	431,46	274,75	678,26	530,88
936	385,38	81,99	132,57	938,59	1084,13	471,45	433,35	275,03	677,26	532,77
937	384,92	82,06	132,71	942,24	1149,03	476,14	435,94	275,28	676,86	536,65
938	386,44	82,14	133,50	950,51	1155,65	478,54	439,80	275,47	676,32	539,22
939	386,45	82,18	133,54	952,09	1155,63	481,59	441,98	275,60	676,23	543,61
940	386,20	82,18	134,04	951,27	1156,35	484,87	445,10	275,68	676,82	546,91
941	387,21	82,31	134,31	949,04	1147,62	487,95	449,08	275,72	677,41	552,44
942	386,79	82,51	134,21	945,48	1135,55	492,32	452,76	275,78	678,06	557,01
943	389,45	82,60	134,63	943,06	1099,07	495,11	457,28	275,79	678,98	562,17
944	387,42	82,45	134,43	936,63	1108,46	498,89	460,54	275,74	680,11	567,03
945	387,36	82,25	134,21	934,87	1124,16	504,37	463,55	275,70	680,83	571,37
946	388,31	82,38	134,54	936,06	1106,13	508,25	465,95	275,60	681,79	574,78
947	387,43	82,48	134,12	931,87	1097,15	513,00	468,71	275,55	683,27	577,80
948	386,53	82,36	133,65	926,59	1088,16	517,31	471,85	275,48	684,80	580,85

949	386,79	82,23	133,55	925,17	1101,49	522,40	474,51	275,43	686,58	583,98
950	388,47	82,20	133,68	930,59	1095,18	526,94	477,84	275,30	686,91	585,91
951	389,64	82,18	134,04	937,91	1087,21	532,25	480,04	275,22	687,32	588,82
952	391,41	82,58	134,49	942,44	1084,57	537,05	483,10	275,17	687,05	590,83
953	391,16	82,52	134,51	943,52	1078,85	542,31	485,30	275,13	686,58	592,50
954	392,18	82,31	134,86	943,03	1077,54	546,92	487,05	275,08	686,18	595,52
955	393,53	82,44	135,22	942,90	1073,37	552,86	491,07	275,08	685,87	598,91
956	393,43	82,49	135,57	940,71	1074,33	559,47	492,89	275,07	685,49	602,51
957	394,35	82,21	135,44	939,71	1064,23	565,85	498,05	275,20	685,32	604,46
958	394,18	82,54	135,21	937,54	1053,29	570,01	501,17	275,33	685,46	609,69
959	393,55	82,55	135,76	933,37	1057,50	573,85	503,58	275,53	685,46	613,58
960	393,27	82,82	136,05	931,05	1039,64	578,66	506,45	275,78	686,07	617,37
961	391,95	83,00	135,80	926,20	1035,93	583,14	508,63	276,09	686,92	620,86
962	392,26	83,18	135,57	925,20	1037,80	587,43	510,87	276,41	687,90	623,53
963	392,76	83,32	135,62	926,14	1038,06	589,63	514,59	276,81	689,59	625,62
964	391,45	83,43	135,62	925,41	1029,88	591,84	517,47	277,27	691,18	627,76
965	391,46	83,42	135,95	922,56	1014,73	596,16	520,69	277,72	693,05	629,73
966	390,85	83,53	135,70	917,96	1008,16	595,96	524,27	278,22	694,90	632,53
967	390,88	83,70	135,81	914,69	1009,02	598,80	528,14	278,78	696,35	633,86
968	391,85	83,57	135,90	914,44	1003,52	601,85	533,16	279,36	697,33	636,58
969	391,33	82,95	135,65	912,34	992,91	607,29	537,39	279,89	697,58	638,56
970	392,14	82,88	135,45	908,90	999,93	613,22	541,65	280,51	697,20	640,31
971	391,79	83,16	135,17	909,79	1005,99	617,54	546,41	281,19	696,57	642,21
972	393,45	83,12	135,02	912,65	1033,16	622,12	552,15	281,80	695,25	643,73
973	395,94	83,03	135,23	920,06	1048,39	627,85	558,28	282,50	693,81	645,47
974	396,17	82,50	135,30	925,04	1070,41	632,55	564,40	283,19	691,72	646,47
975	396,71	82,96	135,89	928,84	1069,45	637,72	569,03	283,89	689,62	645,69
976	396,92	83,31	135,90	929,14	1068,40	641,35	574,01	284,59	687,61	645,06
977	396,49	83,44	135,99	927,69	1062,42	646,23	578,57	285,32	685,09	644,98
978	396,83	83,84	136,47	925,88	1046,56	648,21	583,43	286,04	682,53	646,06
979	395,99	83,87	136,27	922,28	1018,61	651,35	589,10	286,72	680,06	645,10
980	395,59	83,87	135,86	917,85	1001,74	655,24	592,98	287,45	678,07	644,52
981	394,64	84,11	135,80	913,53	981,61	657,97	597,35	288,18	676,58	646,59
982	394,75	83,92	136,04	907,27	956,44	658,45	602,02	288,84	675,03	648,54
983	393,94	83,58	135,31	898,61	938,62	661,32	607,51	289,47	674,06	650,00
984	392,52	83,74	135,08	889,27	931,44	661,49	611,58	290,08	672,75	651,07
985	391,95	83,68	135,02	883,85	926,58	663,72	616,38	290,78	672,04	653,10
986	390,83	84,00	134,96	879,97	930,77	665,70	618,40	291,38	671,14	653,89
987	390,94	83,88	135,07	878,82	929,66	666,52	621,24	292,01	670,16	654,85
988	389,92	83,98	134,56	879,03	931,45	668,44	622,90	292,60	669,57	656,08
989	390,31	84,30	135,12	878,91	922,70	670,61	625,78	293,17	668,73	657,34
990	389,59	84,65	134,78	874,87	897,22	668,95	628,05	293,74	667,20	660,40
991	384,02	84,50	134,32	860,37	875,69	667,60	630,40	294,31	666,50	662,89
992	379,85	84,69	133,80	845,32	860,88	666,03	633,28	294,88	665,74	666,47
993	376,80	84,94	133,21	829,88	837,73	664,50	636,98	295,44	665,23	671,30
994	370,25	85,20	132,43	805,34	815,68	663,43	641,00	296,03	664,91	675,95
995	363,55	85,10	131,29	776,43	798,81	660,96	646,20	296,57	662,87	677,57
996	357,68	85,22	130,56	750,66	784,38	659,77	649,44	297,11	660,40	679,45
997	353,67	85,04	129,25	731,71	774,15	659,28	655,30	297,63	657,74	679,64
998	350,31	84,99	128,16	719,02	764,33	659,52	659,52	298,17	656,09	680,54
999	346,91	85,27	127,61	708,12	756,96	658,22	663,84	298,76	653,88	682,57
1000	345,73	85,52	128,03	701,32	752,70	656,25	668,05	299,32	650,63	683,80
1001	344,88	85,37	127,54	698,56	755,48	653,56	671,15	299,83	647,49	684,65

1002	344,70	85,25	127,53	698,53	750,01	651,30	676,73	300,37	644,54	685,14
1003	342,97	85,16	126,43	696,01	742,94	649,21	682,12	300,91	642,18	686,07
1004	342,05	85,44	126,73	691,99	738,83	647,63	684,02	301,41	640,24	688,59
1005	339,24	85,70	126,36	686,55	734,07	644,82	681,58	301,94	638,53	690,85
1006	338,86	85,80	126,27	680,89	732,16	646,84	680,28	302,45	636,81	692,37
1007	337,11	85,75	126,01	676,61	729,94	645,29	679,37	302,99	634,93	692,81
1008	336,54	85,97	125,51	673,32	727,54	645,68	676,40	303,49	633,18	693,28
1009	335,74	86,17	125,70	670,66	726,10	644,23	676,71	303,95	631,51	691,36
1010	334,66	86,37	125,41	667,18	721,30	646,01	678,28	304,44	629,76	690,20
1011	334,61	86,34	125,74	664,46	721,41	645,64	681,64	304,88	628,09	689,22
1012	333,58	86,26	125,76	664,15	719,37	647,34	684,94	305,36	627,28	687,92
1013	332,93	86,52	125,29	661,87	719,28	646,98	690,70	305,74	626,35	687,01
1014	332,87	86,38	124,91	661,24	722,42	648,21	713,13	306,10	625,50	685,45
1015	333,31	86,63	125,78	663,39	724,60	647,51	729,56	306,42	625,22	684,27
1016	333,12	86,64	125,48	664,78	721,56	649,85	746,15	306,71	625,64	681,52
1017	331,38	86,77	125,15	662,15	715,44	652,04	759,47	307,00	626,14	681,26
1018	328,90	86,73	124,88	656,21	713,48	653,64	772,67	307,19	626,44	681,11
1019	331,25	86,75	125,00	654,39	715,46	654,82	783,85	307,36	626,79	679,19
1020	332,20	86,51	124,86	658,52	717,62	655,36	794,73	307,45	627,66	679,44
1021	332,75	86,68	125,15	663,36	720,48	656,92	803,84	307,48	627,85	679,37
1022	332,56	86,67	125,13	665,16	718,20	657,37	806,79	307,47	629,05	678,77
1023	330,14	86,45	124,37	661,76	713,49	656,96	809,27	307,39	630,29	677,72
1024	326,48	86,73	124,15	651,47	707,67	656,64	812,01	307,32	629,34	676,57
1025	323,33	86,80	123,89	638,78	706,17	656,34	813,84	307,21	627,16	673,12
1026	321,30	87,15	123,58	629,70	703,70	656,41	814,61	307,01	624,00	669,28
1027	321,51	86,87	123,28	626,42	704,39	654,51	815,67	306,85	620,32	666,06
1028	321,62	86,80	123,24	626,67	704,78	654,61	814,58	306,57	616,35	662,17
1029	320,81	87,00	123,19	628,59	703,27	653,58	814,44	306,26	612,33	658,02
1030	320,44	86,83	123,09	628,96	699,52	652,70	814,22	305,91	608,16	654,65
1031	319,47	87,03	123,06	627,66	696,07	652,89	810,59	305,54	604,00	650,76
1032	319,30	87,08	122,73	626,47	692,54	651,60	805,50	305,18	599,83	646,77
1033	318,09	87,10	122,30	624,72	689,85	653,13	798,03	304,78	595,87	643,81
1034	317,52	87,05	122,71	623,44	688,13	650,63	791,19	304,23	592,25	640,69
1035	317,07	87,35	122,91	622,31	685,51	654,10	783,46	303,80	588,81	637,84
1036	316,70	87,53	122,51	620,93	682,15	653,29	778,11	303,27	585,55	634,01
1037	316,25	87,25	122,38	620,48	678,38	650,58	780,42	302,75	581,97	627,17
1038	314,97	87,29	122,20	619,94	676,03	648,68	779,36	302,21	578,38	621,18
1039	314,97	87,41	121,69	619,65	672,42	646,63	775,40	301,61	575,02	614,94
1040	314,10	87,37	121,76	618,96	668,43	643,79	772,20	300,95	571,96	610,90
1041	313,63	87,49	121,95	617,69	664,40	641,88	767,23	300,30	568,64	608,52
1042	312,81	87,14	121,71	616,20	661,47	638,61	762,03	299,69	565,68	606,58
1043	312,77	87,31	121,54	615,09	658,56	635,82	757,16	298,96	562,46	602,68
1044	312,08	87,65	121,79	615,08	654,36	632,50	752,01	298,25	559,73	600,31
1045	310,93	87,51	121,41	613,58	651,54	629,04	746,47	297,53	557,12	598,41
1046	309,62	87,61	121,30	611,44	648,13	627,82	742,39	296,87	554,37	594,90
1047	78,85	76,61	80,55	77,73	84,77	77,46	76,26	74,27	76,23	75,97
1048	93,13	76,55	84,02	97,37	141,66	94,84	96,07	74,29	88,51	90,70
1049	107,23	76,66	87,31	119,45	167,82	116,09	116,42	74,35	107,37	102,57
1050	124,45	76,73	91,58	146,61	210,64	143,15	144,44	74,36	128,78	121,99
1051	147,55	76,86	97,35	188,47	282,14	185,14	186,14	74,40	150,91	149,29
1052	175,81	77,05	104,19	247,81	356,17	240,82	233,74	74,47	181,24	177,18
1053	205,07	77,03	111,74	317,26	425,93	310,69	280,18	74,60	220,27	206,13
1054	235,24	77,36	119,56	390,35	499,64	371,89	309,24	74,74	269,80	228,28

1055	265,55	77,42	127,49	471,31	548,72	426,80	334,31	74,90	323,87	251,15
1056	289,49	77,68	134,30	542,87	587,91	465,53	359,11	75,07	377,16	276,74
1057	309,97	77,82	140,26	599,18	624,61	492,24	378,18	75,34	430,82	303,14
1058	321,65	77,88	144,32	642,16	629,33	525,42	402,16	75,58	478,94	331,82
1059	328,16	78,39	147,43	664,36	631,72	559,44	430,01	75,96	522,25	360,05
1060	370,44	79,09	179,80	672,41	585,33	585,89	481,92	76,33	534,00	406,99
1061	306,11	78,79	150,38	603,43	516,25	524,18	456,05	76,79	529,09	415,38
1062	296,54	79,25	165,74	531,18	447,31	494,65	434,89	77,36	514,14	411,95
1063	268,21	79,39	160,09	452,92	415,63	467,81	418,05	77,93	494,80	400,38
1064	254,83	79,21	155,47	396,97	400,08	449,70	401,00	78,65	475,03	388,82
1065	251,20	79,02	153,50	367,62	396,08	439,55	389,45	79,41	455,65	379,49
1066	257,26	79,14	154,81	359,56	408,49	438,75	384,61	80,30	438,45	373,22
1067	268,24	79,74	158,15	368,52	421,74	448,38	380,97	81,29	425,46	367,21
1068	281,55	79,64	162,08	383,93	443,52	479,69	381,45	82,40	417,92	362,95
1069	296,83	79,82	167,48	407,10	470,50	514,45	393,29	83,62	414,98	366,43
1070	309,80	79,55	172,16	433,71	497,74	543,10	442,24	85,01	415,14	377,39
1071	331,09	79,87	178,44	469,23	#####	566,40	506,55	86,45	420,88	395,18
1072	356,66	80,02	186,85	525,50	582,05	592,17	565,10	88,06	433,93	420,48
1073	371,05	80,01	192,50	574,05	605,64	610,78	611,61	89,73	448,72	447,42
1074	385,85	80,12	197,25	#####	647,98	621,03	659,79	91,57	469,38	472,14
1075	399,95	80,77	201,95	#####	680,96	633,07	692,28	93,52	496,16	494,25
1076	413,72	81,15	206,44	668,03	738,88	678,71	711,39	95,56	520,32	517,76
1077	384,33	80,73	179,77	693,32	758,43	713,43	696,58	97,88	546,66	521,20
1078	376,44	81,21	173,64	723,02	750,94	737,86	687,40	100,28	567,36	522,01
1079	371,89	81,39	171,89	#####	743,45	753,54	690,70	102,86	589,30	530,78
1080	371,17	82,24	171,06	#####	718,45	760,61	702,45	105,54	608,66	540,08
1081	371,86	82,19	170,71	751,22	#####	761,36	708,44	108,42	630,45	546,02
1082	378,03	82,00	172,01	763,99	713,76	759,48	715,43	111,45	655,28	553,69
1083	382,83	81,99	173,67	779,04	723,52	760,85	717,02	114,66	680,91	563,79
1084	386,55	82,74	174,60	794,75	732,27	763,27	716,25	117,98	708,70	571,21
1085	389,25	81,75	175,20	810,64	737,74	766,22	714,50	121,38	732,87	577,65
1086	392,23	82,53	176,38	828,45	744,30	766,53	706,77	124,96	748,83	583,39
1087	394,71	82,57	177,30	841,99	754,64	766,09	701,24	128,59	763,80	588,04
1088	397,24	82,24	178,25	849,37	762,22	771,54	697,50	132,29	777,24	591,93
1089	397,85	83,37	178,38	859,15	765,59	773,91	690,03	136,02	788,99	596,86
1090	398,00	83,18	179,16	868,95	767,19	780,16	679,90	139,83	801,19	600,29
1091	400,61	82,57	179,47	868,47	769,59	785,79	671,61	143,66	809,71	606,91
1092	405,63	83,33	181,03	871,59	775,77	788,81	667,12	147,55	817,11	610,40
1093	426,80	83,18	157,47	893,52	783,95	790,55	665,21	151,40	815,13	617,83
1094	430,85	83,80	144,93	955,56	803,98	770,99	658,92	155,33	803,56	616,36
1095	431,76	83,62	143,09	965,57	845,37	753,20	651,72	159,27	792,10	612,26
1096	434,18	83,13	142,69	935,54	885,21	731,71	645,96	163,09	782,69	606,92
1097	432,33	83,02	141,38	886,71	895,93	724,58	641,13	166,78	774,84	603,74
1098	424,64	84,19	140,83	855,15	875,03	716,01	637,38	170,29	767,22	600,99
1099	414,54	84,25	138,83	835,63	837,90	710,96	634,95	173,62	761,65	599,14
1100	405,11	84,37	137,48	833,33	803,00	719,14	633,74	176,84	756,68	596,51
1101	401,72	84,03	136,67	836,78	782,07	725,75	632,39	179,79	753,66	596,33
1102	400,81	84,18	135,89	844,02	775,64	732,56	631,64	182,64	751,12	596,48
1103	401,52	83,98	136,19	853,73	779,52	743,22	631,25	185,31	748,90	596,87
1104	404,19	84,42	136,13	866,47	788,66	748,42	632,29	187,77	747,90	598,55
1105	407,93	83,46	136,23	887,96	801,50	760,59	633,23	190,05	745,50	599,48
1106	411,96	83,51	136,51	916,73	819,25	767,49	633,85	192,15	742,99	599,78
1107	416,40	83,91	136,90	945,29	842,73	776,39	637,11	194,14	741,22	599,44

1108	420,85	83,51	138,22	962,96	868,22	779,45	638,63	195,92	739,27	599,95
1109	425,52	83,19	138,56	980,13	889,31	784,59	641,14	197,51	737,60	601,54
1110	427,57	84,22	139,08	993,16	906,67	786,71	643,28	199,03	735,86	601,69
1111	428,98	83,93	139,52	1004,49	917,83	785,26	646,85	200,34	734,59	602,30
1112	430,05	84,32	139,66	1013,72	925,05	785,29	650,65	201,59	734,28	604,16
1113	429,07	83,61	140,00	1013,77	928,25	785,60	656,16	202,69	733,69	605,09
1114	429,55	83,32	139,67	1005,04	927,59	793,08	662,11	203,66	731,13	604,42
1115	428,19	83,83	139,41	1003,17	923,30	799,59	672,49	204,57	726,96	607,25
1116	427,71	83,75	138,94	1000,44	918,87	801,54	683,98	205,35	724,01	607,65
1117	427,97	84,27	139,18	989,98	916,95	811,38	693,55	206,05	721,89	607,72
1118	426,66	84,50	139,59	982,26	913,94	814,79	702,39	206,68	720,50	607,96
1119	424,58	85,04	138,96	959,46	906,64	822,02	709,60	207,24	719,38	609,39
1120	423,62	84,00	138,72	940,37	895,79	830,14	717,34	207,75	718,94	608,64
1121	420,11	83,96	138,33	918,55	878,62	832,15	721,00	208,16	719,70	611,26
1122	415,34	85,66	137,62	904,49	857,74	831,39	723,79	208,58	719,50	613,70
1123	411,60	84,79	136,84	900,59	837,98	826,59	726,22	208,90	720,83	616,09
1124	409,24	84,99	136,67	898,73	824,13	819,91	732,20	209,16	723,03	618,38
1125	409,97	85,12	136,68	897,52	817,90	815,90	735,17	209,47	724,93	621,28
1126	410,42	84,19	136,42	892,08	814,98	817,08	733,07	209,69	727,00	622,64
1127	410,33	84,29	136,47	874,29	809,81	821,05	725,55	209,93	730,30	625,41
1128	407,88	85,02	135,94	863,43	800,04	823,49	719,98	210,16	735,25	630,21
1129	404,68	85,09	135,48	857,27	787,44	823,35	715,31	210,37	739,63	635,13
1130	400,30	84,82	134,97	851,73	775,08	821,04	712,89	210,56	744,45	639,14
1131	397,97	85,82	134,70	848,78	763,94	818,44	708,19	210,79	749,62	646,65
1132	395,28	84,48	134,26	855,72	754,02	360,49	704,28	211,01	753,68	657,06
1133	393,32	84,83	133,43	848,91	745,91	815,00	706,20	211,24	757,73	659,00
1134	390,49	85,82	133,14	838,69	738,50	812,73	708,29	211,49	760,84	663,00
1135	387,81	85,73	132,64	828,82	729,52	809,86	710,05	211,77	763,69	666,60
1136	384,38	84,81	132,08	821,39	718,80	806,22	708,33	212,04	767,50	669,63
1137	380,71	85,12	131,49	815,30	707,67	803,13	708,53	212,37	771,27	672,21
1138	378,76	84,90	131,13	814,55	697,95	800,19	709,53	212,72	775,91	676,98
1139	376,15	85,63	130,90	815,75	691,34	795,86	709,14	213,12	778,89	691,35
1140	376,39	85,18	130,51	815,67	687,87	790,83	708,86	213,56	779,86	701,95
1141	375,60	84,83	130,30	812,57	687,23	785,71	708,04	214,01	781,01	708,87
1142	374,45	85,22	130,00	808,81	685,54	780,42	706,52	214,50	781,26	715,38
1143	372,34	84,88	129,67	803,65	682,18	775,25	707,30	215,02	782,66	718,95
1144	369,43	85,20	128,87	797,88	677,30	770,19	705,83	215,58	782,71	722,81
1145	410,92	84,80	147,38	779,90	679,16	740,24	693,05	216,48	766,44	734,63
1146	385,47	85,17	145,02	769,27	672,48	670,57	638,47	217,30	746,34	697,11
1147	360,52	85,52	169,64	781,93	688,47	618,24	592,84	217,81	730,54	665,68
1148	377,16	85,29	177,20	798,87	717,09	586,18	559,67	218,37	728,33	657,68
1149	388,82	85,11	182,43	813,71	743,02	563,63	534,61	219,13	737,70	667,66
1150	397,67	84,72	185,53	823,34	764,46	546,13	514,93	220,05	745,40	681,55
1151	410,32	84,44	175,05	826,26	777,59	539,09	501,97	221,17	751,78	695,41
1152	422,42	83,68	146,50	867,06	781,42	518,13	492,23	222,77	735,99	685,12
1153	425,49	84,22	142,88	868,99	814,69	523,72	484,38	224,63	717,55	675,95
1154	428,72	84,47	142,47	840,82	853,18	515,57	478,03	226,67	702,29	673,68
1155	428,09	84,41	141,74	812,97	871,51	505,59	472,19	228,91	688,48	673,04
1156	422,28	84,60	140,73	785,50	865,73	497,75	466,41	231,32	676,51	666,70
1157	416,09	84,48	139,58	767,32	850,72	490,66	462,64	233,92	665,37	667,48
1158	411,78	84,35	138,76	757,45	833,29	481,12	459,87	236,65	655,88	670,74
1159	407,95	83,74	137,93	751,53	822,64	474,61	456,33	239,52	647,43	675,47
1160	407,41	84,46	137,25	747,29	818,79	468,01	453,55	242,43	640,37	675,38

1161	406,52	83,81	137,62	746,15	821,56	462,74	451,64	245,43	634,61	670,77
1162	408,48	84,41	137,83	745,77	828,79	457,58	449,54	248,47	630,43	662,28
1163	408,85	84,54	138,09	751,79	840,44	452,06	447,53	251,46	627,54	656,28
1164	409,54	84,48	137,86	762,85	853,90	448,59	445,23	254,52	624,56	651,38
1165	412,16	84,23	137,60	767,86	868,69	445,01	443,52	257,52	622,53	645,80
1166	413,65	84,06	137,43	771,50	881,11	442,28	442,22	260,50	620,74	642,23
1167	414,39	84,32	137,52	770,63	890,48	439,08	441,60	263,38	619,52	640,63
1168	415,11	84,52	137,17	768,78	896,25	436,50	441,24	266,26	618,61	641,30
1169	414,23	85,14	137,30	765,41	898,77	435,01	440,97	268,96	617,79	642,03
1170	413,08	85,03	137,26	762,41	898,88	433,84	441,15	271,65	617,17	644,35
1171	412,53	84,54	137,18	759,79	897,98	432,51	441,04	274,21	616,83	645,90
1172	411,13	84,35	136,94	760,46	896,07	431,82	441,62	276,66	617,03	650,46
1173	410,70	83,86	136,94	765,40	895,56	431,32	441,91	279,02	617,68	656,07
1174	409,87	84,20	137,15	779,37	897,07	430,63	443,25	281,22	618,32	661,14
1175	410,56	83,71	136,71	800,69	901,30	430,39	444,95	283,30	619,09	662,40
1176	410,39	83,76	136,58	824,28	907,79	431,09	445,79	285,27	620,04	663,23
1177	411,28	83,49	137,06	839,79	914,43	432,13	447,46	287,12	621,33	667,45
1178	411,02	83,61	137,15	846,22	919,78	432,42	448,42	288,87	623,98	671,15
1179	411,44	84,39	137,35	852,64	922,94	433,21	449,57	290,55	626,62	674,47
1180	411,17	83,93	137,48	856,45	924,07	434,17	451,09	292,01	629,55	676,18
1181	410,93	84,19	137,59	860,11	921,90	436,71	453,35	293,35	633,60	680,20
1182	410,46	82,86	137,78	859,41	917,27	437,82	455,11	294,58	637,88	681,51
1183	409,26	84,13	137,13	860,45	911,37	440,23	458,14	295,77	642,08	686,58
1184	408,66	83,78	137,47	866,23	906,64	444,18	459,73	296,81	645,09	693,69
1185	409,86	84,73	137,75	875,44	904,33	445,26	462,95	297,75	646,33	701,29
1186	410,30	82,89	137,79	879,88	903,17	447,50	466,29	298,60	647,31	708,35
1187	410,64	83,86	138,18	885,96	902,67	451,31	469,70	299,35	648,33	710,70
1188	411,25	84,46	138,35	887,49	902,65	453,04	472,34	300,02	649,44	714,25
1189	410,59	84,00	138,21	895,37	902,25	457,00	476,86	300,67	650,28	715,64
1190	410,16	84,02	138,04	893,06	902,68	460,27	480,60	301,25	651,63	716,13
1191	410,18	84,52	137,38	892,63	904,38	464,03	484,96	301,77	652,84	715,09
1192	409,39	84,66	137,01	900,73	906,36	467,94	490,13	302,21	653,74	712,46
1193	409,63	83,53	136,90	904,26	910,13	471,21	494,43	302,65	654,66	711,17
1194	410,57	83,35	137,05	901,78	913,49	475,49	499,77	303,08	655,77	710,45
1195	409,80	83,66	137,20	899,77	913,39	479,68	504,84	303,44	657,04	709,13
1196	409,91	83,19	137,15	902,12	912,23	483,14	510,41	303,80	658,29	711,33
1197	411,08	84,53	137,55	906,89	912,17	487,42	514,33	304,13	659,86	711,67
1198	411,22	84,18	137,47	909,52	913,39	492,29	520,01	304,47	661,27	714,38
1199	410,93	83,67	137,72	914,14	914,82	495,57	524,54	304,80	662,54	714,59
1200	411,27	84,46	137,65	917,56	916,17	500,79	528,31	305,14	664,43	715,47
1201	411,53	83,68	137,34	923,50	917,76	504,31	532,18	305,49	665,95	716,23
1202	412,43	84,19	137,42	927,31	920,93	508,84	536,27	305,81	667,39	716,90
1203	412,97	83,94	137,12	925,58	924,88	514,81	538,99	306,18	668,48	715,05
1204	414,16	83,74	136,85	921,33	927,93	518,85	542,89	306,54	670,00	713,98
1205	413,45	84,28	136,94	917,96	928,48	523,11	547,82	306,83	671,71	713,57
1206	412,68	83,83	136,86	920,66	927,08	528,20	553,22	307,11	673,46	711,64
1207	412,83	84,46	136,94	924,40	927,47	533,64	556,61	307,46	674,40	708,43
1208	413,29	83,72	136,87	920,32	929,97	537,67	560,35	307,80	675,31	704,96
1209	412,44	84,62	137,41	908,23	930,60	542,50	564,04	308,09	675,38	701,03
1210	413,00	84,60	137,26	895,06	930,49	547,53	568,86	308,47	676,49	698,19
1211	412,66	84,27	137,42	882,24	927,73	552,01	573,76	308,84	677,93	696,81
1212	412,75	83,85	137,18	866,52	922,92	557,38	577,99	309,21	679,80	694,50
1213	410,40	84,10	136,74	852,11	916,21	562,29	581,78	309,55	682,35	692,71

1214	409,08	83,89	136,51	840,30	908,12	566,51	584,36	309,96	684,72	692,10
1215	406,30	84,04	136,09	832,76	898,18	571,05	588,63	310,33	686,45	690,45
1216	405,46	84,23	135,42	824,34	887,59	576,06	591,19	310,79	687,95	690,31
1217	402,58	84,45	135,75	817,04	875,89	580,10	593,09	311,29	689,73	690,16
1218	400,50	84,85	135,49	811,79	864,41	585,88	593,75	311,78	691,51	690,25
1219	397,44	84,26	135,42	805,80	852,58	590,82	595,17	312,25	693,63	691,72
1220	395,56	84,79	134,53	798,59	842,11	595,50	597,48	312,86	696,60	692,49
1221	392,96	84,79	134,43	792,53	831,61	599,97	599,99	313,41	699,58	691,70
1222	391,07	84,44	133,79	787,45	821,78	603,85	602,84	313,99	702,12	692,06
1223	388,94	84,80	133,69	782,94	811,97	608,52	606,25	314,64	703,69	693,36
1224	387,27	84,53	133,07	778,53	802,44	612,21	608,67	315,28	704,96	694,60
1225	385,60	84,52	132,35	775,57	793,96	617,41	611,47	315,85	705,71	696,10
1226	384,09	85,23	132,11	773,18	787,10	618,97	615,09	316,55	706,72	696,75
1227	383,19	84,87	132,13	772,45	781,76	623,00	619,32	317,26	707,29	697,40
1228	380,74	86,03	131,53	770,87	777,62	623,69	624,48	317,93	707,34	698,28
1229	381,12	85,32	131,51	769,40	774,62	626,98	629,36	318,65	706,50	697,08
1230	380,30	85,63	131,49	766,94	771,74	630,53	634,32	319,39	705,94	696,06
1231	380,02	85,51	131,03	765,57	768,46	637,35	638,08	320,13	705,89	696,46
1232	379,17	85,37	131,24	764,01	764,36	638,72	643,11	320,89	705,23	697,78
1233	378,97	86,12	130,98	761,85	760,03	642,98	647,30	321,62	705,09	696,45
1234	377,28	85,09	130,65	760,85	756,11	644,60	650,06	322,40	704,03	696,55
1235	377,16	86,32	130,46	760,36	753,17	646,99	653,12	323,09	702,98	696,10
1236	377,79	84,45	130,78	759,88	751,89	649,15	656,92	323,86	701,64	697,18
1237	378,08	85,08	130,75	758,32	750,35	652,03	659,46	324,67	699,47	696,11
1238	377,87	85,89	130,78	756,65	748,78	656,41	662,70	325,43	696,51	696,66
1239	378,60	85,97	130,51	752,87	746,52	660,24	667,01	326,21	693,08	693,16
1240	377,85	85,19	130,67	750,11	742,60	664,55	670,99	327,00	689,49	692,91
1241	377,41	86,31	130,46	746,72	737,51	668,36	675,25	327,84	686,21	691,33
1242	377,43	86,35	130,62	745,21	731,87	672,46	679,47	328,66	682,45	690,88
1243	375,50	86,17	130,21	747,00	726,35	676,60	685,21	329,47	677,49	688,44
1244	375,62	86,78	130,22	749,37	723,08	680,75	690,08	330,29	672,94	685,06
1245	376,35	85,46	130,28	750,01	721,70	688,89	696,68	331,13	669,18	681,97
1246	376,56	85,21	129,92	749,74	722,24	689,53	701,51	332,01	666,10	680,00
1247	376,69	85,35	129,79	745,39	722,24	693,30	710,54	332,84	662,93	678,36
1248	375,89	84,65	129,63	739,91	720,44	695,64	719,72	333,76	660,26	676,95
1249	374,47	84,99	129,02	735,01	715,61	699,10	731,90	334,64	657,59	675,96
1250	372,80	84,87	128,93	737,07	710,80	696,79	740,97	335,54	653,09	668,06
1251	373,12	85,60	129,10	737,28	709,22	696,86	752,89	336,43	648,99	661,81
1252	373,39	86,16	129,22	732,11	710,23	694,05	764,87	337,37	645,16	656,74
1253	372,05	86,46	129,68	723,69	709,49	689,59	782,70	338,29	641,51	653,51
1254	368,92	87,42	128,45	713,13	704,52	688,30	799,18	339,24	637,86	651,74
1255	365,61	86,04	127,89	704,39	695,61	685,75	809,39	340,15	633,83	649,93
1256	361,66	86,16	127,07	697,54	684,95	680,95	817,90	341,09	629,66	650,13
1257	357,45	86,19	126,62	691,04	673,91	675,44	827,00	342,02	625,70	649,69
1258	354,83	85,34	126,18	685,19	664,43	672,62	832,14	342,92	621,67	649,22
1259	351,75	86,11	125,80	679,37	656,08	671,49	837,69	343,70	617,91	648,78
1260	349,47	85,38	125,26	674,10	649,07	668,72	846,00	344,53	614,12	651,26
1261	347,01	85,49	124,72	669,29	643,03	667,03	852,17	345,28	610,68	650,67
1262	344,37	86,91	124,46	665,79	637,89	665,26	851,26	346,06	607,96	652,44
1263	342,07	85,99	123,92	661,20	633,09	664,40	855,54	346,79	605,44	654,59
1264	341,45	85,93	123,65	657,34	628,43	662,91	858,32	347,48	603,92	654,96
1265	338,98	86,45	123,22	654,50	624,24	663,72	856,02	348,05	602,13	656,39
1266	337,16	86,72	122,63	652,55	620,37	663,06	856,80	348,66	600,51	657,31

1267	335,90	85,91	122,14	649,56	616,89	664,57	850,66	349,17	599,43	656,22
1268	334,76	85,86	122,12	647,83	613,67	664,48	850,11	349,65	598,54	657,04
1269	332,96	86,86	121,88	646,02	610,67	667,15	851,90	349,98	597,33	654,82
1270	332,62	85,25	121,48	643,89	608,53	670,23	852,71	350,28	595,97	654,15
1271	332,03	85,67	121,40	643,63	605,96	673,63	852,66	350,52	594,65	653,26
1272	330,43	85,65	121,32	642,03	603,66	674,65	854,68	350,64	593,46	651,86
1273	329,96	86,20	121,18	641,98	601,74	675,93	853,20	350,71	591,44	650,43
1274	330,42	86,70	120,99	643,17	601,31	676,44	855,19	350,69	589,36	649,32
1275	330,43	85,85	121,10	642,48	602,26	676,89	851,92	350,67	586,82	647,02
1276	330,33	85,63	120,73	641,17	603,49	677,16	852,53	350,58	584,60	645,55
1277	330,72	87,34	120,62	638,61	604,28	676,22	851,36	350,40	582,16	642,60
1278	330,04	85,72	120,78	638,08	604,19	675,65	851,17	350,23	580,20	642,43
1279	329,19	85,87	120,67	637,12	603,91	674,38	848,72	350,02	578,39	642,14
1280	328,54	86,84	120,25	635,33	602,89	673,80	844,12	349,74	576,64	641,34
1281	328,04	86,05	120,48	634,16	600,93	669,56	838,76	349,38	574,67	639,18
1282	326,85	85,67	120,26	631,69	598,36	666,90	831,26	349,10	572,83	638,97
1283	325,44	85,36	119,93	630,40	595,23	665,95	824,96	348,71	570,86	636,84
1284	324,42	86,49	119,40	629,37	592,62	664,56	821,10	348,26	568,91	635,59
1285	78,51	78,07	79,02	80,16	78,61	77,98	78,20	77,95	78,35	78,32
1286	98,22	78,15	86,05	116,68	93,40	82,97	84,18	77,96	80,24	81,00
1287	122,21	78,16	94,09	184,53	123,37	90,61	99,24	77,99	88,96	89,72
1288	175,09	78,17	105,34	340,84	185,80	116,45	134,61	78,03	133,76	126,98
1289	236,03	78,31	122,70	491,24	308,79	158,14	191,79	78,11	178,32	176,10
1290	284,38	78,42	138,25	585,05	463,25	229,62	264,41	78,18	224,74	230,52
1291	307,30	78,48	147,48	639,84	567,93	306,80	345,02	78,33	276,27	283,39
1292	321,87	78,65	153,86	684,95	619,19	395,88	443,15	78,45	327,12	342,31
1293	331,76	78,69	157,89	709,13	648,71	479,42	517,66	78,69	379,22	393,17
1294	336,74	78,85	160,72	708,56	666,07	540,08	583,74	78,94	424,81	439,47
1295	345,26	78,98	163,75	755,10	675,98	577,79	588,69	79,28	477,11	471,34
1296	344,24	79,26	164,81	749,38	684,17	610,49	574,06	79,72	526,28	482,65
1297	316,28	79,73	189,83	521,29	633,36	601,08	544,83	80,25	527,23	492,59
1298	284,70	79,36	172,01	492,84	522,25	562,67	492,92	80,85	514,16	446,99
1299	263,88	79,57	168,90	443,26	459,69	533,34	453,95	81,56	494,97	419,44
1300	264,88	79,79	164,60	454,97	421,23	502,66	423,04	82,36	475,66	395,70
1301	266,68	79,91	164,78	458,51	409,09	476,89	400,17	83,25	459,64	381,35
1302	264,87	79,64	164,36	448,09	404,72	456,37	380,57	84,27	444,36	374,51
1303	263,54	79,58	163,37	453,58	398,89	438,70	365,58	85,38	431,01	372,16
1304	263,52	79,78	163,23	440,03	398,93	425,13	353,96	86,62	417,12	369,84
1305	259,50	79,84	161,81	428,57	395,26	410,97	342,63	87,94	402,71	365,94
1306	254,70	79,83	160,39	418,79	389,62	399,54	330,92	89,42	390,04	356,96
1307	255,03	79,87	160,11	424,65	385,05	390,28	320,49	90,95	378,76	349,22
1308	253,98	80,17	159,86	428,60	383,22	387,74	311,85	92,64	368,88	341,81
1309	255,66	79,87	160,35	431,15	383,48	391,55	305,71	94,42	361,00	336,12
1310	256,14	79,87	160,35	432,61	385,17	392,85	301,15	96,32	354,39	331,89
1311	255,74	79,93	160,21	433,57	385,68	397,32	297,85	98,26	348,88	329,84
1312	265,20	79,91	163,10	449,11	391,08	406,49	296,59	100,29	346,92	329,09
1313	275,13	79,93	164,57	484,27	405,74	438,37	295,24	102,36	348,28	327,36
1314	267,04	79,97	148,09	535,99	429,90	462,17	298,28	104,49	359,68	328,53
1315	265,42	80,07	145,91	552,69	457,05	478,56	303,85	106,63	371,15	331,48
1316	274,69	79,99	147,57	568,56	476,28	488,00	316,80	108,76	390,77	339,68
1317	289,97	80,07	151,65	617,87	501,14	499,96	348,35	110,88	420,98	351,48
1318	306,04	80,35	156,14	657,30	532,93	511,73	420,32	113,03	457,52	368,02
1319	318,57	80,31	160,02	697,01	567,46	522,86	473,47	115,16	496,29	386,49

1320	331,15	80,62	163,86	739,28	600,83	534,41	518,73	117,30	534,12	406,40
1321	342,20	80,62	167,39	753,62	631,41	546,12	545,13	119,47	566,14	427,13
1322	350,24	80,51	170,46	781,36	652,01	563,92	577,26	121,70	597,57	449,66
1323	359,42	80,91	173,72	811,48	671,49	582,72	607,37	123,91	627,42	471,78
1324	370,67	80,90	177,22	865,66	696,86	611,50	632,88	126,13	661,42	491,93
1325	383,15	81,34	118,61	908,48	730,17	639,03	651,20	128,43	696,61	511,96
1326	391,06	81,13	97,92	936,26	757,91	665,83	663,96	130,68	728,04	530,88
1327	391,09	81,35	89,05	918,94	767,24	684,37	672,92	132,91	746,98	547,82
1328	396,08	81,46	84,88	950,30	767,58	704,20	678,02	135,18	764,56	573,89
1329	403,08	81,42	150,86	981,44	779,95	721,65	683,01	137,40	787,05	598,23
1330	405,95	81,73	188,18	992,15	790,24	737,00	697,20	139,63	804,14	620,09
1331	409,33	81,91	192,34	994,58	796,64	752,72	716,17	141,86	817,79	634,74
1332	410,89	82,69	188,31	1004,90	797,91	766,99	734,79	144,07	830,41	654,45
1333	438,55	82,14	151,12	976,03	805,14	753,10	718,48	146,37	830,81	653,48
1334	436,48	82,22	145,04	962,75	826,39	738,26	692,32	148,65	834,51	647,00
1335	426,58	82,32	142,27	927,77	825,88	725,56	675,33	150,90	831,92	640,26
1336	420,17	82,20	140,19	910,51	810,22	714,93	660,34	153,15	821,55	634,73
1337	417,05	82,52	138,91	905,66	799,82	711,58	657,41	155,32	813,11	631,84
1338	415,59	82,44	138,27	915,78	797,58	711,39	668,32	157,48	809,91	631,62
1339	418,46	82,62	138,43	930,75	802,40	715,68	685,78	159,52	805,41	633,08
1340	421,43	82,66	138,34	945,34	814,86	720,20	711,14	161,55	800,44	635,42
1341	424,42	82,63	138,64	960,12	827,80	724,38	730,58	163,53	794,83	639,20
1342	427,81	82,74	139,08	977,89	842,74	726,78	746,26	165,41	788,81	643,60
1343	429,72	82,41	138,95	995,87	854,78	731,94	764,15	167,23	784,78	648,41
1344	434,14	82,71	140,07	1007,90	869,24	737,72	784,59	169,00	780,82	655,79
1345	437,04	82,79	140,68	1025,38	885,23	742,16	799,24	170,71	776,45	670,01
1346	439,51	82,94	141,28	1037,82	898,89	743,63	807,20	172,35	772,45	679,78
1347	441,14	83,39	141,72	1039,60	903,74	745,76	815,88	173,93	769,04	683,62
1348	441,93	83,53	142,15	1032,87	901,92	752,03	826,79	175,43	767,53	688,80
1349	441,06	83,43	142,31	1038,55	898,62	755,31	837,55	176,88	766,36	692,66
1350	443,04	83,47	142,33	1041,88	899,22	760,98	842,02	178,23	765,37	696,49
1351	443,41	83,46	142,31	1035,92	900,16	769,86	847,41	179,59	764,87	701,36
1352	443,67	83,35	142,28	1036,88	899,54	773,94	839,63	180,86	764,32	705,17
1353	444,14	83,36	142,65	1031,19	899,01	782,76	833,76	182,14	763,21	708,08
1354	442,23	83,45	142,00	1022,26	892,26	789,60	834,69	183,36	763,60	711,94
1355	438,97	83,42	141,77	1016,25	879,39	795,85	838,99	184,52	763,78	716,82
1356	438,16	83,89	141,57	1017,15	868,70	802,40	841,33	185,64	764,91	722,62
1357	438,63	83,64	141,69	1017,89	865,24	807,13	840,86	186,76	766,06	727,79
1358	437,43	83,86	141,55	1015,99	861,82	814,83	837,65	187,83	767,35	733,30
1359	438,90	83,76	141,55	1016,93	862,08	821,31	835,03	188,87	768,78	735,85
1360	439,66	84,21	141,56	1005,12	865,86	833,08	831,22	189,92	770,87	736,64
1361	438,57	83,66	141,26	1007,75	862,89	829,05	829,08	190,93	771,36	739,98
1362	436,84	84,20	141,04	1003,94	854,43	823,90	827,70	191,90	773,00	742,55
1363	432,97	84,07	140,77	1003,11	842,10	820,26	827,02	192,84	776,89	746,56
1364	431,20	83,84	140,15	1006,55	831,54	817,08	824,49	193,81	780,67	750,83
1365	428,93	83,88	139,69	1007,98	826,41	814,40	823,20	194,78	785,22	755,44
1366	428,28	84,65	139,70	1009,84	825,12	811,08	821,49	195,72	789,19	759,40
1367	427,34	84,42	139,61	1002,75	824,04	806,96	818,88	196,73	793,19	764,52
1368	422,05	84,18	138,61	985,97	813,07	805,80	816,18	197,65	793,45	771,28
1369	416,10	84,30	137,66	966,35	793,60	803,19	815,43	198,69	791,79	777,47
1370	412,03	84,13	136,93	952,43	775,64	801,79	814,28	199,71	790,84	784,70
1371	452,65	85,08	154,49	879,17	764,95	803,65	804,54	201,02	784,36	799,44
1372	458,00	84,20	155,31	873,78	747,30	745,13	723,45	202,42	768,89	766,71

1373	413,51	85,10	184,29	933,75	790,80	701,19	655,20	203,51	764,43	739,67
1374	424,78	85,10	194,88	959,17	817,55	684,25	607,35	204,60	773,59	720,64
1375	424,77	85,43	197,39	956,98	812,01	676,83	569,34	205,85	785,30	701,06
1376	427,64	84,85	199,24	966,43	804,50	679,55	540,89	207,29	795,49	706,89
1377	432,96	84,95	201,00	975,02	811,55	691,09	521,78	208,90	808,37	710,56
1378	460,81	85,83	157,87	1013,90	822,46	681,14	509,26	210,96	807,05	702,02
1379	463,53	85,60	152,05	943,38	864,48	664,37	497,29	213,19	803,84	685,68
1380	444,63	85,28	147,69	899,32	849,63	648,46	485,40	215,62	809,52	670,78
1381	433,82	85,29	144,76	877,23	817,03	634,78	476,17	218,20	814,55	656,35
1382	427,19	84,63	142,88	863,96	797,32	621,37	466,68	220,93	815,30	647,92
1383	423,40	84,83	141,79	851,79	785,99	610,03	459,84	223,73	817,01	641,44
1384	416,31	85,21	140,45	840,28	772,69	599,95	453,82	226,62	813,60	640,61
1385	412,47	84,86	139,38	830,90	759,12	591,30	448,15	229,60	812,31	637,90
1386	411,06	84,57	138,57	827,79	750,74	582,41	444,08	232,59	804,97	636,88
1387	411,34	85,04	138,14	827,26	753,79	574,09	439,66	235,63	797,05	636,35
1388	414,87	84,85	138,41	824,04	765,49	566,31	435,47	238,68	789,89	632,95
1389	416,35	84,44	138,13	820,23	778,74	558,97	432,15	241,76	785,68	626,01
1390	416,07	84,74	138,17	815,93	788,90	552,31	429,40	244,73	779,19	620,37
1391	419,39	84,88	138,36	825,01	800,83	546,26	426,50	247,71	763,49	616,32
1392	423,39	84,85	138,99	827,46	818,46	540,60	424,88	250,61	748,79	611,80
1393	424,26	85,17	138,95	833,62	832,89	536,25	422,06	253,50	736,67	607,17
1394	427,43	85,45	139,33	850,76	849,13	532,40	420,90	256,33	729,47	603,34
1395	431,00	85,25	139,92	857,55	865,80	528,83	420,91	259,00	726,54	599,49
1396	427,28	84,63	139,51	849,14	864,39	525,80	420,90	261,62	728,80	595,12
1397	427,58	84,60	139,39	850,57	859,94	522,90	421,11	264,16	725,58	589,65
1398	428,29	84,67	139,42	856,43	863,77	521,13	421,27	266,65	719,57	586,06
1399	429,49	84,85	139,79	860,14	867,49	518,61	422,48	269,03	714,02	581,79
1400	427,42	84,90	139,45	884,12	867,63	519,39	423,81	271,38	709,03	578,85
1401	432,24	84,75	139,78	894,85	883,80	520,10	425,70	273,58	705,46	572,81
1402	432,57	84,52	140,03	895,24	899,64	521,76	426,64	275,72	703,44	569,78
1403	433,20	84,40	139,88	916,42	907,20	522,95	427,77	277,70	703,49	565,53
1404	436,54	84,58	140,39	929,97	916,05	524,58	429,15	279,57	706,30	562,62
1405	440,43	84,33	141,41	953,19	925,67	526,79	431,20	281,36	708,65	559,17
1406	441,51	84,68	142,04	954,75	933,44	531,79	432,12	283,13	709,32	556,54
1407	441,06	84,17	142,52	960,30	937,48	543,97	432,78	284,75	710,49	555,97
1408	441,12	84,48	142,71	956,15	936,70	555,09	433,79	286,27	709,23	554,12
1409	437,85	84,58	142,46	937,22	928,68	564,30	435,89	287,63	711,95	554,31
1410	434,12	84,66	142,23	940,42	913,38	575,50	438,04	288,95	719,78	554,69
1411	433,50	84,89	142,06	934,18	901,51	588,61	440,29	290,10	726,69	555,19
1412	430,50	84,58	141,59	930,14	890,94	602,91	442,74	291,20	728,99	558,77
1413	430,97	84,47	141,64	934,08	880,15	616,15	445,81	292,13	732,23	561,01
1414	431,88	84,53	141,57	941,62	876,65	631,04	448,34	292,97	735,63	564,33
1415	431,35	83,83	141,66	947,04	874,83	646,66	450,42	293,73	738,21	569,40
1416	431,81	83,30	141,10	960,83	874,39	661,83	452,52	294,44	739,00	575,88
1417	435,64	84,96	141,98	971,97	884,33	674,22	454,70	295,00	738,80	582,20
1418	437,54	85,13	142,24	976,35	894,82	686,58	458,71	295,52	737,29	592,72
1419	438,54	85,15	142,38	966,50	900,69	697,48	461,63	295,92	735,60	599,32
1420	440,48	85,34	142,52	965,27	901,83	710,97	466,47	296,18	735,05	604,22
1421	438,07	85,20	142,44	970,60	898,89	725,78	470,58	296,41	734,64	609,03
1422	438,76	84,98	142,36	971,33	896,35	738,35	475,36	296,58	734,13	614,52
1423	438,34	85,26	142,11	968,12	893,56	751,85	479,62	296,69	735,31	621,22
1424	437,39	85,45	141,99	959,94	888,73	760,79	484,87	296,81	736,01	627,13
1425	435,86	84,92	141,40	972,48	884,15	767,53	490,51	296,83	736,74	628,59

1426	436,56	85,07	141,57	973,54	885,95	776,67	497,11	296,83	737,11	630,44
1427	435,26	85,45	141,52	967,04	879,85	785,26	504,04	296,80	738,13	632,88
1428	433,80	85,40	141,25	964,23	871,71	792,83	511,63	296,75	740,95	634,32
1429	434,14	85,39	141,09	966,25	869,63	799,58	518,50	296,67	742,89	636,29
1430	433,19	85,33	140,79	964,44	866,63	801,83	525,34	296,59	745,71	639,12
1431	431,31	85,81	141,12	946,56	861,70	799,22	532,18	296,47	750,17	642,44
1432	430,33	85,50	140,50	937,37	850,41	799,53	539,75	296,39	754,49	645,70
1433	427,44	85,65	140,22	935,42	838,86	800,28	546,73	296,36	758,15	650,74
1434	426,92	85,87	140,16	936,01	829,74	801,77	553,36	296,38	761,84	655,46
1435	426,07	85,47	140,04	938,76	825,67	806,42	560,62	296,39	765,33	663,34
1436	425,45	85,44	139,74	938,55	822,53	809,93	567,77	296,39	767,66	668,53
1437	427,74	85,76	140,01	944,76	821,65	814,22	574,01	296,42	769,55	672,20
1438	426,44	85,71	140,00	942,17	821,53	817,02	579,61	296,52	772,41	676,27
1439	425,92	85,59	139,82	936,07	815,03	820,76	585,72	296,68	775,67	681,44
1440	424,42	85,26	139,65	930,89	808,16	824,46	591,77	296,79	779,04	687,15
1441	422,63	85,70	139,43	928,73	801,17	828,51	597,38	296,95	783,30	690,86
1442	422,04	85,85	139,28	927,04	796,40	832,60	600,82	297,19	788,10	696,13
1443	421,81	85,29	138,80	921,22	792,81	837,37	604,65	297,40	791,81	701,95
1444	421,70	85,89	139,06	918,41	791,75	840,92	608,60	297,66	796,32	708,26
1445	420,54	86,73	138,78	912,22	787,97	843,44	612,94	297,81	800,55	712,75
1446	416,80	86,72	138,26	905,14	777,45	844,76	618,01	298,05	804,98	718,43
1447	413,91	86,35	137,62	904,09	765,58	844,22	624,16	298,21	808,69	723,65
1448	410,83	86,31	137,08	902,08	754,71	844,90	629,73	298,34	812,23	724,31
1449	408,05	85,88	136,32	905,93	744,70	845,93	636,75	298,51	811,60	724,96
1450	406,69	85,96	135,95	901,61	737,92	846,84	642,88	298,74	811,32	725,87
1451	406,57	85,92	135,59	892,73	733,54	849,26	648,08	299,01	812,87	726,09
1452	406,85	86,11	135,41	895,37	733,98	850,60	652,77	299,25	813,97	729,04
1453	407,01	85,85	135,43	893,66	737,96	851,92	659,40	299,54	812,77	727,59
1454	407,17	86,01	135,55	894,93	741,90	853,16	665,85	299,74	810,71	727,98
1455	406,11	86,21	135,19	897,70	744,12	852,31	672,04	300,02	806,95	727,70
1456	407,56	85,99	135,29	901,13	746,76	848,78	678,68	300,28	801,82	727,29
1457	408,06	86,32	135,18	904,61	750,34	844,90	685,21	300,51	798,76	726,30
1458	406,32	86,28	135,08	895,81	750,51	843,32	691,75	300,72	799,22	724,85
1459	403,12	85,83	134,68	892,34	745,39	841,72	696,91	300,93	799,49	724,59
1460	400,97	86,14	133,93	891,17	737,29	840,83	701,71	301,12	799,74	723,73
1461	399,25	86,21	133,56	890,40	730,22	839,94	704,17	301,33	801,21	722,94
1462	398,32	86,20	133,31	883,55	724,41	840,95	707,25	301,59	804,62	721,55
1463	396,49	85,73	132,92	880,58	719,14	842,31	709,26	301,77	806,92	720,03
1464	394,53	85,97	132,51	876,26	714,77	842,42	710,46	302,00	808,60	717,64
1465	392,92	86,13	132,18	869,49	710,73	841,04	710,82	302,23	807,27	717,02
1466	393,38	86,09	131,83	863,75	707,23	839,37	711,54	302,41	802,80	715,82
1467	392,32	86,03	131,73	856,50	705,63	836,60	711,89	302,58	795,22	714,39
1468	389,61	85,57	131,23	850,25	702,99	833,64	712,61	302,81	784,67	713,54
1469	391,58	85,96	130,91	848,83	703,62	829,00	713,51	303,06	774,36	711,29
1470	391,86	85,56	131,14	843,68	707,80	824,94	714,14	303,31	766,06	709,42
1471	389,36	85,49	130,50	838,15	708,41	820,13	713,82	303,51	758,67	709,02
1472	387,42	85,96	130,11	832,27	705,12	816,13	715,95	303,69	751,22	705,59
1473	383,54	85,79	129,62	828,57	698,93	813,90	717,02	303,85	743,81	703,54
1474	380,14	86,15	129,07	819,88	691,76	810,73	717,53	304,04	736,72	702,53
1475	377,64	85,62	128,34	811,72	685,37	807,88	717,70	304,20	729,69	701,77
1476	376,28	85,66	128,21	808,72	680,43	805,12	717,50	304,32	722,72	699,03
1477	374,99	85,11	127,90	805,12	677,10	802,79	717,21	304,43	716,41	697,96
1478	374,30	85,81	127,54	803,58	675,27	799,57	715,93	304,51	710,72	695,54

1479	374,50	85,65	127,37	801,20	675,81	796,11	714,87	304,59	705,11	692,68
1480	374,47	85,40	127,43	799,61	677,57	793,60	713,06	304,64	699,12	690,39
1481	374,07	84,99	127,13	797,65	678,97	790,31	712,78	304,65	693,96	686,08
1482	372,30	85,36	127,04	794,55	679,92	787,57	712,28	304,64	688,51	683,75
1483	372,29	85,44	126,84	793,97	679,84	784,27	712,33	304,55	683,37	680,59
1484	371,37	85,16	126,86	788,96	678,99	780,50	712,30	304,52	677,86	678,73
1485	370,13	84,57	126,63	786,10	678,58	777,99	712,64	304,41	672,89	676,94
1486	370,55	85,42	126,47	782,85	678,23	774,22	712,54	304,25	667,78	674,62
1487	369,98	84,10	126,29	782,18	677,68	771,17	711,70	304,13	663,12	672,18
1488	369,43	84,97	126,06	781,39	677,84	767,82	709,28	303,97	658,70	670,88
1489	368,29	84,66	126,10	776,98	677,72	764,95	706,31	303,72	654,37	669,86
1490	366,35	84,97	125,85	772,23	675,58	762,53	702,22	303,49	650,08	668,31
1491	364,96	84,98	125,59	768,14	672,09	761,13	697,86	303,20	646,10	666,60
1492	364,49	84,99	125,33	765,46	669,04	754,44	686,65	302,87	642,20	663,48
1493	360,86	84,92	124,84	760,26	665,37	750,09	675,81	302,52	638,29	660,86
1494	358,92	85,22	124,35	754,29	659,99	747,48	670,34	302,10	634,87	658,48
1495	75,59	75,75	76,60	75,55	75,49	74,44	74,80	74,56	75,20	75,03
1496	75,68	75,70	76,65	75,47	75,48	74,49	74,90	74,60	75,24	75,23
1497	87,21	75,63	80,92	84,46	82,29	79,30	87,85	74,59	76,36	87,05
1498	101,29	75,70	90,11	102,80	101,79	90,93	114,08	74,60	79,43	104,14
1499	137,41	75,83	101,01	145,30	138,30	112,30	152,08	74,66	93,22	141,92
1500	180,07	75,97	111,30	221,09	203,70	153,43	206,14	74,70	124,53	171,91
1501	217,04	76,00	117,69	299,19	288,72	210,35	279,06	74,76	153,87	199,77
1502	259,49	76,14	129,41	385,71	391,48	285,19	344,85	74,87	198,16	237,68
1503	303,20	76,27	142,15	486,61	511,47	363,10	396,82	75,00	257,70	278,56
1504	332,64	76,54	152,30	570,74	628,31	454,06	443,07	75,21	316,09	318,98
1505	351,48	76,69	159,46	642,93	722,87	530,28	479,61	75,45	372,63	364,21
1506	371,11	76,77	128,91	660,25	767,77	583,01	499,88	75,73	408,63	394,10
1507	344,60	76,92	118,10	618,30	755,91	617,29	510,16	76,08	438,65	411,54
1508	323,66	77,02	112,98	595,63	713,99	612,91	528,00	76,53	466,03	437,48
1509	319,57	77,21	111,56	592,43	677,99	605,89	547,30	77,04	490,34	461,12
1510	374,82	77,65	126,01	614,05	665,38	636,14	591,14	77,69	517,91	507,30
1511	354,52	77,70	126,93	621,50	653,54	595,99	556,49	78,38	525,50	485,20
1512	294,35	77,95	158,01	582,34	602,38	564,58	511,42	79,21	513,04	455,30
1513	281,62	78,14	162,25	542,27	527,63	584,68	478,34	80,13	496,49	441,36
1514	275,38	78,18	161,85	518,13	477,84	612,92	453,12	81,10	478,14	433,09
1515	278,72	78,33	162,94	507,47	453,20	630,84	435,65	82,18	460,98	426,62
1516	294,41	78,33	167,96	515,40	455,67	622,71	421,34	83,40	450,95	438,04
1517	321,49	78,62	176,61	542,88	490,24	619,38	426,94	84,72	450,48	456,89
1518	334,24	78,42	182,67	571,08	528,91	615,34	438,02	86,17	455,82	474,80
1519	345,23	78,49	187,21	597,05	557,09	610,73	441,93	87,77	468,16	496,40
1520	350,23	78,77	190,32	614,58	575,22	606,45	439,29	89,48	481,80	522,67
1521	337,34	78,93	181,81	621,95	575,87	602,64	432,22	91,39	497,90	543,30
1522	348,04	79,41	170,72	684,34	601,37	630,92	424,72	93,42	538,30	551,10
1523	352,68	79,54	169,96	733,24	647,67	661,04	421,34	95,63	579,81	545,50
1524	356,63	79,47	170,47	754,07	670,28	678,66	421,47	97,88	617,44	541,43
1525	359,33	79,62	171,20	769,50	679,44	682,92	424,07	100,19	652,63	538,67
1526	362,85	79,84	173,10	785,97	686,71	676,82	428,96	102,58	687,71	539,88
1527	386,96	79,97	140,31	791,14	692,67	665,87	434,21	104,99	701,24	545,01
1528	385,76	79,77	131,45	773,67	710,51	639,87	432,44	107,48	698,88	536,61
1529	378,23	80,18	128,33	751,26	721,68	614,61	430,68	109,97	696,45	528,43
1530	371,85	80,06	126,36	731,80	717,49	591,67	430,03	112,51	693,22	525,68
1531	368,85	79,82	126,30	720,35	714,12	573,15	433,19	115,06	689,05	527,57

1532	370,34	80,04	125,17	720,14	716,72	558,44	441,10	117,58	685,75	535,59
1533	380,52	79,89	126,61	733,65	740,61	549,12	451,44	120,05	684,02	549,80
1534	392,22	79,84	128,24	753,81	781,50	541,43	454,59	122,56	685,37	565,33
1535	397,87	79,70	129,08	772,25	814,43	535,62	455,87	124,92	684,73	577,32
1536	399,72	80,13	129,58	783,33	829,68	531,06	457,28	127,37	685,19	591,61
1537	402,16	80,11	128,80	794,67	837,20	528,83	458,36	129,65	689,39	605,44
1538	410,22	80,22	129,60	822,11	858,97	526,80	460,77	131,97	694,59	618,21
1539	414,35	80,10	130,42	846,43	881,44	525,75	463,07	134,18	699,73	631,58
1540	414,93	80,13	131,59	856,59	887,94	525,91	466,34	136,39	705,24	643,45
1541	414,61	80,24	131,68	858,07	884,15	526,93	470,60	138,51	709,79	658,54
1542	415,56	80,17	132,25	863,32	880,51	529,40	475,13	140,60	713,72	669,52
1543	417,87	80,06	132,47	889,69	891,09	530,89	479,85	142,60	717,11	682,28
1544	420,84	80,15	133,25	912,69	904,83	533,13	485,82	144,62	719,72	693,81
1545	421,93	80,34	133,34	924,60	910,35	536,18	490,99	146,60	723,06	702,10
1546	419,97	80,17	132,96	920,68	905,98	539,92	499,79	148,51	728,85	710,74
1547	419,19	80,21	132,92	908,88	893,93	544,21	511,81	150,39	734,71	721,29
1548	419,78	79,57	133,29	898,60	883,91	547,29	531,08	152,27	740,16	730,25
1549	419,30	79,61	134,77	899,91	879,43	550,42	554,70	154,06	744,88	737,54
1550	421,66	79,83	134,31	908,46	883,53	553,30	572,22	155,85	749,12	745,21
1551	422,85	79,65	134,36	915,65	887,98	556,96	587,03	157,60	753,22	752,85
1552	423,48	79,89	99,72	918,17	888,14	561,52	602,51	159,31	756,82	761,00
1553	421,76	80,19	89,11	915,85	882,44	566,43	622,25	161,02	759,71	769,26
1554	422,39	80,01	84,32	916,19	877,74	572,41	651,09	162,69	759,74	774,39
1555	424,97	80,35	119,94	925,47	881,46	579,38	675,84	164,32	760,93	778,33
1556	425,71	80,30	137,60	936,85	886,21	586,89	696,30	165,92	763,36	786,29
1557	427,19	80,59	137,46	944,19	889,64	595,57	712,49	167,49	764,32	791,07
1558	428,62	80,73	138,16	954,39	893,58	599,45	725,38	169,04	764,03	790,39
1559	429,31	80,82	138,90	961,18	896,78	602,90	738,19	170,54	764,36	789,99
1560	428,38	80,54	139,27	956,09	890,49	608,83	759,76	171,97	766,44	791,15
1561	425,22	81,00	137,68	943,96	872,86	616,62	779,72	173,40	770,65	794,17
1562	422,19	81,00	137,62	935,31	853,64	625,17	794,62	174,80	774,98	795,53
1563	421,76	81,27	137,70	935,74	844,80	632,30	810,12	176,13	779,11	801,28
1564	423,93	80,78	138,05	945,28	848,95	639,63	820,00	177,49	781,95	806,41
1565	427,95	81,34	138,81	962,56	862,83	645,02	826,88	178,81	784,95	810,77
1566	430,84	81,37	139,66	979,76	879,46	650,44	831,12	180,07	788,77	811,20
1567	432,66	81,71	139,99	992,90	890,72	656,67	831,15	181,31	793,31	809,07
1568	433,69	81,43	139,70	1001,08	896,59	663,61	826,19	182,58	798,93	802,86
1569	433,29	81,40	139,39	1006,92	897,26	669,82	817,81	183,82	803,43	795,73
1570	434,21	80,83	140,60	1015,77	899,42	676,15	805,47	185,05	805,23	788,70
1571	435,44	81,39	140,79	1017,15	900,81	682,21	791,58	186,23	803,83	782,93
1572	438,24	81,09	141,14	1022,18	903,20	687,11	775,77	187,48	801,32	776,93
1573	439,13	81,35	141,10	1031,45	907,83	689,43	765,69	188,65	800,92	774,93
1574	438,40	81,42	141,97	1035,80	910,32	692,16	759,21	189,88	799,93	770,57
1575	437,90	81,43	141,84	1036,24	909,53	696,91	756,16	191,11	798,72	767,49
1576	438,98	81,62	142,20	1038,21	908,80	699,13	755,39	192,34	795,49	764,44
1577	437,59	81,61	141,90	1037,05	908,99	704,45	752,71	193,64	791,93	764,35
1578	437,45	81,63	141,55	1025,50	904,61	712,86	751,36	194,90	788,51	764,64
1579	436,16	81,77	141,49	1017,03	899,19	719,72	752,40	196,18	785,15	765,66
1580	436,34	81,75	141,45	1013,20	895,26	726,32	756,47	197,47	782,09	762,93
1581	433,59	81,91	141,20	1006,24	890,14	739,43	761,42	198,80	779,02	758,31
1582	433,46	82,17	141,09	1000,87	883,62	754,05	770,56	200,13	775,75	753,64
1583	432,56	82,31	140,88	995,15	878,89	765,07	779,83	201,49	771,31	749,31
1584	432,15	81,95	141,20	990,83	874,69	781,02	794,62	202,84	766,98	744,42

1585	432,28	82,46	141,18	987,59	871,56	795,24	808,00	204,21	763,53	739,22
1586	431,92	82,27	141,11	982,29	865,10	815,08	816,76	205,53	761,33	736,52
1587	427,89	82,30	140,58	969,69	849,93	827,01	820,12	206,91	759,11	734,52
1588	423,09	82,76	139,93	955,77	828,41	835,40	824,24	208,25	758,11	733,09
1589	423,48	83,60	217,76	903,61	804,71	849,09	815,51	209,80	744,06	728,20
1590	395,90	83,76	228,88	789,49	712,40	824,87	751,14	211,51	716,10	678,80
1591	396,50	83,90	203,91	780,85	666,86	810,25	689,90	213,01	703,70	624,57
1592	423,68	84,23	202,36	853,27	731,91	800,09	653,05	214,35	711,56	594,30
1593	436,76	84,90	205,28	914,36	811,55	800,37	626,42	215,92	727,18	578,33
1594	443,73	84,15	208,20	945,65	851,98	806,53	614,29	217,71	741,31	569,11
1595	446,10	84,48	210,56	963,47	865,04	822,94	611,95	219,78	757,71	564,45
1596	453,89	85,06	198,19	974,58	866,82	834,54	611,81	222,17	774,05	567,77
1597	478,37	84,80	159,61	1009,77	877,57	813,43	594,86	225,04	767,66	566,41
1598	478,58	85,27	154,61	1039,74	933,10	785,70	578,40	228,19	755,26	558,97
1599	470,37	84,60	151,89	1028,00	954,59	758,19	563,72	231,39	741,82	549,59
1600	468,15	84,63	150,25	1021,74	957,54	733,66	551,44	234,83	727,94	542,43
1601	465,26	84,14	149,52	1014,96	962,93	714,83	541,25	238,22	715,09	534,74
1602	462,87	84,14	149,08	1003,13	958,22	699,67	534,04	241,81	703,13	527,19
1603	461,27	84,32	149,12	996,05	956,57	692,36	528,73	245,40	691,96	521,38
1604	459,07	84,95	148,11	989,56	955,07	687,92	523,92	249,02	681,99	516,97
1605	456,96	84,83	146,97	981,43	951,99	687,15	520,80	252,65	673,17	512,35
1606	455,22	85,63	147,66	976,47	950,21	687,15	519,53	256,29	664,96	508,70
1607	458,08	85,56	147,71	981,87	955,09	686,94	519,53	259,81	658,02	505,48
1608	459,35	85,55	147,91	1003,11	962,48	686,37	521,41	263,29	652,71	503,64
1609	464,36	84,77	148,70	1026,86	971,60	687,87	523,23	266,78	648,02	502,55
1610	464,23	85,47	149,25	1040,46	977,02	689,55	525,61	270,08	644,21	502,02
1611	464,63	84,91	149,32	1047,34	979,71	691,32	527,14	273,26	641,56	502,30
1612	466,95	85,12	149,82	1045,51	980,97	693,38	529,06	276,38	639,27	502,67
1613	470,39	85,40	150,87	1051,56	981,10	697,38	532,27	279,44	637,58	503,44
1614	466,42	85,35	150,53	1058,05	979,71	701,27	535,68	282,34	636,80	505,20
1615	466,04	84,98	150,25	1062,40	977,91	705,26	539,25	285,06	635,98	506,95
1616	465,32	85,31	150,08	1062,86	975,57	708,67	544,29	287,75	635,08	510,67
1617	469,22	85,71	151,13	1059,83	971,96	712,52	559,03	290,25	634,98	513,37
1618	462,67	85,22	150,31	1051,95	962,13	719,82	578,12	292,69	634,89	517,34
1619	463,01	85,64	150,24	1046,92	955,84	723,57	594,78	294,94	634,89	520,97
1620	462,47	85,38	150,35	1040,78	951,21	726,47	611,10	297,20	635,21	524,52
1621	460,12	84,76	149,35	1038,82	949,29	731,43	623,64	299,30	634,95	528,91
1622	464,49	85,52	148,90	1037,94	947,05	737,99	639,41	301,24	635,29	533,23
1623	461,93	85,38	149,16	1034,80	943,59	742,29	655,81	303,14	635,73	538,92
1624	461,21	85,38	150,06	1028,36	940,05	753,82	666,55	304,94	636,45	549,41
1625	460,04	84,85	150,27	1018,49	932,21	760,90	675,12	306,67	637,88	558,36
1626	457,36	85,70	149,39	1013,93	924,28	764,11	687,62	308,28	640,06	563,14
1627	454,17	85,17	148,95	1019,64	922,41	767,36	696,64	309,88	642,02	567,67
1628	454,31	85,28	148,55	1023,76	923,88	774,87	704,91	311,43	643,62	572,82
1629	452,30	85,62	147,80	1024,57	924,12	780,01	710,64	312,84	645,91	577,50
1630	452,27	85,38	147,66	1024,18	924,26	784,74	720,31	314,22	648,01	583,87
1631	451,74	85,54	147,89	1027,67	923,78	793,22	726,51	315,53	650,46	589,46
1632	452,13	85,71	147,62	1032,66	926,44	795,85	735,31	316,86	652,96	595,65
1633	453,03	85,09	147,13	1041,55	932,70	794,65	742,67	318,12	655,76	601,31
1634	453,36	85,81	144,65	1043,16	937,92	794,28	750,23	319,25	658,81	609,06
1635	453,04	85,68	144,58	1040,90	939,02	793,94	757,48	320,34	662,20	615,26
1636	453,37	84,98	143,25	1040,50	937,85	795,39	768,86	321,43	665,90	623,42
1637	453,24	85,37	144,62	1041,30	936,88	795,94	780,32	322,48	669,58	630,69

1638	452,39	85,47	145,43	1041,91	937,12	795,90	790,24	323,44	673,27	638,37
1639	452,29	85,11	145,47	1039,12	936,50	795,86	799,52	324,46	678,92	644,83
1640	452,17	85,32	144,99	1035,57	933,36	793,89	805,20	325,33	683,49	652,52
1641	450,41	85,91	145,39	1028,28	927,42	794,71	812,77	326,25	688,51	660,94
1642	449,33	85,32	144,86	1025,46	922,00	793,33	817,82	327,07	693,66	667,24
1643	448,63	85,92	145,10	1024,27	918,07	792,96	821,48	327,86	697,96	671,07
1644	447,79	85,98	145,13	1022,44	914,47	793,18	821,41	328,62	702,51	674,06
1645	446,42	86,24	144,89	1017,88	909,80	792,83	823,25	329,37	707,44	678,10
1646	444,68	86,25	143,99	1013,72	902,63	793,36	822,30	330,08	712,04	679,90
1647	444,18	85,82	143,94	1012,28	896,27	791,97	818,28	330,79	716,09	682,15
1648	441,77	85,66	143,42	1007,60	891,54	793,55	809,02	331,48	719,95	682,19
1649	438,93	86,08	142,50	993,67	880,25	794,42	800,85	332,13	724,01	685,12
1650	434,75	85,72	140,60	970,64	861,44	794,21	793,25	332,82	729,06	689,64
1651	430,49	85,55	140,82	949,80	839,58	793,89	783,71	333,44	733,95	694,84
1652	427,66	85,40	140,77	937,94	822,15	793,71	778,77	334,08	738,02	700,06
1653	424,31	85,46	139,93	928,36	808,91	793,56	774,24	334,73	742,40	705,75
1654	421,57	85,65	139,17	919,96	796,76	793,64	771,82	335,42	745,90	709,98
1655	419,79	85,60	137,93	914,85	786,58	793,47	768,50	336,04	748,63	714,26
1656	417,04	85,97	138,06	911,62	779,92	793,71	767,51	336,67	750,71	717,80
1657	417,43	85,82	137,50	909,41	777,03	794,88	766,04	337,32	751,22	719,90
1658	420,19	85,37	137,73	909,41	781,81	795,00	764,79	337,96	751,18	720,99
1659	419,71	85,38	137,78	908,47	785,77	794,89	762,24	338,54	749,90	722,66
1660	418,88	85,02	137,48	906,12	785,62	794,32	760,80	339,19	748,55	723,29
1661	417,00	85,27	137,65	901,34	782,42	793,77	758,04	339,86	747,55	724,31
1662	414,81	85,23	136,61	896,47	776,24	793,54	755,78	340,49	747,10	726,35
1663	412,57	85,68	135,54	889,70	769,84	793,77	758,47	341,14	749,20	728,80
1664	412,35	85,14	136,25	885,37	766,30	792,54	762,00	341,82	750,12	731,29
1665	411,59	86,13	135,85	881,59	764,93	792,09	766,00	342,48	750,91	732,72
1666	410,26	85,85	136,11	876,25	761,83	792,96	770,75	343,17	750,88	735,19
1667	409,78	85,31	135,70	871,99	758,08	792,11	775,56	343,83	749,57	736,98
1668	408,42	85,75	135,00	868,33	754,54	792,76	776,92	344,46	749,42	738,25
1669	406,55	85,68	134,92	865,85	750,61	793,23	776,05	345,06	748,72	739,83
1670	407,55	85,98	135,12	865,37	749,43	793,12	774,45	345,68	747,73	740,88
1671	406,46	85,93	135,20	863,72	749,73	793,41	775,21	346,27	746,50	742,67
1672	406,37	85,83	135,57	860,85	748,66	790,23	775,16	346,82	745,76	742,24
1673	405,49	86,11	134,94	856,70	746,06	791,00	772,29	347,31	745,28	742,24
1674	403,84	86,37	134,91	854,55	742,56	788,29	770,64	347,81	743,97	742,94
1675	403,43	86,27	134,52	852,60	740,07	787,55	772,95	348,24	742,46	742,06
1676	402,35	86,02	134,86	850,87	737,87	787,08	772,89	348,64	740,92	742,09
1677	401,35	86,13	134,34	848,81	735,59	787,10	773,89	348,95	739,51	741,60
1678	400,32	86,48	134,60	847,66	733,49	789,28	770,46	349,15	738,38	740,23
1679	401,03	86,49	135,20	847,78	733,40	789,20	768,61	349,34	737,25	740,58
1680	401,27	86,39	135,58	848,93	734,29	787,62	766,13	349,48	734,80	738,96
1681	401,41	86,58	135,61	850,36	735,87	787,30	765,12	349,51	731,66	737,11
1682	401,07	86,64	135,84	851,26	737,89	785,73	766,26	349,48	728,11	735,73
1683	400,99	86,87	135,90	851,04	738,64	784,05	767,97	349,38	724,44	734,10
1684	401,04	86,23	135,76	851,76	739,60	783,06	769,05	349,11	720,46	732,51
1685	400,35	86,49	135,69	853,37	741,94	782,29	770,34	348,84	716,80	731,67
1686	400,49	86,37	135,65	854,08	742,97	781,94	777,31	348,49	713,30	731,54
1687	399,41	86,55	135,44	854,85	742,31	781,32	786,27	347,99	710,03	729,40
1688	399,93	86,81	135,62	855,78	740,79	781,19	785,67	347,44	707,59	726,42
1689	397,09	86,75	135,33	857,26	738,17	779,98	783,18	346,88	705,27	724,72
1690	395,59	86,85	134,75	856,28	733,81	779,12	780,79	346,22	703,91	723,34

1691	393,21	87,06	134,51	854,11	727,66	776,30	777,68	345,54	703,96	721,29
1692	391,30	87,03	134,21	850,71	722,26	774,67	775,16	344,86	704,92	719,15
1693	389,09	87,23	133,69	846,28	716,39	771,94	774,64	344,10	706,63	717,65
1694	386,71	87,20	133,38	840,70	708,92	768,35	780,34	343,33	709,38	716,05
1695	383,01	87,21	132,71	831,00	699,26	764,09	792,31	342,48	710,95	706,43
1696	377,87	87,20	131,83	819,90	685,12	760,12	799,52	341,68	716,42	701,34
1697	375,64	87,56	131,43	813,21	673,21	758,49	801,51	340,93	721,05	697,32
1698	375,45	87,28	131,46	808,00	667,77	756,25	801,53	340,25	722,26	694,48
1699	376,16	86,90	131,12	803,25	666,54	752,31	804,49	339,55	718,76	689,29
1700	376,23	87,35	131,10	798,71	668,05	747,30	805,84	338,87	712,02	684,66
1701	374,36	87,31	130,76	793,54	668,41	745,76	804,91	338,25	705,19	679,42
1702	372,23	86,95	130,39	786,36	666,46	743,64	803,51	337,68	698,00	677,30
1703	370,50	87,00	129,92	779,24	662,32	741,55	801,89	337,09	690,75	674,01
1704	368,02	87,03	129,52	772,72	657,90	740,34	802,40	336,54	683,90	671,32
1705	366,76	87,25	129,37	767,22	653,82	737,58	798,18	335,99	677,37	667,15
1706	365,71	86,45	129,11	762,72	651,08	734,46	797,53	335,56	671,46	665,76
1707	365,01	86,73	128,78	759,12	649,55	732,09	796,05	335,10	664,84	663,51
1708	363,72	87,16	128,61	756,35	648,60	728,71	794,94	334,56	659,42	660,45
1709	362,89	86,17	128,40	753,07	648,01	727,65	794,31	334,09	653,94	657,74
1710	362,40	86,13	128,05	750,81	647,56	723,77	790,83	333,67	648,52	655,07
1711	76,41	76,94	78,06	75,78	76,84	75,46	75,62	75,78	75,92	76,04
1712	83,99	76,91	81,17	81,37	81,20	77,32	78,33	75,82	76,91	80,23
1713	102,12	76,82	90,50	99,44	99,27	88,01	89,55	75,86	80,99	93,75
1714	152,20	76,96	113,85	143,95	142,22	132,78	144,46	75,85	94,56	148,35
1715	185,97	76,90	136,15	198,86	201,02	183,57	201,79	75,94	108,43	205,56
1716	218,47	76,98	156,57	263,88	270,72	250,84	271,99	75,98	128,34	272,40
1717	246,04	77,13	173,85	335,87	339,01	313,67	335,23	76,11	163,69	328,47
1718	284,78	77,21	190,04	448,34	444,89	342,64	375,68	76,22	228,45	400,30
1719	316,53	77,36	208,79	561,19	597,23	377,73	411,21	76,42	297,06	461,38
1720	331,18	77,44	221,29	640,16	698,64	420,73	445,52	76,65	374,93	503,60
1721	339,56	77,64	229,07	698,82	740,28	451,68	464,17	77,02	456,12	532,55
1722	346,09	77,91	235,49	744,10	755,25	481,35	480,68	77,44	523,91	549,88
1723	357,59	77,97	231,52	779,60	737,41	515,40	505,33	77,93	570,05	580,52
1724	358,86	77,93	217,76	759,24	721,34	514,56	519,58	78,50	597,33	583,61
1725	332,31	78,17	206,78	696,58	685,48	515,38	533,55	79,24	612,42	586,67
1726	330,36	78,28	216,27	654,16	632,44	528,92	572,74	80,14	607,30	586,26
1727	292,94	78,51	224,04	567,11	561,50	507,61	538,12	81,11	580,33	537,59
1728	273,98	78,46	217,14	509,28	486,89	501,99	495,79	82,20	549,51	490,49
1729	274,48	78,49	215,81	486,42	443,79	509,80	469,69	83,43	519,85	463,91
1730	270,08	78,65	213,92	472,93	422,78	518,27	451,57	84,69	491,00	439,25
1731	275,33	78,61	214,85	472,95	414,30	520,01	441,24	86,11	465,34	420,87
1732	286,66	78,95	219,76	487,65	424,63	542,63	436,04	87,56	443,95	413,35
1733	294,36	79,34	224,65	490,58	437,00	561,41	427,98	89,16	429,17	422,88
1734	321,77	79,01	232,86	508,39	448,18	569,42	429,60	90,80	425,67	445,71
1735	355,92	79,41	246,00	560,08	494,85	582,72	440,12	92,56	431,58	470,02
1736	369,61	79,41	215,89	616,16	547,41	593,94	455,48	94,40	437,87	482,10
1737	386,88	79,29	218,52	673,39	606,49	612,55	477,60	96,30	449,40	492,19
1738	385,05	79,58	200,06	738,13	655,57	635,19	523,48	98,38	481,95	514,44
1739	404,06	79,78	196,21	820,07	756,74	648,49	576,37	100,49	528,23	547,33
1740	409,83	79,77	197,63	859,96	824,84	655,58	619,80	102,76	575,57	578,33
1741	408,32	80,04	197,05	878,59	828,74	656,26	659,44	105,09	623,83	604,48
1742	411,53	79,96	198,11	906,99	829,03	663,54	693,00	107,54	667,79	627,56
1743	428,40	80,17	177,12	919,68	827,08	669,46	715,01	110,20	701,64	651,76

1744	440,12	80,00	150,73	980,23	838,80	657,51	695,19	112,96	705,74	646,54
1745	437,66	80,27	145,36	1046,78	878,69	640,09	684,81	115,84	707,33	633,28
1746	437,78	80,23	143,90	1069,85	910,83	626,26	680,68	118,82	711,70	620,86
1747	433,52	80,22	143,04	1070,88	915,43	616,71	688,18	121,79	714,87	612,61
1748	430,66	80,36	142,08	1070,12	910,21	609,50	698,78	124,82	717,71	607,22
1749	432,07	80,24	142,13	1065,83	912,11	604,81	704,21	127,84	715,56	606,62
1750	432,84	80,32	142,24	1060,47	916,85	601,24	702,35	130,83	712,64	609,72
1751	433,42	80,35	142,34	1045,30	917,46	599,65	706,50	133,80	710,12	614,48
1752	431,62	80,78	142,05	1025,83	908,89	598,91	706,03	136,66	709,08	620,10
1753	429,54	80,26	141,84	1013,54	897,58	601,85	703,17	139,48	709,50	628,54
1754	428,03	80,67	141,71	1006,71	886,86	604,94	706,84	142,21	711,13	635,46
1755	427,46	80,71	141,45	999,18	877,04	609,54	715,29	144,84	714,64	641,20
1756	426,37	80,81	141,18	998,76	870,45	614,33	725,03	147,37	719,17	647,13
1757	426,53	81,13	141,07	1003,02	867,60	620,96	735,26	149,81	723,54	654,53
1758	427,63	81,08	141,50	1013,42	870,18	626,87	745,68	152,12	727,75	659,63
1759	428,59	81,24	141,83	1021,08	875,22	634,13	755,15	154,28	731,53	663,42
1760	429,93	81,05	141,82	1041,89	879,72	639,41	762,62	156,36	734,95	668,11
1761	430,08	81,10	141,90	1030,68	883,67	646,38	769,43	158,35	738,40	671,79
1762	429,33	81,00	142,18	1034,92	878,52	653,38	776,29	160,21	741,39	673,45
1763	430,38	81,23	142,01	1045,86	876,79	659,89	783,75	161,98	743,67	674,71
1764	431,15	81,60	142,13	1053,67	880,51	665,03	790,57	163,60	745,81	676,10
1765	431,82	81,33	142,63	1045,26	882,49	671,60	798,15	165,21	748,20	680,02
1766	429,24	80,83	141,88	1037,22	875,61	677,99	805,92	166,65	750,84	685,86
1767	429,47	81,43	142,16	1038,50	868,84	684,67	813,31	168,08	753,94	690,95
1768	431,49	81,66	142,28	1051,76	869,09	689,99	820,94	169,39	755,34	696,49
1769	433,27	81,53	142,49	1070,64	875,58	695,87	826,98	170,63	757,08	699,05
1770	436,24	81,63	143,10	1106,20	888,55	698,25	832,60	171,77	757,34	699,61
1771	439,52	81,83	143,45	1134,38	904,43	702,58	835,46	172,91	756,51	696,95
1772	442,65	81,85	144,70	1155,43	915,97	708,00	839,20	173,98	756,01	699,43
1773	443,14	82,00	145,14	1146,74	920,33	714,27	844,75	174,96	754,89	699,86
1774	442,76	81,67	144,79	1120,10	916,97	722,87	853,73	175,91	755,52	702,72
1775	439,28	81,67	144,47	1091,41	904,02	731,53	871,59	176,79	759,51	705,46
1776	434,67	81,96	143,94	1075,54	885,29	740,23	874,85	177,67	763,73	712,02
1777	432,62	82,44	143,43	1068,08	870,00	749,45	871,03	178,48	766,62	717,11
1778	432,89	82,18	142,17	1061,34	863,73	759,01	870,67	179,30	769,59	719,46
1779	432,71	82,52	142,95	1056,92	861,02	768,56	871,30	180,11	772,34	721,99
1780	430,87	82,48	142,60	1051,70	856,11	776,86	871,10	180,88	775,35	724,99
1781	430,38	82,56	142,87	1053,02	849,86	783,78	867,80	181,64	778,03	729,15
1782	430,53	82,84	142,55	1055,37	849,89	790,52	860,81	182,40	780,30	733,93
1783	430,51	83,09	142,94	1051,63	848,50	794,90	851,47	183,20	783,09	739,32
1784	430,17	83,10	142,70	1047,93	844,87	802,07	839,50	183,96	786,60	745,80
1785	429,41	82,91	142,65	1044,02	841,23	806,47	828,06	184,74	789,42	751,83
1786	427,48	82,80	142,00	1036,16	834,74	814,51	821,18	185,46	791,90	755,54
1787	426,54	83,65	141,87	1025,08	825,81	823,84	818,25	186,25	794,31	751,36
1788	423,08	82,94	141,22	1009,34	816,41	832,04	812,15	187,04	798,06	746,11
1789	421,87	83,42	140,78	1003,66	806,28	838,59	801,51	187,85	800,57	739,71
1790	421,14	83,24	140,82	1001,29	802,85	842,23	791,59	188,76	804,50	735,06
1791	420,97	83,37	140,71	996,55	799,77	847,10	782,69	189,65	809,39	730,90
1792	421,15	83,73	140,73	994,78	797,28	852,25	775,78	190,63	813,55	728,90
1793	420,44	83,51	140,46	997,63	796,69	854,16	768,78	191,69	816,15	727,07
1794	421,34	83,62	140,65	1003,31	798,97	848,37	765,70	192,87	819,31	725,63
1795	420,08	84,34	140,66	997,21	801,03	844,20	759,39	194,04	821,22	728,25
1796	418,01	84,02	140,18	984,71	797,05	840,28	753,90	195,32	824,88	727,82

1797	415,91	84,49	139,68	972,09	788,59	836,91	749,83	196,63	828,80	728,55
1798	427,75	84,61	223,52	893,01	778,86	827,45	736,91	198,27	809,30	748,23
1799	396,47	84,74	200,52	870,54	717,54	760,68	656,30	199,92	794,87	681,68
1800	415,69	84,32	200,46	926,36	739,65	717,68	596,77	201,48	800,79	645,69
1801	426,00	84,43	203,64	945,16	777,07	682,98	552,21	203,22	818,28	624,48
1802	428,56	84,49	205,15	954,47	795,73	648,74	520,21	205,06	837,48	616,41
1803	430,72	84,27	206,16	962,12	809,68	602,45	497,53	207,03	858,29	614,97
1804	454,77	85,09	165,95	1024,97	814,86	656,01	482,69	209,30	860,40	621,98
1805	466,05	84,91	153,60	1082,72	864,66	611,56	471,84	211,80	834,66	615,21
1806	463,00	84,46	150,83	1073,02	913,50	547,39	462,38	214,55	812,53	605,68
1807	457,39	83,54	149,06	1054,76	923,28	545,04	455,36	217,41	793,29	596,82
1808	453,00	83,67	147,91	1045,28	923,37	523,61	447,99	220,49	774,14	590,26
1809	450,45	83,77	146,86	1041,98	926,19	515,37	441,46	223,63	757,18	583,79
1810	448,69	83,45	146,11	1053,15	931,48	501,43	438,29	226,87	741,10	576,71
1811	447,91	84,14	145,53	1066,17	939,39	496,81	435,04	230,21	726,28	571,33
1812	447,35	84,30	145,52	1074,14	946,24	484,19	432,70	233,65	713,30	566,72
1813	446,09	83,80	145,48	1067,99	950,21	487,05	429,76	237,08	704,01	564,03
1814	446,55	84,41	145,50	1081,83	951,22	502,32	427,74	240,49	695,00	559,11
1815	446,72	83,71	145,62	1080,90	954,21	499,04	426,65	243,95	686,10	555,77
1816	448,39	84,20	145,62	1087,32	956,70	485,74	425,82	247,32	676,78	551,66
1817	449,26	84,09	146,09	1095,15	960,51	482,23	425,31	250,67	669,33	548,66
1818	452,47	83,80	146,33	1104,71	965,39	479,60	424,99	253,93	662,06	545,11
1819	451,99	84,25	146,12	1107,75	968,95	476,99	422,48	257,19	655,43	543,54
1820	451,72	83,96	146,32	1101,20	969,17	473,54	421,93	260,36	650,03	541,71
1821	451,12	84,27	146,27	1093,50	966,41	471,83	422,41	263,45	645,93	540,21
1822	451,83	84,81	146,32	1100,54	964,66	471,10	421,13	266,47	641,92	539,79
1823	453,66	84,38	146,57	1107,89	965,39	470,31	422,09	269,36	638,66	538,81
1824	453,62	83,97	146,62	1142,26	969,83	469,62	421,91	272,20	635,86	539,51
1825	455,49	83,88	146,91	1173,33	977,52	468,53	421,84	274,98	633,70	540,97
1826	456,37	82,80	147,60	1179,24	983,26	468,11	423,04	277,70	635,54	542,11
1827	459,51	83,34	148,30	1187,84	987,39	468,52	422,86	280,27	640,90	545,56
1828	462,55	83,58	148,89	1186,12	988,47	468,88	424,65	282,75	646,08	546,77
1829	461,43	82,42	148,77	1177,88	987,33	473,42	424,81	285,18	651,04	549,38
1830	460,39	83,09	149,06	1172,28	984,58	479,20	425,80	287,49	657,10	551,37
1831	456,65	83,00	148,40	1163,56	978,57	485,38	427,76	289,64	660,28	554,74
1832	457,09	83,51	148,59	1168,63	975,03	495,95	430,63	291,77	666,59	554,33
1833	453,00	82,59	147,88	1148,44	970,10	512,36	431,81	293,79	672,00	555,24
1834	447,05	83,57	147,70	1114,38	957,73	521,09	434,22	295,71	677,60	557,60
1835	436,41	83,71	146,33	1077,87	931,96	528,24	435,90	297,51	683,76	561,43
1836	434,53	83,42	145,52	1077,97	913,04	542,98	443,39	299,24	687,85	564,22
1837	433,50	82,49	145,67	1079,34	902,61	556,25	450,99	300,90	691,29	572,64
1838	433,04	83,20	145,37	1089,83	895,62	574,49	454,59	302,48	696,79	578,90
1839	432,42	84,45	145,81	1092,74	892,76	597,27	466,87	303,98	699,85	586,20
1840	431,67	84,10	145,22	1089,37	889,92	609,77	466,69	305,40	703,37	592,68
1841	431,02	84,51	144,61	1085,23	888,69	614,36	465,26	306,72	709,09	600,42
1842	429,89	83,99	144,11	1106,43	890,38	620,32	465,70	308,07	710,76	608,03
1843	433,75	84,01	143,95	1119,01	897,79	631,11	469,12	309,19	711,97	615,53
1844	434,14	83,57	144,45	1127,62	903,79	651,62	478,48	310,36	712,83	620,61
1845	435,56	84,37	145,18	1132,97	904,98	666,65	481,90	311,48	714,78	628,82
1846	437,14	84,06	144,86	1115,31	905,02	679,21	483,79	312,48	716,27	631,18
1847	436,67	82,73	144,38	1101,09	904,03	690,65	487,10	313,53	716,44	636,15
1848	436,99	84,11	144,43	1089,16	902,76	702,50	489,59	314,46	717,59	641,56
1849	436,18	84,29	144,48	1074,07	901,95	691,39	492,07	315,38	719,01	646,96

1850	435,28	84,30	144,02	1046,32	897,98	692,98	494,07	316,25	720,53	649,90
1851	433,00	84,10	143,49	1026,60	886,07	732,40	497,16	317,00	722,43	651,19
1852	430,59	83,72	142,95	1007,96	873,42	735,00	500,41	317,79	725,59	654,75
1853	428,52	84,06	142,67	993,94	861,69	749,93	503,67	318,52	729,50	659,82
1854	426,38	85,60	142,43	975,07	850,42	759,26	508,10	319,21	734,40	663,84
1855	421,39	84,82	142,10	946,88	832,30	769,68	511,42	319,85	743,22	671,58
1856	417,13	85,28	140,83	929,83	808,02	779,72	516,85	320,55	750,44	678,84
1857	416,24	85,26	140,66	932,50	794,13	785,61	523,25	321,13	753,41	689,33
1858	418,83	85,54	140,95	940,72	795,68	788,81	533,56	321,72	755,17	699,80
1859	420,25	85,21	141,09	950,04	803,87	791,88	543,18	322,33	756,10	710,41
1860	419,85	85,62	141,25	944,98	806,10	794,53	550,97	322,86	756,99	718,38
1861	418,98	85,31	140,94	942,56	804,07	798,43	555,30	323,46	757,69	725,38
1862	418,22	85,99	141,04	936,81	799,56	795,96	559,60	324,04	757,46	740,37
1863	416,44	86,00	140,62	929,06	793,49	794,99	567,20	324,63	757,83	748,68
1864	413,28	85,56	140,03	919,68	784,32	798,74	584,75	325,23	759,90	747,53
1865	411,20	85,50	139,49	912,00	774,39	799,90	597,85	325,84	762,66	750,81
1866	408,66	85,91	138,89	906,97	765,19	799,04	606,43	326,46	765,41	752,62
1867	406,67	85,72	138,54	899,27	756,76	798,71	615,49	327,06	766,73	751,31
1868	404,62	85,91	138,12	892,97	749,47	798,77	620,19	327,71	766,94	749,32
1869	403,49	85,80	137,83	891,12	746,40	797,28	624,53	328,32	766,02	749,01
1870	402,58	86,41	138,05	888,80	745,60	799,26	627,87	328,99	766,20	745,13
1871	437,14	84,06	144,86	1115,31	905,02	679,21	483,79	312,48	716,27	631,18
1872	436,67	82,73	144,38	1101,09	904,03	690,65	487,10	313,53	716,44	636,15
1873	437,14	84,06	144,86	1115,31	905,02	679,21	483,79	312,48	716,27	631,18
1874	437,14	84,06	144,86	1115,31	905,02	679,21	483,79	312,48	716,27	631,18
1875	436,67	82,73	144,38	1101,09	904,03	690,65	487,10	313,53	716,44	636,15
1876	436,99	84,11	144,43	1089,16	902,76	702,50	489,59	314,46	717,59	641,56
1877	436,18	84,29	144,48	1074,07	901,95	691,39	492,07	315,38	719,01	646,96
1878	435,28	84,30	144,02	1046,32	897,98	692,98	494,07	316,25	720,53	649,90
1879	433,00	84,10	143,49	1026,60	886,07	732,40	497,16	317,00	722,43	651,19
1880	430,59	83,72	142,95	1007,96	873,42	735,00	500,41	317,79	725,59	654,75
1881	428,52	84,06	142,67	993,94	861,69	749,93	503,67	318,52	729,50	659,82
1882	426,38	85,60	142,43	975,07	850,42	759,26	508,10	319,21	734,40	663,84
1883	421,39	84,82	142,10	946,88	832,30	769,68	511,42	319,85	743,22	671,58
1884	417,13	85,28	140,83	929,83	808,02	779,72	516,85	320,55	750,44	678,84
1885	416,24	85,26	140,66	932,50	794,13	785,61	523,25	321,13	753,41	689,33
1886	418,83	85,54	140,95	940,72	795,68	788,81	533,56	321,72	755,17	699,80
1887	420,25	85,21	141,09	950,04	803,87	791,88	543,18	322,33	756,10	710,41
1888	419,85	85,62	141,25	944,98	806,10	794,53	550,97	322,86	756,99	718,38
1889	418,98	85,31	140,94	942,56	804,07	798,43	555,30	323,46	757,69	725,38
1890	418,22	85,99	141,04	936,81	799,56	795,96	559,60	324,04	757,46	740,37
1891	416,44	86,00	140,62	929,06	793,49	794,99	567,20	324,63	757,83	748,68
1892	413,28	85,56	140,03	919,68	784,32	798,74	584,75	325,23	759,90	747,53
1893	411,20	85,50	139,49	912,00	774,39	799,90	597,85	325,84	762,66	750,81
1894	408,66	85,91	138,89	906,97	765,19	799,04	606,43	326,46	765,41	752,62
1895	406,67	85,72	138,54	899,27	756,76	798,71	615,49	327,06	766,73	751,31
1896	404,62	85,91	138,12	892,97	749,47	798,77	620,19	327,71	766,94	749,32
1897	403,49	85,80	137,83	891,12	746,40	797,28	624,53	328,32	766,02	749,01
1898	402,58	86,41	138,05	888,80	745,60	799,26	627,87	328,99	766,20	745,13
1899	385,85	85,91	133,02	840,80	713,99	765,15	692,07	348,87	708,54	707,62
1900	386,00	86,38	133,02	838,61	716,78	744,33	694,89	349,43	703,54	704,35
1901	381,86	85,28	132,39	831,07	713,62	759,08	697,08	350,02	698,27	701,96
1902	378,43	86,36	132,06	823,53	705,66	739,82	696,87	350,59	692,53	701,11

1903	376,00	85,13	131,56	812,76	698,06	737,82	696,93	351,15	686,90	701,49
1904	371,39	86,16	130,62	801,23	687,65	677,12	698,54	351,73	681,70	700,13
1905	368,19	86,39	130,08	791,54	677,03	661,47	696,79	352,32	676,61	702,78
1906	365,26	86,16	129,54	785,38	667,62	655,32	696,90	352,87	671,51	705,02
1907	363,61	85,47	129,24	781,06	660,76	649,06	696,57	353,49	667,55	706,14
1908	361,99	85,37	128,85	778,01	656,64	621,53	698,99	354,09	664,01	708,04
1909	361,97	86,05	128,76	776,83	654,55	617,54	700,95	354,67	660,68	708,73
1910	362,23	85,43	128,37	775,49	654,64	619,15	705,84	355,16	658,23	709,79
1911	361,14	86,18	128,53	773,49	654,26	614,65	707,43	355,69	655,87	710,89
1912	361,23	85,61	128,20	772,18	653,68	621,72	710,94	356,16	653,53	711,92
1913	360,37	86,05	128,06	771,25	653,19	719,93	711,25	356,65	651,28	713,46
1914	359,71	85,99	127,89	769,39	652,85	711,96	712,11	357,11	649,30	716,70
1915	359,13	86,25	127,71	766,87	652,06	699,14	713,14	357,54	647,50	720,85
1916	358,21	86,16	127,25	763,82	649,38	688,10	714,32	357,98	645,81	725,16
1917	356,66	86,40	127,16	761,61	646,19	666,73	716,47	358,40	644,09	727,33
1918	356,04	85,34	127,44	760,48	643,81	672,33	726,18	358,78	642,58	724,27
1919	356,46	86,02	126,91	761,18	642,46	669,33	736,77	359,07	641,36	720,51
1920	355,58	86,47	126,70	760,93	642,78	650,28	740,75	359,48	639,96	721,83
1921	354,72	85,37	126,61	759,53	642,37	648,02	748,68	359,77	639,13	719,92
1922	354,76	85,10	126,32	759,92	641,81	648,46	755,47	360,02	638,31	719,33
1923	355,00	86,00	126,48	760,67	641,72	649,14	758,29	360,20	637,64	717,43
1924	355,48	85,93	126,55	762,46	642,82	649,09	753,58	360,37	636,65	718,81
1925	356,07	85,74	126,63	762,51	644,86	648,23	751,41	360,45	635,97	718,81
1926	356,46	84,67	126,45	762,14	645,75	647,11	754,81	360,52	634,90	715,61
1927	355,89	85,58	126,23	762,61	646,67	660,52	755,38	360,57	633,56	716,61
1928	355,47	85,32	126,38	762,66	647,57	680,51	759,92	360,59	632,15	715,49
1929	83,93	75,05	81,50	84,22	81,95	79,20	78,13	76,21	78,15	79,36
1930	103,05	75,06	89,94	100,42	96,77	99,34	83,03	76,23	81,55	81,16
1931	120,63	74,94	98,34	120,21	117,39	126,30	94,90	76,32	87,55	84,38
1932	140,85	75,13	107,80	144,63	143,86	169,00	110,49	76,43	96,17	88,87
1933	158,94	75,09	115,45	178,24	179,00	215,58	137,99	76,61	107,54	98,83
1934	166,17	75,23	107,80	230,72	225,41	236,90	171,13	76,85	129,92	120,24
1935	183,81	74,95	111,83	288,01	286,71	256,04	203,65	77,14	155,42	141,00
1936	202,29	74,95	117,41	341,03	344,61	281,55	244,44	77,50	186,65	170,20
1937	219,71	75,19	122,81	393,48	397,62	317,06	291,23	77,96	226,92	205,71
1938	235,19	75,37	127,77	444,55	446,45	362,05	334,60	78,48	271,89	241,93
1939	255,49	75,55	111,40	471,24	482,63	403,65	370,50	79,06	308,80	270,34
1940	258,81	75,41	103,19	461,76	499,25	421,38	380,35	79,74	328,60	279,91
1941	240,95	75,34	99,54	453,65	479,79	438,91	385,27	80,48	347,31	288,73
1942	231,72	75,54	97,90	450,67	450,94	455,07	389,70	81,27	362,97	295,57
1943	226,50	75,66	97,16	450,21	429,90	477,31	394,66	82,10	376,24	301,39
1944	225,85	75,57	96,81	453,55	416,93	493,18	400,83	83,01	388,16	306,65
1945	278,50	75,88	154,47	487,31	432,61	512,05	421,46	83,98	396,70	324,93
1946	282,59	76,11	144,91	567,71	492,17	530,60	453,13	85,01	434,34	352,45
1947	299,34	76,23	149,63	633,54	561,90	567,99	494,36	86,22	480,16	394,21
1948	316,73	76,36	155,47	691,64	611,23	592,47	539,32	87,62	530,52	445,69
1949	328,90	77,00	160,13	727,34	647,46	616,60	589,13	89,19	572,96	511,11
1950	324,42	77,02	160,40	736,33	654,59	630,78	636,99	91,06	603,02	561,59
1951	325,24	77,21	161,33	752,41	648,67	650,46	677,31	93,21	626,35	610,90
1952	353,96	77,89	205,41	687,57	638,44	651,66	680,43	95,80	625,79	630,76
1953	291,35	77,67	181,75	576,69	541,96	592,70	620,48	98,74	599,15	556,67
1954	282,07	77,70	176,84	535,07	477,35	576,45	568,92	101,85	569,30	506,21
1955	292,33	77,61	180,04	532,62	460,26	583,29	526,90	105,16	540,24	470,94

1956	311,52	77,65	186,39	553,79	473,48	600,03	497,30	108,56	516,64	450,53
1957	326,08	77,84	191,94	580,77	499,04	614,15	477,75	112,07	501,37	441,49
1958	338,11	77,77	197,46	609,29	526,25	631,90	465,17	115,72	492,42	437,22
1959	336,58	77,90	198,37	614,93	541,91	646,88	456,84	119,43	486,94	426,38
1960	336,48	78,06	198,82	615,68	543,81	650,28	452,81	123,27	483,12	422,24
1961	347,80	78,29	202,71	637,03	553,38	660,34	454,48	127,17	484,26	423,36
1962	360,83	77,92	206,85	683,01	576,65	672,27	457,81	131,20	489,26	428,76
1963	373,74	78,24	211,95	728,78	612,17	682,62	463,04	135,24	497,11	435,39
1964	372,49	78,59	212,93	737,88	632,06	690,99	467,48	139,28	507,51	440,33
1965	347,94	79,13	180,14	772,84	639,37	689,41	479,20	143,23	539,03	447,98
1966	339,17	79,26	174,65	777,48	650,93	710,16	490,53	147,13	563,35	453,47
1967	336,15	79,61	172,71	780,98	652,78	725,79	499,70	151,03	584,29	458,56
1968	336,57	79,49	172,33	784,75	653,74	731,29	508,01	154,81	601,96	463,59
1969	339,32	79,41	172,85	791,16	655,83	739,38	529,70	158,57	619,84	471,61
1970	367,28	80,10	139,38	782,07	662,80	738,98	544,97	162,27	635,88	485,59
1971	365,03	79,89	131,66	767,32	671,10	713,76	549,69	165,81	640,05	483,52
1972	359,16	79,50	128,84	754,63	674,38	561,38	547,99	169,13	637,87	476,77
1973	351,97	79,85	126,96	742,68	670,91	547,28	546,84	172,19	634,66	471,30
1974	347,40	80,03	125,40	732,00	662,45	528,71	549,39	174,99	632,60	469,58
1975	344,72	79,97	124,68	726,68	655,46	528,14	549,49	177,53	631,38	470,31
1976	343,37	80,38	123,70	723,17	652,87	527,54	545,85	179,83	629,02	468,49
1977	344,29	80,36	123,82	720,96	653,94	521,14	541,37	181,96	627,05	466,95
1978	347,32	80,48	123,85	718,75	657,69	521,19	537,46	183,86	627,48	467,38
1979	348,60	80,56	123,94	718,61	665,89	522,59	533,52	185,62	628,76	469,34
1980	350,71	80,77	124,19	723,26	672,22	524,58	531,22	187,20	631,59	470,92
1981	354,55	80,84	124,74	730,28	683,94	527,32	529,49	188,69	632,04	471,33
1982	357,11	80,43	124,67	734,20	696,68	531,18	528,13	190,07	630,76	473,08
1983	358,25	80,57	124,62	742,70	704,58	535,85	527,77	191,33	629,92	476,51
1984	363,38	80,89	125,46	754,41	716,90	540,59	528,57	192,50	631,05	479,69
1985	367,57	80,88	126,18	766,47	732,31	552,39	531,06	193,57	634,71	483,30
1986	370,97	80,95	126,58	777,95	744,31	561,16	532,72	194,61	641,08	486,37
1987	376,72	81,30	127,65	799,87	758,30	564,50	536,37	195,57	649,68	491,73
1988	380,61	81,25	128,33	816,89	773,59	569,64	541,06	196,50	655,71	495,71
1989	382,34	81,49	129,09	828,82	780,41	559,39	546,63	197,33	663,30	500,08
1990	384,55	81,44	129,64	840,28	783,77	574,00	551,70	198,17	670,31	505,81
1991	385,78	81,61	130,00	842,96	786,56	575,73	557,12	198,98	675,23	510,62
1992	385,42	81,75	129,87	848,07	784,55	574,18	562,34	199,72	676,96	515,80
1993	389,32	81,57	130,23	884,08	798,36	575,41	566,51	200,43	674,10	520,96
1994	392,69	81,99	130,82	911,53	823,05	572,80	570,45	201,17	673,18	526,02
1995	393,60	82,12	131,49	905,97	834,01	573,42	573,65	201,91	674,85	530,25
1996	383,48	81,82	130,36	861,50	807,49	575,29	578,28	202,60	682,47	536,52
1997	378,47	81,93	129,36	846,49	764,37	579,07	580,59	203,25	687,07	543,37
1998	376,57	81,94	129,20	837,81	742,62	595,93	582,30	203,91	693,42	550,11
1999	378,03	82,03	129,30	848,71	734,88	604,30	586,59	204,63	697,79	555,15
2000	385,46	82,00	130,32	882,88	754,77	609,12	589,86	205,33	696,22	559,11
2001	392,68	82,45	130,84	914,70	792,89	604,06	594,72	206,05	694,71	563,72
2002	396,96	81,96	131,85	932,00	817,96	603,24	599,54	206,74	696,46	567,28
2003	399,18	81,77	132,41	940,31	829,08	604,15	603,24	207,43	700,21	571,13
2004	401,00	81,51	132,20	955,13	833,94	601,45	607,99	208,17	701,02	575,66
2005	403,77	82,17	132,32	974,98	842,70	602,76	611,63	208,93	699,86	580,71
2006	379,39	81,85	160,49	959,81	852,75	604,85	616,67	209,66	707,71	580,59
2007	386,32	82,09	180,70	988,76	840,20	743,94	631,46	210,50	736,85	610,25
2008	405,56	82,34	189,50	1014,61	850,90	786,09	645,82	211,60	765,64	638,73

2009	409,77	82,67	189,01	1019,37	859,68	811,07	656,93	212,96	793,23	656,68
2010	425,23	82,52	168,53	1016,18	848,93	826,53	674,51	214,62	814,44	679,10
2011	441,78	82,67	148,22	1072,25	844,73	818,69	682,59	216,53	812,83	682,80
2012	436,92	82,59	144,12	1053,60	864,15	804,15	685,41	218,54	809,12	682,37
2013	426,74	82,35	141,60	1018,92	860,81	790,78	687,52	220,49	808,23	680,73
2014	417,39	82,65	139,44	986,76	842,43	776,86	697,05	222,45	807,51	680,48
2015	410,20	82,65	137,52	954,11	820,28	765,98	717,53	224,36	807,63	682,88
2016	401,68	82,75	136,00	922,88	791,70	756,15	705,03	226,23	808,18	686,49
2017	395,42	82,91	134,82	903,54	764,19	643,57	689,28	228,12	809,51	688,67
2018	391,54	82,85	133,80	892,46	746,56	617,49	680,02	229,98	809,47	692,34
2019	391,43	82,91	133,61	889,15	739,41	609,47	673,52	231,92	809,80	694,04
2020	391,26	82,93	133,62	889,13	738,61	608,67	669,80	233,78	809,93	696,03
2021	389,97	82,94	133,74	885,82	739,49	617,87	666,27	235,68	808,28	698,69
2022	389,11	83,53	133,41	880,87	737,50	624,11	664,29	237,59	806,24	698,35
2023	387,33	83,46	132,72	874,92	734,38	627,83	662,68	239,56	806,16	699,27
2024	384,20	83,56	132,05	861,71	725,87	636,38	661,16	241,47	808,75	700,10
2025	379,14	83,25	131,23	849,83	709,78	636,14	659,49	243,38	812,06	702,48
2026	378,16	83,16	131,02	844,45	696,75	635,79	659,25	245,30	812,27	706,02
2027	380,02	83,25	131,05	846,66	693,89	640,87	659,96	247,17	811,68	710,33
2028	380,97	83,14	131,12	846,44	697,13	640,81	661,38	249,04	812,05	713,21
2029	380,42	83,17	131,18	846,28	699,49	641,00	662,57	250,90	813,12	715,16
2030	380,59	83,10	130,96	845,91	699,18	640,61	662,83	252,76	813,40	716,62
2031	380,05	83,15	130,54	846,36	699,08	639,56	662,86	254,59	812,80	718,14
2032	380,44	83,05	130,60	847,34	699,79	638,04	661,53	256,41	812,85	719,61
2033	380,43	82,90	130,59	846,55	699,78	636,73	661,10	258,21	813,17	720,79
2034	379,98	82,93	130,39	847,00	698,66	637,65	659,89	259,96	813,47	722,35
2035	379,98	83,05	130,13	848,00	697,27	629,29	657,19	261,72	813,47	724,02
2036	379,50	83,11	130,28	848,61	696,22	603,68	657,49	263,47	814,63	725,42
2037	379,93	83,14	130,43	849,95	696,55	598,49	656,87	265,21	815,40	728,07
2038	380,30	83,24	130,18	849,65	697,82	600,46	656,69	266,90	814,94	730,70
2039	380,25	83,39	130,48	848,58	699,36	594,81	656,49	268,64	813,75	731,92
2040	379,21	83,71	130,28	847,88	698,12	600,02	656,12	270,27	812,85	732,79
2041	377,36	83,48	130,07	845,35	694,43	592,74	654,97	271,90	812,63	737,51
2042	376,55	83,81	129,87	840,35	690,26	580,45	653,66	273,56	812,50	742,35
2043	374,28	83,65	129,45	834,65	684,75	570,06	653,71	275,23	813,08	745,95
2044	385,21	83,66	207,48	769,66	682,98	680,51	645,77	277,05	786,66	767,45
2045	384,11	83,85	219,48	697,12	629,84	629,10	587,22	279,22	749,84	722,35
2046	401,23	83,43	227,98	677,47	610,82	603,01	547,93	281,27	721,04	701,18
2047	415,06	83,33	235,23	686,21	617,83	592,48	525,22	282,89	699,48	691,28
2048	437,16	83,84	242,52	708,41	639,93	594,98	516,47	284,16	683,31	692,73
2049	407,34	83,84	204,26	791,44	688,77	589,98	500,12	285,13	697,31	675,50
2050	394,04	84,05	194,90	814,04	733,58	584,44	482,74	285,97	704,91	653,90
2051	384,23	84,16	190,65	806,51	741,91	579,32	465,57	286,80	701,56	637,97
2052	378,16	83,92	188,14	794,25	733,56	568,91	449,69	287,84	696,61	627,01
2053	374,27	83,94	186,28	782,12	722,93	560,84	434,65	288,93	693,37	620,42
2054	394,15	83,69	152,33	801,65	715,38	559,73	425,57	290,42	690,41	626,62
2055	415,18	83,38	143,41	854,84	749,06	552,96	419,39	292,05	681,46	623,86
2056	415,41	83,52	141,26	870,85	804,56	544,27	413,90	293,89	671,62	619,63
2057	415,04	83,59	139,67	881,92	835,40	534,06	409,37	295,74	660,71	611,21
2058	410,79	83,96	138,98	859,79	845,88	525,09	404,27	297,72	649,67	602,79
2059	403,51	83,51	137,18	834,86	833,52	515,40	400,12	299,71	638,66	595,22
2060	398,43	83,73	136,07	816,05	816,40	507,22	396,18	301,75	627,68	589,88
2061	395,70	83,75	135,38	802,99	806,15	498,49	392,20	303,78	617,30	585,60

2062	393,31	83,75	134,88	798,10	802,93	491,37	389,63	305,88	607,47	582,16
2063	393,34	83,53	134,32	797,43	805,71	484,93	386,30	307,84	598,21	577,70
2064	393,68	83,74	134,13	801,17	812,88	477,95	384,00	309,84	589,19	572,34
2065	396,35	83,86	134,32	806,67	823,80	470,72	381,88	311,81	581,91	571,22
2066	396,57	82,92	134,12	808,80	829,10	464,43	380,62	313,63	575,45	570,45
2067	398,96	84,08	134,21	829,83	841,37	459,35	378,70	315,51	569,90	566,17
2068	401,99	83,76	134,32	852,76	861,37	454,66	377,68	317,35	564,60	565,76
2069	404,72	83,65	134,72	899,97	879,25	450,59	377,57	319,09	564,14	565,06
2070	412,66	83,90	135,92	1007,93	905,69	446,92	377,59	320,73	564,76	564,94
2071	417,82	83,38	137,03	1062,02	934,78	444,91	378,11	322,33	565,60	563,69
2072	420,66	83,51	137,55	1060,94	948,01	441,98	378,84	323,88	566,61	563,23
2073	420,00	83,73	137,85	1053,66	949,28	441,62	379,76	325,32	567,93	560,98
2074	419,62	83,28	137,77	1047,00	946,13	441,66	381,48	326,70	570,60	560,11
2075	419,53	83,35	137,73	1038,18	943,46	442,16	383,91	327,95	574,79	558,56
2076	419,30	83,81	137,75	1027,08	939,47	443,45	385,29	329,17	579,45	558,13
2077	417,85	83,67	137,95	999,27	933,19	445,61	387,93	330,30	585,26	558,99
2078	415,91	83,55	137,58	983,63	922,34	448,05	391,15	331,33	591,34	558,14
2079	414,25	83,33	137,19	995,82	915,93	451,13	394,42	332,34	598,17	558,02
2080	414,73	83,24	137,37	1025,17	919,28	454,68	397,85	333,24	603,36	556,05
2081	417,63	83,04	137,95	1057,96	927,62	459,47	401,61	334,03	608,09	555,79
2082	419,90	82,92	138,46	1079,14	936,34	463,45	405,95	334,79	613,30	556,47
2083	423,27	83,17	139,28	1099,60	941,79	468,34	410,29	335,43	617,29	559,93
2084	425,10	82,67	139,63	1155,19	948,08	472,22	414,01	335,95	620,51	563,69
2085	432,94	82,59	141,17	1204,61	960,81	475,98	418,58	336,49	623,27	567,61
2086	438,17	83,45	141,98	1230,43	971,25	478,34	423,28	336,92	625,43	572,39
2087	440,08	83,21	142,62	1226,87	976,71	480,37	427,11	337,22	628,51	580,48
2088	436,69	83,00	142,08	1227,65	973,82	484,44	431,93	337,48	630,82	591,09
2089	435,06	82,97	141,97	1219,86	970,06	488,17	436,57	337,67	634,64	601,03
2090	433,29	83,11	142,05	1215,89	966,75	492,17	440,87	337,84	638,39	612,11
2091	432,69	83,19	141,95	1223,65	963,50	496,28	445,96	337,94	642,42	620,27
2092	431,59	83,49	141,60	1225,20	962,57	500,51	450,42	337,98	647,40	626,59
2093	428,71	82,90	141,19	1207,20	960,01	504,03	455,67	338,00	652,92	631,79
2094	428,89	82,90	140,66	1217,16	957,51	506,89	461,57	337,96	657,84	635,10
2095	429,02	83,08	141,18	1195,20	956,40	510,13	465,82	337,87	662,79	638,11
2096	426,96	83,39	141,20	1191,11	950,05	513,96	470,21	337,77	668,12	640,73
2097	424,48	83,29	140,52	1194,38	944,66	518,41	474,63	337,70	672,72	643,13
2098	425,33	82,74	140,44	1193,30	943,21	521,83	480,07	337,57	677,68	646,38
2099	426,82	83,00	140,30	1201,23	944,84	525,64	484,96	337,54	681,14	646,71
2100	429,51	82,50	140,51	1236,02	952,36	529,35	489,78	337,45	682,80	645,37
2101	433,56	82,17	140,97	1247,24	964,78	533,10	494,42	337,41	682,86	644,56
2102	435,38	82,58	141,25	1264,80	972,80	538,15	498,93	337,33	681,25	643,47
2103	436,51	82,84	141,17	1269,43	975,83	542,18	503,90	337,27	679,47	643,30
2104	436,56	82,48	141,17	1259,81	976,17	546,33	510,15	337,27	678,06	643,55
2105	436,00	82,76	141,20	1232,52	972,48	552,07	516,11	337,24	676,73	646,84
2106	433,20	82,63	141,00	1219,43	964,84	557,06	521,01	337,33	675,44	651,94
2107	431,68	82,22	140,59	1196,83	958,35	561,32	526,96	337,35	674,57	655,87
2108	429,17	82,59	140,56	1175,55	951,20	567,24	530,55	337,35	673,44	662,53
2109	428,44	82,76	140,47	1169,22	945,81	572,69	534,62	337,47	672,77	669,86
2110	426,48	82,75	140,06	1160,27	941,53	577,13	539,84	337,54	672,70	676,77
2111	425,06	83,25	139,53	1154,84	936,82	582,05	543,47	337,65	673,03	680,81
2112	425,70	82,65	139,70	1160,04	936,88	587,09	547,53	337,74	673,55	682,52
2113	424,86	82,88	139,24	1150,77	937,52	591,33	550,35	337,84	674,22	683,50
2114	425,10	81,92	138,91	1126,11	935,91	595,33	553,48	337,98	674,82	685,56

2115	423,33	81,71	138,46	1100,16	930,15	599,84	554,99	338,11	676,29	684,79
2116	421,07	81,66	137,64	1074,26	921,50	603,22	556,50	338,20	677,85	686,70
2117	420,71	81,03	137,67	1051,05	913,21	606,76	559,56	338,33	679,48	684,17
2118	418,98	81,44	137,39	1040,00	905,52	610,83	560,95	338,48	681,20	682,09
2119	417,12	81,07	137,20	1004,41	896,46	615,94	563,30	338,58	682,94	677,61
2120	413,39	81,25	136,58	969,37	877,02	621,61	566,73	338,77	684,14	675,37
2121	408,60	81,38	135,98	952,62	852,86	628,93	571,57	338,92	684,95	673,57
2122	407,09	80,16	135,50	953,84	837,78	635,72	576,31	339,17	685,29	670,09
2123	407,28	80,88	135,68	963,57	837,17	635,38	579,88	339,35	685,24	667,58
2124	406,79	81,08	135,45	963,30	841,12	630,02	583,83	339,57	685,39	666,76
2125	406,77	81,35	135,25	966,92	840,43	652,59	589,44	339,75	685,40	664,51
2126	407,26	80,89	135,54	971,85	843,71	661,16	591,42	339,95	684,56	659,73
2127	410,62	81,34	135,95	1006,82	850,49	670,97	593,11	340,23	685,01	654,24
2128	414,13	80,96	136,09	1029,31	866,22	681,02	592,22	340,51	686,33	650,23
2129	415,42	80,78	136,36	1025,80	877,72	688,15	592,81	340,79	688,50	645,53
2130	412,78	79,98	135,98	992,29	873,09	695,91	590,99	341,07	690,67	643,75
2131	407,18	81,06	135,26	960,15	850,27	703,10	590,13	341,37	691,60	642,84
2132	403,17	81,25	134,21	934,50	824,90	708,74	587,36	341,69	691,66	642,90
2133	399,86	81,33	133,84	921,71	806,03	713,93	585,90	341,98	690,31	643,52
2134	398,44	81,39	133,28	914,86	795,38	718,00	585,18	342,30	684,78	644,66
2135	396,04	81,81	132,94	907,00	789,83	720,81	586,46	342,63	680,82	644,11
2136	394,99	81,51	132,53	898,87	784,36	721,98	588,25	342,98	677,25	643,90
2137	392,73	80,96	131,78	886,56	778,11	723,83	588,40	343,38	674,11	644,96
2138	388,82	81,16	131,75	874,19	769,69	726,64	588,08	343,72	671,75	645,15
2139	387,23	81,14	131,22	866,54	761,28	730,70	591,01	344,15	669,99	643,98
2140	384,90	81,28	130,67	857,23	754,50	734,54	591,84	344,55	668,17	643,65
2141	382,49	81,51	130,26	850,13	747,77	737,70	594,24	344,98	666,51	644,33
2142	380,24	81,03	129,75	842,54	741,73	741,37	596,54	345,35	665,17	644,87
2143	379,08	81,40	129,31	837,68	736,05	744,37	597,57	345,70	664,72	643,52
2144	377,18	81,28	129,10	833,98	731,23	745,83	598,86	346,03	665,01	644,02
2145	375,70	81,40	128,75	830,54	726,84	746,58	601,56	346,41	665,34	643,09
2146	375,35	81,23	128,55	829,21	723,50	747,53	602,01	346,76	664,99	643,53
2147	374,88	81,49	128,29	828,73	722,05	747,31	604,17	347,08	665,22	642,75
2148	373,55	82,15	128,24	825,37	720,35	746,90	608,04	347,35	665,56	642,12
2149	372,03	81,58	127,62	819,05	716,73	745,55	609,66	347,67	665,52	641,12
2150	369,40	81,30	127,27	811,49	709,41	745,96	611,19	347,98	666,36	642,93
2151	366,02	82,26	126,64	804,56	700,33	745,87	612,50	348,31	667,29	642,22
2152	362,80	82,19	125,91	798,08	690,62	747,10	614,53	348,58	668,01	642,24
2153	362,04	81,40	125,54	794,64	682,73	746,30	613,68	348,84	666,86	641,35
2154	361,57	81,46	125,29	793,75	679,59	746,85	620,29	349,14	665,28	640,70
2155	360,57	82,11	124,97	790,51	679,03	745,71	628,64	349,37	663,13	641,06
2156	358,72	82,61	124,68	787,53	676,87	745,41	636,13	349,67	661,15	639,14
2157	356,68	82,31	124,19	782,49	673,19	744,66	642,57	349,85	658,61	639,91
2158	354,47	82,41	123,85	777,61	668,07	743,33	646,89	350,07	656,03	639,37
2159	352,24	82,23	123,37	774,60	661,74	741,58	650,19	350,27	653,15	638,92
2160	349,69	82,64	123,04	771,23	656,40	740,44	642,23	350,45	650,75	638,21
2161	348,20	82,94	122,39	772,35	650,31	734,51	637,59	350,57	647,77	634,59
2162	347,42	82,76	122,60	772,87	649,73	731,50	637,12	350,72	644,44	633,11
2163	346,47	83,35	122,75	772,01	650,45	728,26	638,03	350,89	640,97	630,28
2164	346,17	83,63	122,69	768,68	650,40	724,48	638,87	351,03	637,32	627,20
2165	345,93	84,48	122,22	766,67	647,88	722,15	643,16	351,11	633,67	625,64
2166	343,88	84,57	122,17	764,79	645,02	665,33	647,67	351,14	630,19	623,76
2167	343,65	83,01	122,20	763,97	643,05	717,57	650,33	351,24	626,94	622,12

2168	342,00	84,74	121,94	761,37	642,23	714,47	652,46	351,29	623,47	620,25
2169	342,15	83,25	122,02	760,66	641,43	712,84	654,27	351,23	620,52	618,69
2170	341,72	83,92	121,91	759,29	640,28	710,19	653,99	351,22	618,00	616,71
2171	342,63	83,92	122,08	761,20	640,60	707,98	653,26	351,13	615,33	614,15
2172	343,29	83,77	122,26	761,47	643,28	703,67	650,72	350,99	612,38	612,45
2173	342,44	84,73	122,35	760,47	645,05	702,66	649,95	350,85	609,70	611,49
2174	342,91	84,53	122,30	760,55	645,97	699,45	654,13	350,70	606,91	608,70
2175	342,30	84,28	122,11	759,59	646,47	644,52	658,14	350,42	604,07	606,77
2176	341,55	84,71	121,87	758,01	645,82	680,78	666,45	350,14	601,71	604,80
2177	341,71	84,15	122,06	761,79	645,26	658,64	675,73	349,79	598,93	601,34
2178	345,78	84,89	122,77	768,19	651,45	656,98	688,27	349,39	595,96	599,00
2179	348,16	84,91	123,08	768,57	661,29	686,27	695,98	348,95	593,05	595,81
2180	347,13	84,72	122,97	761,98	665,73	687,26	701,29	348,52	590,23	591,48
2181	345,23	84,19	122,66	754,42	663,93	695,86	702,97	347,93	587,69	588,01
2182	343,93	84,31	122,30	747,52	660,17	700,11	710,42	347,38	584,71	585,25
2183	340,84	84,58	122,02	739,82	655,13	699,27	717,19	346,81	581,38	582,57
2184	337,48	85,67	121,59	734,28	647,45	698,67	721,65	346,21	578,25	581,06
2185	335,65	85,17	121,20	731,09	640,97	698,89	723,47	345,59	575,03	577,36
2186	335,34	85,85	120,95	728,50	636,47	697,95	724,99	344,92	571,89	575,13
2187	333,61	85,80	120,82	725,50	634,06	695,88	724,52	344,25	569,04	572,22
2188	332,71	85,64	120,36	722,10	630,78	692,13	724,54	343,65	565,81	570,00
2189	332,11	85,43	120,35	715,78	627,83	657,78	720,84	343,00	563,06	568,43
2190	329,48	85,63	119,76	709,57	623,74	684,11	719,04	342,31	560,41	566,21
2191	328,31	85,58	119,61	705,77	618,42	660,54	715,45	341,72	557,86	564,81
2192	326,95	85,57	119,26	702,41	614,91	670,43	711,11	341,08	555,38	562,64
2193	326,34	85,62	119,11	698,84	612,34	646,78	704,93	340,41	553,07	560,93
2194	324,41	85,98	118,94	694,74	610,58	658,65	699,91	339,80	550,64	557,67
2195	323,86	85,85	118,64	691,34	607,87	647,94	693,28	339,14	548,34	555,81
2196	323,26	86,11	118,62	688,35	605,66	627,97	687,02	338,53	546,30	554,07
2197	322,52	85,88	118,43	685,81	603,99	623,53	682,10	337,91	544,62	551,83
2198	322,56	85,72	118,20	684,53	603,09	616,61	675,67	337,29	542,74	549,53
2199	321,78	85,49	118,30	681,88	602,08	670,10	667,67	336,55	541,01	547,97
2200	319,74	85,69	117,94	676,87	601,38	668,76	660,70	335,94	539,66	545,83
2201	318,44	85,66	117,67	672,91	597,71	666,74	654,32	335,30	538,36	544,00
2202	317,94	85,67	117,59	669,77	594,71	665,17	648,34	334,62	537,13	542,03
2203	317,50	85,56	117,29	667,87	593,05	663,37	642,41	333,90	535,60	540,49
2204	317,05	85,66	117,32	667,13	591,96	661,86	637,12	333,18	534,32	538,61
2205	120,63	74,94	98,34	120,21	117,39	126,30	94,90	76,32	87,55	84,38
2206	140,85	75,13	107,80	144,63	143,86	169,00	110,49	76,43	96,17	88,87
2207	158,94	75,09	115,45	178,24	179,00	215,58	137,99	76,61	107,54	98,83
2208	166,17	75,23	107,80	230,72	225,41	236,90	171,13	76,85	129,92	120,24
2209	183,81	74,95	111,83	288,01	286,71	256,04	203,65	77,14	155,42	141,00
2210	202,29	74,95	117,41	341,03	344,61	281,55	244,44	77,50	186,65	170,20
2211	219,71	75,19	122,81	393,48	397,62	317,06	291,23	77,96	226,92	205,71
2212	235,19	75,37	127,77	444,55	446,45	362,05	334,60	78,48	271,89	241,93
2213	255,49	75,55	111,40	471,24	482,63	403,65	370,50	79,06	308,80	270,34
2214	258,81	75,41	103,19	461,76	499,25	421,38	380,35	79,74	328,60	279,91
2215	240,95	75,34	99,54	453,65	479,79	438,91	385,27	80,48	347,31	288,73
2216	231,72	75,54	97,90	450,67	450,94	455,07	389,70	81,27	362,97	295,57
2217	226,50	75,66	97,16	450,21	429,90	477,31	394,66	82,10	376,24	301,39
2218	225,85	75,57	96,81	453,55	416,93	493,18	400,83	83,01	388,16	306,65
2219	278,50	75,88	154,47	487,31	432,61	512,05	421,46	83,98	396,70	324,93
2220	282,59	76,11	144,91	567,71	492,17	530,60	453,13	85,01	434,34	352,45

2221	299,34	76,23	149,63	633,54	561,90	567,99	494,36	86,22	480,16	394,21
2222	316,73	76,36	155,47	691,64	611,23	592,47	539,32	87,62	530,52	445,69
2223	328,90	77,00	160,13	727,34	647,46	616,60	589,13	89,19	572,96	511,11
2224	324,42	77,02	160,40	736,33	654,59	630,78	636,99	91,06	603,02	561,59
2225	325,24	77,21	161,33	752,41	648,67	650,46	677,31	93,21	626,35	610,90
2226	353,96	77,89	205,41	687,57	638,44	651,66	680,43	95,80	625,79	630,76
2227	291,35	77,67	181,75	576,69	541,96	592,70	620,48	98,74	599,15	556,67
2228	282,07	77,70	176,84	535,07	477,35	576,45	568,92	101,85	569,30	506,21
2229	292,33	77,61	180,04	532,62	460,26	583,29	526,90	105,16	540,24	470,94
2230	311,52	77,65	186,39	553,79	473,48	600,03	497,30	108,56	516,64	450,53
2231	326,08	77,84	191,94	580,77	499,04	614,15	477,75	112,07	501,37	441,49
2232	338,11	77,77	197,46	609,29	526,25	631,90	465,17	115,72	492,42	437,22
2233	336,58	77,90	198,37	614,93	541,91	646,88	456,84	119,43	486,94	426,38
2234	336,48	78,06	198,82	615,68	543,81	650,28	452,81	123,27	483,12	422,24
2235	347,80	78,29	202,71	637,03	553,38	660,34	454,48	127,17	484,26	423,36
2236	360,83	77,92	206,85	683,01	576,65	672,27	457,81	131,20	489,26	428,76
2237	373,74	78,24	211,95	728,78	612,17	682,62	463,04	135,24	497,11	435,39
2238	372,49	78,59	212,93	737,88	632,06	690,99	467,48	139,28	507,51	440,33
2239	347,94	79,13	180,14	772,84	639,37	689,41	479,20	143,23	539,03	447,98
2240	339,17	79,26	174,65	777,48	650,93	710,16	490,53	147,13	563,35	453,47
2241	336,15	79,61	172,71	780,98	652,78	725,79	499,70	151,03	584,29	458,56
2242	336,57	79,49	172,33	784,75	653,74	731,29	508,01	154,81	601,96	463,59
2243	339,32	79,41	172,85	791,16	655,83	739,38	529,70	158,57	619,84	471,61
2244	367,28	80,10	139,38	782,07	662,80	738,98	544,97	162,27	635,88	485,59
2245	365,03	79,89	131,66	767,32	671,10	713,76	549,69	165,81	640,05	483,52
2246	359,16	79,50	128,84	754,63	674,38	561,38	547,99	169,13	637,87	476,77
2247	351,97	79,85	126,96	742,68	670,91	547,28	546,84	172,19	634,66	471,30
2248	347,40	80,03	125,40	732,00	662,45	528,71	549,39	174,99	632,60	469,58
2249	344,72	79,97	124,68	726,68	655,46	528,14	549,49	177,53	631,38	470,31
2250	343,37	80,38	123,70	723,17	652,87	527,54	545,85	179,83	629,02	468,49
2251	344,29	80,36	123,82	720,96	653,94	521,14	541,37	181,96	627,05	466,95
2252	347,32	80,48	123,85	718,75	657,69	521,19	537,46	183,86	627,48	467,38
2253	348,60	80,56	123,94	718,61	665,89	522,59	533,52	185,62	628,76	469,34
2254	350,71	80,77	124,19	723,26	672,22	524,58	531,22	187,20	631,59	470,92
2255	354,55	80,84	124,74	730,28	683,94	527,32	529,49	188,69	632,04	471,33
2256	357,11	80,43	124,67	734,20	696,68	531,18	528,13	190,07	630,76	473,08
2257	358,25	80,57	124,62	742,70	704,58	535,85	527,77	191,33	629,92	476,51
2258	363,38	80,89	125,46	754,41	716,90	540,59	528,57	192,50	631,05	479,69
2259	367,57	80,88	126,18	766,47	732,31	552,39	531,06	193,57	634,71	483,30
2260	370,97	80,95	126,58	777,95	744,31	561,16	532,72	194,61	641,08	486,37
2261	376,72	81,30	127,65	799,87	758,30	564,50	536,37	195,57	649,68	491,73
2262	380,61	81,25	128,33	816,89	773,59	569,64	541,06	196,50	655,71	495,71
2263	382,34	81,49	129,09	828,82	780,41	559,39	546,63	197,33	663,30	500,08
2264	384,55	81,44	129,64	840,28	783,77	574,00	551,70	198,17	670,31	505,81
2265	385,78	81,61	130,00	842,96	786,56	575,73	557,12	198,98	675,23	510,62
2266	385,42	81,75	129,87	848,07	784,55	574,18	562,34	199,72	676,96	515,80
2267	389,32	81,57	130,23	884,08	798,36	575,41	566,51	200,43	674,10	520,96
2268	392,69	81,99	130,82	911,53	823,05	572,80	570,45	201,17	673,18	526,02
2269	393,60	82,12	131,49	905,97	834,01	573,42	573,65	201,91	674,85	530,25
2270	383,48	81,82	130,36	861,50	807,49	575,29	578,28	202,60	682,47	536,52
2271	378,47	81,93	129,36	846,49	764,37	579,07	580,59	203,25	687,07	543,37
2272	376,57	81,94	129,20	837,81	742,62	595,93	582,30	203,91	693,42	550,11
2273	378,03	82,03	129,30	848,71	734,88	604,30	586,59	204,63	697,79	555,15

2274	385,46	82,00	130,32	882,88	754,77	609,12	589,86	205,33	696,22	559,11
2275	392,68	82,45	130,84	914,70	792,89	604,06	594,72	206,05	694,71	563,72
2276	396,96	81,96	131,85	932,00	817,96	603,24	599,54	206,74	696,46	567,28
2277	399,18	81,77	132,41	940,31	829,08	604,15	603,24	207,43	700,21	571,13
2278	401,00	81,51	132,20	955,13	833,94	601,45	607,99	208,17	701,02	575,66
2279	403,77	82,17	132,32	974,98	842,70	602,76	611,63	208,93	699,86	580,71
2280	379,39	81,85	160,49	959,81	852,75	604,85	616,67	209,66	707,71	580,59
2281	386,32	82,09	180,70	988,76	840,20	743,94	631,46	210,50	736,85	610,25
2282	405,56	82,34	189,50	1014,61	850,90	786,09	645,82	211,60	765,64	638,73
2283	409,77	82,67	189,01	1019,37	859,68	811,07	656,93	212,96	793,23	656,68
2284	425,23	82,52	168,53	1016,18	848,93	826,53	674,51	214,62	814,44	679,10
2285	441,78	82,67	148,22	1072,25	844,73	818,69	682,59	216,53	812,83	682,80
2286	436,92	82,59	144,12	1053,60	864,15	804,15	685,41	218,54	809,12	682,37
2287	426,74	82,35	141,60	1018,92	860,81	790,78	687,52	220,49	808,23	680,73
2288	417,39	82,65	139,44	986,76	842,43	776,86	697,05	222,45	807,51	680,48
2289	410,20	82,65	137,52	954,11	820,28	765,98	717,53	224,36	807,63	682,88
2290	401,68	82,75	136,00	922,88	791,70	756,15	705,03	226,23	808,18	686,49
2291	395,42	82,91	134,82	903,54	764,19	643,57	689,28	228,12	809,51	688,67
2292	391,54	82,85	133,80	892,46	746,56	617,49	680,02	229,98	809,47	692,34
2293	391,43	82,91	133,61	889,15	739,41	609,47	673,52	231,92	809,80	694,04
2294	391,26	82,93	133,62	889,13	738,61	608,67	669,80	233,78	809,93	696,03
2295	389,97	82,94	133,74	885,82	739,49	617,87	666,27	235,68	808,28	698,69
2296	389,11	83,53	133,41	880,87	737,50	624,11	664,29	237,59	806,24	698,35
2297	387,33	83,46	132,72	874,92	734,38	627,83	662,68	239,56	806,16	699,27
2298	384,20	83,56	132,05	861,71	725,87	636,38	661,16	241,47	808,75	700,10
2299	379,14	83,25	131,23	849,83	709,78	636,14	659,49	243,38	812,06	702,48
2300	378,16	83,16	131,02	844,45	696,75	635,79	659,25	245,30	812,27	706,02
2301	380,02	83,25	131,05	846,66	693,89	640,87	659,96	247,17	811,68	710,33
2302	380,97	83,14	131,12	846,44	697,13	640,81	661,38	249,04	812,05	713,21
2303	380,42	83,17	131,18	846,28	699,49	641,00	662,57	250,90	813,12	715,16
2304	380,59	83,10	130,96	845,91	699,18	640,61	662,83	252,76	813,40	716,62
2305	380,05	83,15	130,54	846,36	699,08	639,56	662,86	254,59	812,80	718,14
2306	380,44	83,05	130,60	847,34	699,79	638,04	661,53	256,41	812,85	719,61
2307	380,43	82,90	130,59	846,55	699,78	636,73	661,10	258,21	813,17	720,79
2308	379,98	82,93	130,39	847,00	698,66	637,65	659,89	259,96	813,47	722,35
2309	379,98	83,05	130,13	848,00	697,27	629,29	657,19	261,72	813,47	724,02
2310	379,50	83,11	130,28	848,61	696,22	603,68	657,49	263,47	814,63	725,42
2311	379,93	83,14	130,43	849,95	696,55	598,49	656,87	265,21	815,40	728,07
2312	380,30	83,24	130,18	849,65	697,82	600,46	656,69	266,90	814,94	730,70
2313	380,25	83,39	130,48	848,58	699,36	594,81	656,49	268,64	813,75	731,92
2314	379,21	83,71	130,28	847,88	698,12	600,02	656,12	270,27	812,85	732,79
2315	377,36	83,48	130,07	845,35	694,43	592,74	654,97	271,90	812,63	737,51
2316	376,55	83,81	129,87	840,35	690,26	580,45	653,66	273,56	812,50	742,35
2317	374,28	83,65	129,45	834,65	684,75	570,06	653,71	275,23	813,08	745,95
2318	385,21	83,66	207,48	769,66	682,98	680,51	645,77	277,05	786,66	767,45
2319	384,11	83,85	219,48	697,12	629,84	629,10	587,22	279,22	749,84	722,35
2320	401,23	83,43	227,98	677,47	610,82	603,01	547,93	281,27	721,04	701,18
2321	415,06	83,33	235,23	686,21	617,83	592,48	525,22	282,89	699,48	691,28
2322	437,16	83,84	242,52	708,41	639,93	594,98	516,47	284,16	683,31	692,73
2323	407,34	83,84	204,26	791,44	688,77	589,98	500,12	285,13	697,31	675,50
2324	394,04	84,05	194,90	814,04	733,58	584,44	482,74	285,97	704,91	653,90
2325	384,23	84,16	190,65	806,51	741,91	579,32	465,57	286,80	701,56	637,97
2326	378,16	83,92	188,14	794,25	733,56	568,91	449,69	287,84	696,61	627,01

2327	374,27	83,94	186,28	782,12	722,93	560,84	434,65	288,93	693,37	620,42
2328	394,15	83,69	152,33	801,65	715,38	559,73	425,57	290,42	690,41	626,62
2329	415,18	83,38	143,41	854,84	749,06	552,96	419,39	292,05	681,46	623,86
2330	415,41	83,52	141,26	870,85	804,56	544,27	413,90	293,89	671,62	619,63
2331	415,04	83,59	139,67	881,92	835,40	534,06	409,37	295,74	660,71	611,21
2332	410,79	83,96	138,98	859,79	845,88	525,09	404,27	297,72	649,67	602,79
2333	403,51	83,51	137,18	834,86	833,52	515,40	400,12	299,71	638,66	595,22
2334	398,43	83,73	136,07	816,05	816,40	507,22	396,18	301,75	627,68	589,88
2335	395,70	83,75	135,38	802,99	806,15	498,49	392,20	303,78	617,30	585,60
2336	393,31	83,75	134,88	798,10	802,93	491,37	389,63	305,88	607,47	582,16
2337	393,34	83,53	134,32	797,43	805,71	484,93	386,30	307,84	598,21	577,70
2338	393,68	83,74	134,13	801,17	812,88	477,95	384,00	309,84	589,19	572,34
2339	396,35	83,86	134,32	806,67	823,80	470,72	381,88	311,81	581,91	571,22
2340	396,57	82,92	134,12	808,80	829,10	464,43	380,62	313,63	575,45	570,45
2341	398,96	84,08	134,21	829,83	841,37	459,35	378,70	315,51	569,90	566,17
2342	401,99	83,76	134,32	852,76	861,37	454,66	377,68	317,35	564,60	565,76
2343	404,72	83,65	134,72	899,97	879,25	450,59	377,57	319,09	564,14	565,06
2344	412,66	83,90	135,92	1007,93	905,69	446,92	377,59	320,73	564,76	564,94
2345	417,82	83,38	137,03	1062,02	934,78	444,91	378,11	322,33	565,60	563,69
2346	420,66	83,51	137,55	1060,94	948,01	441,98	378,84	323,88	566,61	563,23
2347	420,00	83,73	137,85	1053,66	949,28	441,62	379,76	325,32	567,93	560,98
2348	419,62	83,28	137,77	1047,00	946,13	441,66	381,48	326,70	570,60	560,11
2349	419,53	83,35	137,73	1038,18	943,46	442,16	383,91	327,95	574,79	558,56
2350	419,30	83,81	137,75	1027,08	939,47	443,45	385,29	329,17	579,45	558,13
2351	417,85	83,67	137,95	999,27	933,19	445,61	387,93	330,30	585,26	558,99
2352	415,91	83,55	137,58	983,63	922,34	448,05	391,15	331,33	591,34	558,14
2353	414,25	83,33	137,19	995,82	915,93	451,13	394,42	332,34	598,17	558,02
2354	414,73	83,24	137,37	1025,17	919,28	454,68	397,85	333,24	603,36	556,05
2355	417,63	83,04	137,95	1057,96	927,62	459,47	401,61	334,03	608,09	555,79
2356	419,90	82,92	138,46	1079,14	936,34	463,45	405,95	334,79	613,30	556,47
2357	423,27	83,17	139,28	1099,60	941,79	468,34	410,29	335,43	617,29	559,93
2358	425,10	82,67	139,63	1155,19	948,08	472,22	414,01	335,95	620,51	563,69
2359	432,94	82,59	141,17	1204,61	960,81	475,98	418,58	336,49	623,27	567,61
2360	438,17	83,45	141,98	1230,43	971,25	478,34	423,28	336,92	625,43	572,39
2361	440,08	83,21	142,62	1226,87	976,71	480,37	427,11	337,22	628,51	580,48
2362	436,69	83,00	142,08	1227,65	973,82	484,44	431,93	337,48	630,82	591,09
2363	435,06	82,97	141,97	1219,86	970,06	488,17	436,57	337,67	634,64	601,03
2364	433,29	83,11	142,05	1215,89	966,75	492,17	440,87	337,84	638,39	612,11
2365	432,69	83,19	141,95	1223,65	963,50	496,28	445,96	337,94	642,42	620,27
2366	431,59	83,49	141,60	1225,20	962,57	500,51	450,42	337,98	647,40	626,59
2367	428,71	82,90	141,19	1207,20	960,01	504,03	455,67	338,00	652,92	631,79
2368	428,89	82,90	140,66	1217,16	957,51	506,89	461,57	337,96	657,84	635,10
2369	429,02	83,08	141,18	1195,20	956,40	510,13	465,82	337,87	662,79	638,11
2370	426,96	83,39	141,20	1191,11	950,05	513,96	470,21	337,77	668,12	640,73
2371	424,48	83,29	140,52	1194,38	944,66	518,41	474,63	337,70	672,72	643,13
2372	425,33	82,74	140,44	1193,30	943,21	521,83	480,07	337,57	677,68	646,38
2373	426,82	83,00	140,30	1201,23	944,84	525,64	484,96	337,54	681,14	646,71
2374	429,51	82,50	140,51	1236,02	952,36	529,35	489,78	337,45	682,80	645,37
2375	433,56	82,17	140,97	1247,24	964,78	533,10	494,42	337,41	682,86	644,56
2376	435,38	82,58	141,25	1264,80	972,80	538,15	498,93	337,33	681,25	643,47
2377	436,51	82,84	141,17	1269,43	975,83	542,18	503,90	337,27	679,47	643,30
2378	436,56	82,48	141,17	1259,81	976,17	546,33	510,15	337,27	678,06	643,55
2379	436,00	82,76	141,20	1232,52	972,48	552,07	516,11	337,24	676,73	646,84

2380	433,20	82,63	141,00	1219,43	964,84	557,06	521,01	337,33	675,44	651,94
2381	431,68	82,22	140,59	1196,83	958,35	561,32	526,96	337,35	674,57	655,87
2382	429,17	82,59	140,56	1175,55	951,20	567,24	530,55	337,35	673,44	662,53
2383	428,44	82,76	140,47	1169,22	945,81	572,69	534,62	337,47	672,77	669,86
2384	426,48	82,75	140,06	1160,27	941,53	577,13	539,84	337,54	672,70	676,77
2385	425,06	83,25	139,53	1154,84	936,82	582,05	543,47	337,65	673,03	680,81
2386	425,70	82,65	139,70	1160,04	936,88	587,09	547,53	337,74	673,55	682,52
2387	424,86	82,88	139,24	1150,77	937,52	591,33	550,35	337,84	674,22	683,50
2388	425,10	81,92	138,91	1126,11	935,91	595,33	553,48	337,98	674,82	685,56
2389	423,33	81,71	138,46	1100,16	930,15	599,84	554,99	338,11	676,29	684,79
2390	421,07	81,66	137,64	1074,26	921,50	603,22	556,50	338,20	677,85	686,70
2391	420,71	81,03	137,67	1051,05	913,21	606,76	559,56	338,33	679,48	684,17
2392	418,98	81,44	137,39	1040,00	905,52	610,83	560,95	338,48	681,20	682,09
2393	417,12	81,07	137,20	1004,41	896,46	615,94	563,30	338,58	682,94	677,61
2394	413,39	81,25	136,58	969,37	877,02	621,61	566,73	338,77	684,14	675,37
2395	408,60	81,38	135,98	952,62	852,86	628,93	571,57	338,92	684,95	673,57
2396	407,09	80,16	135,50	953,84	837,78	635,72	576,31	339,17	685,29	670,09
2397	407,28	80,88	135,68	963,57	837,17	635,38	579,88	339,35	685,24	667,58
2398	406,79	81,08	135,45	963,30	841,12	630,02	583,83	339,57	685,39	666,76
2399	406,77	81,35	135,25	966,92	840,43	652,59	589,44	339,75	685,40	664,51
2400	407,26	80,89	135,54	971,85	843,71	661,16	591,42	339,95	684,56	659,73
2401	410,62	81,34	135,95	1006,82	850,49	670,97	593,11	340,23	685,01	654,24
2402	414,13	80,96	136,09	1029,31	866,22	681,02	592,22	340,51	686,33	650,23
2403	415,42	80,78	136,36	1025,80	877,72	688,15	592,81	340,79	688,50	645,53
2404	412,78	79,98	135,98	992,29	873,09	695,91	590,99	341,07	690,67	643,75
2405	407,18	81,06	135,26	960,15	850,27	703,10	590,13	341,37	691,60	642,84
2406	403,17	81,25	134,21	934,50	824,90	708,74	587,36	341,69	691,66	642,90
2407	399,86	81,33	133,84	921,71	806,03	713,93	585,90	341,98	690,31	643,52
2408	398,44	81,39	133,28	914,86	795,38	718,00	585,18	342,30	684,78	644,66
2409	396,04	81,81	132,94	907,00	789,83	720,81	586,46	342,63	680,82	644,11
2410	394,99	81,51	132,53	898,87	784,36	721,98	588,25	342,98	677,25	643,90
2411	392,73	80,96	131,78	886,56	778,11	723,83	588,40	343,38	674,11	644,96
2412	388,82	81,16	131,75	874,19	769,69	726,64	588,08	343,72	671,75	645,15
2413	387,23	81,14	131,22	866,54	761,28	730,70	591,01	344,15	669,99	643,98
2414	384,90	81,28	130,67	857,23	754,50	734,54	591,84	344,55	668,17	643,65
2415	382,49	81,51	130,26	850,13	747,77	737,70	594,24	344,98	666,51	644,33
2416	380,24	81,03	129,75	842,54	741,73	741,37	596,54	345,35	665,17	644,87
2417	379,08	81,40	129,31	837,68	736,05	744,37	597,57	345,70	664,72	643,52
2418	377,18	81,28	129,10	833,98	731,23	745,83	598,86	346,03	665,01	644,02
2419	375,70	81,40	128,75	830,54	726,84	746,58	601,56	346,41	665,34	643,09
2420	375,35	81,23	128,55	829,21	723,50	747,53	602,01	346,76	664,99	643,53
2421	374,88	81,49	128,29	828,73	722,05	747,31	604,17	347,08	665,22	642,75
2422	373,55	82,15	128,24	825,37	720,35	746,90	608,04	347,35	665,56	642,12
2423	372,03	81,58	127,62	819,05	716,73	745,55	609,66	347,67	665,52	641,12
2424	369,40	81,30	127,27	811,49	709,41	745,96	611,19	347,98	666,36	642,93
2425	366,02	82,26	126,64	804,56	700,33	745,87	612,50	348,31	667,29	642,22
2426	362,80	82,19	125,91	798,08	690,62	747,10	614,53	348,58	668,01	642,24
2427	362,04	81,40	125,54	794,64	682,73	746,30	613,68	348,84	666,86	641,35
2428	361,57	81,46	125,29	793,75	679,59	746,85	620,29	349,14	665,28	640,70
2429	360,57	82,11	124,97	790,51	679,03	745,71	628,64	349,37	663,13	641,06
2430	358,72	82,61	124,68	787,53	676,87	745,41	636,13	349,67	661,15	639,14
2431	356,68	82,31	124,19	782,49	673,19	744,66	642,57	349,85	658,61	639,91
2432	354,47	82,41	123,85	777,61	668,07	743,33	646,89	350,07	656,03	639,37

2433	352,24	82,23	123,37	774,60	661,74	741,58	650,19	350,27	653,15	638,92
2434	349,69	82,64	123,04	771,23	656,40	740,44	642,23	350,45	650,75	638,21
2435	348,20	82,94	122,39	772,35	650,31	734,51	637,59	350,57	647,77	634,59
2436	347,42	82,76	122,60	772,87	649,73	731,50	637,12	350,72	644,44	633,11
2437	346,47	83,35	122,75	772,01	650,45	728,26	638,03	350,89	640,97	630,28
2438	346,17	83,63	122,69	768,68	650,40	724,48	638,87	351,03	637,32	627,20
2439	345,93	84,48	122,22	766,67	647,88	722,15	643,16	351,11	633,67	625,64
2440	343,88	84,57	122,17	764,79	645,02	665,33	647,67	351,14	630,19	623,76
2441	343,65	83,01	122,20	763,97	643,05	717,57	650,33	351,24	626,94	622,12
2442	342,00	84,74	121,94	761,37	642,23	714,47	652,46	351,29	623,47	620,25
2443	342,15	83,25	122,02	760,66	641,43	712,84	654,27	351,23	620,52	618,69
2444	341,72	83,92	121,91	759,29	640,28	710,19	653,99	351,22	618,00	616,71
2445	342,63	83,92	122,08	761,20	640,60	707,98	653,26	351,13	615,33	614,15
2446	343,29	83,77	122,26	761,47	643,28	703,67	650,72	350,99	612,38	612,45
2447	342,44	84,73	122,35	760,47	645,05	702,66	649,95	350,85	609,70	611,49
2448	342,91	84,53	122,30	760,55	645,97	699,45	654,13	350,70	606,91	608,70
2449	342,30	84,28	122,11	759,59	646,47	644,52	658,14	350,42	604,07	606,77
2450	341,55	84,71	121,87	758,01	645,82	680,78	666,45	350,14	601,71	604,80
2451	341,71	84,15	122,06	761,79	645,26	658,64	675,73	349,79	598,93	601,34
2452	345,78	84,89	122,77	768,19	651,45	656,98	688,27	349,39	595,96	599,00
2453	348,16	84,91	123,08	768,57	661,29	686,27	695,98	348,95	593,05	595,81
2454	347,13	84,72	122,97	761,98	665,73	687,26	701,29	348,52	590,23	591,48
2455	345,23	84,19	122,66	754,42	663,93	695,86	702,97	347,93	587,69	588,01
2456	343,93	84,31	122,30	747,52	660,17	700,11	710,42	347,38	584,71	585,25
2457	340,84	84,58	122,02	739,82	655,13	699,27	717,19	346,81	581,38	582,57
2458	337,48	85,67	121,59	734,28	647,45	698,67	721,65	346,21	578,25	581,06
2459	335,65	85,17	121,20	731,09	640,97	698,89	723,47	345,59	575,03	577,36
2460	335,34	85,85	120,95	728,50	636,47	697,95	724,99	344,92	571,89	575,13
2461	333,61	85,80	120,82	725,50	634,06	695,88	724,52	344,25	569,04	572,22
2462	332,71	85,64	120,36	722,10	630,78	692,13	724,54	343,65	565,81	570,00
2463	332,11	85,43	120,35	715,78	627,83	657,78	720,84	343,00	563,06	568,43
2464	329,48	85,63	119,76	709,57	623,74	684,11	719,04	342,31	560,41	566,21
2465	328,31	85,58	119,61	705,77	618,42	660,54	715,45	341,72	557,86	564,81
2466	326,95	85,57	119,26	702,41	614,91	670,43	711,11	341,08	555,38	562,64
2467	326,34	85,62	119,11	698,84	612,34	646,78	704,93	340,41	553,07	560,93
2468	324,41	85,98	118,94	694,74	610,58	658,65	699,91	339,80	550,64	557,67
2469	323,86	85,85	118,64	691,34	607,87	647,94	693,28	339,14	548,34	555,81
2470	323,26	86,11	118,62	688,35	605,66	627,97	687,02	338,53	546,30	554,07
2471	322,52	85,88	118,43	685,81	603,99	623,53	682,10	337,91	544,62	551,83
2472	322,56	85,72	118,20	684,53	603,09	616,61	675,67	337,29	542,74	549,53
2473	321,78	85,49	118,30	681,88	602,08	670,10	667,67	336,55	541,01	547,97
2474	319,74	85,69	117,94	676,87	601,38	668,76	660,70	335,94	539,66	545,83
2475	318,44	85,66	117,67	672,91	597,71	666,74	654,32	335,30	538,36	544,00
2476	317,94	85,67	117,59	669,77	594,71	665,17	648,34	334,62	537,13	542,03
2477	317,50	85,56	117,29	667,87	593,05	663,37	642,41	333,90	535,60	540,49
2478	317,05	85,66	117,32	667,13	591,96	661,86	637,12	333,18	534,32	538,61
2479	144,86	75,10	101,99	134,58	128,26	129,55	93,72	74,26	91,54	87,15
2480	207,87	75,22	124,01	226,29	223,35	209,28	120,57	74,28	117,75	108,31
2481	235,21	75,33	124,76	327,50	356,76	277,67	170,90	74,34	162,69	152,66
2482	256,42	75,40	131,29	413,84	473,82	336,54	231,92	74,45	207,87	199,46
2483	276,06	75,55	137,48	492,06	553,10	411,32	298,04	74,56	257,70	246,11
2484	293,65	75,82	143,67	558,95	614,31	481,27	356,20	74,77	309,98	284,11
2485	296,59	75,87	140,46	595,08	646,88	525,14	405,93	75,05	355,84	324,65

2486	309,86	75,89	114,59	591,88	647,09	537,53	435,34	75,39	390,46	340,74
2487	290,67	75,96	108,22	568,20	633,23	528,32	447,26	75,76	416,95	349,94
2488	274,75	75,88	104,95	550,86	590,82	522,53	464,24	76,24	437,81	366,60
2489	314,42	76,03	115,16	561,89	563,72	531,04	494,80	76,81	465,82	407,06
2490	361,18	76,43	123,39	646,82	595,78	606,28	580,54	77,45	511,26	485,93
2491	345,93	76,73	134,52	701,96	658,44	652,00	633,72	78,13	552,02	537,13
2492	318,94	76,60	149,67	720,91	681,37	650,92	664,75	78,93	586,33	565,18
2493	323,21	76,66	154,31	745,94	674,30	662,36	684,38	79,83	615,78	577,76
2494	368,25	77,11	180,80	740,64	673,36	675,90	690,13	80,78	628,04	617,24
2495	333,66	77,51	192,12	633,59	615,22	625,24	671,78	81,93	609,26	578,29
2496	316,33	77,44	181,53	583,25	553,64	585,58	635,47	83,27	585,69	516,38
2497	308,90	77,69	179,55	557,06	516,67	563,00	590,96	84,70	560,96	472,89
2498	316,44	77,68	180,26	566,92	504,14	566,62	560,16	86,31	538,56	443,89
2499	364,47	77,74	193,58	671,16	555,67	586,16	541,86	88,03	523,98	432,25
2500	388,41	77,45	202,69	746,21	633,11	604,70	532,81	89,88	520,41	437,04
2501	413,37	77,67	212,00	833,88	700,12	632,76	529,15	91,87	528,07	442,40
2502	403,38	78,25	212,88	806,71	727,08	654,42	526,71	94,02	533,99	450,12
2503	417,09	78,27	216,86	822,97	725,77	684,33	529,53	96,30	544,07	477,88
2504	407,85	78,64	210,93	867,18	740,10	715,36	531,02	98,80	565,73	486,06
2505	396,55	78,61	193,21	860,86	767,44	732,87	577,19	101,47	602,42	498,53
2506	396,08	78,76	189,58	864,75	782,66	742,91	654,54	104,32	641,38	523,36
2507	399,32	79,24	189,82	881,56	791,74	744,46	708,45	107,34	677,98	546,61
2508	398,95	79,30	189,18	897,89	796,74	747,75	743,02	110,52	716,31	566,43
2509	406,33	79,82	183,06	918,59	801,34	751,96	765,52	113,79	748,70	585,01
2510	431,63	80,21	150,32	968,45	820,59	742,69	747,56	117,23	747,20	588,76
2511	423,51	79,64	143,90	928,27	848,67	725,44	709,46	120,74	742,64	582,75
2512	396,16	79,40	138,24	868,34	809,11	706,56	677,05	124,32	739,75	581,07
2513	381,49	79,45	134,13	838,27	752,43	691,10	652,05	127,88	737,09	580,68
2514	378,55	79,39	132,34	826,97	724,28	675,98	634,49	131,35	734,16	582,14
2515	378,86	79,13	131,48	819,49	718,35	663,95	621,45	134,79	732,79	585,83
2516	380,86	79,21	131,07	818,18	721,08	653,29	612,46	138,15	732,64	591,34
2517	379,66	79,30	130,80	813,28	726,06	645,20	605,27	141,40	731,42	594,21
2518	373,17	79,52	129,42	800,73	717,22	640,09	600,99	144,52	730,92	596,19
2519	369,07	79,45	128,28	791,56	700,68	637,55	597,71	147,58	731,85	599,43
2520	368,25	80,15	127,91	788,03	690,32	639,29	596,02	150,50	734,95	604,57
2521	369,03	79,69	127,61	787,64	687,23	641,88	594,22	153,29	738,41	608,57
2522	369,34	79,62	127,65	787,24	688,27	645,60	593,27	156,00	740,89	612,66
2523	369,64	79,90	127,23	789,67	689,97	653,61	591,06	158,52	744,27	616,46
2524	371,13	79,85	127,80	795,91	691,89	665,73	589,75	160,98	745,78	619,91
2525	374,14	79,77	128,33	802,95	696,30	675,62	590,23	163,26	749,39	627,97
2526	381,85	80,13	129,00	818,86	711,78	681,66	590,00	165,48	752,42	633,88
2527	384,20	80,01	129,68	827,31	731,83	687,40	590,60	167,57	756,94	640,44
2528	382,36	79,89	129,85	827,08	736,13	692,01	590,48	169,56	762,59	645,93
2529	384,35	79,96	130,01	828,76	735,00	695,30	591,73	171,38	767,79	651,39
2530	384,54	79,85	130,17	829,85	735,52	700,47	593,44	173,15	771,47	655,66
2531	385,78	80,00	130,18	832,00	734,42	706,90	595,97	174,81	775,28	659,31
2532	387,31	80,12	130,47	838,88	735,83	713,20	597,42	176,37	778,12	664,06
2533	389,95	80,15	130,98	851,39	741,46	720,13	599,45	177,89	780,18	668,72
2534	396,69	80,11	131,82	872,07	754,64	722,87	603,24	179,26	779,43	673,68
2535	404,00	80,21	132,67	900,60	779,72	728,32	607,05	180,57	778,41	675,61
2536	409,66	80,30	134,09	928,06	810,05	730,43	612,84	181,84	779,28	677,38
2537	414,63	80,49	134,69	946,40	832,04	733,64	617,77	182,98	778,62	679,78
2538	415,73	80,38	135,12	952,05	843,68	735,07	622,25	184,09	779,64	680,67

2539	417,42	80,63	135,66	960,90	849,16	740,37	627,99	185,15	780,67	681,48
2540	417,87	80,94	135,76	959,23	853,15	742,97	634,80	186,15	782,51	683,05
2541	400,16	81,01	143,83	955,34	851,54	748,39	640,11	187,09	783,60	678,03
2542	389,58	81,39	174,22	965,92	838,40	782,42	682,96	187,96	799,74	690,95
2543	420,55	81,09	187,29	1009,71	855,80	814,18	745,17	188,70	818,57	714,73
2544	433,29	80,87	193,72	1032,09	885,33	831,94	792,03	189,50	837,10	739,58
2545	435,58	81,13	196,11	1040,22	891,96	848,66	825,91	190,32	855,56	756,99
2546	434,45	81,37	197,53	1045,90	886,61	864,20	850,31	191,13	873,21	772,42
2547	461,12	81,61	162,89	1113,66	873,43	866,48	858,52	192,00	878,72	792,57
2548	457,01	81,21	151,82	1135,99	878,85	853,82	852,21	192,99	873,46	790,79
2549	449,60	81,74	147,53	1110,78	891,66	845,95	844,00	194,04	866,79	788,53
2550	442,58	82,32	144,99	1072,26	889,13	837,50	837,34	195,14	860,40	785,38
2551	432,28	81,82	142,93	1028,58	868,34	829,32	828,72	196,27	853,66	784,89
2552	424,09	81,85	141,10	999,90	839,18	824,83	822,63	197,44	848,31	787,05
2553	415,98	81,43	139,64	975,00	811,35	824,65	818,88	198,66	842,71	787,93
2554	411,67	81,73	138,62	963,48	787,18	826,40	816,22	199,86	837,52	792,21
2555	411,09	81,72	137,73	960,15	777,40	826,44	816,24	201,15	832,92	795,82
2556	408,82	81,39	137,29	954,41	774,59	826,74	817,24	202,40	829,02	794,68
2557	403,19	81,92	136,52	938,01	766,78	827,13	818,56	203,66	824,99	792,24
2558	396,47	81,98	134,95	918,42	750,89	828,36	818,39	204,94	821,94	791,88
2559	390,63	82,12	133,83	905,11	731,64	827,27	815,91	206,15	818,59	788,33
2560	385,73	82,26	132,87	891,49	715,89	820,91	815,23	207,42	816,47	785,04
2561	383,39	82,08	132,07	879,39	702,56	814,25	811,30	208,66	815,11	782,20
2562	382,17	81,93	131,74	875,21	693,45	745,03	804,39	209,93	813,68	781,36
2563	380,85	82,43	131,30	874,32	688,99	712,84	793,51	211,20	810,64	782,24
2564	380,38	82,52	131,15	873,89	686,59	751,56	778,69	212,45	809,34	783,40
2565	380,20	82,49	131,28	874,96	685,74	682,24	766,96	213,68	807,20	788,22
2566	381,10	83,48	131,14	878,41	687,19	703,43	756,57	214,93	807,34	795,42
2567	382,11	83,04	131,16	877,59	689,80	772,75	746,00	216,22	810,63	797,17
2568	381,98	82,73	131,23	872,83	690,33	776,99	736,99	217,48	816,37	796,72
2569	381,38	82,95	130,94	866,50	688,94	766,50	728,53	218,77	818,02	795,57
2570	379,06	82,38	130,53	857,26	684,97	693,16	719,95	220,10	816,74	793,39
2571	377,43	82,46	130,28	848,70	679,70	736,93	712,19	221,38	818,44	794,59
2572	375,01	82,09	129,78	841,43	674,26	754,16	707,29	222,69	817,59	795,37
2573	373,48	82,51	129,54	834,08	669,42	708,86	702,75	224,01	813,17	789,76
2574	372,23	82,44	129,29	828,41	665,53	687,14	698,93	225,37	808,10	782,29
2575	370,50	82,71	128,63	823,26	663,02	679,74	694,78	226,76	803,16	779,54
2576	368,41	82,72	128,44	818,31	660,47	658,94	692,10	228,16	797,88	776,45
2577	367,45	83,21	128,21	814,36	658,40	658,45	688,52	229,57	792,82	773,10
2578	365,80	83,57	193,47	737,48	657,88	708,00	664,05	231,04	762,12	747,74
2579	361,15	83,58	186,41	730,28	614,70	645,91	597,24	232,59	739,85	642,52
2580	371,82	83,03	180,44	788,50	645,40	614,64	548,31	234,15	739,34	577,12
2581	381,60	83,10	182,56	829,59	692,30	606,59	513,90	235,78	740,12	540,24
2582	380,68	83,14	183,10	836,18	717,52	604,39	486,38	237,40	736,86	521,95
2583	377,82	82,84	182,72	832,07	724,13	605,82	462,53	239,07	733,90	511,61
2584	393,11	82,50	166,41	823,27	720,60	609,66	445,42	240,80	730,48	509,26
2585	406,69	82,74	144,93	824,06	713,23	604,03	433,46	242,67	724,32	511,80
2586	408,62	82,57	140,64	840,08	732,37	591,32	423,68	244,52	717,00	508,97
2587	406,40	82,32	138,73	839,11	757,98	577,65	415,78	246,47	708,41	503,13
2588	401,87	82,33	136,99	827,85	768,46	564,93	409,88	248,43	699,18	497,99
2589	398,38	82,78	135,89	816,72	767,02	486,25	405,05	250,44	690,00	492,73
2590	393,58	82,40	135,08	805,22	760,54	476,28	401,74	252,43	680,92	484,46
2591	393,29	82,49	134,11	799,74	756,51	466,50	399,02	254,37	671,02	480,00

2592	394,40	81,82	133,59	801,97	760,20	461,00	395,45	256,33	662,51	475,02
2593	395,16	82,00	133,71	799,61	768,04	444,57	394,36	258,21	654,10	466,16
2594	393,12	81,71	133,51	796,05	772,02	437,47	392,40	260,08	646,20	458,84
2595	393,89	81,84	133,04	800,43	774,93	428,88	389,87	261,90	635,85	452,96
2596	396,49	81,72	132,90	820,88	788,04	425,54	388,92	263,61	623,16	446,83
2597	401,42	81,67	133,68	836,21	812,10	417,72	388,02	265,27	610,99	439,90
2598	401,94	81,76	133,82	839,82	827,75	412,41	386,23	266,86	600,36	432,85
2599	401,02	81,71	133,60	838,67	833,06	407,22	385,76	268,42	590,62	427,07
2600	399,85	81,76	133,57	838,23	834,87	402,17	384,37	269,92	581,82	421,75
2601	400,71	81,90	133,64	835,64	836,35	398,74	384,41	271,33	574,59	417,73
2602	402,43	80,72	133,76	853,21	842,07	396,04	384,11	272,68	568,60	416,53
2603	405,78	80,92	134,28	867,40	859,58	393,31	384,68	274,03	562,82	421,59
2604	405,12	81,34	134,34	873,21	871,87	390,56	384,72	275,27	558,03	429,98
2605	405,19	81,24	134,26	858,87	871,56	386,39	384,35	276,49	553,26	433,18
2606	399,18	80,86	133,65	835,23	856,18	384,01	384,16	277,65	548,98	434,36
2607	394,95	80,93	132,86	822,34	837,51	381,21	385,19	278,84	545,22	435,75
2608	398,38	82,78	135,89	816,72	767,02	486,25	405,05	250,44	690,00	492,73
2609	393,58	82,40	135,08	805,22	760,54	476,28	401,74	252,43	680,92	484,46
2610	393,29	82,49	134,11	799,74	756,51	466,50	399,02	254,37	671,02	480,00
2611	394,40	81,82	133,59	801,97	760,20	461,00	395,45	256,33	662,51	475,02
2612	395,16	82,00	133,71	799,61	768,04	444,57	394,36	258,21	654,10	466,16
2613	393,12	81,71	133,51	796,05	772,02	437,47	392,40	260,08	646,20	458,84
2614	393,89	81,84	133,04	800,43	774,93	428,88	389,87	261,90	635,85	452,96
2615	396,49	81,72	132,90	820,88	788,04	425,54	388,92	263,61	623,16	446,83
2616	401,42	81,67	133,68	836,21	812,10	417,72	388,02	265,27	610,99	439,90
2617	401,94	81,76	133,82	839,82	827,75	412,41	386,23	266,86	600,36	432,85
2618	401,02	81,71	133,60	838,67	833,06	407,22	385,76	268,42	590,62	427,07
2619	399,85	81,76	133,57	838,23	834,87	402,17	384,37	269,92	581,82	421,75
2620	400,71	81,90	133,64	835,64	836,35	398,74	384,41	271,33	574,59	417,73
2621	402,43	80,72	133,76	853,21	842,07	396,04	384,11	272,68	568,60	416,53
2622	405,78	80,92	134,28	867,40	859,58	393,31	384,68	274,03	562,82	421,59
2623	405,12	81,34	134,34	873,21	871,87	390,56	384,72	275,27	558,03	429,98
2624	405,19	81,24	134,26	858,87	871,56	386,39	384,35	276,49	553,26	433,18
2625	399,18	80,86	133,65	835,23	856,18	384,01	384,16	277,65	548,98	434,36
2626	394,95	80,93	132,86	822,34	837,51	381,21	385,19	278,84	545,22	435,75
2627	438,09	81,24	140,63	1225,35	964,45	585,77	427,12	292,65	564,01	536,61
2628	432,95	81,24	140,54	1192,43	951,29	587,33	436,07	293,08	568,29	546,03
2629	426,50	81,00	139,46	1182,05	933,81	592,03	441,95	293,44	573,09	551,93
2630	428,76	81,57	139,45	1186,42	930,48	561,12	447,83	293,80	577,52	556,47
2631	429,94	81,42	139,83	1178,43	930,96	526,50	454,53	294,15	581,61	562,82
2632	428,88	81,36	140,12	1165,09	925,30	583,37	463,92	294,43	585,28	567,96
2633	428,24	82,09	140,00	1165,80	917,07	605,14	471,74	294,72	589,03	567,98
2634	426,87	81,33	139,50	1179,33	916,22	561,36	478,24	294,96	592,22	568,83
2635	428,88	81,15	139,47	1187,31	923,83	574,73	484,62	295,21	595,38	574,65
2636	429,54	81,53	139,55	1187,55	929,71	627,66	490,35	295,41	598,77	577,44
2637	430,57	81,41	139,76	1192,63	935,34	653,47	496,36	295,57	601,80	582,72
2638	431,24	81,92	139,86	1197,28	938,85	626,07	503,16	295,72	605,04	587,18
2639	430,66	81,67	139,34	1190,91	940,27	670,08	510,06	295,90	608,60	588,47
2640	431,25	82,30	139,36	1186,21	941,69	690,33	516,21	296,06	611,71	589,01
2641	431,72	81,82	139,29	1183,19	945,99	684,16	522,31	296,25	613,75	590,00
2642	432,23	81,90	139,39	1165,55	950,28	698,02	528,48	296,43	615,04	590,13
2643	433,45	82,85	139,25	1142,71	949,61	707,17	534,52	296,56	616,07	590,70
2644	433,15	82,31	139,31	1115,99	947,70	703,90	541,45	296,73	617,11	590,26

2645	432,95	82,08	139,50	1084,86	938,45	705,13	548,47	296,89	618,60	591,54
2646	430,90	82,55	139,06	1082,66	927,38	702,48	555,69	297,04	620,42	594,57
2647	430,72	82,63	139,04	1085,64	923,69	698,33	562,90	297,25	622,47	597,47
2648	430,08	82,39	138,96	1071,92	921,38	696,73	569,19	297,41	625,62	602,63
2649	429,09	82,14	139,07	1055,20	913,41	697,30	576,64	297,66	629,05	608,12
2650	427,09	82,81	138,96	1045,54	903,72	699,20	583,59	297,84	632,75	612,98
2651	425,84	82,45	138,85	1019,24	895,95	715,14	589,06	298,07	638,64	630,91
2652	420,59	82,16	138,45	969,60	878,06	724,54	594,45	298,29	646,29	648,61
2653	409,29	82,55	137,05	924,72	841,64	731,90	598,58	298,53	655,35	662,46
2654	401,65	82,42	135,65	901,92	802,56	736,41	603,14	298,76	662,75	668,61
2655	401,71	82,57	134,70	909,95	784,91	738,11	607,19	299,00	664,53	668,03
2656	409,09	83,01	135,13	929,39	800,22	738,06	611,68	299,27	664,85	667,10
2657	410,55	83,20	135,49	926,03	818,45	739,67	617,39	299,53	664,72	666,90
2658	407,32	82,72	134,96	914,86	817,31	741,50	624,37	299,86	665,46	666,32
2659	404,44	82,56	135,13	901,75	807,28	743,90	632,01	300,17	667,68	666,45
2660	399,15	82,63	134,12	889,40	791,92	747,06	637,25	300,49	668,99	668,07
2661	400,36	82,66	133,79	893,59	782,68	749,45	642,22	300,87	667,94	668,96
2662	399,62	83,01	133,89	890,61	783,94	752,41	644,76	301,23	667,13	668,54
2663	398,34	83,11	133,49	887,03	782,08	753,64	648,62	301,75	666,23	671,11
2664	395,98	82,70	133,20	880,06	777,22	755,19	649,54	302,17	665,78	672,74
2665	392,19	82,78	132,88	861,81	767,56	758,94	642,34	302,64	667,83	679,32
2666	385,62	82,63	131,95	847,84	747,87	762,23	641,20	303,18	670,34	687,63
2667	384,79	83,32	131,32	847,25	733,77	764,03	639,76	303,68	671,13	692,60
2668	387,37	83,63	131,56	854,96	733,54	763,64	640,77	304,22	671,43	694,89
2669	388,23	83,41	131,68	850,97	739,67	763,97	642,09	304,76	672,21	698,83
2670	383,05	83,80	130,93	840,98	735,93	763,30	642,39	305,37	673,57	704,08
2671	381,31	83,40	130,60	834,47	726,35	764,14	644,29	305,93	675,35	709,06
2672	381,09	83,65	130,39	831,32	719,13	762,87	643,10	306,54	677,27	714,54
2673	380,96	83,59	130,50	835,89	715,84	759,11	642,09	307,16	678,92	717,55
2674	384,81	83,46	130,69	841,38	720,67	754,18	642,73	307,74	680,53	718,77
2675	386,42	83,80	130,74	844,18	728,49	750,17	644,45	308,37	681,62	719,17
2676	386,52	83,68	130,94	844,02	731,84	748,72	646,75	309,01	682,31	720,21
2677	388,04	84,03	131,05	849,26	734,25	746,38	649,04	309,62	682,74	715,81
2678	390,35	84,25	130,97	852,41	740,08	745,82	650,50	310,26	683,01	711,85
2679	390,56	83,44	131,58	851,58	743,87	745,41	652,94	310,92	682,56	711,03
2680	389,20	84,11	131,17	849,33	744,05	744,76	654,94	311,57	682,67	708,26
2681	388,80	83,61	131,19	850,53	742,56	743,52	657,34	312,22	683,04	707,07
2682	386,89	83,53	131,10	844,82	739,59	741,53	658,63	312,89	684,07	710,32
2683	384,03	83,62	130,52	838,76	730,25	727,74	660,49	313,53	684,47	713,84
2684	384,43	83,41	130,27	838,34	723,19	706,00	661,52	314,09	684,91	712,85
2685	384,88	83,76	130,20	837,01	723,90	703,30	662,95	314,70	685,44	710,65
2686	384,58	83,49	130,08	835,94	723,89	704,08	662,68	315,30	684,65	709,32
2687	385,62	83,62	130,08	836,87	723,95	702,88	664,32	315,82	683,89	708,25
2688	382,42	83,58	129,74	828,48	723,92	703,20	664,73	316,45	683,87	708,89
2689	381,15	83,58	129,58	822,62	718,25	703,67	665,03	316,98	683,80	708,32
2690	379,50	83,74	129,31	815,00	711,25	706,02	666,08	317,49	684,56	708,06
2691	377,00	83,08	128,72	810,39	704,33	723,46	666,51	318,00	685,55	707,86
2692	375,95	83,56	128,53	808,71	699,51	731,52	667,22	318,46	686,36	708,50
2693	372,64	83,37	128,04	804,01	694,02	732,79	668,23	318,85	689,24	710,07
2694	371,53	83,71	127,61	799,63	685,20	751,25	671,02	319,30	691,77	711,62
2695	370,96	83,43	127,58	801,31	679,88	747,19	673,96	319,65	694,05	711,72
2696	371,37	83,48	127,37	800,84	678,91	744,15	674,85	319,99	697,13	712,67
2697	370,86	83,44	127,52	801,13	678,04	740,66	674,88	320,27	699,71	710,91

2698	370,75	83,71	127,53	800,80	676,87	732,79	672,85	320,54	702,18	709,18
2699	369,48	83,52	127,35	799,90	674,64	732,76	671,25	320,75	705,70	710,32
2700	367,52	83,25	127,21	796,63	669,33	732,72	671,84	320,95	710,11	711,37
2701	365,75	83,25	126,74	796,33	662,59	729,94	675,14	321,14	716,29	713,03
2702	366,48	83,80	126,59	798,14	658,31	712,70	695,54	321,22	723,50	711,19
2703	367,59	83,17	126,26	810,18	658,58	711,48	713,15	321,31	731,65	709,95
2704	373,69	83,69	127,18	827,14	669,19	683,87	726,89	321,40	734,29	708,33
2705	381,56	83,72	128,29	838,19	691,50	697,89	736,90	321,43	732,30	704,77
2706	381,99	82,79	128,41	834,67	709,49	665,44	745,91	321,37	725,82	702,40
2707	377,81	83,12	128,11	826,30	710,66	627,72	753,15	321,34	719,52	702,92
2708	374,24	83,32	127,52	820,40	703,00	650,00	756,19	321,24	712,00	703,79
2709	373,71	83,27	127,15	820,28	696,68	633,26	756,81	321,13	704,78	703,66
2710	372,60	83,04	127,22	819,28	694,45	627,04	761,06	320,94	697,81	701,82
2711	369,19	83,86	126,66	813,30	691,21	626,93	765,97	320,77	691,11	701,22
2712	368,26	83,29	126,40	812,16	686,03	626,62	769,94	320,54	685,21	701,08
2713	368,74	83,35	126,43	814,15	683,78	622,95	776,43	320,34	679,24	701,62
2714	368,53	83,84	126,16	813,81	684,38	654,51	772,17	320,08	673,37	696,79
2715	368,62	83,81	126,11	815,60	685,55	634,05	773,90	319,76	667,62	694,27
2716	367,03	83,59	125,93	812,29	686,05	689,39	779,20	319,49	661,80	689,19
2717	363,87	83,99	125,72	805,36	683,40	667,04	772,76	319,16	656,08	682,53
2718	361,18	83,98	125,42	797,84	677,70	678,92	765,32	318,81	650,10	675,92
2719	359,36	83,90	124,92	791,05	670,79	617,97	757,48	318,50	644,36	670,43
2720	356,68	84,16	124,59	786,17	664,78	607,83	747,32	318,15	638,67	665,62
2721	355,70	84,48	124,16	782,40	661,19	602,25	739,34	317,83	632,90	660,96
2722	354,64	84,14	124,22	777,89	659,07	597,47	731,91	317,60	627,49	656,05
2723	353,63	85,14	124,34	771,55	656,78	589,06	725,67	317,35	622,02	651,63
2724	352,48	85,15	124,31	765,83	653,69	584,22	718,93	317,04	616,70	646,71
2725	351,59	85,19	124,24	760,33	650,80	575,62	712,68	316,82	611,77	642,54
2726	350,40	85,57	124,11	756,86	647,90	571,14	706,41	316,64	606,76	638,02
2727	349,39	85,78	124,00	752,75	646,18	567,63	700,88	316,48	602,04	634,82
2728	348,55	85,64	124,00	748,35	644,64	563,88	697,09	316,32	597,49	632,04
2729	347,10	85,49	123,96	745,71	642,61	560,63	693,15	316,16	593,29	628,77
2730	346,31	85,55	123,68	743,42	641,50	557,19	688,35	315,98	589,20	625,38
2731	344,93	85,60	123,64	740,61	641,15	553,61	684,01	315,79	585,27	623,58
2732	345,69	86,00	123,62	738,52	640,73	553,24	678,74	315,61	581,63	619,62
2733	89,87	78,10	85,54	88,80	83,39	99,47	86,22	74,85	77,22	81,05
2734	111,87	78,00	94,17	114,65	103,56	112,66	118,07	74,91	80,74	94,22
2735	202,17	78,16	125,33	216,27	170,23	183,53	172,23	74,94	96,57	139,62
2736	262,90	78,17	133,33	378,05	325,74	242,66	217,91	74,94	154,21	172,34
2737	314,72	78,51	147,96	521,65	560,05	292,95	252,52	75,02	218,24	211,66
2738	344,23	78,59	158,18	628,24	712,32	374,12	288,64	75,12	272,21	250,34
2739	357,51	78,70	164,50	702,29	786,22	432,09	320,99	75,24	325,79	285,78
2740	362,97	78,96	168,24	745,80	818,92	490,58	357,92	75,41	383,44	328,45
2741	374,57	79,35	181,01	750,17	792,77	567,24	455,28	75,68	446,61	424,34
2742	338,61	79,18	168,00	722,95	733,02	593,71	520,73	75,94	494,33	474,82
2743	330,36	79,52	165,04	715,62	687,45	617,27	584,37	76,36	537,46	524,29
2744	327,50	79,55	163,87	716,03	665,74	636,71	652,26	76,82	568,64	565,06
2745	329,16	79,56	163,91	723,64	654,74	658,74	690,91	77,47	595,49	603,20
2746	336,21	80,14	194,76	644,63	630,72	623,27	664,72	78,18	589,41	608,61
2747	283,98	79,97	181,17	544,89	535,55	570,91	597,95	79,05	567,29	562,18
2748	263,23	79,99	173,09	487,20	458,11	529,99	544,58	80,02	540,24	523,48
2749	264,09	80,37	171,71	465,97	416,72	500,78	502,10	81,19	514,25	493,66
2750	287,19	80,17	176,88	479,22	408,61	491,98	474,98	82,49	492,47	473,98

2751	327,39	80,40	188,94	534,70	449,86	515,46	466,75	83,92	480,29	473,11
2752	391,10	80,16	206,74	664,93	541,53	548,56	474,57	85,50	483,81	493,94
2753	440,33	81,12	223,01	840,81	676,75	590,38	496,62	87,22	503,93	538,35
2754	463,87	81,24	233,30	927,93	791,60	644,73	518,97	89,04	531,71	594,50
2755	476,08	81,50	240,00	971,99	841,21	701,10	548,01	91,02	564,09	651,73
2756	446,83	81,55	221,53	986,65	848,86	740,26	567,07	93,14	605,01	665,49
2757	420,42	81,65	204,27	951,05	844,41	756,53	619,10	95,39	649,50	664,12
2758	409,09	81,79	198,68	934,65	818,34	773,83	674,05	97,77	685,49	673,91
2759	407,26	82,13	196,29	942,51	807,52	782,07	722,28	100,27	718,11	682,29
2760	409,36	82,68	195,91	953,17	809,81	793,69	757,52	102,86	747,20	692,22
2761	432,19	82,52	174,66	978,12	814,19	803,49	773,75	105,53	770,23	706,20
2762	443,81	82,89	154,17	1027,17	834,87	777,16	746,10	108,30	774,26	693,50
2763	429,26	82,64	148,34	950,02	846,25	748,37	704,13	111,11	774,67	681,85
2764	410,42	83,50	143,47	898,97	804,07	721,17	674,74	113,96	771,79	672,23
2765	399,08	82,69	140,37	872,29	764,41	698,91	653,78	116,87	765,52	666,10
2766	395,59	83,23	138,65	864,02	745,45	677,74	638,87	119,78	757,17	658,13
2767	393,86	83,32	137,56	861,51	743,64	659,60	628,74	122,73	748,29	651,42
2768	392,88	83,66	136,99	856,49	746,78	644,14	620,63	125,68	738,79	644,59
2769	390,28	83,97	136,39	845,11	747,55	632,64	614,28	128,68	731,10	638,00
2770	386,15	83,88	135,33	833,38	740,76	623,57	611,77	131,65	724,87	636,23
2771	382,57	84,16	134,72	823,10	730,87	616,12	609,72	134,52	718,54	635,15
2772	380,52	84,16	134,09	816,97	722,19	606,02	607,87	137,37	710,61	633,07
2773	379,84	84,04	133,62	815,19	717,65	588,03	606,14	140,19	703,13	631,85
2774	377,96	83,40	133,34	812,90	714,54	577,70	606,07	142,91	696,82	630,05
2775	377,62	83,32	133,15	812,21	711,62	583,41	606,52	145,56	691,38	627,54
2776	375,30	82,76	132,54	809,11	709,28	619,11	608,37	148,12	688,03	626,64
2777	372,36	84,07	132,01	803,33	703,46	620,54	609,53	150,62	687,44	625,67
2778	368,31	83,93	131,58	796,83	691,56	608,36	610,91	152,96	689,03	628,28
2779	362,46	83,35	130,05	792,44	675,74	603,19	614,56	155,29	691,39	630,34
2780	360,33	83,80	130,03	792,47	662,59	651,84	618,24	157,45	698,36	637,39
2781	362,78	84,08	130,19	799,43	657,82	636,37	622,24	159,55	707,69	644,07
2782	366,44	83,48	130,48	808,10	661,85	673,56	628,06	161,54	717,32	651,21
2783	369,75	83,98	130,87	816,30	669,86	685,76	632,18	163,47	724,03	661,56
2784	373,48	83,80	131,42	830,40	679,22	696,10	636,76	165,25	729,94	666,54
2785	353,29	83,07	156,11	850,29	699,17	703,67	634,80	166,94	733,40	667,14
2786	374,69	83,47	174,42	919,54	725,89	754,70	666,26	168,48	753,16	704,69
2787	420,03	83,11	188,80	1027,72	808,35	797,91	734,85	169,99	775,93	739,66
2788	436,86	84,30	196,22	1060,95	877,98	829,42	784,80	171,44	800,15	767,45
2789	442,20	85,03	200,23	1077,24	897,78	856,83	822,64	172,84	824,26	788,99
2790	463,84	85,08	178,66	1107,02	895,59	875,98	850,66	174,24	842,25	809,97
2791	461,16	85,58	158,28	1185,63	881,94	859,02	847,84	175,63	843,30	798,52
2792	455,88	85,32	152,86	1276,05	888,20	847,30	853,88	177,02	840,84	783,85
2793	452,42	85,83	150,68	1292,39	902,10	837,25	856,16	178,38	837,01	772,90
2794	451,05	85,02	149,20	1287,95	910,60	827,92	861,53	179,79	833,00	764,05
2795	448,48	85,37	148,20	1268,99	912,70	824,36	864,34	181,14	829,22	757,29
2796	446,05	85,95	147,40	1234,11	909,96	823,08	865,28	182,53	826,42	752,69
2797	442,05	84,59	146,31	1176,72	900,02	819,60	869,37	183,90	824,76	752,92
2798	433,97	85,56	144,85	1095,12	875,35	816,16	875,79	185,20	823,21	753,58
2799	419,77	85,74	142,83	1023,42	831,04	816,07	882,64	186,57	820,39	760,58
2800	409,75	85,57	140,96	995,72	785,12	810,33	889,99	187,88	816,59	771,67
2801	403,12	85,38	139,43	966,14	756,04	804,42	878,30	189,15	814,13	778,02
2802	394,33	85,35	137,74	936,10	732,38	797,75	857,57	190,47	812,67	782,67
2803	388,89	85,62	136,54	920,39	711,08	798,99	838,76	191,74	810,18	783,40

2804	385,60	85,57	135,71	908,03	697,19	801,32	822,84	192,96	804,67	780,92
2805	383,68	86,14	135,24	900,53	689,25	800,14	810,10	194,20	801,67	778,37
2806	383,43	86,45	134,71	895,39	685,01	799,34	801,86	195,41	800,12	778,40
2807	382,99	86,01	134,49	893,88	683,60	797,13	793,80	196,58	799,88	778,32
2808	383,20	85,46	134,29	893,58	684,32	794,09	786,88	197,77	800,30	777,18
2809	383,29	86,00	134,25	893,58	686,08	792,76	779,82	198,96	799,91	776,79
2810	385,42	85,99	134,25	898,04	688,56	790,16	773,24	200,19	800,96	776,12
2811	388,31	85,50	134,51	913,78	695,06	785,49	769,32	201,36	803,82	774,24
2812	391,53	86,17	134,93	922,68	706,45	782,20	762,87	202,58	807,50	771,67
2813	392,04	85,99	135,09	925,24	715,09	778,61	757,28	203,73	811,44	769,64
2814	391,76	86,03	135,11	922,94	717,34	776,29	750,83	204,94	815,42	765,43
2815	391,96	85,88	135,11	921,21	716,04	774,52	746,48	206,09	817,22	762,05
2816	392,90	86,03	135,30	920,49	714,86	772,20	739,41	207,34	818,25	759,12
2817	392,77	86,11	135,57	919,14	714,61	767,78	733,60	208,56	819,32	759,20
2818	394,12	86,33	135,64	918,33	714,14	767,12	729,98	209,82	820,30	756,76
2819	390,27	86,63	135,30	905,58	710,85	760,61	726,16	211,03	819,79	755,89
2820	386,84	86,87	134,38	889,31	701,71	763,29	723,55	212,28	816,74	754,19
2821	383,15	86,42	133,68	876,79	690,94	761,66	721,64	213,58	811,32	752,38
2822	381,39	86,30	200,19	756,07	682,13	738,37	690,78	214,88	780,23	731,71
2823	372,64	86,54	199,20	720,27	628,73	668,16	620,86	216,20	750,76	667,53
2824	376,39	86,74	184,82	791,03	639,36	648,76	572,38	217,45	742,83	628,70
2825	385,79	86,80	185,85	836,69	685,95	652,16	538,87	218,81	744,17	614,23
2826	390,16	86,10	187,23	857,01	719,48	650,44	515,33	220,23	748,72	603,13
2827	393,25	86,70	188,16	870,39	736,23	652,50	503,54	221,69	757,61	600,63
2828	404,85	87,42	174,01	871,94	741,98	654,19	493,38	223,19	769,95	618,04
2829	411,59	86,62	148,97	875,17	730,67	621,53	479,64	224,83	759,01	614,96
2830	403,62	87,15	143,27	875,29	730,15	625,85	465,96	226,48	740,89	600,58
2831	396,21	86,47	140,17	865,49	734,59	618,34	452,71	228,17	722,53	585,18
2832	387,87	87,05	137,85	842,82	732,94	525,59	441,39	229,83	704,65	570,43
2833	379,21	87,10	135,79	820,58	721,02	527,93	431,22	231,51	686,81	557,33
2834	372,08	86,62	134,04	800,67	707,04	519,10	421,69	233,24	669,63	544,25
2835	367,32	86,98	132,80	780,51	694,09	557,50	413,65	234,92	652,93	530,52
2836	361,92	86,68	131,47	762,83	681,47	545,30	405,98	236,64	636,65	516,16
2837	357,58	85,93	130,57	748,45	670,98	533,10	399,32	238,26	621,14	503,38
2838	354,36	86,14	129,64	735,46	662,76	522,28	393,26	239,88	606,66	490,73
2839	351,27	86,05	128,86	724,02	656,82	511,99	387,92	241,50	593,00	480,10
2840	348,69	86,12	128,21	716,32	652,53	502,32	381,43	243,05	580,11	471,11
2841	348,01	86,28	127,86	707,20	649,47	494,75	377,34	244,54	567,96	461,71
2842	345,50	86,60	127,22	695,71	647,44	487,07	371,76	246,05	556,49	455,30
2843	343,27	86,09	126,86	685,59	644,60	480,82	367,39	247,40	545,60	447,43
2844	341,68	86,09	126,48	676,54	641,85	474,17	363,68	248,77	535,44	440,00
2845	340,73	86,49	126,07	671,29	640,13	469,05	360,42	250,10	525,93	433,83
2846	340,91	86,26	125,92	667,23	640,79	463,92	356,55	251,37	517,01	428,31
2847	339,68	86,46	125,56	662,96	642,43	458,56	352,96	252,63	508,72	423,83
2848	340,21	86,53	125,49	659,88	644,28	454,05	349,78	253,77	500,69	419,41
2849	339,71	86,25	125,08	655,33	646,44	449,70	346,76	254,91	493,55	414,16
2850	339,01	86,11	124,96	650,39	647,70	445,23	344,66	255,97	486,52	409,60
2851	338,94	85,88	124,41	650,31	649,10	441,60	342,03	256,97	479,80	406,46
2852	339,74	86,40	124,62	652,77	652,56	437,82	339,99	257,96	473,54	402,30
2853	340,33	86,47	124,76	653,68	657,87	433,79	337,48	258,90	467,69	398,86
2854	340,98	85,79	124,88	651,64	662,66	429,74	334,94	259,73	462,22	397,55
2855	340,95	86,40	125,05	648,70	666,18	426,62	334,31	260,57	457,27	393,64
2856	340,84	86,02	125,04	642,15	668,52	423,32	333,28	261,36	452,58	391,75

2857	339,42	85,92	124,66	635,45	668,27	419,76	331,46	262,11	448,26	389,58
2858	337,08	86,09	124,42	626,36	665,04	417,48	330,50	262,83	444,38	386,96
2859	334,16	86,09	123,79	618,74	659,39	414,58	329,74	263,44	440,62	385,05
2860	331,75	85,35	123,41	612,98	653,69	412,25	328,20	264,13	437,30	382,94
2861	329,98	85,68	123,24	606,73	649,31	409,50	326,84	264,71	433,95	382,31
2862	329,19	86,22	123,04	602,34	645,07	407,60	326,35	265,28	430,76	380,49
2863	327,71	86,67	122,64	600,42	641,54	405,75	326,62	265,83	427,90	378,46
2864	326,60	85,76	122,53	599,60	640,02	403,68	325,26	266,31	425,23	378,12
2865	326,67	86,73	122,40	598,48	639,76	401,67	323,79	266,76	422,66	378,43
2866	325,78	86,41	122,28	599,65	640,01	399,56	322,53	267,24	420,10	377,60
2867	327,31	85,75	122,15	602,60	642,28	398,12	320,93	267,65	417,38	378,13
2868	327,02	86,27	121,82	604,78	645,44	396,96	320,62	268,07	414,78	378,41
2869	327,65	86,01	122,07	606,32	648,66	395,62	319,75	268,45	412,54	377,75
2870	328,41	85,52	122,10	609,01	652,18	395,14	319,36	268,87	410,45	377,70
2871	328,73	85,62	122,24	610,87	655,72	394,41	319,12	269,18	408,42	379,06
2872	328,92	86,43	122,30	612,37	658,22	394,28	318,84	269,50	406,88	379,14
2873	329,29	86,04	122,43	614,77	660,93	394,47	318,68	269,82	405,21	381,64
2874	330,79	86,16	122,55	617,37	663,72	393,26	318,81	270,09	404,05	380,98
2875	330,44	86,25	122,41	620,31	666,53	393,41	318,33	270,38	402,94	382,89
2876	331,21	85,90	122,55	625,36	670,38	393,68	318,26	270,64	402,24	383,95
2877	332,52	85,88	122,69	627,95	675,15	394,28	319,07	270,87	401,68	384,89
2878	333,87	85,51	122,97	632,24	679,07	395,43	319,97	271,10	401,45	386,02
2879	335,46	86,08	123,24	637,78	683,86	396,46	319,97	271,32	401,35	388,30
2880	337,95	86,22	123,44	646,06	690,27	397,05	321,61	271,53	401,31	389,35
2881	339,59	85,84	123,75	650,28	698,12	397,52	323,02	271,76	401,40	390,58
2882	339,72	86,05	124,06	645,87	703,71	396,75	323,09	271,96	401,42	398,88
2883	341,96	86,32	124,18	651,74	705,40	396,50	324,60	272,16	402,13	401,71
2884	345,93	85,85	124,71	664,58	714,29	396,16	326,56	272,34	403,55	402,80
2885	350,70	86,02	125,25	679,82	728,89	396,52	329,03	272,59	405,19	404,54
2886	354,45	86,17	125,89	699,21	745,19	395,46	331,10	272,76	406,97	405,38
2887	358,97	85,31	126,70	712,86	761,88	395,60	333,83	272,98	409,37	407,58
2888	360,31	86,12	126,96	719,81	771,69	396,97	336,30	273,18	412,67	409,91
2889	361,87	85,79	127,55	735,45	776,45	399,54	340,19	273,36	415,86	412,14
2890	364,34	86,13	127,91	783,04	787,36	404,15	343,31	273,55	418,94	417,04
2891	367,90	86,21	128,20	851,96	811,06	409,37	348,19	273,75	421,66	416,69
2892	374,13	86,32	129,23	941,35	843,35	416,28	352,96	273,98	426,98	417,82
2893	380,72	86,14	130,66	919,49	872,30	423,92	358,72	274,17	439,72	419,77
2894	379,68	86,24	131,32	876,38	870,28	431,88	363,84	274,36	451,41	425,14
2895	377,01	86,29	130,90	883,60	850,03	439,93	368,36	274,55	460,00	431,77
2896	379,07	85,85	131,53	883,75	847,32	447,05	373,93	274,69	467,75	445,60
2897	381,45	86,05	131,80	891,14	849,33	454,58	379,10	274,84	480,24	450,08
2898	384,53	86,67	131,67	983,98	858,04	461,84	382,39	274,93	486,84	451,54
2899	391,87	85,84	133,30	942,49	880,47	464,87	387,39	275,11	500,94	457,35
2900	387,96	85,79	133,35	899,23	869,22	467,48	391,70	275,22	509,50	469,49
2901	388,43	85,87	133,10	911,29	849,43	470,63	397,16	275,33	520,92	475,90
2902	390,74	86,26	134,11	891,91	845,53	474,22	402,38	275,45	535,62	479,98
2903	389,41	86,53	133,78	905,32	832,67	478,69	406,64	275,55	548,10	485,48
2904	391,96	86,55	134,22	945,70	830,28	485,59	413,86	275,66	560,59	492,02
2905	397,80	86,73	134,76	1013,06	851,56	489,79	420,17	275,75	570,27	497,59
2906	403,79	85,92	135,91	1048,63	882,90	494,57	425,66	275,86	579,82	503,22
2907	404,24	86,64	136,11	1073,60	897,71	500,44	431,62	275,90	587,03	508,48
2908	410,21	87,06	137,26	1070,13	906,84	505,90	434,81	275,95	598,16	512,24
2909	412,40	86,14	137,52	1083,75	909,05	512,96	439,95	275,99	608,08	517,04

2910	404,09	86,53	137,63	1004,91	892,09	517,53	445,65	276,00	620,43	522,47
2911	405,26	86,15	137,67	1030,05	867,83	524,21	452,06	276,07	631,66	530,13
2912	407,38	86,41	138,10	1034,13	868,05	532,17	460,00	276,10	644,67	538,19
2913	404,37	86,21	137,82	1030,15	859,38	539,84	467,07	276,11	658,68	545,59
2914	403,06	86,58	137,77	1057,50	853,05	549,24	472,39	276,17	670,79	555,01
2915	408,84	86,51	138,49	1086,85	860,32	556,83	478,18	276,20	681,39	561,81
2916	409,25	86,14	138,76	1055,01	866,29	565,66	483,97	276,25	694,29	567,85
2917	409,50	86,07	138,60	1111,46	861,30	575,54	489,68	276,26	701,41	573,98
2918	416,47	86,27	139,51	1215,95	882,25	587,06	495,95	276,33	707,00	578,22
2919	421,43	86,75	140,55	1221,48	909,87	600,84	501,95	276,41	709,71	580,58
2920	425,15	86,94	141,12	1266,10	922,75	625,09	508,71	276,47	709,51	582,79
2921	428,99	87,37	141,61	1263,47	934,34	641,34	515,48	276,58	708,44	586,90
2922	428,44	87,66	141,88	1213,08	936,25	644,72	521,64	276,68	708,68	587,44
2923	427,64	87,67	141,93	1191,69	928,98	648,76	538,92	276,80	707,21	587,88
2924	429,86	87,96	142,25	1250,99	927,25	651,24	577,92	276,95	703,96	588,39
2925	431,50	87,41	142,65	1237,95	936,31	647,40	602,39	277,17	700,76	588,56
2926	431,77	87,38	142,47	1256,76	941,62	583,31	627,81	277,33	697,20	589,64
2927	433,37	88,11	142,71	1268,12	949,22	566,98	642,19	277,49	692,49	587,35
2928	434,08	87,60	142,85	1255,99	954,97	577,14	665,57	277,69	687,65	586,50
2929	434,32	86,85	143,31	1209,52	954,68	580,53	668,99	277,92	683,38	585,49
2930	434,52	88,38	143,24	1152,57	945,10	569,55	656,49	278,14	680,30	587,38
2931	430,96	87,43	143,55	1091,02	925,43	548,32	646,19	278,41	678,29	589,64
2932	421,32	87,88	142,52	1021,77	891,21	618,58	639,60	278,69	676,64	589,54
2933	408,11	88,15	140,66	968,95	842,72	638,88	634,72	279,03	675,96	595,67
2934	400,68	87,69	139,43	945,69	803,40	652,37	632,20	279,34	676,37	600,30
2935	399,25	88,19	138,70	944,18	784,24	669,18	630,37	279,73	675,83	603,60
2936	398,22	88,15	138,31	935,51	779,46	677,83	629,46	280,17	675,94	607,17
2937	396,13	87,71	138,09	929,28	775,18	686,74	629,33	280,56	675,84	610,27
2938	394,65	88,22	137,94	917,22	770,37	696,72	627,15	281,11	675,89	617,77
2939	391,02	88,78	136,93	928,27	762,37	705,29	623,26	281,61	672,14	637,49
2940	392,51	88,16	136,79	937,40	762,86	708,31	621,76	282,18	668,85	647,89
2941	393,44	88,21	136,81	935,40	769,05	710,29	621,83	282,77	664,88	652,48
2942	393,15	87,67	136,87	923,31	771,00	709,48	624,87	283,37	661,15	654,35
2943	390,82	88,51	136,67	912,85	766,55	708,64	628,14	284,03	657,32	654,83
2944	388,86	88,62	136,36	903,65	759,91	708,05	633,52	284,70	654,22	653,67
2945	387,57	88,84	136,00	892,79	754,52	709,21	640,12	285,43	650,83	651,66
2946	384,99	88,67	135,69	892,98	748,47	708,05	647,59	286,15	647,68	651,47
2947	385,99	88,80	135,57	896,30	748,01	706,13	651,79	286,93	644,87	652,37
2948	386,31	88,77	135,43	894,90	750,69	706,85	654,43	287,71	641,77	654,28
2949	385,54	88,96	135,59	893,43	751,93	706,02	653,59	288,51	638,85	654,10
2950	384,93	88,78	135,06	888,65	751,20	705,45	656,29	289,39	635,73	656,28
2951	383,70	88,87	135,19	875,70	748,40	705,90	657,92	290,16	632,30	658,22
2952	380,38	88,76	134,63	866,02	741,47	707,12	661,65	291,08	629,68	658,70
2953	379,71	89,91	134,43	863,86	736,32	705,72	664,84	291,97	627,90	654,97
2954	380,51	88,71	134,36	863,47	736,46	705,14	667,28	292,90	625,56	653,10
2955	381,42	90,36	134,35	861,33	738,72	702,95	671,81	293,85	624,63	650,66
2956	380,14	88,63	134,23	852,81	737,92	700,79	677,90	294,77	625,63	649,92
2957	377,94	88,49	133,80	842,71	732,71	700,33	682,44	295,66	627,74	649,50
2958	375,85	88,31	133,55	832,73	725,24	698,38	687,33	296,51	629,68	650,00
2959	372,66	88,23	133,11	825,15	717,12	696,91	691,63	297,49	632,43	651,28
2960	371,31	88,32	132,83	815,39	709,02	698,47	696,24	298,44	636,40	650,68
2961	368,56	88,04	132,41	809,02	699,92	699,39	699,76	299,35	640,18	651,53
2962	367,19	88,19	132,10	806,94	692,69	699,05	700,68	300,25	642,83	652,74

2963	366,62	87,73	131,45	805,67	687,74	700,26	699,98	301,15	645,51	652,77
2964	365,73	89,95	131,55	803,81	684,42	700,15	702,59	302,07	648,55	652,16
2965	364,82	88,73	131,33	801,94	681,49	701,94	704,16	302,90	650,19	652,16
2966	366,56	88,75	131,58	811,52	681,48	699,73	711,05	303,76	650,17	651,90
2967	369,91	88,80	131,85	817,74	690,10	696,58	718,45	304,59	649,36	650,20
2968	370,41	88,38	132,02	818,53	699,15	694,25	726,95	305,36	647,96	650,39
2969	370,70	88,33	132,21	818,59	702,21	691,52	731,25	306,13	645,45	650,58
2970	368,64	88,90	131,94	812,68	701,89	689,73	733,20	306,86	643,49	652,64
2971	366,02	88,77	131,75	807,11	697,06	688,24	740,68	307,57	641,64	653,73
2972	364,09	89,07	131,06	804,85	690,61	687,62	743,77	308,28	640,21	655,88
2973	362,69	88,56	130,91	803,21	685,26	688,38	745,89	308,96	638,99	657,45
2974	361,31	89,71	130,54	798,09	680,29	687,66	749,90	309,59	636,82	658,22
2975	359,58	89,73	130,08	798,06	674,96	685,62	751,05	310,18	634,26	657,08
2976	357,64	89,62	130,08	796,06	671,83	684,30	752,46	310,71	631,20	655,20
2977	356,30	89,09	129,50	795,79	668,08	683,00	750,58	311,22	628,17	652,22
2978	356,23	89,37	129,17	799,09	666,20	681,06	746,46	311,65	624,48	648,59
2979	356,17	89,26	129,29	795,76	666,76	680,05	745,16	312,08	620,78	645,44
2980	352,34	88,96	128,60	788,22	663,86	679,23	745,57	312,53	617,27	641,96
2981	350,86	88,65	128,22	784,71	657,76	678,18	743,21	312,97	613,25	637,79
2982	352,59	88,35	128,32	793,59	656,36	674,45	744,63	313,28	610,27	637,13
2983	353,95	89,33	128,68	795,24	663,50	671,85	750,00	313,65	607,00	636,53
2984	86,11	81,34	86,01	84,65	83,43	84,18	81,19	78,79	79,69	80,89
2985	118,42	81,39	99,96	115,78	107,31	113,48	116,59	78,87	83,07	92,24
2986	159,50	81,50	114,95	158,80	148,85	161,98	133,49	78,89	94,61	105,53
2987	209,33	81,53	125,04	261,22	242,56	256,64	180,63	78,93	133,15	145,40
2988	254,39	81,60	137,24	390,51	401,54	361,31	246,32	78,97	173,62	198,91
2989	283,58	81,80	147,52	499,17	548,92	448,68	323,90	79,06	227,34	254,41
2990	305,55	82,09	155,19	592,58	625,13	505,85	395,22	79,16	291,97	313,29
2991	319,61	82,10	160,80	660,21	660,78	542,61	467,00	79,28	348,19	372,70
2992	333,64	82,30	132,68	756,17	674,14	573,86	501,61	79,44	388,20	406,46
2993	343,55	82,15	123,81	782,32	703,88	573,32	506,68	79,64	416,05	407,39
2994	355,76	82,36	133,46	685,11	706,31	576,48	561,32	79,84	444,67	430,04
2995	312,95	82,52	157,60	676,40	665,29	590,19	622,38	80,17	478,52	473,37
2996	312,84	82,90	161,54	688,61	638,73	610,82	655,27	80,53	513,41	516,54
2997	317,41	83,02	163,85	707,13	632,35	634,46	679,20	80,98	543,53	547,25
2998	320,86	82,93	165,52	721,71	633,51	648,96	695,75	81,48	571,48	569,88
2999	322,95	83,22	166,78	734,61	634,59	654,01	720,43	82,04	592,60	596,15
3000	371,20	83,60	197,06	726,78	640,77	674,34	755,24	82,74	610,44	655,03
3001	367,38	83,51	209,04	658,08	625,99	641,92	705,99	83,52	606,13	620,38
3002	376,55	83,85	211,34	644,70	605,98	640,10	671,26	84,41	588,05	575,93
3003	410,92	84,00	222,36	701,43	641,62	654,19	666,27	85,46	579,14	554,51
3004	445,59	84,28	232,67	817,33	719,03	681,83	675,89	86,62	585,89	549,29
3005	457,35	84,55	239,32	873,55	783,06	706,47	670,53	88,01	599,64	547,36
3006	464,51	84,80	243,02	912,76	809,66	727,24	658,86	89,54	615,86	550,44
3007	483,58	84,58	248,72	984,52	835,69	745,46	641,94	91,32	641,82	568,58
3008	504,09	85,45	254,69	1057,97	877,00	762,40	630,38	93,38	674,13	606,40
3009	481,42	85,45	239,56	1088,81	908,50	770,63	624,82	95,59	708,97	634,66
3010	456,84	86,20	221,62	1082,59	910,93	791,03	649,02	98,02	751,27	644,15
3011	444,19	85,94	216,16	1056,75	895,03	807,54	710,14	100,65	785,37	655,33
3012	435,57	86,09	212,46	1041,55	871,40	820,78	760,11	103,49	807,88	661,54
3013	433,05	86,78	211,27	1042,07	856,27	834,49	795,17	106,40	826,97	668,77
3014	446,58	86,89	189,62	1058,28	847,04	844,34	812,30	109,44	843,21	684,20
3015	456,49	86,76	162,14	1117,37	848,51	828,06	783,77	112,61	835,81	677,93

3016	444,54	86,99	156,23	1019,37	855,31	807,67	740,75	115,89	826,55	668,95
3017	423,63	86,96	151,12	954,74	813,06	789,68	707,04	119,24	816,51	657,32
3018	410,47	87,02	147,81	922,77	768,85	776,24	683,11	122,64	807,52	646,61
3019	403,08	86,60	145,90	903,31	741,30	767,31	664,11	125,98	798,95	637,16
3020	398,76	86,55	144,36	891,39	725,47	762,51	650,24	129,28	790,99	628,21
3021	396,39	87,02	143,39	884,38	717,22	762,65	639,95	132,53	785,35	623,07
3022	395,17	87,53	142,66	880,65	713,08	765,03	635,13	135,67	781,88	622,17
3023	392,39	87,10	142,01	871,58	710,41	767,52	631,72	138,80	778,68	622,85
3024	389,70	86,56	141,33	864,00	704,63	769,24	629,71	141,80	777,60	623,60
3025	386,96	86,64	140,47	856,97	697,40	771,45	628,68	144,68	776,04	626,66
3026	384,78	87,18	139,75	852,73	690,08	772,95	629,29	147,44	774,15	629,33
3027	383,35	87,80	139,24	850,08	684,77	773,69	630,83	150,07	773,37	632,90
3028	384,01	87,21	139,36	851,01	682,04	775,26	633,91	152,66	773,21	636,93
3029	384,33	87,29	139,21	855,99	682,74	777,76	636,65	155,08	774,64	640,62
3030	384,73	87,44	139,42	857,91	685,90	779,12	639,05	157,40	777,16	643,26
3031	384,67	87,42	139,18	858,28	688,06	780,83	641,85	159,60	780,22	645,20
3032	384,59	87,50	139,05	858,67	688,12	782,15	644,53	161,68	782,37	647,15
3033	385,24	87,36	138,95	861,63	688,16	783,66	647,62	163,65	783,29	650,54
3034	386,43	87,24	139,13	865,74	690,57	786,91	651,11	165,54	785,40	653,64
3035	389,06	87,90	139,35	875,55	695,01	790,77	654,79	167,31	788,64	655,19
3036	365,85	87,42	167,04	884,35	706,80	794,27	653,50	168,98	785,12	650,02
3037	389,69	87,46	187,99	968,47	738,23	829,52	663,03	170,53	801,66	692,59
3038	424,81	88,32	200,28	1063,78	809,36	855,86	691,65	172,01	829,40	725,57
3039	444,67	88,59	207,20	1115,07	868,98	881,63	739,00	173,37	850,13	751,57
3040	450,41	88,80	210,61	1132,94	899,65	898,15	800,60	174,79	871,09	775,24
3041	471,05	88,66	182,82	1157,48	900,41	910,40	836,02	176,15	882,26	796,54
3042	471,93	88,12	162,27	1258,99	890,28	894,44	839,03	177,56	876,99	785,74
3043	467,27	88,85	158,02	1229,11	903,47	883,98	850,26	178,93	870,32	770,94
3044	456,51	88,33	155,54	1142,57	900,84	876,27	858,56	180,31	864,16	761,25
3045	448,32	88,07	153,28	1096,66	876,13	867,22	863,32	181,66	857,37	761,59
3046	441,34	89,00	151,45	1071,23	849,74	862,26	866,78	182,96	850,99	761,70
3047	436,66	89,75	150,16	1057,16	831,87	856,42	870,89	184,30	845,41	761,63
3048	432,91	89,51	149,44	1050,00	819,85	848,25	874,47	185,60	842,42	762,93
3049	430,75	88,99	149,05	1054,01	812,89	840,81	881,47	186,91	839,48	763,09
3050	429,35	88,66	148,60	1081,33	810,66	831,06	889,88	188,23	836,79	765,21
3051	433,98	89,25	148,68	1093,64	822,51	829,20	891,09	189,47	831,51	763,52
3052	431,69	88,80	148,61	1067,05	830,77	825,60	888,37	190,72	827,46	765,23
3053	425,52	89,58	147,16	1036,17	817,57	821,52	876,75	191,95	823,02	765,09
3054	419,60	89,86	146,49	1003,38	798,32	819,15	863,31	193,20	819,10	768,92
3055	413,46	89,00	145,43	978,16	777,43	815,11	857,23	194,40	816,15	774,61
3056	409,73	88,67	144,66	961,80	759,69	808,59	850,37	195,59	813,25	782,07
3057	407,80	88,74	144,16	950,08	747,40	800,73	840,10	196,79	810,77	790,65
3058	405,89	89,61	143,79	943,12	739,25	792,76	829,50	197,91	808,64	797,99
3059	404,65	90,16	143,42	938,08	734,17	786,19	823,03	199,09	806,44	804,98
3060	402,92	88,95	143,27	931,03	731,04	779,19	819,33	200,27	803,68	809,77
3061	402,84	88,97	142,56	931,30	728,30	775,10	808,16	201,36	802,31	814,98
3062	404,09	89,09	142,62	934,29	729,01	770,61	800,44	202,51	801,79	818,82
3063	403,38	89,34	142,68	929,69	730,39	769,10	799,02	203,63	805,16	820,88
3064	400,97	89,94	142,25	925,52	726,26	766,90	802,96	204,73	810,37	821,96
3065	397,53	89,82	141,80	918,91	719,36	760,86	807,13	205,85	813,06	828,22
3066	394,80	89,89	141,06	906,17	710,84	756,59	806,04	207,02	818,31	833,94
3067	393,51	89,44	140,69	901,57	702,85	750,87	803,26	208,20	823,82	841,40
3068	392,78	89,80	140,84	897,29	699,03	745,07	797,95	209,38	828,24	844,23

3069	391,29	89,69	140,34	890,39	696,52	739,88	792,71	210,53	828,10	845,67
3070	386,99	89,77	139,40	878,76	690,81	735,03	787,18	211,75	823,94	843,01
3071	383,70	89,52	138,92	869,16	682,61	711,86	781,91	212,96	818,59	834,06
3072	381,52	89,23	138,32	861,72	675,51	683,85	777,26	214,21	811,44	822,12
3073	372,58	88,97	144,91	852,48	671,89	714,84	770,85	215,45	798,93	810,52
3074	358,12	90,14	208,41	683,24	653,26	627,89	715,42	216,86	760,08	775,02
3075	380,10	90,34	216,68	657,01	597,73	608,51	647,17	218,21	726,66	713,03
3076	416,60	89,93	229,42	692,99	608,99	604,44	603,21	219,70	702,70	699,82
3077	437,02	90,42	229,78	763,83	661,26	588,93	569,38	221,22	693,43	684,02
3078	436,40	89,83	227,23	785,35	709,90	589,96	540,48	222,79	689,95	657,86
3079	427,93	89,98	225,82	780,26	714,29	528,77	518,48	224,42	686,48	638,14
3080	400,11	89,79	204,10	815,37	707,18	615,72	501,94	226,05	693,92	627,39
3081	398,81	90,31	201,66	833,97	728,77	624,53	488,68	227,74	695,95	616,60
3082	392,44	90,86	199,18	825,48	739,10	604,05	480,27	229,56	694,23	605,13
3083	385,68	90,54	196,56	813,25	734,96	636,73	470,77	231,43	691,42	594,97
3084	382,38	90,56	194,90	801,18	727,62	577,83	459,68	233,36	685,18	588,51
3085	408,41	90,69	154,71	828,86	717,20	621,35	453,55	235,51	676,37	589,63
3086	408,96	90,40	148,79	835,55	730,05	533,00	446,72	237,58	665,32	581,43
3087	400,47	89,85	145,68	827,48	738,47	577,31	439,88	239,71	653,20	565,83
3088	391,39	90,60	143,58	811,34	734,84	545,39	433,79	241,85	641,18	554,49
3089	383,62	90,53	141,34	789,96	723,65	512,43	427,09	243,94	628,65	538,73
3090	376,68	90,15	139,84	772,67	709,73	541,68	421,35	246,02	616,66	528,19
3091	373,56	89,95	138,33	759,07	698,75	530,49	414,73	248,09	604,92	514,57
3092	369,15	90,02	137,60	743,60	691,25	519,59	409,50	250,11	593,58	504,28
3093	366,47	89,56	136,78	731,06	684,64	510,74	403,75	252,12	582,54	494,04
3094	364,66	89,56	136,07	720,51	679,85	501,78	399,15	254,07	571,96	484,85
3095	362,82	90,24	135,68	710,85	677,80	493,69	394,31	255,92	561,95	477,62
3096	361,34	89,74	135,10	703,50	677,10	486,64	389,72	257,74	552,61	470,96
3097	360,83	89,13	134,60	696,52	678,11	480,07	384,79	259,57	543,60	463,89
3098	360,34	89,31	134,58	691,19	680,05	473,90	381,45	261,26	535,25	457,81
3099	359,63	89,27	134,15	685,98	681,87	468,65	377,81	262,88	527,39	452,93
3100	360,17	89,88	134,21	681,63	684,37	464,89	374,58	264,48	520,18	447,64
3101	360,92	89,76	134,20	679,37	688,01	459,78	371,54	266,04	513,37	443,32
3102	362,33	89,55	134,07	680,53	693,30	455,50	368,17	267,45	506,93	439,64
3103	363,52	89,60	134,29	681,58	700,24	451,28	365,44	268,85	501,17	436,76
3104	364,43	89,39	134,29	679,83	706,78	448,96	363,32	270,19	495,78	434,38
3105	364,29	89,39	134,55	674,84	710,57	446,46	361,04	271,46	490,86	432,18
3106	364,47	90,29	134,42	672,96	713,11	444,49	359,68	272,64	486,30	430,23
3107	364,50	89,52	134,44	670,20	715,20	441,35	357,75	273,83	482,18	428,64
3108	364,66	89,40	134,52	672,34	718,16	440,22	356,57	274,86	478,11	427,04
3109	365,33	89,97	134,33	671,91	721,86	438,49	355,88	275,89	474,57	425,73
3110	366,71	89,21	134,47	672,86	725,57	436,67	355,08	276,90	471,45	424,78
3111	367,59	89,76	134,52	672,32	729,29	435,93	354,98	277,76	468,68	423,28
3112	367,63	89,48	134,83	672,15	731,65	434,94	354,22	278,60	466,10	422,06
3113	368,38	90,13	134,75	681,20	734,55	434,40	354,33	279,39	463,63	420,68
3114	369,87	90,27	135,14	687,34	741,06	434,39	354,67	280,16	461,53	419,62
3115	370,14	89,92	134,81	688,50	746,26	434,42	354,28	280,85	459,73	419,25
3116	369,74	89,74	134,91	687,56	748,62	433,01	354,75	281,55	458,08	419,31
3117	369,26	89,75	135,05	688,23	749,31	434,09	356,01	282,18	456,90	418,75
3118	369,49	89,51	135,01	685,16	749,78	434,44	356,75	282,76	455,82	419,44
3119	368,38	90,13	134,76	685,01	747,67	434,52	357,63	283,30	454,87	421,18
3120	368,70	90,20	134,59	689,09	747,43	436,15	359,19	283,82	454,20	421,89
3121	370,30	90,43	135,39	693,89	750,94	438,65	360,26	284,32	453,77	422,15

3122	370,02	90,45	135,41	689,29	754,27	439,74	362,00	284,75	453,90	423,41
3123	368,91	90,13	135,42	683,62	751,97	444,31	363,52	285,21	454,21	426,54
3124	367,39	90,34	135,02	679,88	747,25	476,11	365,21	285,61	455,18	428,55
3125	365,25	90,50	134,41	670,94	740,21	475,46	366,64	286,00	456,03	432,06
3126	363,78	90,13	134,59	678,16	733,29	465,50	368,15	286,41	457,11	435,62
3127	366,03	89,94	134,75	699,80	737,37	498,14	369,80	286,73	459,21	435,46
3128	368,79	89,79	135,16	707,56	749,71	444,54	371,71	287,03	461,84	434,65
3129	370,91	90,09	135,24	713,41	757,63	465,06	374,42	287,29	464,82	433,73
3130	373,46	89,94	135,87	725,24	763,12	503,01	376,85	287,51	468,16	432,81
3131	375,44	89,58	136,47	742,89	770,62	506,34	379,17	287,74	472,36	432,69
3132	378,62	89,73	136,71	770,03	781,94	510,77	382,21	287,92	478,02	432,73
3133	380,90	90,66	137,01	792,72	796,90	516,66	385,49	288,09	486,73	433,23
3134	383,72	90,66	137,76	814,77	808,00	524,29	388,74	288,23	504,75	434,80
3135	384,99	90,28	137,90	813,84	811,41	532,01	393,03	288,35	534,37	438,54
3136	381,68	90,30	138,00	818,69	794,79	539,25	397,74	288,47	564,58	441,70
3137	382,55	90,40	137,74	830,44	781,17	546,73	403,97	288,48	589,87	445,25
3138	384,70	90,43	138,40	844,03	779,02	554,88	408,27	288,51	598,78	448,39
3139	388,91	90,36	138,71	887,12	790,40	561,93	412,59	288,45	594,89	451,50
3140	396,60	90,50	139,74	921,67	819,00	567,55	417,06	288,37	590,26	454,67
3141	400,97	90,93	140,66	936,40	843,35	574,71	420,33	288,31	590,24	457,86
3142	403,98	91,27	141,48	941,40	855,36	580,82	424,85	288,21	591,91	462,15
3143	406,65	91,40	142,26	941,14	858,49	603,02	430,40	288,13	601,51	465,91
3144	409,50	91,29	142,78	978,73	856,76	632,47	437,14	287,95	614,61	470,18
3145	411,72	91,26	142,96	984,02	861,60	652,21	443,14	287,81	620,66	474,38
3146	413,95	90,89	143,45	995,73	862,79	659,07	451,80	287,70	626,96	480,41
3147	413,40	90,35	143,72	976,15	860,82	672,08	459,79	287,51	635,79	485,44
3148	412,50	90,64	143,87	977,22	851,56	681,04	466,88	287,29	643,99	491,68
3149	410,53	90,87	143,63	976,27	842,67	692,68	474,51	287,08	656,31	496,97
3150	412,88	90,81	144,08	980,64	836,94	707,45	481,96	286,82	664,39	502,42
3151	415,46	90,84	144,09	1020,22	838,41	714,75	488,87	286,58	671,51	508,26
3152	417,98	91,19	144,54	1033,94	847,97	725,79	495,41	286,34	677,67	512,93
3153	421,04	90,47	145,06	1080,03	858,94	732,48	501,89	286,06	682,36	518,14
3154	424,86	91,15	145,61	1108,67	874,19	737,85	508,13	285,83	687,43	522,58
3155	425,43	91,46	145,96	1100,03	881,48	743,89	516,00	285,64	699,00	527,76
3156	426,33	91,37	146,50	1135,79	879,49	748,13	525,04	285,40	706,85	532,56
3157	429,34	91,54	147,04	1215,89	886,62	748,70	537,64	285,18	707,83	538,03
3158	430,84	91,51	147,50	1152,51	898,66	749,74	549,28	284,97	715,79	542,36
3159	428,83	91,09	146,91	1161,12	891,87	745,21	561,73	284,87	715,83	547,01
3160	428,03	91,26	147,18	1162,60	888,43	738,07	572,16	284,66	715,39	552,26
3161	430,02	91,83	146,93	1215,29	892,43	683,19	579,71	284,55	710,95	556,48
3162	432,57	92,32	147,43	1210,71	903,96	693,68	584,15	284,45	708,43	561,12
3163	432,03	92,39	147,56	1114,51	903,30	690,96	589,33	284,33	710,55	566,33
3164	430,24	91,71	147,39	1088,13	885,16	709,41	594,31	284,30	709,55	571,34
3165	428,32	91,54	147,19	1058,19	870,73	720,38	598,62	284,26	708,28	577,55
3166	425,11	92,62	146,73	1020,67	854,17	716,97	602,34	284,29	708,13	584,35
3167	418,56	91,44	145,70	984,61	831,51	716,81	604,39	284,32	708,73	593,21
3168	415,13	91,51	145,29	967,61	809,96	716,06	607,43	284,43	708,73	600,67
3169	413,65	92,17	145,21	963,66	797,55	714,52	611,30	284,56	710,01	609,49
3170	410,44	91,71	144,68	940,89	789,14	705,60	615,06	284,74	710,61	617,42
3171	405,45	91,47	143,92	926,08	775,49	643,69	619,64	284,99	711,62	624,45
3172	402,91	91,52	143,38	913,01	763,67	649,81	624,92	285,26	711,41	629,50
3173	400,44	91,80	142,67	898,72	754,42	669,77	629,32	285,59	712,10	633,32
3174	398,61	92,83	142,37	890,46	747,08	664,13	633,24	285,94	711,97	636,57

3175	396,68	91,44	141,82	885,14	740,95	695,39	636,90	286,37	711,61	641,73
3176	395,74	91,91	141,84	879,19	737,03	697,87	639,95	286,80	710,50	643,40
3177	394,50	91,13	141,88	878,50	733,62	698,26	642,61	287,33	707,72	646,74
3178	395,68	92,25	141,58	876,96	733,04	671,51	646,41	287,93	704,64	648,47
3179	394,07	91,80	141,29	870,67	733,43	653,67	649,45	288,54	702,24	650,13
3180	392,58	91,80	141,21	865,46	730,83	671,78	653,21	289,23	700,88	651,17
3181	391,50	91,75	140,94	859,81	727,42	681,05	656,26	289,97	700,20	653,05
3182	390,91	92,64	140,65	857,53	723,29	686,13	660,34	290,66	699,01	653,10
3183	390,01	91,35	140,42	853,57	720,82	695,06	664,47	291,46	698,78	653,76
3184	389,59	91,71	140,51	851,24	718,81	693,68	669,03	292,29	697,76	654,47
3185	388,73	92,13	140,10	848,06	716,79	693,07	673,12	293,13	696,40	654,27
3186	387,21	92,53	139,75	846,43	714,55	692,08	676,74	293,98	694,88	654,79
3187	386,81	92,23	139,91	845,60	713,13	693,10	679,29	294,86	693,12	656,03
3188	387,73	92,79	139,86	848,83	713,17	688,59	682,29	295,75	692,16	652,95
3189	387,71	93,67	140,01	849,76	713,85	690,82	682,28	296,66	691,25	650,65
3190	385,98	92,91	139,49	845,05	712,48	692,34	681,84	297,57	691,40	650,86
3191	384,46	92,96	139,20	841,09	708,69	691,90	681,31	298,44	690,92	650,48
3192	383,43	92,74	138,82	837,95	704,86	688,58	681,76	299,38	691,14	650,95
3193	382,60	92,52	138,43	833,95	702,03	692,53	682,10	300,23	692,45	651,62
3194	382,46	92,28	138,50	832,05	699,97	693,31	682,13	301,09	692,93	651,63
3195	381,41	91,78	138,25	830,89	698,19	689,83	682,16	301,93	693,96	651,38
3196	380,61	92,74	138,41	826,76	696,43	680,36	684,17	302,71	694,69	649,55
3197	380,05	92,84	138,28	822,54	693,81	656,01	686,76	303,49	693,88	649,38
3198	379,08	92,56	137,95	820,41	690,63	653,47	691,66	304,24	693,72	646,05
3199	378,60	92,30	137,91	816,94	688,57	649,31	695,60	304,95	695,20	646,91
3200	376,58	91,80	137,83	810,10	686,16	652,92	699,31	305,62	697,13	646,49
3201	375,19	92,34	137,58	804,96	681,08	658,45	701,88	306,28	698,13	647,54
3202	374,63	92,19	137,02	807,40	676,45	653,08	703,89	306,92	698,42	646,32
3203	375,36	92,63	137,33	809,62	676,27	649,02	705,79	307,47	694,37	645,96
3204	375,31	92,44	137,35	810,71	679,03	690,57	706,89	308,06	688,65	646,21
3205	374,25	92,72	137,13	809,59	680,79	666,17	709,24	308,59	681,66	645,79
3206	372,44	93,19	136,52	810,70	679,65	692,82	708,18	309,10	673,98	645,82
3207	374,09	92,98	136,79	816,05	681,11	692,42	707,80	309,58	665,66	646,48
3208	373,04	92,41	136,57	819,18	685,20	690,46	711,78	310,05	657,61	646,31
3209	373,62	92,81	136,31	819,33	688,57	688,44	717,44	310,48	650,09	646,91
3210	372,05	92,93	135,53	814,45	689,75	672,07	723,25	310,81	643,53	647,60
3211	369,36	92,25	135,56	810,08	686,80	661,99	726,12	311,14	637,65	646,90
3212	368,19	92,38	135,01	807,37	682,68	659,38	728,91	311,49	631,97	645,57
3213	366,43	92,34	134,81	806,42	679,38	637,12	726,99	311,65	626,86	644,80
3214	365,28	92,63	134,60	801,51	676,73	650,09	724,82	311,81	621,77	644,56
3215	363,18	92,54	134,11	795,49	672,52	657,46	723,08	312,03	616,78	642,59
3216	360,86	92,51	133,88	790,06	668,07	646,82	721,56	312,08	611,76	642,61
3217	359,45	92,89	133,56	785,63	663,87	654,79	719,00	312,17	607,03	640,65
3218	357,96	92,40	133,03	778,55	660,61	639,07	728,01	312,20	602,64	640,35
3219	356,01	93,04	133,02	770,97	656,11	591,63	739,47	312,24	598,25	636,45
3220	354,28	91,88	132,85	766,11	651,24	650,50	746,24	312,23	593,92	634,46
3221	352,90	91,84	132,60	763,61	647,79	615,28	751,91	312,17	589,85	631,83
3222	352,32	91,86	132,62	763,02	645,44	626,91	755,74	312,04	585,57	629,76
3223	351,62	91,99	132,29	760,11	644,69	616,05	756,71	311,92	581,87	627,82

APPENDIX 5: Participants

Danick Power ing.
v-p operation
Services Polytests inc.
450.741.3636
www.polytests.com

Maxime Martin
Technicien
Services Polytests inc.
450.741.3636
www.polytests.com

APPENDIX 6: Drawings and specifications

APPENDIX 7: Operator's manual

CATALYST



WOOD STOVE OWNER'S MANUAL

Safety Notice: Please save these instructions for future reference. Please read this entire manual before you install and use your new room heater. Failure to follow instructions may result in property damage, bodily injury, or even death. Contact local building or fire officials about restrictions and installation inspection requirements in your area. Do not install in a mobile home!



UL 1482- 2011



Report # 000-S-00-0

INTRODUCTION

What you have in your hands is not the greatest wood burning device ever invented, it is just the manual for the greatest wood burning device ever invented.

The award-winning Catalyst (Model #001) is the world's first smart, ultra-clean wood stove. We built the Catalyst around state-of-the-art combustion techniques and using a revolutionary smart controller that lets you control the burn from your smartphone. In the 2013 Wood Stove Design Challenge, the prototype Catalyst won the Low Emissions Prize. In the 2014 Wood Stove Design Challenge, the Catalyst won the Grand Prize. In the MIT Clean Energy Prize, the Catalyst won the Energy Efficiency Prize and the People's Choice Award. Not a bad track record.

Traditional wood stoves are dirty, inefficient, and can be difficult to operate. Other home heating systems, like fuel oil, propane or natural gas, are expensive, non-renewable, or both. Catalyst was designed by fire scientists to outperform all of these: providing the natural heat of inexpensive and renewable wood without emitting health-harming emissions. Best of all – the Catalyst is made and assembled in the U.S.A.

Thank you for your purchase of the Catalyst and welcome to the MF Fire Family!

Sincerely,
The MF Fire Team

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SAFETY PRECAUTIONS

INSTALLATION

- The Catalyst must be properly installed to prevent house fires. Please strictly adhere to the installation instructions.
- The Catalyst must be connected to a listed high temperature chimney or approved masonry chimney with liner.
- Do not install in a mobile home
- We recommend you use smoke and CO detectors
- Contact your local building officials to obtain information on any local wood stove installation requirements.
- Carefully route all power cords through to avoid contact with hot stove surfaces.
- Do not connect to or use in conjunction with any air distribution ductwork unless specifically approved for such installations

OPERATION

- The viewing door and back panel of the Catalyst must be shut and latched during operation.
- Do not touch the Catalyst while hot. Young children should be supervised while the Catalyst is in use.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or "freshen up" a fire in this stove. Keep all such liquids well away from the stove while it is in use.
- This wood heater has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instructions in this manual.
- Hot while in operation. Keep children, clothing and furniture away. Contact may cause skin burns.
- Never obstruct airflow through the inlet vents or exhaust vents
- The Catalyst has been designed for the burning of cordwood only. Do not attempt to burn any other type of fuel in the Catalyst.
- Keep all flammable objects (fabrics, paper, wood, etc.) at least 1 yd (1 m) from the front of the Catalyst.
- Do not use chemicals or fluids to start the fire.
- Do not burn garbage or flammable fluids such as gasoline, naphtha or engine oil
- Never over-fire the Catalyst, as it could lead to a house fire. If the unit or chimney connector glows, you have over-fired the unit.

MAINTENANCE

- Never attempt to modify or repair the appliance beyond instructions given in this manual.
- Empty the ash regularly and dispose of it in a metal container with tight lid.
- Allow the Catalyst to cool before conducting any maintenance.
- Inspect the chimney connector at least twice monthly.

FEATURES AND SPECIFICATIONS

FEATURES

- 2.3 cubic foot (0.065 m³) firebox
- Accepts 18" (0.46 m) logs
- Push button smart control
- Durable steel construction
- Full-fire viewing window
- Classic soapstone top

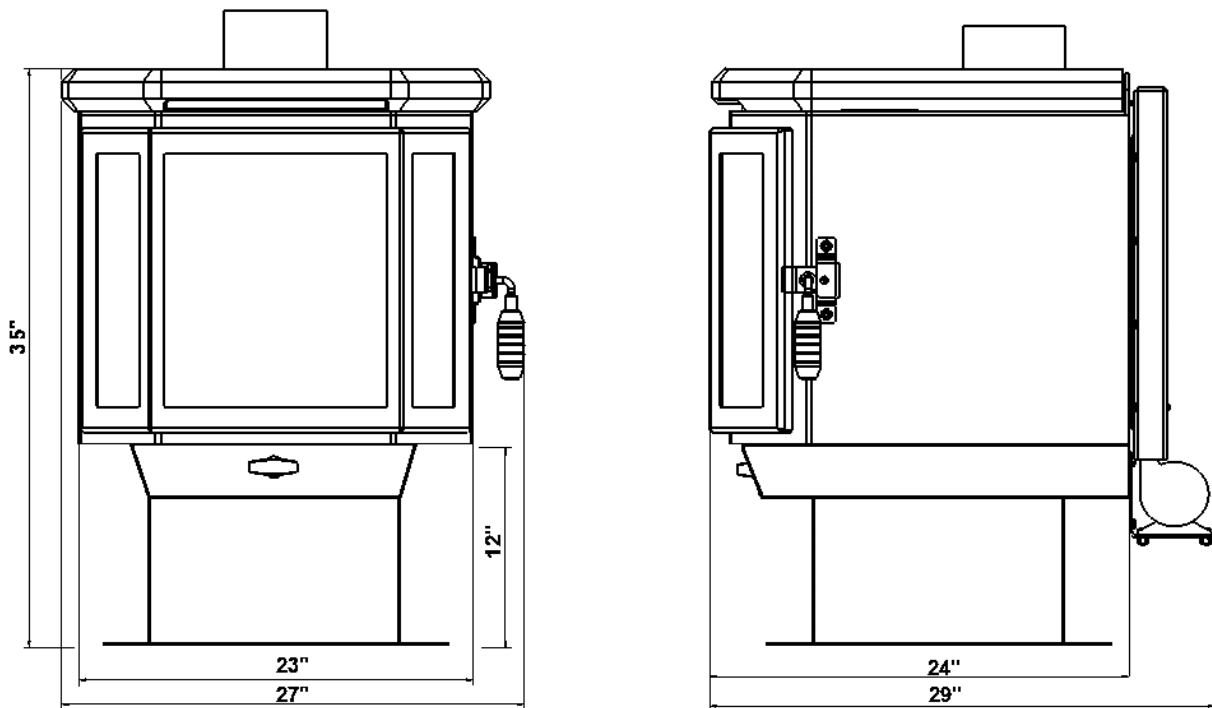
HEATING SPECIFICATIONS

2,000 sq. ft. (175 m²) approximate maximum heating capacity. Heating capacity will vary depending on the home's floor plan, degree of insulation, and the outside temperature.

65,000 BTU per hour (20 kW) maximum heat release rate.

12 hour maximum burn time.

DIMENSIONS



All clearances, side, corner, and back, are measured from the largest dimensions.

EMISSIONS

This heater meets the 2020 U.S. EPA's crib wood emission limits for wood heaters sold after May 15, 2015. Tested to Method 28, 5G2 this heater has been shown to deliver heat at rates ranging from 10,000 to 30,000 BTU/hr and an emission value of 0.2 g/h and an efficiency of 83%

STOVE INSTALLATION

Safety Notice: Please read this entire manual before you install and use your new room heater. Failure to follow instructions may result in property damage, bodily injury, or even death. Contact local building or fire officials about restrictions and installation inspection requirements in your area. Do not install in a mobile home!

PLANNING THE INSTALLATION

We suggest that you have a certified chimney sweep install your Catalyst. If you will be installing the stove yourself, we advise you consult a certified chimney sweep. Check with your local building officials and your home insurance company before installation.

If there are any major dents or other damage to your stove, please report to MF Fire prior to installation.

When this room heater is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Contact local building or fire officials about restrictions and installation inspection requirements in your area.

STOVE PLACEMENT REQUIREMENTS

The Catalyst must be placed with the following requirements:

Catalyst must be placed in a room with a source of fresh air.

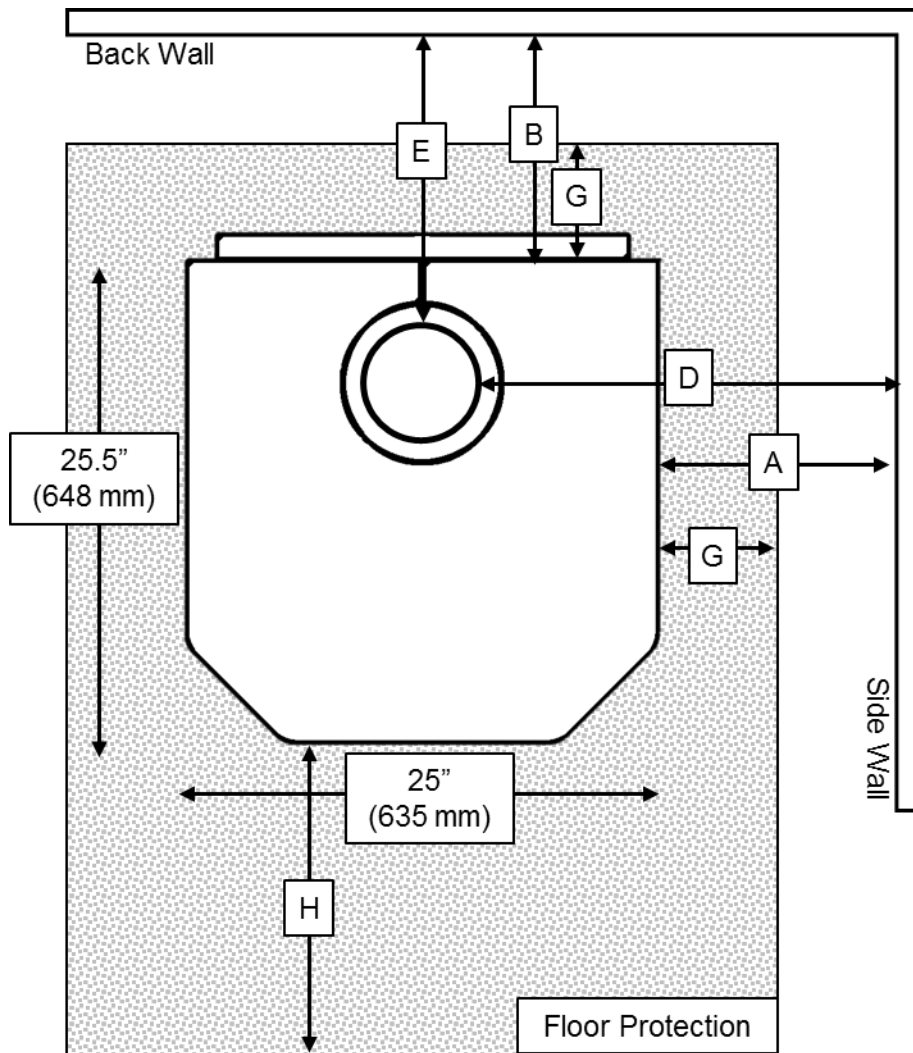
Stove must be placed so that no combustibles are within, or can swing within 36" (914mm) of the front of the stove (drapes, doors, etc.).

Floor protection must extend around the front, sides, and rear of the stove, according to listed clearance requirements below. Floor protection must be made of a non-combustible material and at least 0.018" (0.45 mm) thick with a minimum R-value of 0.41.

The Catalyst must also maintain the following minimum clearances to combustibles (drywall, furniture, etc.):

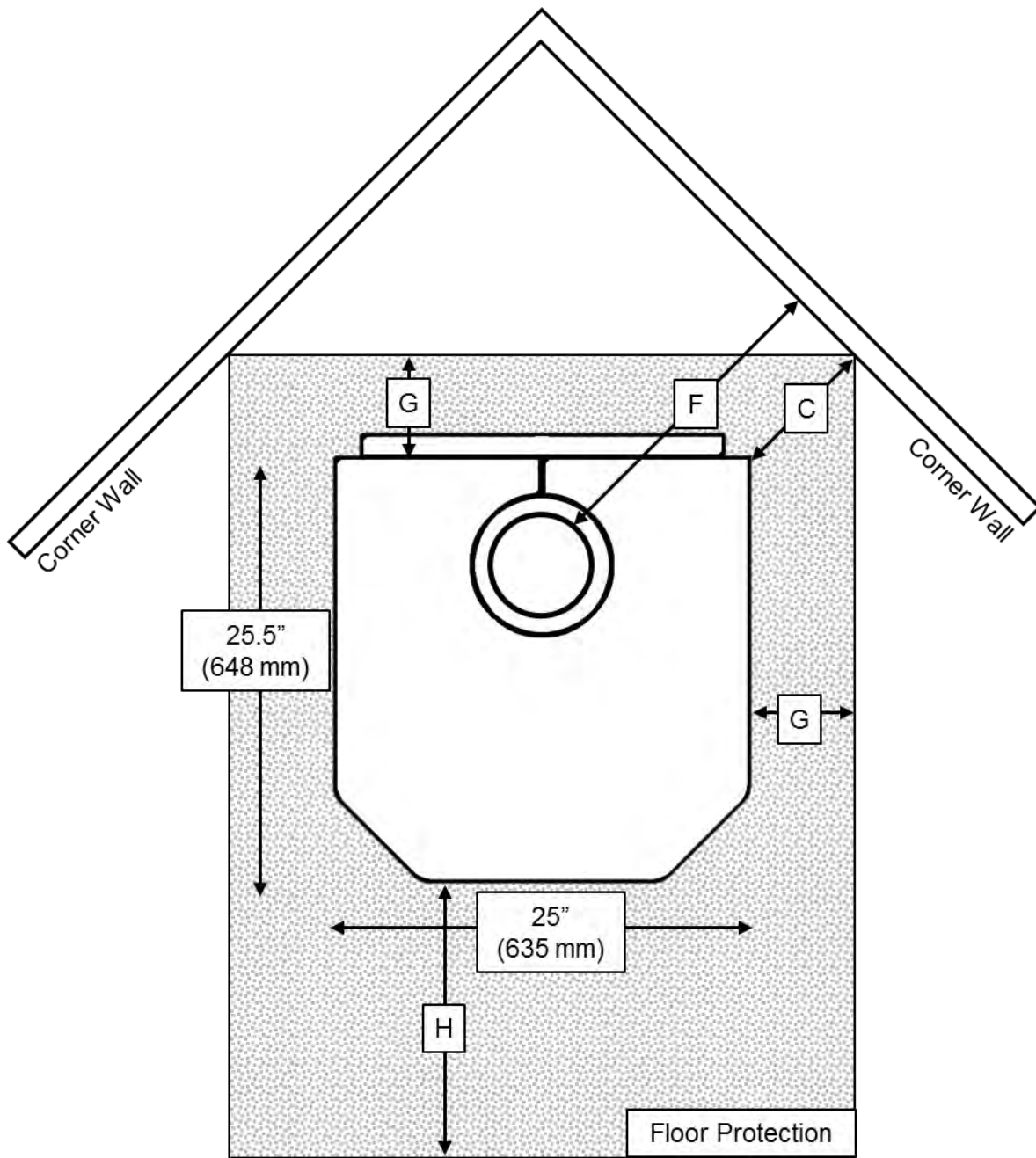
Minimum Clearance Requirements		
A	Side wall to stovetop	12" (305 mm)
B	Back wall to stovetop	12" (305 mm)
C	Corner wall to stovetop	8" (203 mm)
D	Connector to side wall	22" (559 mm)
E	Connector to back wall	15" (381 mm)
F	Connector to corner wall	18" (458 mm)
G	Floor protection, side and back	6" (153 mm)
H	Floor protection, front	16" (407 mm)

STANDARD INSTALLATION – TOP VIEW



Minimum Clearance Requirements		
A	Side wall to stovetop	12" (305 mm)
B	Back wall to stovetop	12" (305 mm)
D	Connector to side wall	22" (559 mm)
E	Connector to back wall	15" (381 mm)
G	Floor protection, side and back	8" (200 mm)
H	Floor protection, front	18" (450 mm)

CORNER INSTALLATION – TOP VIEW



Minimum Clearance Requirements

C	Corner wall to stovetop	8" (203 mm)
F	Connector to corner wall	18" (458 mm)
G	Floor protection, side and back	8" (200 mm)
H	Floor protection, front	18" (450 mm)

CHIMNEY REQUIREMENTS

Do not connect Catalyst to a chimney flue serving any other appliance or use in conjunction with any air distribution ductwork, unless specifically approved. This room heater must be connected to:

1. A 6" (150 mm) diameter, UL 103 HT chimney, from a single manufacturer

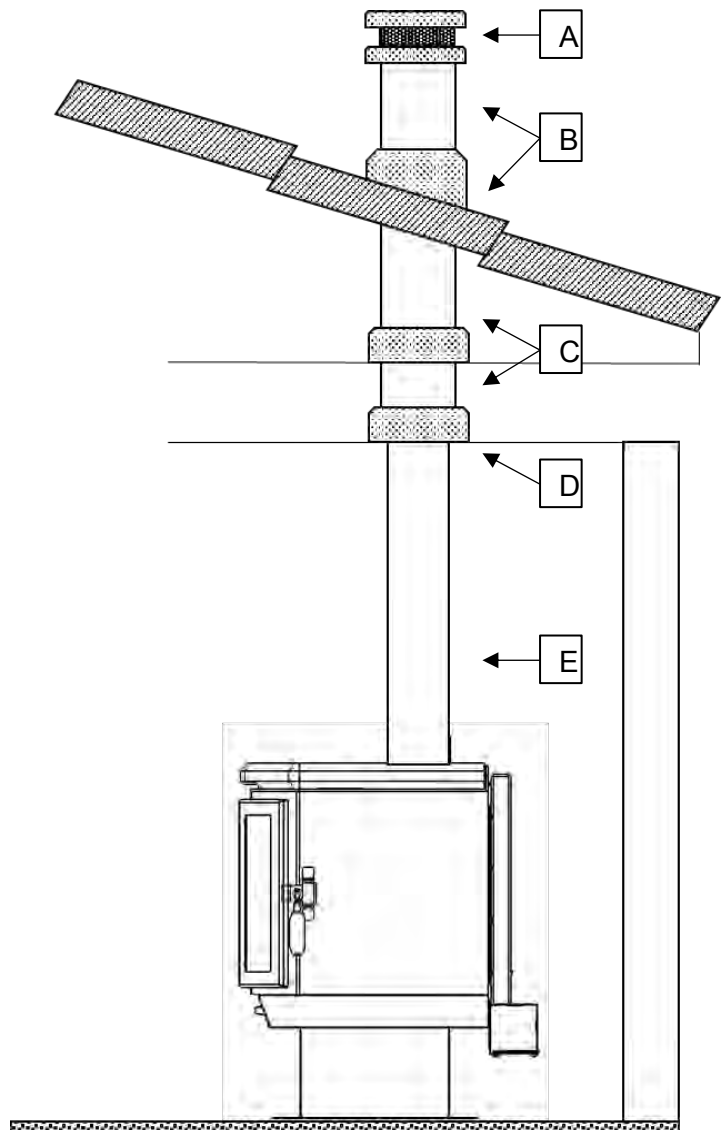
OR

2. A code approved masonry chimney with a flue liner.

In Canada, Catalyst must be connected to a factory-built chimney conforming to CAN/ULC S629, Standard for 650°C Factory-Built Chimneys.

Standard Chimney Arrangement

- A. Chimney termination
15'/33' (4.5/10m) min/max height
- B. Roof penetration
- C. Chimney sections
- D. Ceiling penetration
- E. Chimney connector



CHIMNEY CONNECTOR REQUIREMENTS

Chimney connector is required from the flue collar of the stove to the factory-built chimney or masonry chimney. The chimney connector must be 6" (152mm) diameter and a minimum 24 gauge black steel. Aluminum or galvanized steel is not allowed – these materials cannot withstand the flue temperatures and may give off toxic fumes when heated.

The chimney connector may not pass through a ceiling, attic, roof, closet, or any other concealed space (use listed UL 103 HT chimney – see "Chimney Requirements for details). DO NOT USE CONNECTOR PIPE AS CHIMNEY.

IN CANADA: Where passage through a wall or partition of combustible construction is desired, the installation shall conform to CAN/CSA-B365, Installation Code for Solid-Fuel-Burning Appliances and Equipment.

The chimney connector should be as short and direct as possible. No more than 180° of elbows (two 90° elbows, or two 45° & one 90° elbow, etc.) may be used for the entire system (connector and chimney). Horizontal runs should slope upwards 1/4" (6mm) per foot and be a maximum 36" (914mm) long.

The chimney connector must be installed with the crimped end pointing downwards. This prevents creosote from leaking to the exterior of the pipe.

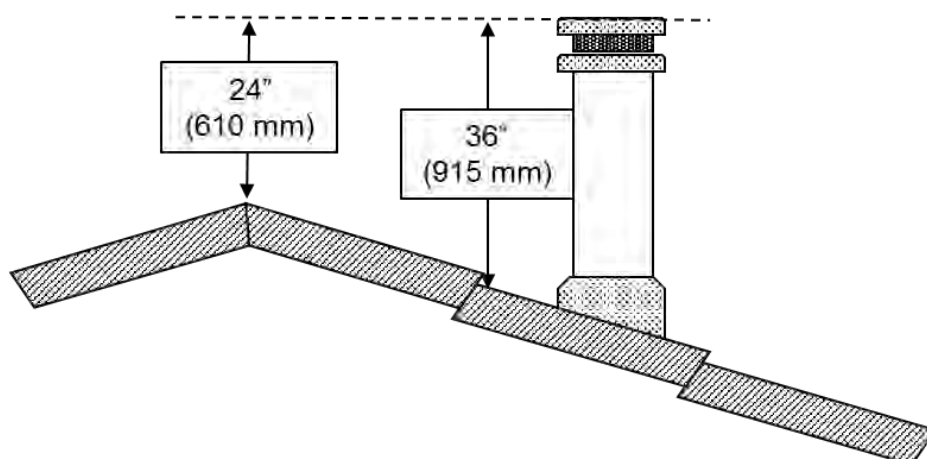
The chimney connector must be fastened to the stove and each adjoining section (and chimney) and kept clean.

CHIMNEY TERMINATION REQUIREMENTS

Must have an approved cap (to prevent water from entering)

Must not be located where it will become plugged by snow or other material

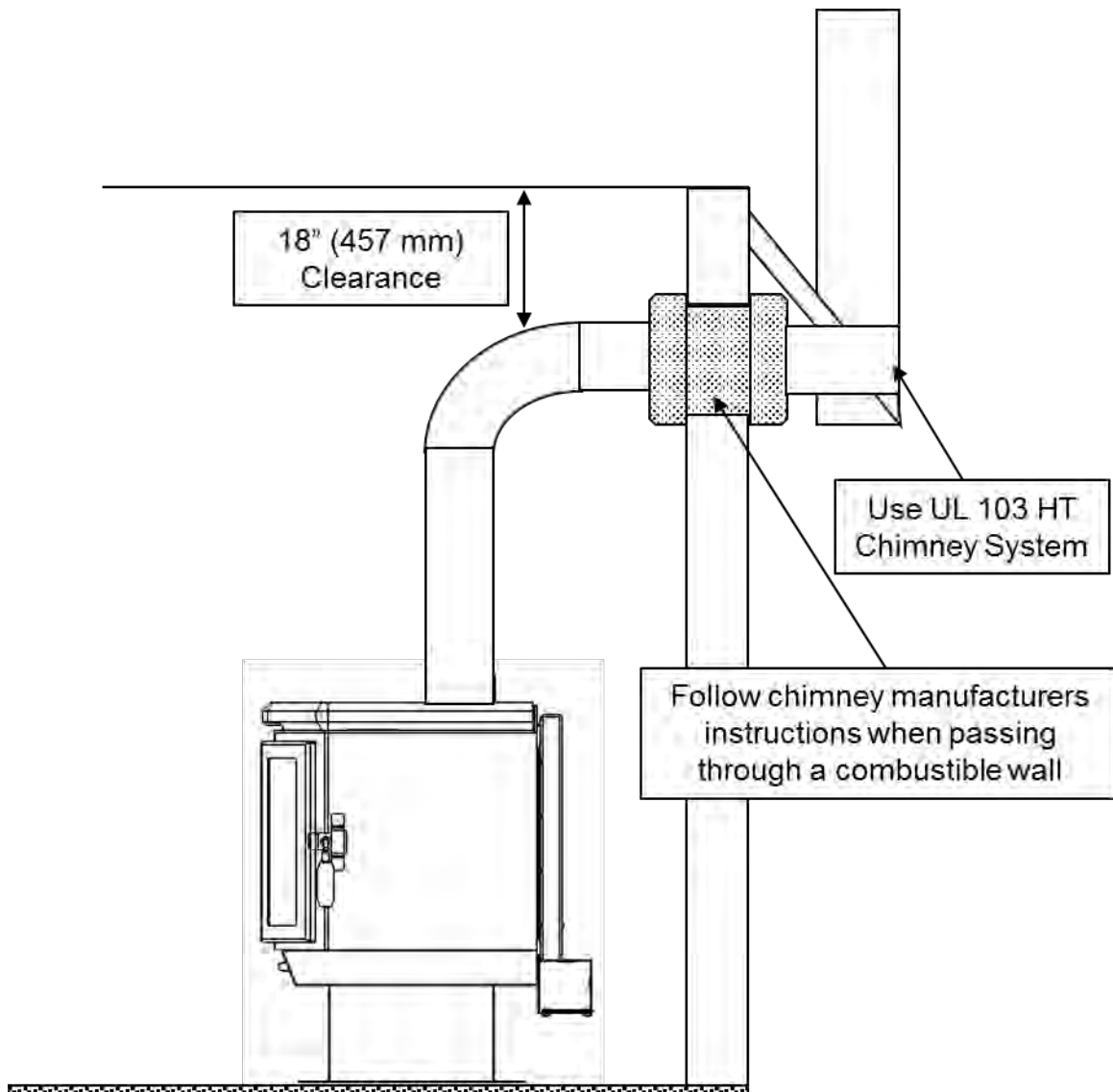
Must terminate at least 3' (914mm) above the roof and at least 2' (610mm) above any portion of the roof within 10' (3.048M)



SPECIAL INSTALLATION: EXTERIOR FACTORY-BUILT CHIMNEY

Catalyst may be used in conjunction with an exterior factory built chimney provided that the chimney meets UL 103 HT requirements.

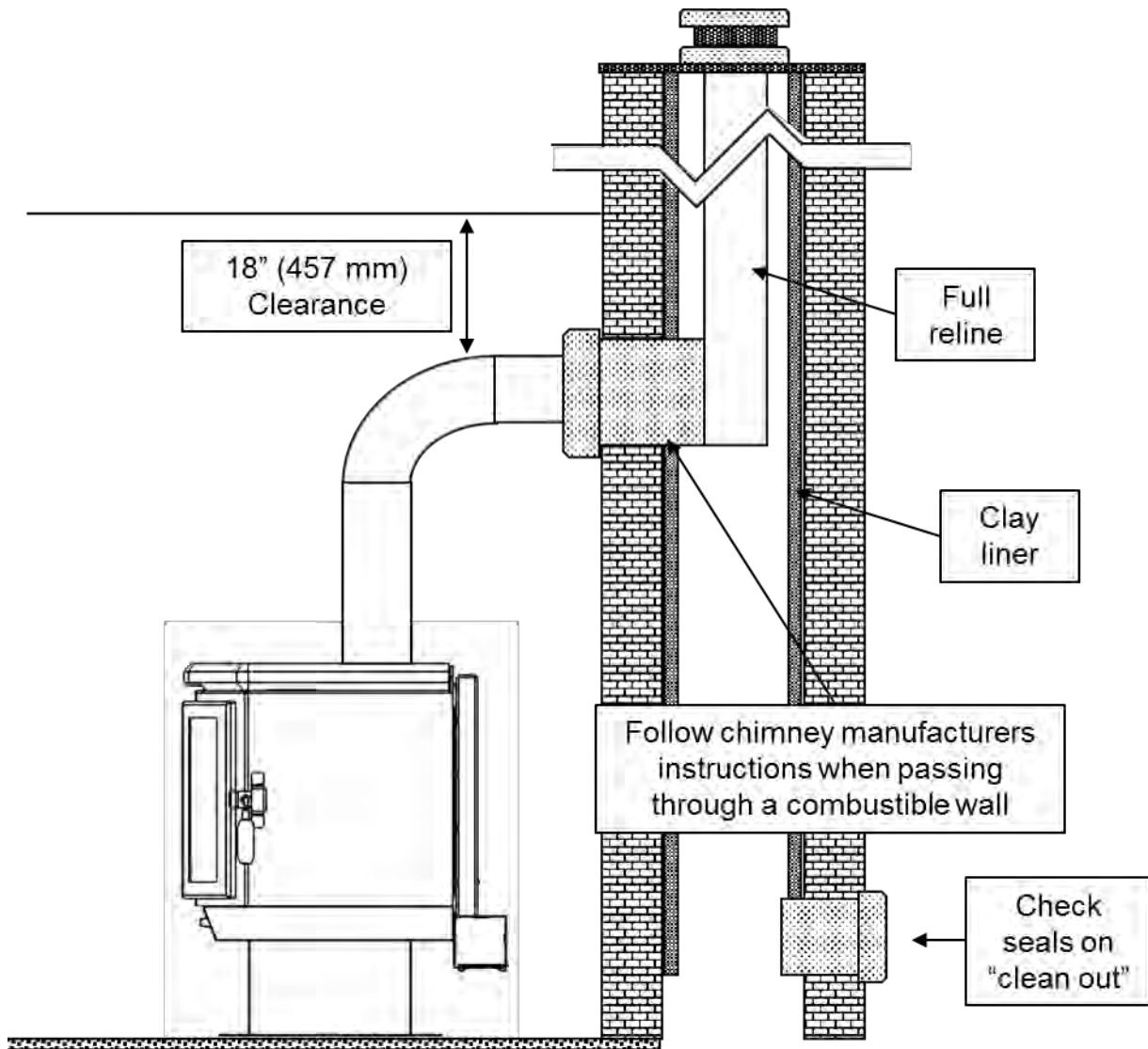
Special care must be taken regarding the wall thimble, or penetration from the chimney connector pipe to the exterior chimney, if the wall thimble must pass through an exterior wall. Here all chimney manufacturer's instructions must be followed, including guidance on spacing to combustible surfaces, piping requirements, and liner requirements. Check with local authorities before installation to ensure all requirements are met.



SPECIAL INSTALLATION: MASONRY CHIMNEY

Catalyst may be used in conjunction with a masonry chimney provided all installation instructions are followed.

We strongly recommend (required in Canada) a full reline when installing the Catalyst in a masonry chimney. If the chimney does not have a clay tile liner, a full reline is required. The chimney must be clean, undamaged, and meet all local building codes.

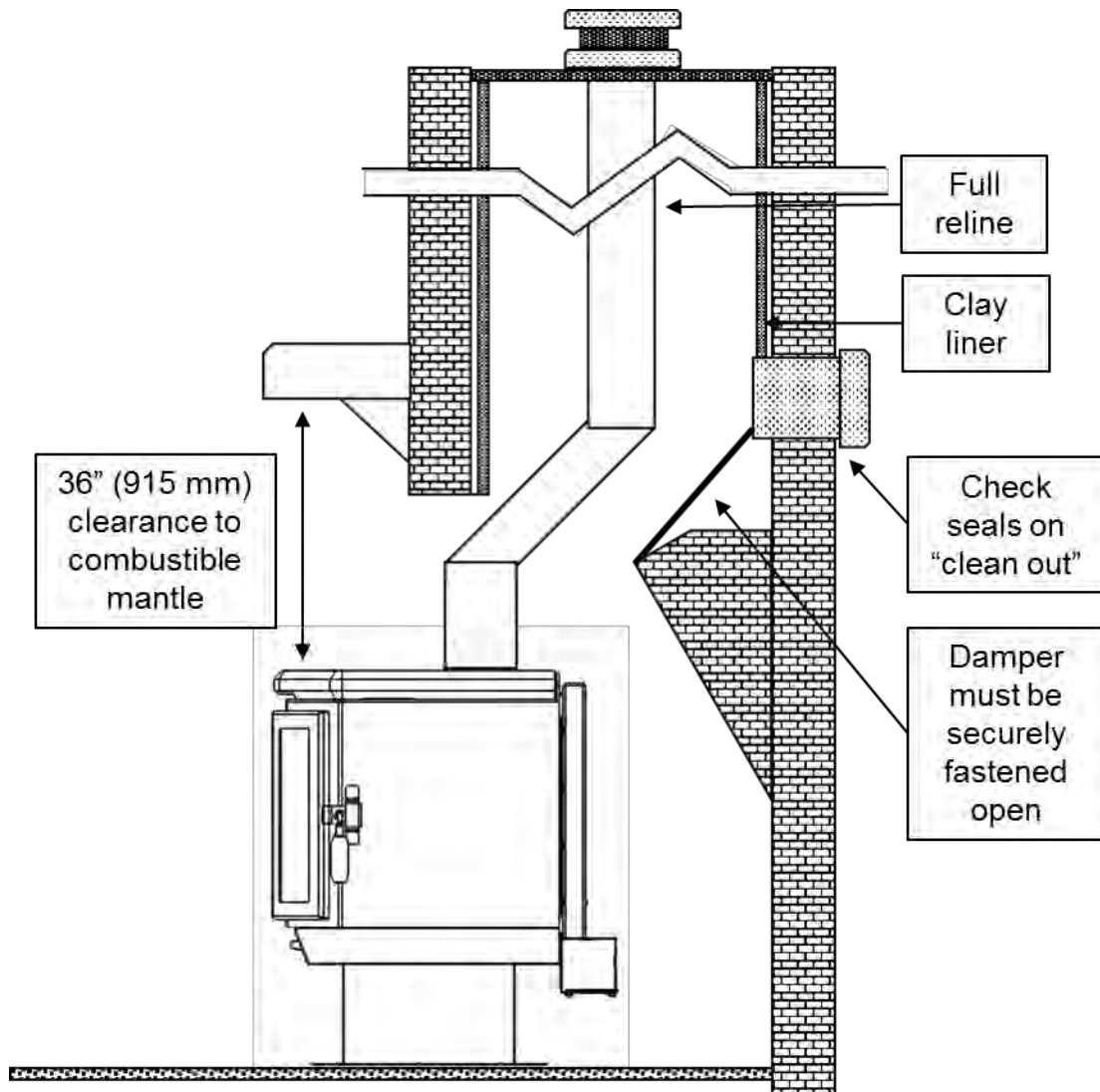


Special care must be taken regarding the wall thimble, or penetration from the chimney connector pipe to the masonry chimney, if the wall thimble must pass through an exterior wall. Here all chimney manufacturer's instructions must be followed, including guidance on spacing to combustible surfaces, piping requirements, and liner requirements. Check with local authorities before installation to ensure all requirements are met.

SPECIAL INSTALLATION: MASONRY FIREPLACE

Catalyst may be used in conjunction with a masonry fireplace provided all installation instructions are followed.

The entire fireplace must be clean, undamaged, and meet all local building codes. This installation requires a full reline. The liner must be stainless steel chimney connector or flexible vent pipe. Follow the liner manufacturer's instructions for installation and support.



CONNECTING THE ELECTRONICS

To be added.

Do not route power cord under or in front of appliance.

USING THE CATALYST: FROM STACK TO STAND

Catalyst is the world's first smart wood stove, which means that it is a whole lot easier to use than any wood stove you have ever used. Gone are dampers and catalytic combustor bypasses. Gone is keeping the door open to start the stove, spilling smoke into the room. Instead, Catalyst is 100% automatic, so you just build a fire and walk away, and the Catalyst goes to work automatically tending your fire and minimizing emissions.

Let's get started to see how it works.

START UP

Safety Notice: Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or "freshen up" a fire in this heater. Keep all such liquids well away from the heater while it is in use.

Before starting your Catalyst, be sure that all power cords are remote from the main firebox, to prevent burning and electrical failure.

When you open the front door of the Catalyst, your combustion fan will kick on high. It knows you are ready to start.

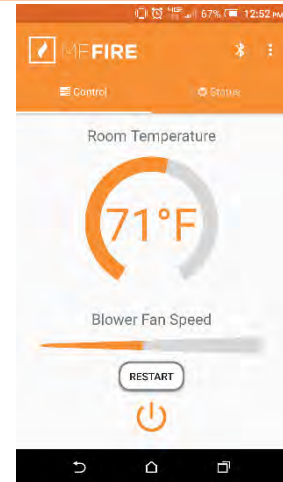
The easiest way to start a fire in a cold stove is to use newspaper to create a base, then cover the base in small kindling, and cover the kindling in logs. When placing logs atop the kindling, increase log size as you build up. One of the keys to a quick and easy start up is to ensure there is plenty of air for the fire. So, be sure to leave air gaps between kindling and logs alike. The newspaper, kindling, and log combination should be built to fill the majority of the firebox. Do not elevate the fire above the provided grate by use of additional grates, andirons, etc.

When you have stacked your wood take a match or lighter and light the newspaper in several different areas. Immediately after lighting, shut and latch the door. **There is no need to leave the front door ajar.** Catalysts smart control system will help provide enough air flow to start the burn, and will automatically adjust to burn in the burn mode you have selected.

SETTING THE TEMPERATURE

Your Catalyst has only one burn mode – perfect. Catalyst will automatically adjust to maintain the perfect room temperature. This temperature can be chosen from the MF Fire app by moving the slider circle pictured in the center of the app.

If you don't do anything, Catalyst will automatically work to achieve a perfect 70°F.



RELOADING

Your Catalyst knows when you want to reload.

When reloading, if there is a large coal bed (glowing red coals, covering the entire bottom, at least an inch deep), there is no need to use kindling or newspaper. To reload, slowly open the door. Your exhaust fan will increase its speed to prevent smoke from spilling into the room. Fill the firebox chamber with logs, taking care not to stack the logs too close to the glass on the front door. Then simply shut the door, and walk away.

CONTROLLING THE BLOWER

The blower can be cycled on and off by pushing the right button on the controller. When the button light is lit, the blower is on. When the button light is not lit, the blower is off. The blower will not run when there is no fire in the firebox.

TYPES OF COMBUSTION

The Catalyst uses three levels of combustion: Primary, Secondary, and Catalytic. Carefully regulating these combustion types leads to clean and efficient burning.

Primary: This is the first step in the combustion process of your Catalyst. Primary combustion occurs directly surrounding the wood. Did you know that *flames are never actually on the wood?* Primary combustion occurs just off the wood surface by combusting gases that are released from the wood as it heats up. The air supply the first row of holes in the firebox walls are used to feed the primary combustion process.

Secondary: The next step in the combustion process is secondary combustion, which is any combustion distant from the wood fuel. This typically occurs for the first time just underneath of the baffle in the firebox and continues above the baffle. Secondary combustion helps to eliminate any products of incomplete combustion, like soot or carbon monoxide that are left

over from primary combustion. We need local temperatures of over 1100°F (600°C) before secondary combustion kicks in.

Catalytic: The final stage of combustion happens inside the catalytic combustor. Your Catalyst has a catalytic combustor (or catalyst, this part gets a little confusing) that scrubs the air just before the exhaust gases leave the stove. Catalyst's catalyst (see) is a fine metal honeycomb, coated in platinum. Platinum lowers the activation energy of certain chemical reactions, which means that the same chemical reactions can occur at much lower temperatures if there is a little platinum hanging around. For our particular reactions, this combustion process begins at about 550°F (300°C). With the large viewing window, you will be able to sometimes see your catalytic combustor glowing. Don't worry – that just means it is doing its job.

WOOD SELECTION

Use **ONLY** untreated wood in your Catalyst. The use of any other fuel may result in unsafe burning conditions and cause damage to the stove.

When choosing wood, please try to use dry wood, meaning wood of between 15-20% moisture content. To test the moisture content, split a piece of wood and use your wood moisture meter on the interior center of the wood. Store this wood in a dry place and remote from your Catalyst. Do not dispose of ashes where near where fuel is stored to prevent accidental fires.

Why does dry wood matter? It burns much more efficiently, increasing heat output from the stove and reducing creosote buildup in the chimney.

ORDINARY OPERATING SOUNDS

During the typical operation of your Catalyst, the wood stove will make occasional creaking noises. This is completely normal and is likely caused by the heating and cooling of the stove. Additionally, the fans will create a slight noise as they move air through the stove and the room.

REGULAR MAINTENANCE

Woodstoves, even those as clean as Catalyst, must be cleaned frequently because soot, ash, and creosote may accumulate. Please follow a routine maintenance schedule as suggested here.

GLASS

The air wash on the Catalyst is designed to help keep the front glass clean. The glass may become dirtied in some spots when using unseasoned wood (please read Wood Selection section) or when burning in the lower burn mode. To clean the glass, the unit should be allowed to cool. Use a soft cloth and a non-ammonia, non-abrasive cleaner. There are many retail options for wood stove glass cleaner.

ASH REMOVAL

Disposal of Ashes: Ashes should be placed in a steel container with a tight-fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.

DOOR GASKETS

Inspect all gaskets and door seals before each use. Catalyst should be operated with both front door and ash pan door tightly shut.

MONTHLY MAINTENANCE

CREOSOTE

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited, this creosote makes an extremely hot fire.

The chimney and chimney connector should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If creosote has accumulated, it should be removed to reduce the risk of a chimney fire.

The use of unseasoned (wet, green) wood will increase the formation of creosote.

If you are not confident in performing a creosote inspection, contact a local chimney sweep to perform an inspection. Excess creosote buildup may cause a chimney fire that may result in property damage, injury, or death.

SOAPSTONE

The soapstone top on the Catalyst can be removed of light scratches by lightly sanding the surface using a fine abrasive sandpaper or Grade 1 (medium) steel wool. Any soapstone dust created by sanding should be removed with a vacuum.

DUCT/BLOWER CLEANING

The air duct and the blower should be cleaned by using a vacuum to remove excessive dust.

GASKET

There is gasket located on the front door, on the front door glass, and on the ash pan. The gasket in these areas should be visually inspected for any signs of deterioration or smoke leakage into the room. If the gasket is deteriorating, contact MF Fire for replacement gasket.

ANNUAL MAINTENANCE

EXTERIOR PAINT

To fix areas on the exterior of the stove that have been scratched or dinged, a can of black stove spray paint was provided along with your Catalyst. If additional paint is needed, contact MF Fire. The paint should only ever be applied with the stove is cool. Allow the paint at least one hour to cool. After applying the paint, the newly painted area may appear darker than original until it is cured. When using the stove next, the curing process may give off some fumes. Windows and other ventilation means should be utilized.

GLASS

In the event of broken door glass, a new pane of glass must be installed before usage may continue. Do not operate with broken glass!

To avoid breaking the glass, avoid striking the glass, slamming the door shut, or building the fire too close to the glass.

To replace broken glass, carefully open the front door while the stove is cool. Remove large shards with gloves and dispose of appropriately. Then carefully unscrew the interior doorframe, taking care to keep all screws.

Replace the glass with official MF Fire replacement glass. The main pane is 0.1875" (5 mm) ceramic glass, 16.375" (416 mm) x 13.750" (349 mm). The side panes are 0.1875" (5 mm) ceramic glass, 16.375" (416 mm) x 4.625" (117 mm) Do not use unauthorized substitute materials.

When replacing glass, ensure that the glass is properly surrounded by graphene impregnated wood stove gasket (1" rope gasket on the exterior, 1"x1/8" flat gasket on the interior), and centered over window openings.

CATALYTIC COMBUSTOR

This wood heater contains a catalytic combustor, which needs periodic inspection and replacement for proper operation. It is against federal regulations to operate this wood heater in a manner inconsistent with operating instructions in this manual, or if the catalytic element is deactivated or removed.

Your catalytic combustor should be visually inspected at monthly to check its condition. Do not attempt to inspect the catalytic combustor unless the stove is cool and not currently in use. To inspect the catalytic combustor, first remove the back panel on the stove and place it to the side. Next, remove the catalytic combustor chamber panel. Remove the steel baffle in this area and then remove the catalytic combustor for inspection. If there is some ash on the catalytic combustor, use a soft bristled brush to clean off the ash.

If there is creosote accumulation on the catalytic combustor, it should be placed back in the stove and all parts removed should be added back in. Next, the stove should be burned in “High Mode” in an attempt to burn the creosote off of the catalytic combustor. If the creosote does not burn off after a full burn on “High Mode”, a new catalytic combustor is needed. Another sign that the catalytic combustor is in need of replacement may be if there is excessive smoke from the chimney in the “High Mode”. Contact MF Fire for a replacement catalytic combustor (#CAT001). If the combustor needs replacement, the stove may be operated as usual until the replacement arrives and is installed.

Burn untreated wood only. Burning materials such as treated wood, metal foil, coal, plastic, garbage, Sulphur, or oil may damage the catalytic combustor. Excessive smoking indicated the combustor has failed and requires replacement.

LIMITED 5 YEAR WARRANTY

Your Catalyst is automatically registered for MF Fire's 5 year warranty with purchase. All portions of the stove are subject to the warranty, excluding paint, gasket, glass, and fasteners. Mileage and service charges, if necessary, are not covered by this warranty.

IF WARRANTY SERVICE IS NEEDED

1. If you discover a problem that you believe is covered by this warranty, you must report it to MF Fire WITHIN 30 DAYS, indicating model name and serial number.
2. MF Fire has the option of either repairing or replacing the defective component.
3. Any appliance or part thereof that is repaired or replaced during the limited warranty period will be warranted under the terms of the original limited warranty for a period not to exceed the remaining term of the original limited warranty.

CONDITIONS AND EXCLUSIONS

1. This device must be installed, operated, and maintained at all times in accordance with the instructions in the Owner's Manual. Any alteration, willful abuse, accident, neglect, or misuse of the product shall nullify this warranty.
2. Discoloration and some minor expansion, contraction, or movement of certain parts and resulting noise, is normal and not a defect and, therefore, not covered under warranty.
3. This warranty does not cover misuse of the stove. Misuse includes over-firing or use of any fuel not recommended by the manual. Misuse of Catalyst can cause serious damage and will void the warranty.
4. Damage to the appliance while it is in transit is not covered by this warranty, but is subject to a claim against the carrier.
5. The warranty, as outlined within this document, does not apply to the chimney components or other accessories used in conjunction with the installation or use of the stove.
6. MF Fire is not responsible for inadequate performance caused by environmental conditions.
7. Exclusions to this 5 Year Warranty include: injury, loss of use, damage, failure to function due to accident, negligence, misuse, improper installation, alteration or adjustment of the manufacturer's settings of components, lack of proper and regular maintenance, damage incurred while the appliance is in transit, alteration, or act of God.
8. Damage to surfaces caused by fingerprints, scratches, melted items, or other external sources left on the surfaces from the use of abrasive cleaners is not covered in this warranty.
9. Damage to the surfaces from over-firing (operation where the steel may glow red) is not covered in this warranty.
10. MF Fire is free of liability for any damages caused by the appliance, as well as inconvenience expenses and materials. Incidental or consequential damages are not covered by this warranty.
11. This warranty does not cover any loss or damage incurred by the use or removal of any component or apparatus to or from the Catalyst.
12. Any statement or representation of products and their performance contained in MF Fire advertising, packaging literature, or printed material is not part of this 5 year warranty.
13. MF Fire will not cover the cost of the removal or re-installation of hearths, facing, mantels, venting or other components.
14. This 5 year warranty is the only warranty supplied by MF Fire, the manufacturer of the appliance. All other warranties, whether express or implied, are hereby expressly disclaimed and purchaser's recourse is expressly limited to the warranties set forth herein.

LABEL LISTING

DO NOT REMOVE THIS LABEL Contact local building or fire officials about installation and restrictions in your area. Suitable for use in a conventional residential installation. For use with solid wood fuel only.

Tested & Listed By  Portland Oregon USA
 OMNI-Test Laboratories, Inc.
 Report No. 100517863-001
 Control No. 4000515



Catalyst
Model #001

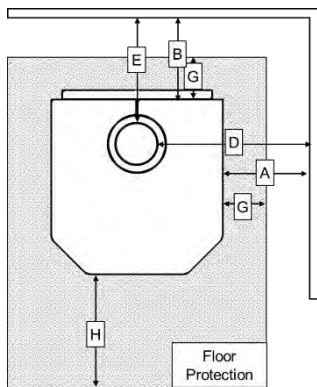
Serial Number:
#00001

Conforms to UL STD 1482; Certified to ULC STD S627-2000

Prevent House Fires: Install and use only in accordance with the manufacturer’s installation and operating instructions found in the Owner’s Manual. Contact your local building or fire officials about restrictions and installation inspection in your area. Refer to local building codes and manufacturer’s instructions for precautions required for passing a chimney through a combustible wall or ceiling. Do not run a chimney connector through a combustible wall or ceiling. Do not connect this unit to a chimney flue serving another appliance. Clearances may be reduced by methods specified in NFPA 211, listed wall shields, pipe shields, or other means approved by local building or fire officials. Do not overfire, if chimney connector glows, you are overfiring. Inspect and clean chimney frequently – under certain conditions of use creosote buildup may occur rapidly. Do not use grate or elevate fire – build wood directly on hearth.

This wood heater contains a catalytic combustor, which needs periodic inspection and replacement for proper operation. Consult Owner’s Manual for further information. It is against the law to operate this wood heater in a manner inconsistent with operating instructions in the owner’s manual, or if the catalytic element is deactivated or removed. **CAUTION:** the combustor used in this appliance (part no. #CAT001) is fragile and must be handled carefully. Burn only dry wood. The burning of metal foils, plastic, garbage, sulphur and diesel oil will render the catalyst in the combustor inactive. The performance and durability of the catalytic combustor has not been evaluated as part of the certification.

Free Standing Installation: Standard residential freestanding installations require a 6” diameter, minimum 24 MSG black, with listed UL-103 HT factory-built chimney, suitable for use with solid fuels or masonry chimney. If installed on a combustible floor, a noncombustible floor protector must be used, extending to at least 18” (450 mm) on the firing side and 8” (200 mm) on the other sides. Do not obstruct the space beneath the heater. Operate with doors closed.



Minimum Clearances	
A Side wall to stovetop	12” (305 mm)
B Back wall to stovetop	12” (305 mm)
D Connector to side wall	22” (559 mm)
E Connector to back wall	15” (381 mm)
G Floor protection, side/back	8” (200 mm)
H Floor protection, front	18” (450 mm)

Electrical Rating: 115V, 60 Hz, 1.8 Amps
 Exhaust Fan: #XF001
 Room Blower: #RB001

Do not route power cord under or in front of appliance.
 Replace glass only with 5mm ceramic glass.

Manufactured by:
 MF Fire
 12921 Bikle Rd,
 Smithsburg, MD,US

www.mffire.com

U.S. ENVIRONMENTAL PROTECTION AGENCY
 Certified to comply with May 2020 particulate emission standards using crib wood.

Made in U.S.A

DATE OF MANUFACTURE: _____

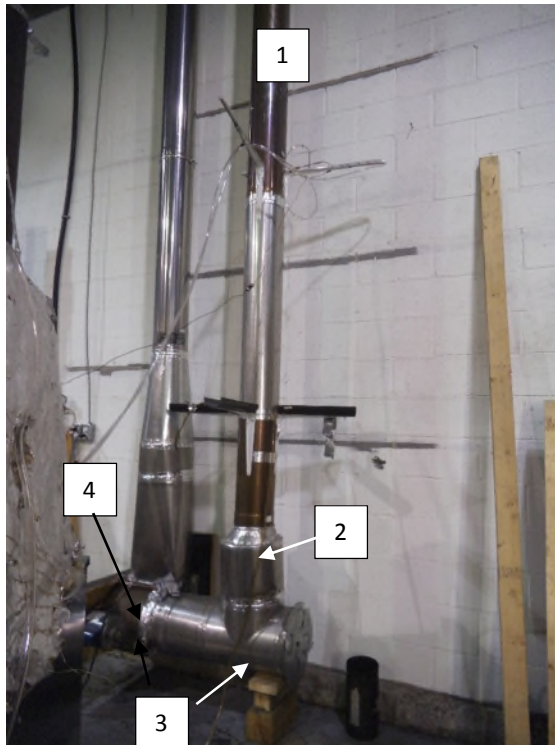
INDEX

To be added

APPENDIX 8: Photographs of test set up

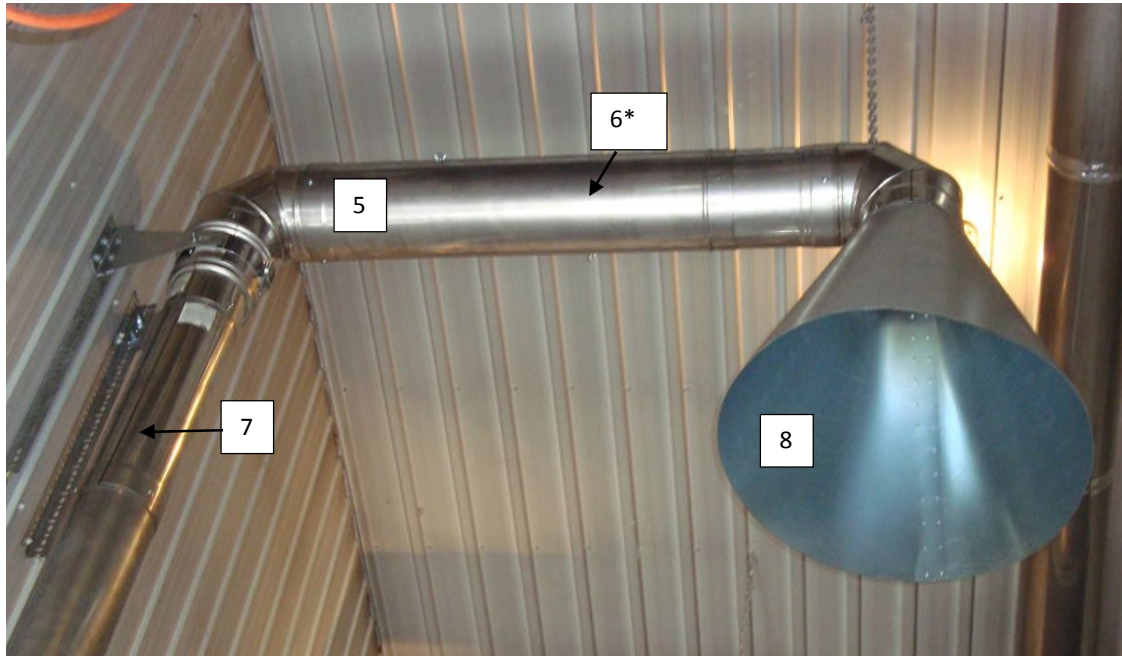
Dilution picture Dia 8

Picture 1: Sampling system



- 1 : 8 in dia Stainless steel pipe
- 2 : 16 in. Between sampling probe and lower elbow
- 3 : Air intake with damper to adjust flow rate
- 4 : Exhaust blower

Picture 2: Hood and mixing baffle



*The arrow point the deflectors inside of the pipe

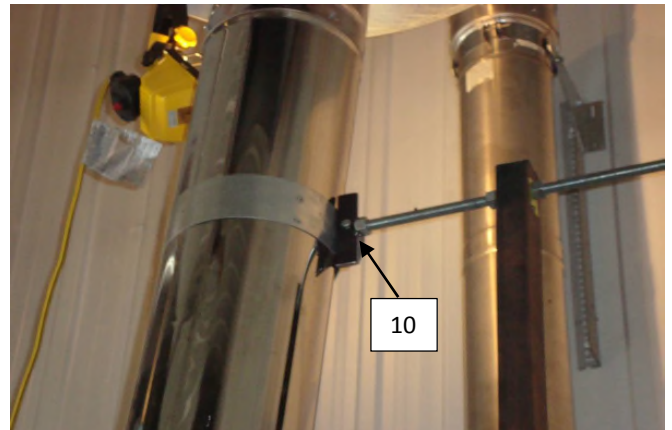
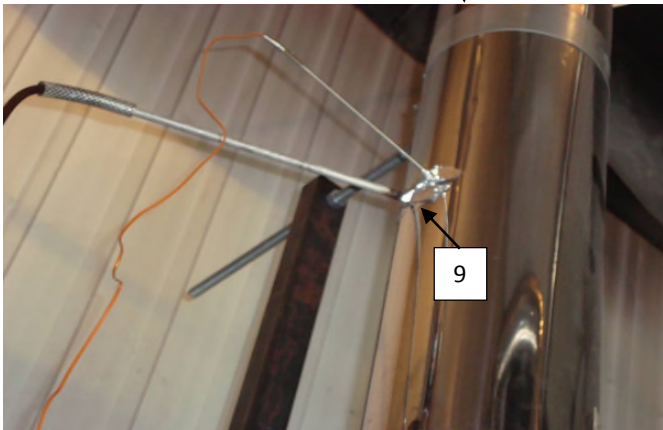
- 5 : 8 in. dia. Stainless steel pipe
- 6 : Mixing baffle (2) location 1 foot between baffles
- 7 : 10 feet long between velocity port and upper elbow
- 8 : 48 in. dia. Galvanized steel smoke captures hood

Picture 3: Stack sampling



Picture 3.1: Gas analysis and temperature probe

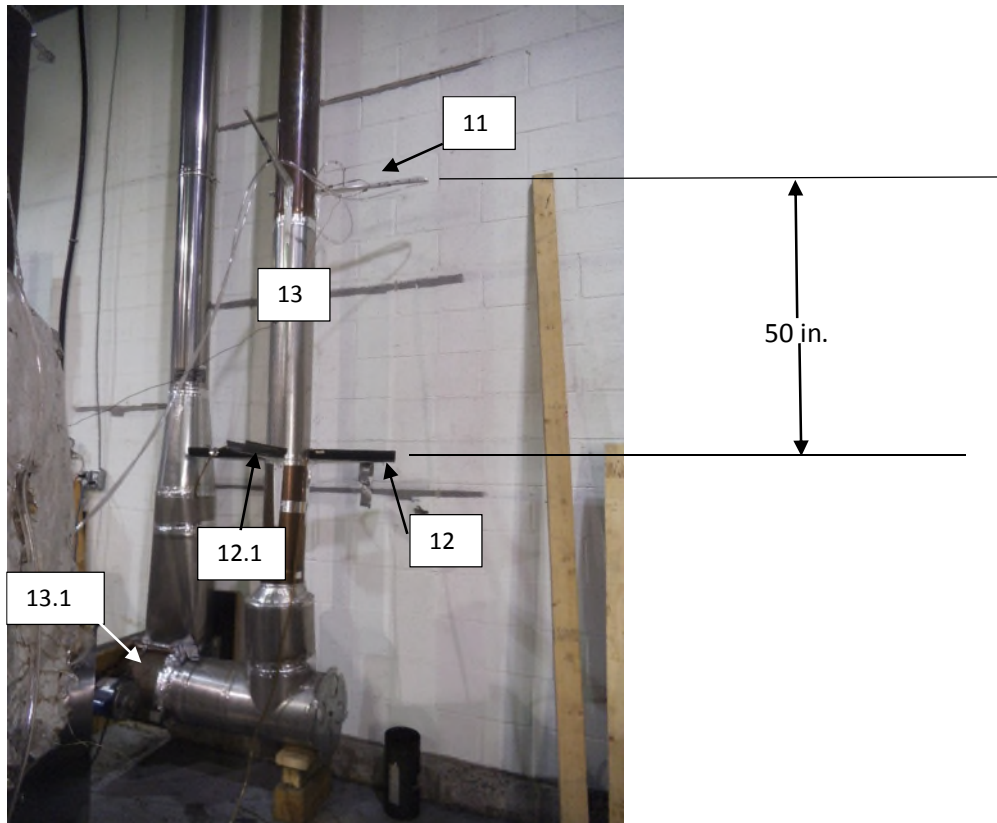
Picture 3.2: chimney support



9 : Temperature and gas analyser sampling ports located 9 feet above platform

10 : Exhaust system support bracket

Picture 4: Tunnel flow measurement and sampling probe



11 : Velocity port

12 : Sampling port, 2 sampling probes with 2x48 mm. dia.filter each. Filter used:
Millipore AP4004700

12.1 : Sampling port, sampling probes with 2x48 mm. dia.filter each. Filter used:
Millipore AP4004700, for first hour sampling

13 : 18 feet long dilution tunnel

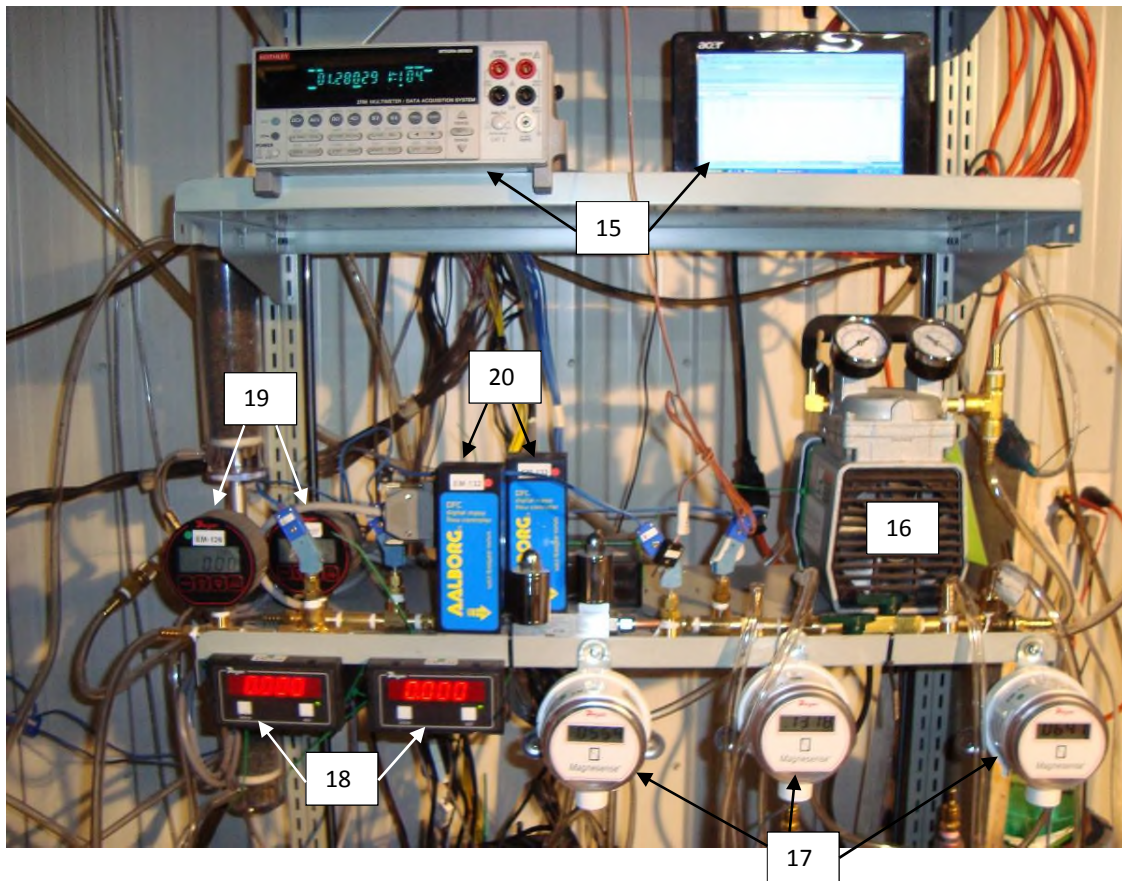
13.1 : Extraction blower

Picture 5: Draft sampling



14 : Draft sampling port located 6 in. from the flue outlet

Picture 6: Equipments



- 15 : Acquisition system
- 16 : Vacuum pump
- 17 : Digital manometer
- 18 : Digital read out for mass flow meter
- 19 : Digital vacuum gage
- 20 : Mass flow meter

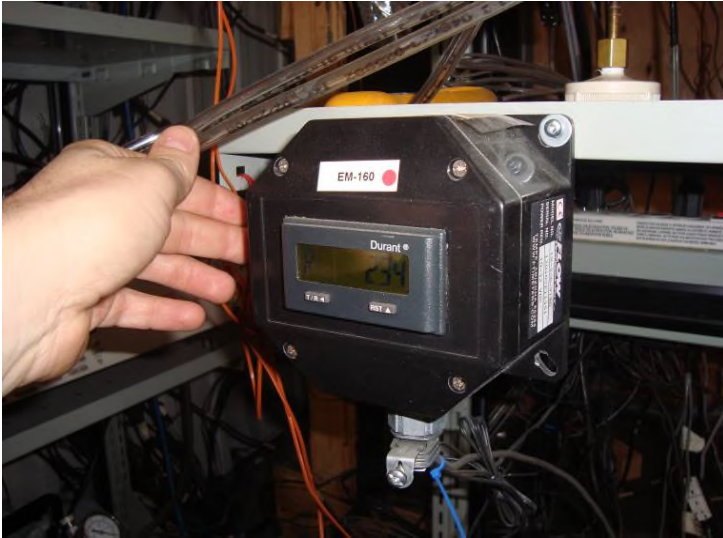
Picture 7: Gaz analyser



Picture 8: Reference dry gas meter



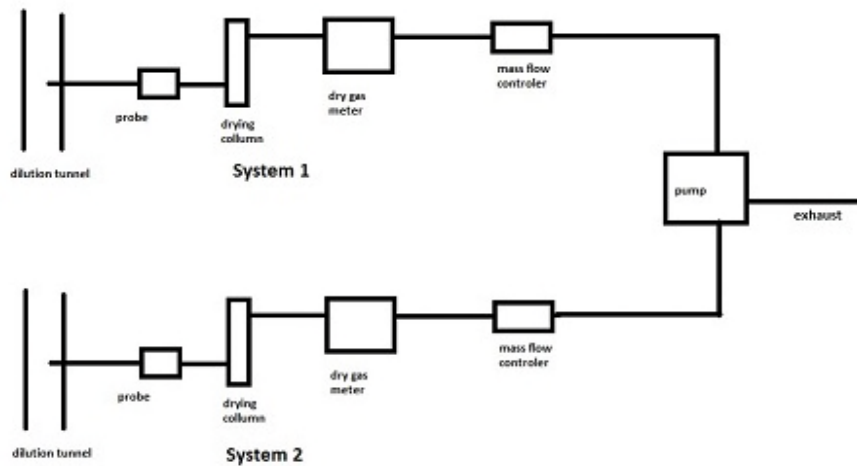
Picture 10: Water flow meter



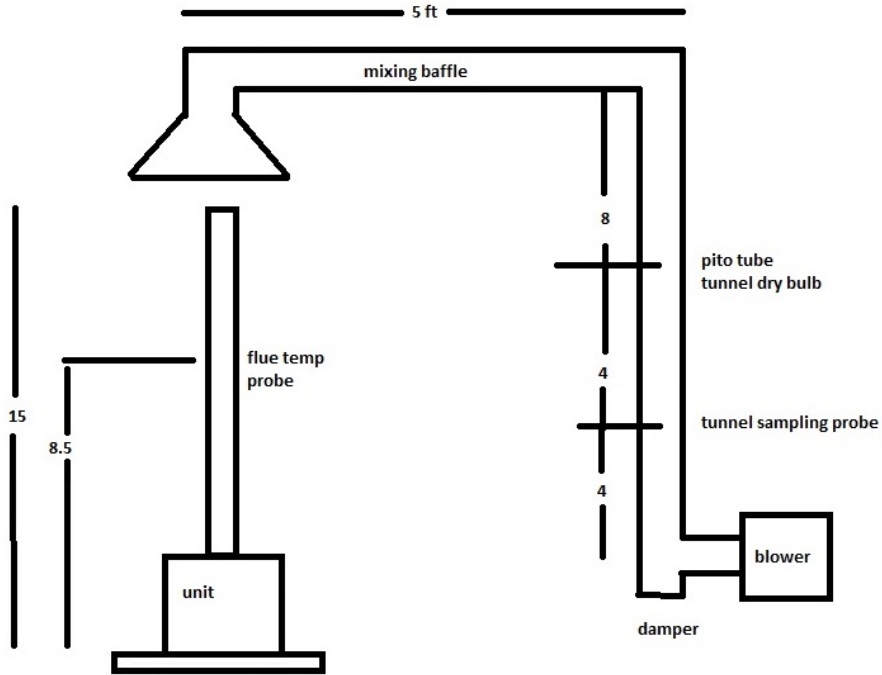
Picture 11: Dry gas meter



Picture 12 : Dilution tunnel sample system



Picture 13: Dilution tunnel



APPENDIX 9: Test load photographs

Run 1



Run 2



APPENDIX 10: Laboratory Operating Procedures

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SFBA EMISSIONS AND EFFICIENCY TESTING LABORATORY OPERATING PROCEDURE

INTRODUCTION

This document provides a step by step guide for the technician conducting tests to EPA standard requirements. Procedures outlined here, when followed, will result in tests in conformance with EPA Methods 28R, ASTM E2780, ASTM E2515, ASTM E2618, Method 28WHH, Method 28 PTS.

The primary measurements to be made are particulate emissions rates. The technician's duties include the following steps.

1. Incoming inspection of test units.
2. Set-up of test units.
3. Preliminary testing to establish unit operating procedures and familiarity with operating controls.
4. Calibration of test equipment.
5. Set-up, checking and operation of sampling apparatus.
6. Conduct of tests including complete record keeping and data recording for non-automated functions.
7. Operation of hardware and software included in automatic data acquisition system.
8. Review and analysis of data at test completion to ensure test validity.

The technician running this test must be familiar with the following documents, which are to be kept in the laboratory at all, times.

EPA METHODS

1. EPA Methods 28R
2. ASTM E2780
3. ASTM E2515
4. ASTM E2618
5. Method 28WHH
6. Method 28 PTS

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SFBA EMISSIONS AND EFFICIENCY TESTING LABORATORY OPERATING PROCEDURE

I. APPLIANCE INSPECTION AND SET-UP

A. INCOMING INSPECTION

1. Check for completeness of unit including parts, accessories, installation and operating instructions, drawings and specifications etc. Note any discrepancies or missing parts or information.
2. Check for shipping damage. If damage has occurred, notify the laboratory manager. In some cases, repairs may be made, provided the manufacturer and laboratory manager concur that repairs will not affect the unit's performance. If damage is irreparable, a new unit will need to be obtained.
3. Note whether unit is catalytic or non-catalytic.
4. Mark unit with manufacturer's name, model number, work order number and date received.
5. If unit is safety listed, note label data including listing agency and serial number. If unit is not listed, mark all data sheets "UNLISTED". Test results will not be released until unit passes safety tests without modification unless authorized by laboratory manager.

B. UNIT SET-UP

1. All new units must be operated for a breaking in period as follows.
 - a) Non-catalytic units: Ten (48) hours at medium burn rate with Douglas Fir scrap or cordwood.
 - b) Catalytic units: Fifty (50) hours at medium burn rate with Douglas Fir scrap or cordwood.

During these break-in runs the unit may be connected to a lab chimney and fuel additions noted into the corresponding data acquisition file. For catalytic units, a thermocouple must be installed in the catalyst.

Record catalyst temperature at 1-hour intervals or on chart recorder. Operating should continue until data shows at least fifty (50) hours of operation with catalyst temperature in excess of 800 degrees Fahrenheit (active range).

For non-catalytic units a stack thermocouple should be installed and stack temperature recorded at 1-hour intervals. Fourty-eight (48) hours minimum burn time with a stack temperature of at least 250 degrees Fahrenheit is required.

2. Once break-in is completed, allow unit to cool. Clean unit thoroughly.

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3. Unit is to be placed on scale for testing. Prior to proceeding with verification process, scale should be turned on and allowed to warm up for one (1) hour minimum. Zero scale and check calibration with standard weights. One (1) 1 kg weight and one (1) 2 kg weight are provided for this purpose. Use scale verification test form no. EPA-7-TP to record results. If scale fails to reproduce weights within tolerance, check with laboratory manager before proceeding.
 4. If scale checks out, place unit on scale and align so chimney will be centered in hood.
 5. Attach chimney connector and chimney. Be sure all joints are sealed below sampling points. Chimney and connector should be cleaned with a wire brush. Be sure chimney connector terminates and chimney starts at proper level above scale platform. Chimney must be supported from scale so that it does not touch test enclosure or hood walls.
 6. Thermocouples should be attached to surfaces of unit prior to testing. EPA requires a thermocouple on the bottom of the firebox. This must be installed prior to putting the unit on the scale. In some cases, the required thermocouple locations will be inaccessible on finished units. These units should have thermocouples installed by the manufacturer during construction. Check with the laboratory manager if problems are encountered in proper thermocouple attachment.
 7. Measure firebox dimensions and record on data forms nos. EPA-2-TP. Make a three dimensional sketch of the firebox including firebrick, baffles and obstructions. Calculate firebox volume in cubic feet with both addition and subtraction methods using forms nos. EPA-3-TP and EPA-4-TP. See Section 6.2.4 of EPA Method 28 for details of firebox volume determination.
 8. If unit is catalytically equipped, additional thermocouples must be installed upstream and downstream of catalyst. Thermocouples should also be placed in the primary and secondary combustion chambers of all units.
 9. Plug thermocouples into data acquisition system jacks making a check of locations and jack numbers for each test on data form no. EPA-5-TP.
 10. Note that inserts are tested as if they are freestanding stoves.
 11. Dilution tunnel should be cleaned prior to each certification test series and at anytime a higher burn rate follows a lower test burn rate.
- II. SAMPLING SYSTEM – SET-UP
- A. GAS ANALYSIS**
1. Instruments should be turned on and allowed to warm up for one (1) hour minimum.

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2. Calibrate analyzers as follows:

NOTE : Prior to proceeding with calibration, make sure to use NIST traceable calibration gas bottles. Adjust flow meter if necessary at each instrument to required flow value.

- a) Using span gas, adjust span control to values specified on calibration gas label.
- b) Using nitrogen, adjust zero controls to provide a 0.00 analyzer readout.
- c) Repeat a) and b) until no further adjustment is required.
- d) Check readout vs. calibration gases (2) labels.

The CO₂ and CO analyzers are “ZEROED” on nitrogen. The O₂ analyzer is spanned on air and set for 20.9%. It is zeroed on nitrogen as well.

3. Check for response time synchronization.

- a) With no fire in unit, allow reading to stabilize (O₂ should be 20.93, CO and CO₂ should equal 0).
- b) Flow the calibration gas in the unit and start stop watch. Note the time required for each unit to reach .90 of the calibration gas bottle value. If all three analyzers reach this value within 15 seconds of each other, synchronization is adequate. If not, contact the laboratory manager. Synchronization is adjusted by internal instrument setting.

4. Set-up sample clean-up and water collection train as follows.

- a) Load impingers as follows:
Impinger #1: 100 ml distilled water and 5 ml H₂SO₄
Impinger #2: 100 ml distilled water and 5 ml H₂SO₄
Impinger #3: Empty
Impinger #4: 200 – 300 grams silica gel (dry)
- b) Place impingers in container and connect with “U TUBES”. Grease carefully on bottom half of ball joint so that grease will not get into tubes.
- c) Connect filter to first impinger and sample line to last impinger.
- e) Leak check system as follows.

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- 1) Plug probe.
 - 2) Turn on sample system.
 - 3) Observe sample flow rotometer and vacuum gauge. If necessary, use vacuum; adjust valve to set vacuum to the maximum inches Hg.
 - 4) If the float in rotometer does not stabilize below 10 on scale, system must be resealed.
 - 5) Repeat leak check procedure until satisfactory results are obtained.
- f) Just prior to starting test, fill impinger container with water and ice and record ambient conditions on data form no. EPA-8-TP.

B. DILUTION TUNNEL SAMPLE TRAIN SET-UP

1. Filters and holders.
 - a) Clean probes and filter holder front housings carefully and desiccate for at least 24 hours prior to use.
 - b) Filters should be numbered and filter and probe combinations labeled prior to use.
 - c) Weigh desiccated filters and probe-filter units on analytical balance. Record weights data form no. EPA-10-TP. Note that probe and front half of front filter are to be weighed as a unit.
 - d) Carefully assemble filter holder units and connect to sampling systems. Check "DRIERITE" columns for adequate dry absorbent (blue).
2. Leak checking.
 - a) Each sample system is to be checked for leakage prior to inserting probes in tunnel.
 - b) Plug probes and start samplers, adjust pump bypass valve to produce a vacuum reading of 5 inches Hg. (NOTE: During test, vacuum must not exceed 5 inches unless posttest leak check shows acceptable results.)

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c) Allow vacuum indication to stabilize for two (2) minutes, then record time and dry gas (DGM₁) and (DGM₂) meter readings. Wait ten (10) minutes and record dry gas meter readings again (DGM₃, DGM₄). NOTE: If mark, system is leaking too much and all seals should be checked.

d) Calculate leakage rate as follows.

1) System 1: $\frac{(DGM_3 - DGM_1)}{10} = CFM_1$

2) System 2: $\frac{(DGM_4 - DGM_2)}{10} = CFM_2$

If CFM₁ or CFM₂ is greater than .02 CFM, leakage is unacceptable and system must be resealed.

If CFM₁ or CFM₂ is greater than 0.04 X sample rate, leakage is unacceptable. For most tests, the sample rate will be about 0.15 CFM, thus leakage rates in excess of 0.04 X 0.15 = 0.006 CFM are not acceptable. Record leakage rates on form no. EPA-5-TP

e) Once leakage check is satisfactory, unplug probe and set flow to appropriate rate for test. This should be done in the minimum amount of time necessary and with the probes in ambient air. Do not insert probes in tunnel until the start of the test run. When flow is established, replug probes to prevent contamination.

III. TEST CONDUCT

A. FUEL LOAD

1. Determine optimum load weight by multiplying firebox volume in cubic feet by 7. This is the load weight on an as-fired basis.
2. Determine piece size to obtain the requested load configuration and meet the test load weight criteria. The load should consist of the following: **TO BE DETERMINED**
3. Weigh out test load and adjust weight by shortening all pieces equally if necessary. Record individual piece load on form no. EPA-11-TP.

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4. Measure and record moisture content of each fuel piece using Delmhorst moisture meter. Determine if fuel load moisture content is in required range. If not, construct new load using wood with required moisture content. All wood in the humidity chamber should be within range. Contact project manager if you cannot find suitable pieces. Record moisture of each individual piece load on form no. EPA-11-TP.

B. UNIT START-UP

1. Before lighting a fire, turn on dilution tunnel and set flow rate to 140 SCFM if burn rate is to be less than 3 kg/hr or to an appropriate rate from table provided in laboratory for higher burn rates. Record readings on data form no. EPA-9-TP.
2. Check draft imposed on cold stove with all inlets closed and a draft gauge in the chimney. If draft is greater than 0.005 inches water column, adjust tunnel to stack gap until draft is less than 0.005.
3. Check for ambient airflow around unit with hot wire anemometer. Must be less than 50 ft/min.
4. Check all equipment for proper operation. Analyzers should be on and in sample mode. Computer should be loaded with test program and awaiting test start command.
5. Zero scale and start fire with uncolored newspaper and kindling representing 10 % of test load with the same type of fuel.
6. Once kindling is burning well after 5 minutes, add splitted pieces having a bottom surface around 4 sq. inches and representing 25% of test load weight. Operate at high fire for 15 minutes. Then adjust settings to intended test run levels as per the manufacturer's.
7. Following addition of pretest fuel load (splitted pieces), start computer for data logging.

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8. All fuel additions, air intake settings and operational characteristics shall be noted with associated time stamp on form no. EPA-1-TP.

C. TEST RUN

1. Once the targeted test fuel bed weight is obtained, the test is to be started as follows:
 - a) Insert the sample probes into the tunnel being careful not to hit sides of tunnel with probe tip.
 - b) Check tunnel pitot tube for proper position. (Pitot should be carefully cleaned prior to each test.)
 - c) Turn on probe sample systems and stack sampler.
 - d) Open stove door, rake coals and load stove as follows: **TO BE DETERMINED**
 - e) Close door or follow manufacturer's start-up procedures. (Five (5) minutes maximum time before all doors and controls must be set to final positions for duration of test.)
 - f) An alarm will sound an audible signal at the (10) minutes intervals. This signal a reading interval. You must verify at each interval that the following readings are correctly logged by the data acquisition system and make observations of any unusual or non routine events that could occur.
 - 1) Rotometer readings.
 - 2) Tunnel pitot tube reading.
(Zero regularly between readings)
 - 3) Gas meter readings.
 - 4) Temperature readings.
 - 5) Draft reading
 - 6) Test load weight
 - 7) CO, CO₂ and O₂ readings
 - 8) Observations of any unusual or non-routine events.
 - g) During the test, any condition approaching unacceptable limits will be noted. The filter probes and housings are installed in small holders just outside the tunnel. If the filter temperature gets too high, you will have to increase the water flow through the cooling unit until acceptable temperatures are obtained. In between readings, check on

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other equipment. Be sure dryers and filters are working and monitor impinger train for proper water and ice levels etc.

- h) When the fuel charge is consumed, it will signal end of test and shut down the sampling systems. When this occurs, remove filter holder and probes from tunnel and impingers from sample line.

IV. POST TEST PROCEDURES

A. SAMPLE RECOVERY – FILTER TRAINS

1. Carefully clean outside of probes and filter housings with alcohol.
2. Disassemble filter holder and transfer filters to clean petri dish. Scrape gasket with scalpel and collect any loose material on filters.
3. Place probe and front half of first filter holders (still assembled) and filters in desiccator. Allow 24-hour desiccation before weighing.
4. Weigh probe filter holder units and filters at two (2) hour intervals until weight change between weighings is less than 0.5 mg. Record all weights taken on data form no. EPA-10-TP.

B. CALCULATION OF RESULTS

The computer program carries out all final calculations. When run, it will ask for data from forms used during the test. Enter data as called for.

GENERAL

This guide cannot cover every possible contingency, which may develop during a particular test program. Many questions, which may arise, can be answered by a complete understanding of the test standards and their intent. When in doubt on any detail, check with the laboratory manager and be sure you understand the procedures involved.

It is critical that all spaces on the data forms be properly filled in. Each test must be represented by a complete record of what was done and when.

APPENDIX 11: Sample calculations

Validation du fichier de calcul avec les équations provenant des normes:

ASTM E2515-11

ASTME2618

Dry burn rate (BR)

Equation used

B415.1, 13.4

$$BR = \left[\frac{60W_{WD}}{\theta} \right] \left[\frac{100 - \%M_W}{100} \right]$$

Nomenclature

BR	Dry wood burn rate, kg/hr (lb/hr)
W_{WD}	Total mass of wood burned (wet basis) during the test run, kg (lb)
θ	Total time of test run, minutes
$\%M_W$	Average moisture in test fuel charge, wet basis, % To convert from dry basis to wet basis: % moisture wet basis =

Sample calculation

Data

W_{WD}	12,776 lbs
θ	138 min
$\%M_W$	16,41 %

Calculation

BR	2,107 Dry kg/hr
----	-----------------

Volume of gas sample corrected to dry standard conditions ($V_{m(std)}$)

Equation used

ASTM 2515, equation 6

$$V_{m(std)} = K_1 V_m Y \left[\frac{P_{bar} + \left(\frac{\Delta H}{13.6} \right)}{T_m} \right]$$

Nomenclature

$V_{m(std)}$	Volume of gas sample , corrected to standard conditions, dscm ³ (dscf)
K_1	17.64 R/in Hg
V_m	Volume of gas sample
Y	DGM calibration factor
P_{bar}	Barometric pressure mmHg (in Hg)
ΔH	Average pressure at the outlet of the dry gas meter mm water (in. Water)
T_m	Absolute average dry gas meter temperature K (R)

Sample calculation

Data

V_m	24,67 dcf
Y	0,992
P_{bar}	30,28 in Hg
ΔH	-0,4802 in Hg
T_m	542,6 R

Calculation

$V_{m(std)}$	23,71 dscf
--------------	------------

Total amount of particulate matter collected (m_n)

Equation used

ASTM 2515, equation 12

$$m_n = F_1 + F_2 + \Delta PF$$

Nomenclature

m_n	Total amount of particulate matter collected, mg
F_1	Particulate matter collected on front filter, mg
F_2	Particulate matter collected on second filter, mg
ΔPF	Post-test weight gain of probe and filter holder assembly, mg

Sample calculation

Data

F_1	0,002 g
F_2	0,000 g
ΔPF	0,001 g

Calculation

m_n	3,100 mg
-------	----------

Calculation based of train 2 data

Particulate concentration (C_s)

Equation used

ASTM 2515, equation 13

$$C_s = (0,001 \text{ g/mg}) \times \left(\frac{m_n}{V_{m(\text{std})}} \right)$$

Nomenclature

C_s	Concentration of particulate matter in stack gas or dilution tunnel, dry basis, corrected to standard conditions, g/dsm^3 (g/dscf)
m_n	Total amount of particulate matter collected in the sampling train, mg
$V_{m(\text{std})}$	Volume of gas sample measured corrected to dry standard conditions, dsm^3 (dscf)

Sample calculation

Data

m_n	3,100 mg
$V_{m(\text{std})}$	23,71 dscf

Calculation

C_s	0,000131 g/dscf
-------	-----------------

Calculation based of train 2 data

Particulate concentration for room air (C_r)

Equation used

ASTM 2515, equation 14

$$C_r = (0,001 \text{ g/mg}) \times \left(\frac{m_r}{V_{mr(std)}} \right)$$

Nomenclature

C_r	Concentration of particulate matter in room air, dry basis, corrected to standard conditions, g/dsm ³ (g/dscf)
m_r	Total amount of particulate matter collected in the sampling train, mg
$V_{mr(std)}$	Volume of room air sample measured corrected to dry standard conditions, dsm ³ (dscf)

Sample calculation

Data

m_r	0,100 mg
$V_{mr(std)}$	17,67 dscf

Calculation

C_r	0,000006 g/dscf
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Calculation based of train 2 data

Adjustment factor for alternative pitot tube placement (FP)

Equation used

ASTM 2515, equation 1

$$F_P = \frac{V_{strav}}{V_{scent}}$$

Nomenclature

V_{strav}	Average gas velocity cacluated after the Pitot tube traverse
V_{scent}	Average gas velocity at the center of the dilution tunnel cacluated after the multi-point Pitot traverse
F_P	Adjustment factor for center of tunnel pitot tube placement

Sample calculation

Data

V_{strav}	0,0565
V_{scent}	0,0595

Calculation

F_P	0,949580
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Average dilution tunnel gas velocity (V_S)

Equation used

ASTM 2515, equation 9

$$V_S = F_p K_p C_p (\sqrt{\Delta P})_{avg} \sqrt{\frac{T_S}{P_S M_S}}$$

Nomenclature

V_S	Average dilution tunnel gas velocity, m/s (ft/s)
K_p	Pitot tube constant For the metric units: $34.97 \text{ m/sec} \left[\frac{(\frac{\text{g}}{\text{g-mole}})(\text{mm Hg})}{(^{\circ}\text{K})(\text{mm H}_2\text{O})} \right]^{1/2}$ For English units: $85.49 \text{ ft/sec} \left[\frac{(\frac{\text{lb}}{\text{lb-mole}})(\text{in Hg})}{(^{\circ}\text{R})(\text{in H}_2\text{O})} \right]^{1/2}$
C_p	Pitot tube coefficient (use 0.99 for standard pitot tube, 0.84 may be used for S-type tubes constructed according to Method 2 specifications)
F_p	Pitot tube correction factor
$(\sqrt{\Delta P})_{avg}$	Average square root of each individual velocity head (ΔP)
P_{bar}	Barometric pressure at measurement site, mm H ₂ O (in. H ₂ O)
P_g	Stack static pressure, mm Hg (in. Hg)
P_S	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or $P_{bar} + P_g$
M_S	Molecular weight of dilution tunnel gas, wet basis, g/g-mole (lb/lb-mol) may be assumed to be 28.78 or 29 for CSA B415
t_s	Dilution tunnel temperature, °C (°F)
T_S	Absolute dilution tunnel temperature, °K (°R), or $273 + t_s$ for metric units, $460 + t_s$ for English units

Sample calculation

Data

K_p	85,49
C_p	0,99
F_p	0,950
$(\sqrt{\Delta P})_{avg}$	0,2420 in H ₂ O ^{1/2}

P_{bar}	30,28 in Hg
P_g	0,24 in H ₂ O
P_s	30,30 in Hg
M_s	28,78 lb/lb-mol
t_s	120,57 F
T_s	580,57 R

Calculation

V_s	15,8693 ft/s
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Average dilution tunnel gas flow rate (Qstd)

Equation used

ASTM 2515, equation 3

$$Q_{std} = 60(1 - B_{ws})V_s A \left(\frac{T_{std}}{T_s}\right) \left(\frac{P_s}{P_{std}}\right)$$

Nomenclature

Q_{std}	Total gas flow rate corrected to dry standard conditions, dsm ³ /min (dscf/min)
60	Conversion factor minutes per hour
B_{ws}	Water vapour in the dilution tunnel stream, proportion by volume (may be assumed to be 2%)
V_s	Average dilution tunnel gas velocity, m/s (ft/s)
A	Cross-sectional area of dilution tunnel, m ² (ft ²)
T_{std}	Standard absolute temperature, 293 °K (528°R)
T_s	Absolute average dilution tunnel temperature, K (°R), or 273 + t_s for metric units, 460 + t for English units
t_s	Dilution tunnel temperature, °C (°F)
P_s	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or $P_{bar} + P_g$
P_{bar}	Barometric pressure at measurement site, mm Hg (in. Hg)
P_g	Dilution tunnel static pressure, mm Hg (in. Hg)
P_{std}	Standard absolute pressure, 760 mm Hg (29.92 in. Hg)

Sample calculation

Data

B_{ws}	0,02
V_s	15,869
A	0,349 ft ²
T_{std}	528 R
T_s	580,57 R
P_s	30,301 in Hg
P_{std}	29,92 in Hg

Calculation

Q_{std}	300,00 dscf/min
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Particulate emission rate (E)

Equation used

$$E = (C_S - C_r)Q_{std}$$

Nomenclature

E	Particulate emission rate, g/hr
C_S	Concentration of particulate matter in stack gas or dilution tunnel gas, dry basis corrected to standard conditions, g/dscm ³ (g/dscf)
C_r	Concentration of particulate matter in room air, g/dscm ³ (g/dscf)
Q_{std}	Total gas flow rate, dry basis corrected to standard conditions, dsm ³ /min (dscf/min)

Sample calculation

Data

C_S	0,000131 g/dscf
C_r	0,000006 g/dscf
Q_{std}	300,00 dscf/min

Calculation

E	0,04 g/min
E	2,25 g/h

Calculation based on train 2 data.

Total particulate emission rate (E_T)

Equation used

ASTM 2515, equation 15

$$E_T = (C_S - C_r)Q_{std}\theta$$

Nomenclature

E_T	Total particulate emission, g
C_S	Concentration of particulate matter in stack gas or dilution tunnel gas, dry basis corrected to standard conditions, g/dscm ³ (g/dscf)
C_r	Concentration of particulate matter in room air, g/dscm ³ (g/dscf)
Q_{std}	Total gas flow rate, dry basis corrected to standard conditions, dsm ³ /min (dscf/min)
θ	Total sampling time, min

Sample calculation

Data

C_S	0,000131 g/dscf
C_r	0,000006 g/dscf
Q_{std}	300,00 dscf/min
θ	138 min

Calculation

E 5,18 g
Calculation based on train 2 data.

Average gas velocity in dilution tunnel during each min interval, i, of the test run

Equation used

ASTM 2515, equation 10

$$v_{si} = F_p K_p C_p \sqrt{\Delta p_i} \sqrt{\frac{T_{si}}{P_s M_s}}$$

Nomenclature

	Average gas velocity in dilution tunnel during each min interval, i of the test run
v_{si}	m/sec (ft/sec)
F_p	Pitot tube correction factor
K_p	Pitot tube constant
	For the metric units: $34.97 \text{ m/sec} \left[\frac{(\frac{g}{g\text{-mole}})(\text{mm Hg})}{(^{\circ}\text{K})(\text{mm H}_2\text{O})} \right]^{1/2}$
	For English units: $85.49 \text{ ft/sec} \left[\frac{(\frac{\text{lb}}{\text{lb-mole}})(\text{in Hg})}{(^{\circ}\text{R})(\text{in H}_2\text{O})} \right]^{1/2}$
C_p	Pitot tube coefficient (use 0.99 for standard pitot tube, 0.84 may be used for S-type tubes constructed according to Method 2 specifications)
Δp_i	interval, i, of the test run
T_{si}	Absolute average gas temperature in the dilution tunnel during the i^{th} minutes
P_s	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or $P_{\text{bar}} + P_g$
M_s	Molecular weight of dilution tunnel gas, wet basis, g/g-mole (lb/lb-mol) may be assumed to be 28.78

Sample calculation

Data

i=1		i=2	
F_p	0,950	F_p	0,950
K_p	85,49	K_p	85,49
C_p	0,99	C_p	0,99
Δp_i	0,057 in H ₂ O	Δp_i	0,058 in H ₂ O
T_{si}	619,7 R	T_{si}	621,0 R
P_s	30,30 in Hg	P_s	30,30 in Hg
M_s	28,78 lb/lb-mol	M_s	28,78 lb/lb-mol

Calculation

i=1		i=2	
v_{si}	16,19 ft/sec	v_{si}	16,28 ft/sec

Percent of proportional sampling rate (PR)

Equation used

B415, equation 13.1

$$PR = \left(\frac{\theta V_{mi(std)} V_S T_m T_{Si}}{\theta_i V_m V_{Si} T_{mi} T_S} \right) \times 100$$

Nomenclature

PR	Percent of proportional sampling rate (%)
θ	Total sampling time, min
θ_i	Time of interval, 1 min
V_m	Volume of gas sample measured by the DGM, dsm ³ (dscf)
$V_{mi(std)}$	Volume of gas sample measured by the digital mass flow controller during the i th 1 minutes interval, dsm ³ (dscf)
V_S	Average gas velocity in the dilution tunnel, ft/min
V_{Si}	Average gas velocity in the dilution tunnel during the i th 10 minutes interval, ft/min
T_m	Absolute average digital mass flow controller temperature, K (R)
T_{mi}	Absolute average digital mass flow controller temperature during the i th 1 minutes
T_S	Absolute average gas temperature in the dilution tunnel, K (R)
T_{Si}	Absolute average gas temperature in the dilution tunnel during the i th 1 minutes

Sample calculation

Data

train =1			train =2		
θ	138	min	θ	138	min
θ_i	1	min	θ_i	1	min
V_m	24,33	dcf	V_m	23,72	dcf
$V_{mi(std)}$	0,176	cuft	$V_{mi(std)}$	0,1735	cuft
V_S	15,88	ft/sec	V_S	15,88	ft/sec
V_{Si}	16,195	ft/sec	V_{Si}	16,195	ft/sec
T_m	542,0	R	T_m	542,6	R
T_{mi}	540,62	R	T_{mi}	541,29	R
T_S	580,57	R	T_S	580,57	R
T_{Si}	619,7	R	T_{Si}	619,7	R

Calculation

train=1		train=2	
PR	104,8 %	PR	105,9 %

Filter face velocity check

Equation used

$$FV_{max} = \frac{V_{mL}}{1} \times \frac{1}{F_A}$$

Nomenclature

FV_{max}	Maximum filter face velocity during the test run, m/min (ft/min)
V_{mL}	Largest 1 minute interval metered gas volume value recorded during the test run, dm ³ (dcf)
F_A	Filter area exposed to gas sample during train operation, m ² (ft ²)

Sample calculation

Data

V_{mL}	0,170 dcf
F_A	0,0116 ft ²

Calculation

FV_{max}	14,69 ft/min
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Dual train precision

Equation used

$$\frac{\text{Train 1} - \text{average train 1 and train 2}}{\text{average train 1 and train 2}} \times 100 \leq 7.5\%$$

Nomenclature

Dual train precision	Deviation between emission's train 1 and 2
Train 1	Total emission for train 1
Train 2	Total emission for train 2

Sample calculation

Data

Train 1	5,21 g
Train 2	5,18 g

Calculation

Dual train precision	0,34 %
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Analyzer drift checks

Equation used

$$Drift = \frac{\Delta R}{span} \times 100$$

Nomenclature

Drift	The change in analyzer response to calibration gas over the duration of the test run
ΔR	The difference between the analyzer response at the end of the test run and the
Span	The upper limit of the instrument range, ppmv or %

Sample calculation

Data

ΔR	0,015 %
Span	5 %

Calculation

Drift	0,30 %
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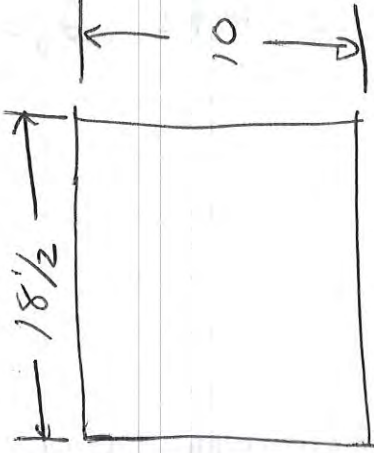
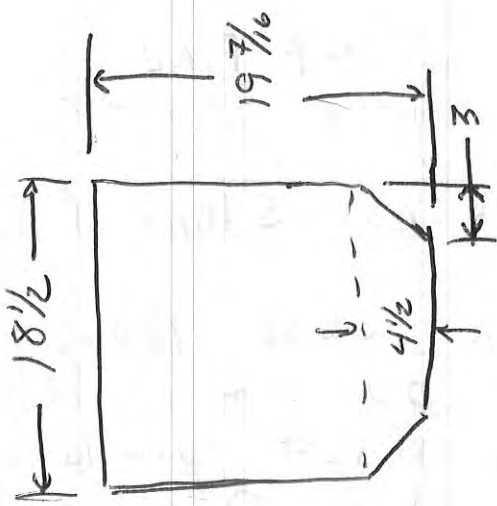
Calculated with CO concentration values.

APPENDIX 12: Volume calculations

Date: Sept. 2016
Project #: P1 20132

Manufacturer: MF Inc
Run: 1 Tech: MM

Model: Molecule
Reviewer: DP

Side view	Front view	Top view
$V = \frac{18.5 \times 19.4375 \times 10}{1728} - \frac{4\frac{1}{2} \times 3 \times 10}{1728}$ $V = 2.08 \text{ cu ft} - 0.078 \text{ cu ft}$ $V = 2 \text{ cu ft}$		

APPENDIX 13: Operating instruction

Operating instruction PI-20132

MF Fire, Mulciber

Single burn rate fire procedure:

- Start with 4.3 lbs of kindling
- Close the door at 3.8 lbs
- At 0.90lbs insert preload
- At 13.1 close the door
- At 2.7 lbs, tare scale, start pump, insert load
- Keep door slightly open for 2,5 minutes

APPENDIX 14: Drawing Air flow pattern

APPENDIX 15: Application for wood stove program