

**Tighe&Bond**

## **2013 Greenhouse Gas Reporting**

Prepared For:

**Worcester Polytechnic Institute  
Worcester, Massachusetts**

April 2014



# Tighe & Bond

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# Section 1

## Introduction

In August 2008, Massachusetts enacted into law the Global Warming Solutions Act (GWSA). The Act requires an 80 percent reduction of greenhouse gas (GHG) emissions economy-wide by 2050, with a 2020 target to be set between 10 and 25 percent below 1990 levels. As part of the GWSA, Massachusetts promulgated greenhouse gas reporting regulations in July 2009 that affect approximately 300 facilities in the state.

### 1.1 Applicability

In July of 2009, the Massachusetts Department of Environmental Protection (MADEP) promulgated greenhouse gas emissions reporting (310 CMR 7.71). In accordance with 310 CMR 7.71, the following facilities are subject to the reporting requirements:

- All facilities that are regulated under Title V of the U.S. Clean Air Act and 310 CMR 7.0, Appendix C
- Facilities that emit more than 5,000 tons per year of carbon dioxide equivalent emissions
- Retail sellers of electricity

GHG Emissions Reporting for facilities subject to the requirements of 310 CMR 7.71 commenced in 2010 for calendar year 2009. Reporting of 2009 emissions was due by June 15, 2010 and only included carbon dioxide emissions from stationary and mobile fuel combustion sources. Beginning in 2011, for emissions that occur in 2010, and each year thereafter, facilities are required to report emissions of all greenhouse gases by April 15 in carbon dioxide equivalent. The additional gasses include methane, nitrous oxide, sulfur hexafluoride, hydroflourocarbons and perflourocarbons.

Worcester Polytechnic Institute (WPI) is applicable to the GHG reporting requirements of 310 CMR 7.71 because the carbon dioxide equivalent emission from the site in 2013 exceeded the 5,000 tons threshold. Therefore, this facility is required to report GHG emissions to the MADEP.

### 1.2 Emissions Reporting

The MADEP has adopted the General Reporting Protocol (GRP) established by The Climate Registry, a nonprofit collaboration, to record and track the greenhouse gas emissions of businesses, municipalities and other organizations. Reporters are required to refer to 310 CMR 7.71 to determine which emissions sources should be reported and then use methodologies included in the GRP to quantify emissions from those sources. The relevant sections of the GRP are the methodologies that explain how to quantify emissions from particular source categories (e.g., boilers, refrigeration units, vehicle fleets, etc.), and facilities are required to use these methodologies to quantify emissions for reporting to MADEP.

As described in the GRP, the reporting of the six greenhouse gases from applicable sources at a facility is required. Facilities emitting greater than 5,000 tons of carbon dioxide equivalent (CO<sub>2</sub>e) are required to include carbon dioxide emissions from on-road vehicles. Title V facilities emitting less than 5,000 tons of carbon dioxide equivalent

emissions are not required to report emissions from motor vehicles, while all facilities emitting greater than 5,000 tons of carbon dioxide are required to report emissions from all vehicles operated by the facility.

Facilities subject to the Massachusetts GHG Reporting Program are required to electronically report their greenhouse gas emissions using a regional electronic reporting system. The MADEP contracted with The Climate Registry to develop the Massachusetts Greenhouse Gas Registry which is built off of The Climate Registry's Climate Registry Information System (CRIS) software platform. The MA GHG Registry allows subject facilities to calculate and report GHG emissions per the requirements of the MA GHG Reporting Regulation and the quantification methodologies of The Climate Registry's General Reporting Protocol. This comprehensive reporting tool is used by Massachusetts facility reporters, the MADEP, and the general public.

A total facility emissions report for WPI using the MA GHG Reporting Program is included in Appendix A of this report.

### **1.3 Grouping Emission Sources**

In accordance with Chapter 11 of The Climate Registry General Reporting Protocol, facilities with a large number of small emissions sources are required to report GHG emissions from these units, regardless of unit size. However, small emission units such as space heaters and welding tools can be accounted for by using simplified estimation methods to quantify emissions, as long as the total amount of emissions quantified in accordance with simplified emissions methods does not exceed 1,000 short tons. Simplified estimation methods allow for the aggregation of smaller emission units and provide a credible estimate of emissions while minimizing the reporting burden on a facility.

### **1.4 Methodology**

The MADEP requires emission quantification based upon The Climate Registry General Reporting Protocol. The following subsections identify the prescribed methodologies.

#### **1.4.1 Calculation-Based Methodologies**

Calculation-based methodologies involve the calculation of emissions based on activity data and emission factors. Activity data can include data on fuel consumption, input material flow, or product output. Emission factors are determined by means of direct measurement and laboratory analyses or by using generalized default factors.

Default emission factors sometimes change over time as the components of energy (electricity, fuel, etc.) change and as emission factor quantification methods are refined. The Registry updates emission factors on an annual basis in January to reflect the most up-to-date knowledge. In most cases, facilities reporting emissions data from previous years can use the most up to date emission factors available when the inventory is being reported. In the case of default emission factors for electricity use, facilities must use the emission factor closest to the emissions year reported that do not post-date the emissions year.

Facilities with access to high-quality site specific emission factors are encouraged to use those factors. Activity data and calculations should be reported in appropriately accurate detail.

### 1.4.2 Measurement-Based Methodologies

Measurement-based methodologies determine emissions by means of continuous measurement of the exhaust stream and the concentration of the relevant GHG(s) in the flue gas. Direct measurement will only be relevant to entities with facilities using existing continuous emission monitoring systems (CEMS), such as power plants or industrial facilities with large stationary combustion units. Facilities without existing monitoring systems will not need to install new monitoring equipment to comply with The Registry's quantification requirements.

### 1.4.3 Mandatory Methodologies

The Registry accepts all GHG emission calculation methodologies mandated by a state, provincial, or federal GHG Regulatory reporting program. Like all information publically reported through The Registry, data calculated using mandatory methodologies must be included in the Verification Body's risk assessment in accordance with the guidelines of the General Verification Protocol.

Although it is encouraged, Facilities are not required to use mandatory calculation methods. Facilities may also elect to use some mandatory calculation methods for select sources or gasses and other Registry-approved methods for others. Please note, where mandatory requirements exclude certain emission sources, Facilities are still required to quantify emissions from those sources in accordance with The Registry's reporting requirements.

### 1.4.4 Simplified Emissions

Facilities are encouraged to use the Climate Registry's approved methodologies described in the paragraph above. However, the Registry understands that in some cases these methodologies are not feasible for a facility within their organizational boundaries. In these cases, facilities are allowed to use alternative, simplified estimation methods for any combination of emission sources or gases, provided that the emissions from these sources and/or gases are less than 5% of the facility's total emissions.

Methodologies used for specific emission sources and gases are detailed in Section 2.2.

## 1.5 Carbon Dioxide Equivalents

Beginning in RY 2010, facilities are required to report emissions from additional GHGs, as described in Section 1.1. In order to report emissions of non CO<sub>2</sub> gases, facilities must convert the emissions to CO<sub>2</sub> equivalents, calculated on the basis of each GHG's Global Warming Potential (GWP). GWPs represent the ratio of the heat trapping ability of each green-house gas relative to that of CO<sub>2</sub>. For this report, the emissions of non-CO<sub>2</sub> gases are converted to units of CO<sub>2</sub> equivalent by using the following GWPs:

**TABLE 1-1**

Global Warming Potentials

Common Name	Formula	GWP
Carbon Dioxide	CO <sub>2</sub>	1
Methane	CH <sub>4</sub>	21
Nitrous Oxide	N <sub>2</sub> O	310
Sulfur Hexafluoride	SF <sub>6</sub>	23,900
HFCs/PFCs	Varies	Varies (150-11,700)

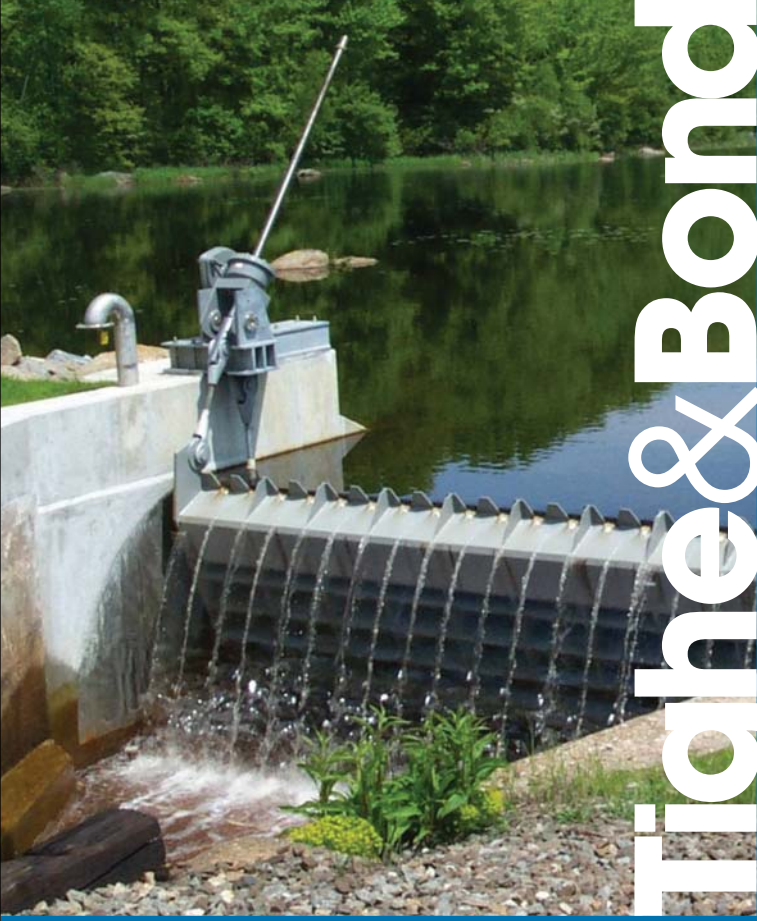
## 1.6 Verification

Once every three years on a staggered schedule, a MADEP approved verification body is required to verify the greenhouse gas emissions report. The table below identifies the verification schedule:

<b>Facility Criteria</b>	<b>Reporting Deadline for Verified GHG Report</b>	<b>Verification Deadline</b>	<b>Facility Criteria</b>
All other facilities	April 15, 2013 (2012 emissions)	December 31, 2013	All other facilities
Reported >25,000 short tons CO <sub>2</sub> in 2011	April 15, 2014 (2013 emissions)	December 31, 2014	Reported >25,000 short tons CO <sub>2</sub> in 2011
Reported >10,000 short tons CO <sub>2</sub> e in 2010 (but not required to verify 2010 emissions)	April 15, 2015 (2014 emissions)	December 31, 2015	Reported >10,000 short tons CO <sub>2</sub> e in 2010 (but not required to verify 2010 emissions)

WPI was required to complete its first third-party verification process in December 2013 employing an approved verification body.





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## **Section 2**

# **Project Scope**

WPI is located at 100 Institute Road in Worcester, Massachusetts and is a technological university. WPI Campus comprises 35 major buildings. The off-campus buildings including Lee Street and Gateway Park are also included in this report.

WPI is applicable to the Greenhouse Gas reporting requirements of 310 CMR 7.71 as an emitter of greater than 5,000 tons/year CO<sub>2</sub>e during the calendar year 2013 as stated in 310 CMR 7.71(2).

This report includes all applicable GHG emissions, including carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride in tons of CO<sub>2</sub>e.

### **2.1 Inventory**

WPI has the following emission sources subject to GHG emissions inventory:

- Founders Equip. Boiler # 4
- Generator # 1 Daniels Hall, Kohler
- Generator # 2 Founders Hall, CPI
- Generator # 3 Harrington, Onan
- Generator # 4 Salisbury, Olympian
- Generator - Security, Honda
- Generator # 5 Fuller #1 Roof, Superior
- Generator # 6 Fuller #2 Caterpillar
- Generator # 9 Power Plant, Caterpillar
- Generator #7 Gateway, Kohler
- Generator #10 East Hall, Kohler
- Generator # 11 Goddard, Olympian
- Generator #8 Gateway Garage, Caterpillar
- Generator #13 Gateway 2 Generator
- Generator #12 Gateway Garage, Caterpillar
- Power House New Boiler #1
- Power House New Boiler #2
- Power House New Boiler #3
- Off Campus Residences (group)
- On-Campus Miscell. 1st set (group)
- On-Campus Miscell. 2nd set (group)
- On-Campus Miscell. 3rd set (group)

- Off-Campus Residences Oil (group)
- Gateway Cleaver Brooks Boilers (2)
- Gateway Lattern Boilers (2)
- Salisbury Estates Heating
- HVAC units
- Vehicle Air Conditioning units
- Refrigeration units
- Non-highway Motor units
- Tier 0 1990-1997 - Light Trucks
- Tier 1 1998-2003 Light Trucks
- Tier 2 2004-2009 Light Trucks
- Passenger Cars

WPI uses ABC, K, K-CL, Halon, CL-D and CO<sub>2</sub> type fire extinguishers. WPI contracts the services of Bob O'Connell Fire Protection from Worcester, MA to maintain the fire extinguishers. Therefore, WPI is not including the emission from fire extinguishers that were used in 2013 in its GHG report.

WPI uses and maintains multiple refrigeration units that mainly include R-22, R404A, R410A and R134A as a heat transfer medium. The emissions reported were calculated based on available purchase records, maintenance inventory records and available capacity data provided by WPI personnel.

WPI uses AC window units that contain only R-22. WPI uses a variety of refrigerators that contain R134A. It was estimated that WPI used 250 G.E. units model GTH21KBAWN that contained 4.23 ounces of R134A each. WPI uses a number of vehicles that are equipped with air conditioning. The refrigerator and mobile air conditioning emissions were calculated using the operation emission factor from GRP Table 16.3.

## 2.2 Methodology

For 2013, WPI has chosen to utilize Calculation-based methodologies. Default emission factors are found in the GRP's 2013 update to Table 12.1 – Default Factors for Calculating CO<sub>2</sub> Emissions from Fossil Fuel Combustion.

The selection of the calculation-based methodology is due to the technical constraints and excessive costs of data collection per unit of emission. As shown in the CRIS emission report included in Appendix A of this report, fuel combustion at the WPI facility resulted in the generation of approximately 10,695 short tons of carbon dioxide (9,702 metric tons). Informal research identified the costs associated with the purchase of a Continuous Emissions Monitoring (CEM) system at approximately \$30,000. The additional costs of installing, operating and maintain such a system would be in excess of this amount. It should be noted that a CEM would be needed it for each emission source. A CEM system quote is included in Appendix B

The specific heat and carbon contents of the fuels combusted at the facility are unknown. Therefore, WPI has utilized the emission factors in Tables 12.1 and 12.2 of the

Climate Registry General Reporting Protocol. These tables are included in Appendix B of this report.

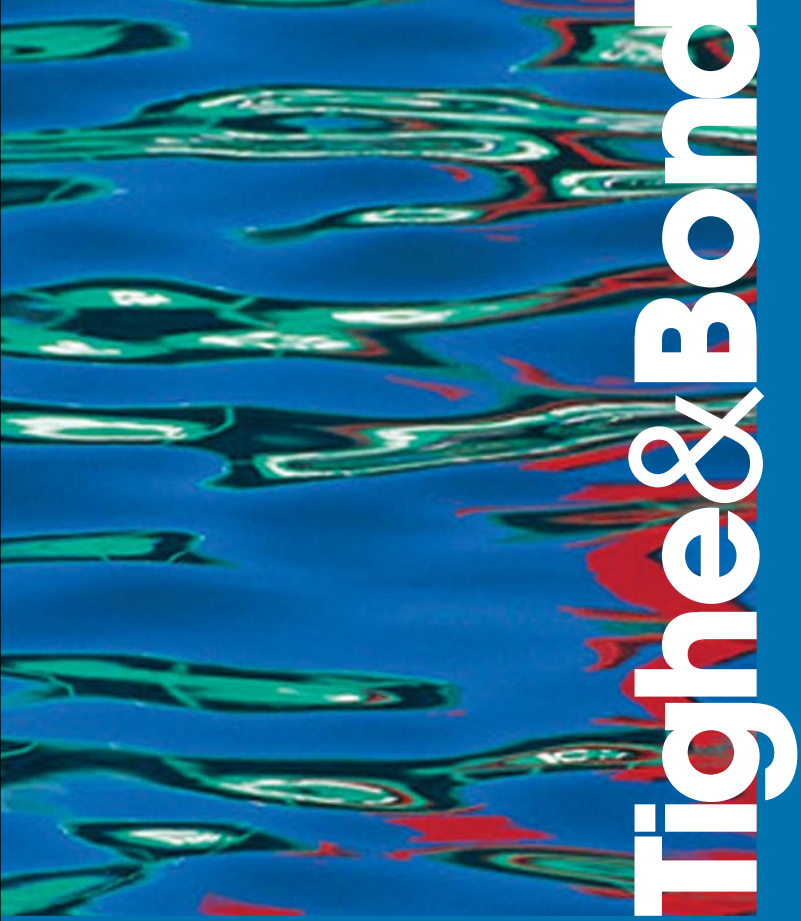
In addition, WPI has chosen to utilize the Simplified Method for the calculation of HFC emissions utilizing default emission factors found in the GRP's update to Table 16.3 – Default Emission Factors for Refrigeration/Air Conditioning Equipment. Equation 16e was used to estimate emissions from each type of refrigerant. This methodology was chosen because it is not feasible for WPI to determine a base inventory for each refrigerant used at the facility, which is required for use of Tier A. However, WPI was able to conduct an inventory, identifying the refrigeration unit and the capacity and type of refrigerant for the larger units, allowing them to use a more accurate version of the Screening Method. Additionally, records of maintenance to refrigeration units, which is required for use of Tier B were used. Where specific capacity was not available, the most conservative value from Table 13.6 was used. It should be noted that the refrigerant's emissions calculated using the Screening Method is less than 1,000 short tons.

### **2.3 Combined Reporting Units**

Stationary emission units are grouped in the same manner as reported in the Source Registration Emission Statement. Mobile sources are grouped by type of fuel and EPA Tier classification as follows: Tier 0 for years 1987-1997; Tier 1 for years 1998-2003; and Tier 2 for vehicles years 2004-2012. A summary of the vehicles grouped under each Tier is included in Appendix B. Also, refrigerant units were grouped by type of refrigerant as indicated in Section 2.2.

### **2.4 Data Collection**

The data used to calculate emissions at WPI was provided by WPI personnel and was taken directly from fuel consumption, operating, maintenance and purchase records.



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## Section 3

# Report Summary

### 3.1 Reporting Year 2013

In calendar year 2013, WPI generated 10,695 short tons (9,702 metric tons) of CO<sub>2</sub>e. Table 3-1 below provides source specific emissions data. Additionally, Appendix A of this report includes the Climate Registry Information System (CRIS) Report submitted to the Climate Registry and MADEP.

**TABLE 3-1**  
Emissions Report Summary

Emission Source	Methodology	Fuel	Carbon Dioxide Equivalent Emissions (metric tons)
Founders Equip. Boiler # 4	Calculations-Based	N.G.	258.52
Generator # 1 Daniels Hall, Kohler	Calculations-Based	N.G.	1.45
Generator # 2 Founders Hall, CPI	Calculations-Based	N.G.	1.60
Generator # 3 Harrington, Onan	Calculations-Based	N.G.	0.31
Generator # 4 Salisbury, Olympian	Calculations-Based	N.G.	32.34
Generator - Security, Honda	Calculations-Based	N.G.	0.00
Generator # 5 Fuller #1 Roof, Superior	Calculations-Based	diesel	0.80
Generator # 6 Fuller #2 Caterpillar	Calculations-Based	diesel	2.12
Generator # 9 Power Plant, Caterpillar	Calculations-Based	Diesel	9.56
Generator #7 Gateway, Kohler	Calculations-Based	diesel	13.94
Generator #10 East Hall, Kohler	Calculations-Based	diesel	3.31
Generator # 11 Goddard, Olympian	Calculations-Based	N.G.	0.32
Generator #8 Gateway Garage, Caterpillar	Calculations-Based	diesel	0.92
Generator #13 Gateway 2 Generator	Calculations-Based	diesel	5.52
Generator #12 Gateway Garage, Caterpillar	Calculations-Based	diesel	11.92
Power House New Boiler #1	Calculations-Based	N.G./diesel	1,844.35
Power House New Boiler #2	Calculations-Based	N.G.	1,468.96
Power House New Boiler #3	Calculations-Based	N.G./diesel	1,534.24
Off Campus Residences	Calculations-Based	N.G.	909.55
On-Campus Miscell. 1st set	Calculations-Based	N.G.	230.12

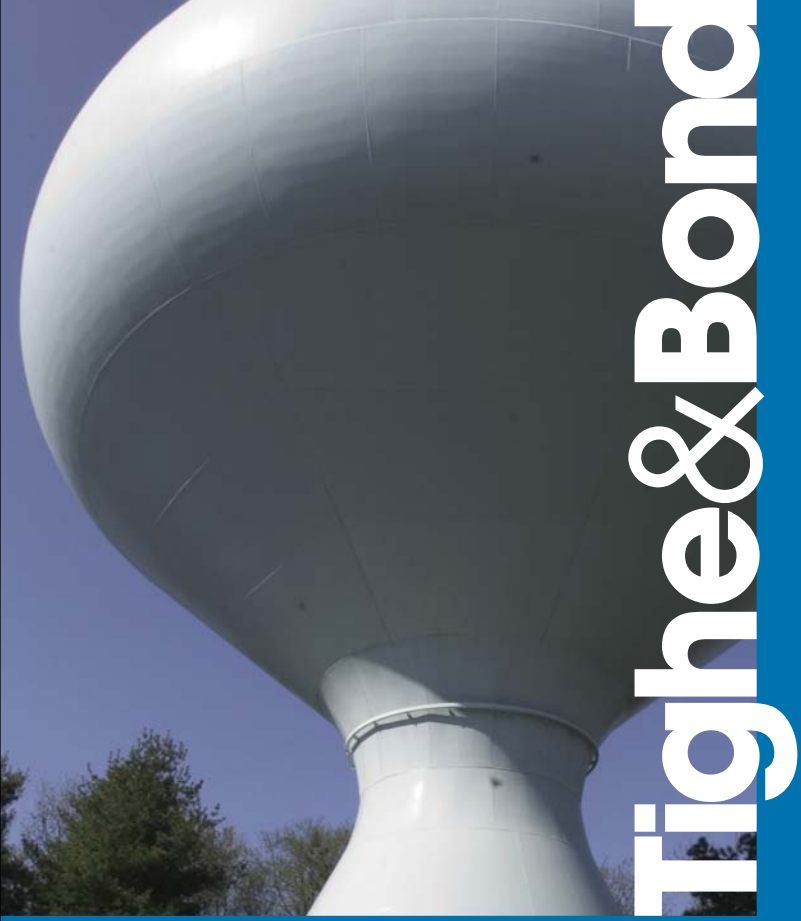


**TABLE 3-1**  
Emissions Report Summary

Emission Source	Methodology	Fuel	Carbon Dioxide Equivalent Emissions (metric tons)
On-Campus Miscell. 2nd set	Calculations-Based	N.G.	481.53
On-Campus Miscell. 3rd set	Calculations-Based	N.G.	204.45
Off-Campus Residences Oil	Calculations-Based	#2 Oil	108.09
Gateway Cleaver Brooks Boilers (2)	Calculations-Based	N.G.	903.33
Gateway Lattern Boilers (2)	Calculations-Based	N.G.	252.18
Salisbury Estates Heating	Calculations-Based	N.G.	748.35
Refrigeration units	Calculations-Based /Simplified	R134A	156
Non-highway Motor units (7 vehicles)	Calculations-Based	diesel	0.00
Tier 0 1990-1997 Light Trucks (2 cars)	Calculations-Based	gasoline	0.00
Tier 1 1998-2003 Light Trucks (8 cars)	Calculations-Based	gasoline	24.53
Tier 2 2004-2009 Light Trucks (18 cars)	Calculations-Based	gasoline	346.34
Passenger Cars (4 cars)	Calculations-Based	gasoline	135.13
Vehicle Refrigeration	Calculations-Based	R134A	12
<b>TOTAL</b>			<b>9,702</b>

### 3.2 Data Retention

WPI will maintain GHG emission documentation on site for at least 5 years from the date of submittal to the climate registry as required by 310 CMR 7.71.



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# **Appendix A**

## **Climate Registry Submittal**

# Massachusetts Greenhouse Gas Emissions Reporting Program



## Total Facility Emissions Report

WORCESTER POLYTECHNICAL INSTITUTE [Facility AQ ID: 1180127]

WORCESTER, United States

MA Facility AQ Id 1180127

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### Facility Information

Facility Name WORCESTER POLYTECHNICAL INSTITUTE [Facility AQ ..  
Facility Category Stationary source(e.g. power plants etc)  
Facility Location Massachusetts  
Facility Address 100 INSTITUTE RD,  
WORCESTER, Massachusetts,  
016090000, United States

Facility Contact GRUDZINSKI, WILLIAM  
Contact Email WILLIAMG@WPI.EDU  
Contact Phone 5088316406  
NAIC Code 611310 - Colleges, Universities, and Professional Schools  
Facility Description

### 2013 Emissions Information

Report Status Certified\_Submitted  
Reporting Protocol The Climate Registry's General Reporting Protocol and associated updates and clarifications

### ASSOCIATED ENTITIES

Entity Name	Consolidation Methodology	Equity Share	Operational Control	Financial Control
WORCESTER POLYTECHNIC INSTITUTE	Operational Control Only	Not Applicable	Yes	Not Applicable

# Massachusetts Greenhouse Gas Emissions Reporting Program



## Total Facility Emissions Report

WORCESTER POLYTECHNICAL INSTITUTE [Facility AQ ID: 1180127]

WORCESTER, United States

MA Facility AQ Id 1180127

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TOTAL EMISSIONS: WORCESTER POLYTECHNICAL INSTITUTE [Facility AQ ID: 1180127]

DIRECT EMISSIONS (Scope 1) Metric Tons	CO2e	CO2	CH4	N2O	HFCs	PFCs	SF6
Fugitive - Scope 1	169.91	0	0	0	0.1307	0	0
Mobile Combustion - Scope 1	508.12333	505.9914	0.00679	0.00642	0	0	0
Process - Scope 1	0	0	0	0	0	0	0
Stationary Combustion - Scope 1	9089.35145	9026.95518	0.6268	0.15884	0	0	0
<b>TOTAL DIRECT EMISSIONS</b>	<b>9767.38478</b>	<b>9532.94658</b>	<b>0.63359</b>	<b>0.16526</b>	<b>0.1307</b>	<b>0</b>	<b>0</b>

BIOGENIC EMISSIONS Metric Tons	CO2
Mobile Biomass Combustion - Biomass	0
Stationary Biomass Combustion - Biomass	0
<b>TOTAL BIOGENIC EMISSIONS</b>	<b>0</b>

Total Facility Emissions	
CO2e in metric ton (t)	9767.38478
CO2e in short ton (ton)	10766.69871

# Massachusetts Greenhouse Gas Emissions Reporting Program



## Total Facility Emissions Report

WORCESTER POLYTECHNICAL INSTITUTE [Facility AQ ID: 1180127]

WORCESTER, United States

MA Facility AQ Id 1180127

4/18/2014 13:56:56

### DETAILED EMISSIONS

Emitting Activity Name	Emissions Category	Emitting Activity	Green House Gas	Amount (metric tons)	Total CO2e (metric tons)	Calculation Methodology	Factor Source	Fuel	Amount	Emission Factor	Heat Content	Oxidation Coefficient	Efficiency Perform	Efficiency Comment
BOILER #4 FOUNDERS -2 HB SMITH+2 PVI NATURAL GAS	Stationary Combustion - Scope 1	Boilers	CO2	258.51297	258.51297	Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	4885.9 MMBtu	52.91 kg/MMBtu	1025 Btu/scf			
BOILER #4 FOUNDERS -2 HB SMITH+2 PVI NATURAL GAS	Stationary Combustion - Scope 1	Boilers	CH4	0.0044	0.09234	Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	4885.9 MMBtu	0.9 g/MMBtu	1025 Btu/scf			
BOILER #4 FOUNDERS -2 HB SMITH+2 PVI NATURAL GAS	Stationary Combustion - Scope 1	Boilers	N2O	0.0044	1.36317	Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	4885.9 MMBtu	0.9 g/MMBtu	1025 Btu/scf			
BOILERS (2) GATEWAY - CLEAVER BROOKS - NAT GAS	Stationary Combustion - Scope 1	Boilers	CO2	903.29857	903.29857	Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	17072.36 MMBtu	52.91 kg/MMBtu	1025 Btu/scf			
BOILERS (2) GATEWAY - CLEAVER BROOKS - NAT GAS	Stationary Combustion - Scope 1	Boilers	CH4	0.01537	0.32267	Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	17072.36 MMBtu	0.9 g/MMBtu	1025 Btu/scf			
BOILERS (2) GATEWAY - CLEAVER BROOKS - NAT GAS	Stationary Combustion - Scope 1	Boilers	N2O	0.01537	4.76319	Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	17072.36 MMBtu	0.9 g/MMBtu	1025 Btu/scf			
BOILERS (2) GATEWAY - LATTNER - NAT GAS	Stationary Combustion - Scope 1	Boilers	CO2	252.17118	252.17118	Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	4766.04 MMBtu	52.91 kg/MMBtu	1025 Btu/scf			
BOILERS (2) GATEWAY - LATTNER - NAT GAS	Stationary Combustion - Scope 1	Boilers	CH4	0.00429	0.09008	Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	4766.04 MMBtu	0.9 g/MMBtu	1025 Btu/scf			
BOILERS (2) GATEWAY - LATTNER - NAT GAS	Stationary Combustion - Scope 1	Boilers	N2O	0.00429	1.32973	Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	4766.04 MMBtu	0.9 g/MMBtu	1025 Btu/scf			
EM GEN #6 FULLER #1 ROOF, SUPERIOR	Stationary Combustion - Scope 1	Unspecified Technology	CO2	0.79638	0.79638	Emission Factor	2014 Default Emission Factors - Table #12.1	Distillate Fuel Oil No. 2	78 gal	10.21 kg/gal	0.138 MMBtu/gal			
EM GEN #6 FULLER #1 ROOF, SUPERIOR	Stationary Combustion - Scope 1	Unspecified Technology	CH4	3e-005	0.00068	Emission Factor	2014 Default Emission Factors - Table #12.9	Distillate Fuel Oil No. 2	78 gal	0.003 kg/MMBtu	0.138 MMBtu/gal			
EM GEN #6 FULLER #1 ROOF, SUPERIOR	Stationary Combustion - Scope 1	Unspecified Technology	N2O	1e-005	0.002	Emission Factor	2014 Default Emission Factors - Table #12.9	Distillate Fuel Oil No. 2	78 gal	0.0006 kg/MMBtu	0.138 MMBtu/gal			
EMER GEN #1 - KOHLER 80-R2-82 - NAT GAS - PWR HSE	Stationary Combustion - Scope 1	Reciprocating Engines (2-Stroke Lean Burn)	CO2	1.43069	1.43069	Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	27.04 MMBtu	52.91 kg/MMBtu	1025 Btu/scf			
EMER GEN #1 - KOHLER	Stationary Combustion - Scope 1	Reciprocating Engines (2-Stroke)	CH4	0.01779	0.37364	Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu	27.04 MMBtu	658 g/MMBtu	1025 Btu/scf			



# Massachusetts Greenhouse Gas Emissions Reporting Program



## Total Facility Emissions Report

WORCESTER POLYTECHNICAL INSTITUTE [Facility AQ ID: 1180127]

WORCESTER, United States

MA Facility AQ Id 1180127

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Stationary Combustion - Scope 1	Lean Burn)					/ SCF					
80-R2-82 - NAT GAS - PWR HSE EMER GEN #11 - KOHLER 80-R2-82 - NAT GAS - PWR HSE	Stationary Combustion - Scope 1 Reciprocating Engines (2-Stroke Lean Burn)	N2O	0	0	PreCalculated	1,000 - 1,025 Btu / SCF	27.04 MMBtu				EF 0.0001
EMER GEN #11 GODDARD HALL OLYMPIAN G60F3 NAT GAS	Stationary Combustion - Scope 1 Reciprocating Engines (2-Stroke Lean Burn)	CO2	0.31534	0.31534	Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	5.96 MMBtu	52.91 kg/MMBtu	1025 Btu/scf	
EMER GEN #11 GODDARD HALL OLYMPIAN G60F3 NAT GAS	Stationary Combustion - Scope 1 Reciprocating Engines (2-Stroke Lean Burn)	CH4	0.00392	0.08236	Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	5.96 MMBtu	658 g/MMBtu	1025 Btu/scf	
EMER GEN #11 GODDARD HALL OLYMPIAN G60F3 NAT GAS	Stationary Combustion - Scope 1 Reciprocating Engines (2-Stroke Lean Burn)	N2O	0	0	PreCalculated		1,000 - 1,025 Btu / SCF	5.96 MMBtu			EF 0.0001
EMER GEN #12 GATEWAY GARAGE CAT D125-6 DIESEL	Stationary Combustion - Scope 1 Unspecified Technology	CO2	0.91788	0.91788	Emission Factor	2014 Default Emission Factors - Table #12.1	Distillate Fuel Oil No. 2	89.9 gal	10.21 kg/gal	0.138 MMBtu/gal	
EMER GEN #12 GATEWAY GARAGE CAT D125-6 DIESEL	Stationary Combustion - Scope 1 Unspecified Technology	CH4	4e-005	0.00078	Emission Factor	2014 Default Emission Factors - Table #12.9	Distillate Fuel Oil No. 2	89.9 gal	0.003 kg/MMBtu	0.138 MMBtu/gal	
EMER GEN #12 GATEWAY GARAGE CAT D125-6 DIESEL	Stationary Combustion - Scope 1 Unspecified Technology	N2O	1e-005	0.00231	Emission Factor	2014 Default Emission Factors - Table #12.9	Distillate Fuel Oil No. 2	89.9 gal	0.0006 kg/MMBtu	0.138 MMBtu/gal	
EMER GEN #2 - CPI 115G0 - NAT GAS - FOUNDERS HALL	Stationary Combustion - Scope 1 Reciprocating Engines (2-Stroke Lean Burn)	CO2	1.58254	1.58254	Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	29.91 MMBtu	52.91 kg/MMBtu	1025 Btu/scf	
EMER GEN #2 - CPI 115G0 - NAT GAS - FOUNDERS HALL	Stationary Combustion - Scope 1 Reciprocating Engines (2-Stroke Lean Burn)	CH4	0.01968	0.4133	Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	29.91 MMBtu	658 g/MMBtu	1025 Btu/scf	
EMER GEN #2 - CPI 115G0 - NAT GAS - FOUNDERS HALL	Stationary Combustion - Scope 1 Reciprocating Engines (2-Stroke Lean Burn)	N2O	0	0	PreCalculated		1,000 - 1,025 Btu / SCF	29.91 MMBtu			EF 0.0001
EMER GEN #3 - ONAN 15JC4R - NAT GAS - HARRINGTON	Stationary Combustion - Scope 1 Reciprocating Engines (2-Stroke Lean Burn)	CO2	0.30476	0.30476	Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	5.76 MMBtu	52.91 kg/MMBtu	1025 Btu/scf	
EMER GEN #3 - ONAN 15JC4R - NAT GAS - HARRINGTON	Stationary Combustion - Scope 1 Reciprocating Engines (2-Stroke Lean Burn)	CH4	0.00379	0.07959	Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	5.76 MMBtu	658 g/MMBtu	1025 Btu/scf	
EMER GEN #3 - ONAN 15JC4R - NAT GAS - HARRINGTON	Stationary Combustion - Scope 1 Reciprocating Engines (2-Stroke Lean Burn)	N2O	0	0	PreCalculated		1,000 - 1,025 Btu / SCF	5.76 MMBtu			EF 0.0001
EMER GEN #4 - OLYMPIAN 96A - NAT GAS - SALISBURY	Stationary Combustion - Scope 1 Reciprocating Engines (2-Stroke Lean Burn)	CO2	31.93859	31.93859	Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	603.64 MMBtu	52.91 kg/MMBtu	1025 Btu/scf	
EMER GEN #4 - OLYMPIAN 96A - NAT GAS - SALISBURY	Stationary Combustion - Scope 1 Reciprocating Engines (2-Stroke Lean Burn)	CH4	0.3972	8.3411	Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	603.64 MMBtu	658 g/MMBtu	1025 Btu/scf	

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NAT GAS - SALISBURY		Lean Burn)					/ SCF				
EMER GEN #4 - OLYMPIAN 96A - NAT GAS - SALISBURY	Stationary Combustion - Scope 1	Reciprocating Engines (2-Stroke Lean Burn)	N2O	0.0001	0.031 PreCalculated		1,000 - 1,025 Btu / SCF	603.64 MMBtu			EF 0.0001
EMER GEN #5 - HONDA 6 KW - NAT GAS - SECURITY	Stationary Combustion - Scope 1	Reciprocating Engines (2-Stroke Lean Burn)	CO2	0	0 Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	0 MMBtu	52.91 kg/MMBtu	1025 Btu/scf	
EMER GEN #5 - HONDA 6 KW - NAT GAS - SECURITY	Stationary Combustion - Scope 1	Reciprocating Engines (2-Stroke Lean Burn)	CH4	0	0 Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	0 MMBtu	658 g/MMBtu	1025 Btu/scf	
EMER GEN #5 - HONDA 6 KW - NAT GAS - SECURITY	Stationary Combustion - Scope 1	Reciprocating Engines (2-Stroke Lean Burn)	N2O	0	0 PreCalculated		1,000 - 1,025 Btu / SCF	0 MMBtu			EF 0.0001
Generator # 12 Rec Center Generator	Stationary Combustion - Scope 1	Unspecified Technology	CO2	11.92018	11.92018 Emission Factor	2014 Default Emission Factors - Table #12.1	Distillate Fuel Oil No. 2	1167.5 gal	10.21 kg/gal	0.138 MMBtu/gal	
Generator # 12 Rec Center Generator	Stationary Combustion - Scope 1	Unspecified Technology	CH4	0.00048	0.01015 Emission Factor	2014 Default Emission Factors - Table #12.9	Distillate Fuel Oil No. 2	1167.5 gal	0.003 kg/MMBtu	0.138 MMBtu/gal	
Generator # 12 Rec Center Generator	Stationary Combustion - Scope 1	Unspecified Technology	N2O	0.0001	0.02997 Emission Factor	2014 Default Emission Factors - Table #12.9	Distillate Fuel Oil No. 2	1167.5 gal	0.0006 kg/MMBtu	0.138 MMBtu/gal	
GENERATOR #10 - KOHLER 150	Stationary Combustion - Scope 1	Unspecified Technology	CO2	3.30804	3.30804 Emission Factor	2014 Default Emission Factors - Table #12.1	Distillate Fuel Oil No. 2	324 gal	10.21 kg/gal	0.138 MMBtu/gal	
GENERATOR #10 - KOHLER 150	Stationary Combustion - Scope 1	Unspecified Technology	CH4	0.00013	0.00282 Emission Factor	2014 Default Emission Factors - Table #12.9	Distillate Fuel Oil No. 2	324 gal	0.003 kg/MMBtu	0.138 MMBtu/gal	
GENERATOR #10 - KOHLER 150	Stationary Combustion - Scope 1	Unspecified Technology	N2O	0.0002	0.062 PreCalculated		Distillate Fuel Oil No. 2	324 gal			
Generator #13 Gateway 2 Generator	Stationary Combustion - Scope 1	Unspecified Technology	CO2	5.5185	5.5185 Emission Factor	2014 Default Emission Factors - Table #12.1	Distillate Fuel Oil No. 2	540.5 gal	10.21 kg/gal	0.138 MMBtu/gal	
Generator #13 Gateway 2 Generator	Stationary Combustion - Scope 1	Unspecified Technology	CH4	0.00022	0.0047 Emission Factor	2014 Default Emission Factors - Table #12.9	Distillate Fuel Oil No. 2	540.5 gal	0.003 kg/MMBtu	0.138 MMBtu/gal	
Generator #13 Gateway 2 Generator	Stationary Combustion - Scope 1	Unspecified Technology	N2O	0.00032	0.0992 PreCalculated		Distillate Fuel Oil No. 2	540.5 gal			
GENERATOR #7-CATERPILLAR #D200P4 DIESEL	Stationary Combustion - Scope 1	Unspecified Technology	CO2	2.12368	2.12368 Emission Factor	2014 Default Emission Factors - Table #12.1	Distillate Fuel Oil No. 2	208 gal	10.21 kg/gal	0.138 MMBtu/gal	
GENERATOR #7-CATERPILLAR #D200P4 DIESEL	Stationary Combustion - Scope 1	Unspecified Technology	CH4	9e-005	0.00181 Emission Factor	2014 Default Emission Factors - Table #12.9	Distillate Fuel Oil No. 2	208 gal	0.003 kg/MMBtu	0.138 MMBtu/gal	
GENERATOR #7-CATERPILLAR	Stationary Combustion - Scope 1	Unspecified Technology	N2O	0.0001	0.031 PreCalculated		Distillate Fuel Oil	208 gal			

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#D200P4 DIESEL GENERATOR Stationary Combustion - Scope 1 #8-CATERPILLAR # SR-4 DIESEL	Unspecified Technology	CO2	9.55656	9.55656 Emission Factor	2014 Default Emission Factors - Table #12.1	No. 2 Distillate Fuel Oil No. 2	936 gal	10.21 kg/gal	0.138 MMBtu/gal
GENERATOR Stationary Combustion - Scope 1 #8-CATERPILLAR # SR-4 DIESEL	Unspecified Technology	CH4	0.00039	0.00814 Emission Factor	2014 Default Emission Factors - Table #12.9	Distillate Fuel Oil No. 2	936 gal	0.003 kg/MMBtu	0.138 MMBtu/gal
GENERATOR Stationary Combustion - Scope 1 #8-CATERPILLAR # SR-4 DIESEL	Unspecified Technology	N2O	0.0006	0.186 PreCalculated		Distillate Fuel Oil No. 2	936 gal		
GENERATOR #9 Stationary Combustion - Scope 1 - KOHLER 500	Unspecified Technology	CO2	13.93971	13.93971 Emission Factor	2014 Default Emission Factors - Table #12.1	Distillate Fuel Oil No. 2	1365.3 gal	10.21 kg/gal	0.138 MMBtu/gal
GENERATOR #9 Stationary Combustion - Scope 1 - KOHLER 500	Unspecified Technology	CH4	0.00057	0.01187 Emission Factor	2014 Default Emission Factors - Table #12.9	Distillate Fuel Oil No. 2	1365.3 gal	0.003 kg/MMBtu	0.138 MMBtu/gal
GENERATOR #9 Stationary Combustion - Scope 1 - KOHLER 500	Unspecified Technology	N2O	0.0008	0.248 PreCalculated		Distillate Fuel Oil No. 2	1365.3 gal		
HVAC Units Fugitive - Scope 1	Unspecified Technology	HFC-13 ..	0.12	156 PreCalculated		N/A	89 L		
Light truck Vehicles Tier 0	EPA Tier 0	CO2	0	0 Emission Factor	2014 Default Emission Factors - Table #13.1	All	0 gal	8.78 kg/gal	5.25 MMBtu/bbl
Light truck Vehicles Tier 0	EPA Tier 0	CH4	0	0 Emission Factor	2014 Default Emission Factors - Table #13.4	All	0 mi	0.0776 g/mi	
Light truck Vehicles Tier 0	EPA Tier 0	N2O	0	0 Emission Factor	2014 Default Emission Factors - Table #13.4	All	0 mi	0.1056 g/mi	
Light truck vehicles Tier 1	EPA Tier 1	CO2	24.52254	24.52254 Emission Factor	2014 Default Emission Factors - Table #13.1	All	2793 gal	8.78 kg/gal	5.25 MMBtu/bbl
Light truck vehicles Tier 1	EPA Tier 1	CH4	0.00174	0.03657 Emission Factor	2014 Default Emission Factors - Table #13.4	All	38530 mi	0.0452 g/mi	
Light truck vehicles Tier 1	EPA Tier 1	N2O	0.00336	1.04035 Emission Factor	2014 Default Emission Factors - Table #13.4	All	38530 mi	0.0871 g/mi	
Light truck vehicles Tier 2	EPA Tier 2	CO2	346.33588	346.33588 Emission Factor	2014 Default Emission Factors - Table #13.1	All	39446 gal	8.78 kg/gal	5.25 MMBtu/bbl
Light truck vehicles Tier 2	EPA Tier 2	CH4	0.00307	0.06443 Emission Factor	2014 Default Emission Factors - Table #13.4	All	188228 mi	0.0163 g/mi	
Light truck	EPA Tier 2	N2O	0.00124	0.38511 Emission Factor	2014 Default Emission	All	188228 mi	0.0066 g/mi	

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vehicles Tier 2		Factors - Table #13.4								
Mobile Air Conditioning	Fugitive - Scope 1	Unspecified Technology	HFC-13 ..	0.0107	13.91 PreCalculated	N/A	8 L			
Motor Equipment	Mobile Combustion - Scope 1	Agricultural Equipment	CO2	0	0 Emission Factor	2014 Default Emission Factors - Table #13.1	All	0 gal	10.21 kg/gal	5.8 MMBtu/bbl
Motor Equipment	Mobile Combustion - Scope 1	Agricultural Equipment	CH4	0	0 Emission Factor	2014 Default Emission Factors - Table #13.7	All	0 gal	1.44 g/gal	5.8 MMBtu/bbl
Motor Equipment	Mobile Combustion - Scope 1	Agricultural Equipment	N2O	0	0 Emission Factor	2014 Default Emission Factors - Table #13.7	All	0 gal	0.26 g/gal	5.8 MMBtu/bbl
NEW BOILER #1-VICTORY ENERGY - NAT GAS / #2 OIL	Stationary Combustion - Scope 1	Boilers	CO2	1844.29181	1844.29181 Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	34857.15 MMBtu	52.91 kg/MMBtu	1025 Btu/scf
NEW BOILER #1-VICTORY ENERGY - NAT GAS / #2 OIL	Stationary Combustion - Scope 1	Boilers	CH4	0.03137	0.6588 Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	34857.15 MMBtu	0.9 g/MMBtu	1025 Btu/scf
NEW BOILER #1-VICTORY ENERGY - NAT GAS / #2 OIL	Stationary Combustion - Scope 1	Boilers	N2O	0.03137	9.72514 Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	34857.15 MMBtu	0.9 g/MMBtu	1025 Btu/scf
NEW BOILER #1-VICTORY ENERGY - NAT GAS / #2 OIL	Stationary Combustion - Scope 1	Unspecified Technology	CO2	0	0 Emission Factor	2014 Default Emission Factors - Table #12.1	Distillate Fuel Oil No. 2	0 gal	10.21 kg/gal	0.138 MMBtu/gal
NEW BOILER #1-VICTORY ENERGY - NAT GAS / #2 OIL	Stationary Combustion - Scope 1	Unspecified Technology	CH4	0	0 Emission Factor	2014 Default Emission Factors - Table #12.9	Distillate Fuel Oil No. 2	0 gal	0.003 kg/MMBtu	0.138 MMBtu/gal
NEW BOILER #1-VICTORY ENERGY - NAT GAS / #2 OIL	Stationary Combustion - Scope 1	Unspecified Technology	N2O	0	0 Emission Factor	2014 Default Emission Factors - Table #12.9	Distillate Fuel Oil No. 2	0 gal	0.0006 kg/MMBtu	0.138 MMBtu/gal
NEW BOILER #2-VICTORY ENERGY - NAT GAS	Stationary Combustion - Scope 1	Boilers	CO2	1468.90488	1468.90488 Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	27762.33 MMBtu	52.91 kg/MMBtu	1025 Btu/scf
NEW BOILER #2-VICTORY ENERGY - NAT GAS	Stationary Combustion - Scope 1	Boilers	CH4	0.02499	0.52471 Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	27762.33 MMBtu	0.9 g/MMBtu	1025 Btu/scf
NEW BOILER #2-VICTORY ENERGY - NAT GAS	Stationary Combustion - Scope 1	Boilers	N2O	0.02499	7.74569 Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	27762.33 MMBtu	0.9 g/MMBtu	1025 Btu/scf
NEW BOILER #3-VICTORY ENERGY - NAT GAS / #2 OIL	Stationary Combustion - Scope 1	Boilers	CO2	1534.18947	1534.18947 Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	28996.21 MMBtu	52.91 kg/MMBtu	1025 Btu/scf
NEW BOILER #3-VICTORY ENERGY - NAT GAS / #2 OIL	Stationary Combustion - Scope 1	Boilers	CH4	0.0261	0.54803 Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	28996.21 MMBtu	0.9 g/MMBtu	1025 Btu/scf
NEW BOILER	Stationary Combustion - Scope 1	Boilers	N2O	0.0261	8.08994 Emission Factor	2014 Default Emission	1,000 -	28996.21	0.9 g/MMBtu	1025

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						Factors - Table #12.7	1,025 Btu / SCF	MMBtu	Btu/scf	
#3-VICTORY ENERGY - NAT GAS / #2 OIL	Stationary Combustion - Scope 1	Unspecified Technology	CO2	0	0 Emission Factor	2014 Default Emission Factors - Table #12.1	Distillate Fuel Oil No. 2	0 gal	10.21 kg/gal	0.138 MMBtu/gal
NEW BOILER #3-VICTORY ENERGY - NAT GAS / #2 OIL	Stationary Combustion - Scope 1	Unspecified Technology	CH4	0	0 Emission Factor	2014 Default Emission Factors - Table #12.9	Distillate Fuel Oil No. 2	0 gal	0.003 kg/MMBtu	0.138 MMBtu/gal
NEW BOILER #3-VICTORY ENERGY - NAT GAS / #2 OIL	Stationary Combustion - Scope 1	Unspecified Technology	N2O	0	0 Emission Factor	2014 Default Emission Factors - Table #12.9	Distillate Fuel Oil No. 2	0 gal	0.0006 kg/MMBtu	0.138 MMBtu/gal
OFF-CAMPUS RESIDENCES < 10 MMBTU - #2 OIL	Stationary Combustion - Scope 1	Unspecified Technology	CO2	108.05243	108.05243 Emission Factor	2014 Default Emission Factors - Table #12.1	Distillate Fuel Oil No. 2	10583 gal	10.21 kg/gal	0.138 MMBtu/gal
OFF-CAMPUS RESIDENCES < 10 MMBTU - #2 OIL	Stationary Combustion - Scope 1	Unspecified Technology	CH4	0.0317	0.6657 PreCalculated		Distillate Fuel Oil No. 2	10583 gal		
OFF-CAMPUS RESIDENCES < 10 MMBTU - #2 OIL	Stationary Combustion - Scope 1	Unspecified Technology	N2O	0.0063	1.953 PreCalculated		Distillate Fuel Oil No. 2	10583 gal		
OFF-CAMPUS RESIDENCES < 10 MMBTU - NAT. GAS	Stationary Combustion - Scope 1	Boilers	CO2	909.5229	909.5229 Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	17190 MMBtu	52.91 kg/MMBtu	1025 Btu/scf
OFF-CAMPUS RESIDENCES < 10 MMBTU - NAT. GAS	Stationary Combustion - Scope 1	Boilers	CH4	0.01547	0.32489 Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	17190 MMBtu	0.9 g/MMBtu	1025 Btu/scf
OFF-CAMPUS RESIDENCES < 10 MMBTU - NAT. GAS	Stationary Combustion - Scope 1	Boilers	N2O	0.01547	4.79601 Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	17190 MMBtu	0.9 g/MMBtu	1025 Btu/scf
ON-CAMPUS MISCELLANEOUS SOURCES 1ST SET - NAT. GAS	Stationary Combustion - Scope 1	Boilers	CO2	230.11088	230.11088 Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	4349.1 MMBtu	52.91 kg/MMBtu	1025 Btu/scf
ON-CAMPUS MISCELLANEOUS SOURCES 1ST SET - NAT. GAS	Stationary Combustion - Scope 1	Boilers	CH4	0.00391	0.0822 Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	4349.1 MMBtu	0.9 g/MMBtu	1025 Btu/scf
ON-CAMPUS MISCELLANEOUS SOURCES 1ST SET - NAT. GAS	Stationary Combustion - Scope 1	Boilers	N2O	0.00391	1.2134 Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	4349.1 MMBtu	0.9 g/MMBtu	1025 Btu/scf
ON-CAMPUS MISCELLANEOUS SOURCES 2ND SET - NAT. GAS	Stationary Combustion - Scope 1	Boilers	CO2	481.481	481.481 Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	9100 MMBtu	52.91 kg/MMBtu	1025 Btu/scf
ON-CAMPUS MISCELLANEOUS SOURCES 2ND SET - NAT. GAS	Stationary Combustion - Scope 1	Boilers	CH4	0.00819	0.17199 Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	9100 MMBtu	0.9 g/MMBtu	1025 Btu/scf
ON-CAMPUS MISCELLANEOUS SOURCES 2ND SET - NAT. GAS	Stationary Combustion - Scope 1	Boilers	N2O	0.00819	2.5389 Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	9100 MMBtu	0.9 g/MMBtu	1025 Btu/scf

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ON-CAMPUS MISCELLANEOUS SOURCES 3RD SET - NAT. GAS	Stationary Combustion - Scope 1	Boilers	CO2	204.44424	204.44424 Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	3864 MMBtu	52.91 kg/MMBtu	1025 Btu/scf
ON-CAMPUS MISCELLANEOUS SOURCES 3RD SET - NAT. GAS	Stationary Combustion - Scope 1	Boilers	CH4	0.00348	0.07303 Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	3864 MMBtu	0.9 g/MMBtu	1025 Btu/scf
ON-CAMPUS MISCELLANEOUS SOURCES 3RD SET - NAT. GAS	Stationary Combustion - Scope 1	Boilers	N2O	0.00348	1.07806 Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	3864 MMBtu	0.9 g/MMBtu	1025 Btu/scf
Passenger Vehicles Tier 2	Mobile Combustion - Scope 1	EPA Tier 0	CO2	135.13298	135.13298 Emission Factor	2014 Default Emission Factors - Table #13.1	All	15391 gal	8.78 kg/gal	5.25 MMBtu/bbl
Passenger Vehicles Tier 2	Mobile Combustion - Scope 1	EPA Tier 0	CH4	0.00198	0.04157 Emission Factor	2014 Default Emission Factors - Table #13.4	All	28115 mi	0.0704 g/mi	
Passenger Vehicles Tier 2	Mobile Combustion - Scope 1	EPA Tier 0	N2O	0.00182	0.5639 Emission Factor	2014 Default Emission Factors - Table #13.4	All	28115 mi	0.0647 g/mi	
SALISBURY ESTATES HEATING	Stationary Combustion - Scope 1	Boilers	CO2	748.322	748.322 Emission Factor	2014 Default Emission Factors - Table #12.1	1,000 - 1,025 Btu / SCF	14143.3 MMBtu	52.91 kg/MMBtu	1025 Btu/scf
SALISBURY ESTATES HEATING	Stationary Combustion - Scope 1	Boilers	CH4	0.0132	0.2772 PreCalculated		1,000 - 1,025 Btu / SCF	14143.3 MMBtu		
SALISBURY ESTATES HEATING	Stationary Combustion - Scope 1	Boilers	N2O	0.01273	3.94598 Emission Factor	2014 Default Emission Factors - Table #12.7	1,000 - 1,025 Btu / SCF	14143.3 MMBtu	0.9 g/MMBtu	1025 Btu/scf





# Tighe & Bond

# **Appendix B**

## **Supporting Documentation**

4971 8747

# INVOICE



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BRANCH LOCATION			SHIP TO			INSTRUCTIONS		
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605						REFERENCE INVOICE # e COMMERCE ORDER #		
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE	
04/11/13	38079076-00	83874	437131	1% 10thprox	KEVIN	PICK-UP	04/11/13	

LINE NO.	PRODUCT / DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	30R22 R-22 REFRIGERANT 30LB CYLINDER ***** HAZARDOUS MATERIAL *****	4	0	4	ea	450.00000	ea	1,800.00
2	50R22 R-22 REFRIGERANT 50LB CYLINDER *****HAZARDOUS MATERIAL*****	2	0	2	ea	750.00000	ea	1,500.00
2	Lines 33.00 Cash Discount	Shipped Total		6		Total Invoice Total		3,300.00 3,300.00

*Kevin Smith*  
 11001-4640-74121

Thank you for your Business!

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INVOICE



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BRANCH	INVOICE DATE	INVOICE NUMBER
039	05/29/13	38637396-00
P.O. NO.	CUST. NO.	PAGE #:
83874	437131	1 of 1
INVOICE AMOUNT	AMOUNT PAID	
755.00		

For questions concerning this invoice please contact the credit office:  
 11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197  
 Phone: (800) 852-5132 Fax: (215) 673-3429

BILL TO:  
 E0089X 10235 D702569672 P1463708 0001:0002



WORCESTER POLYTECHNIC INS  
 Office of Facilities  
 100 INSTITUTE RD  
 WORCESTER MA 01609-2280

FED I.D. NO.: 23-1307731

REMIT TO:

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 PO BOX 82-0100  
 PHILADELPHIA, PA 19182-0100

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BRANCH LOCATION			SHIP TO			INSTRUCTIONS		
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605						REFERENCE INVOICE # e COMMERCE ORDER #		
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE	
05/29/13	38637396-00	83874	437131	1% 10thprox	DAVE	PICK-UP	05/29/13	

LINE NO.	PRODUCT / DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	30R22 R-22 REFRIGERANT 30LB CYLINDER ***** HAZARDOUS MATERIAL *****	1	0	1	ea	435.00000	ea	435.00
2	30R134A R134A REFRIGERANT 30LB CYLINDER *****HAZARDOUS MATERIAL*****	2	0	2	ea	160.00000	ea	320.00
2	Lines 7.55 Cash Discount	Shipped Total		3		Total Invoice Total		755.00 755.00

*Reggie Gufford*  
 11001-4660-7425

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COPY

BRANCH	INVOICE DATE	INVOICE NUMBER
039	06/06/13	38761584-00
P.O. NO.	CUST. NO.	PAGE #:
83874	437131	1 of 1
INVOICE AMOUNT	AMOUNT PAID	
35.00		

For questions concerning this invoice please contact the credit office:  
 11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197  
 Phone: (800) 852-5132 Fax: (215) 673-3429

BILL TO:  
 49 1 AB 0.384 E0009 I0019 D709509605 P1476542 0003:0003

FED I.D. NO.: 23-1307731



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 PHILADELPHIA, PA 19182-0100

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BRANCH LOCATION				SHIP TO		INSTRUCTIONS	
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605						REFERENCE INVOICE # e COMMERCE ORDER #	
						0-00	
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE
06/06/13	38761584-00	83874	437131	1% 10thprox	RON	PICK-UP	06/06/13

LINE NO.	PRODUCT / DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	RC40R REF RECLAIM 40# CYL DEPOSIT RETURN	-1	0	-1	ea	100.00000	ea	-100.00
2	R22DISP RECOVERED R22 HANDLING	-15	0	-15	ea	0.00000	ea	0.00
3	RC30 REF RECLAIM 30LB CLY DEP	1	0	1	ea	100.00000	ea	100.00
4	RCFEE RECOVERY SERVICE FEE	1	0	1	ea	35.00000	ea	35.00
***** All Recovered Refrigerant Returned With Less Than 98% Purity Will Be Charged a \$3/lb Handling Fee. *****								
4	Lines 0.35 Cash Discount	Shipped Total		2	Total Invoice Total			35.00 35.00

*Proge Griffin*  
 11001-4640-74121

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BRANCH	INVOICE DATE	INVOICE NUMBER
039	06/21/13	38978798-00
P.O. NO.	CUST. NO.	PAGE #:
83874	437131	1 of 1
INVOICE AMOUNT	AMOUNT PAID	
800.00		

For questions concerning this invoice please contact the credit office:  
 11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197  
 Phone: (800) 852-5132 Fax: (215) 673-3429

**BILL TO:**

E0086X 10202 D718985585 P1494390 0001:0002



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FED I.D. NO.: 23-1307731

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BRANCH LOCATION		SHIP TO			INSTRUCTIONS		
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605					REFERENCE INVOICE #		e COMMERCE ORDER #
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE
06/21/13	38978798-00	83874	437131	1% 10thprox	KEVIN	PICK-UP	06/21/13

LINE NO.	PRODUCT / DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	30R134A R134A REFRIGERANT 30LB CYLINDER *****HAZARDOUS MATERIAL*****	5	0	5	ea	160.00000	ea	800.00
1	Lines 8.00 Cash Discount	Shipped	Total	5		Total Invoice Total		800.00 800.00

*Reg. Duff*  
 11001-4640-74121

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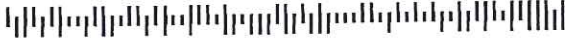
**COPY**

BRANCH	INVOICE DATE	INVOICE NUMBER
039	07/09/13	39204166-00
P.O. NO.	CUST. NO.	PAGE #:
83784	437131	1 of 1
INVOICE AMOUNT	AMOUNT PAID	
1,111.26		

For questions concerning this invoice please contact the credit office:  
 11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197  
 Phone: (800) 852-5132 Fax: (215) 673-3429

**BILL TO:**

20 1 SP 0.460 E0020 I0034 D731513233 P1522216 0002:0003



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FED I.D. NO.: 23-1307731

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BRANCH LOCATION			SHIP TO			INSTRUCTIONS		
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605						REFERENCE INVOICE # e COMMERCE ORDER #		
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE	
07/09/13	39204166-00	83784	437131	1% 10thprox	ron	PICK-UP	07/09/13	

LINE NO.	PRODUCT / DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	TZAA3242A757 T/Z NITROGEN CHARGED R22 COND UNIT 2TON 13SEER UNIT IS NITROGEN CHARGED ONLY AND HAS NO R22 Serial #: 8342W211323517	1	0	1	ea	596.35000	ea	596.35
4	4008S DIVERSITECH HPR-6-2PG 6" PUMP RISER	4	0	4	ea	3.12000	ea	12.48
5	J50210 KLEIN 10" PUMP PLIERS	1	0	1	ea	29.07000	ea	29.07
6	csg083s SPORLAN 3/8ODS 9 CU/IN DRIER/S.G. COMBO	1	0	1	ea	44.42000	ea	44.42
7	n 40CU/FT NITROGEN TANK EXCHANGE ***** HAZARDOUS MATERIAL *****	1	0	1	ea	15.58000	ea	15.58
8	30r22 R-22 REFRIGERANT 30LB CYLINDER ***** HAZARDOUS MATERIAL *****	1	0	1	ea	385.00000	ea	385.00
9	nqt2000 QT2000 ACID TEST KIT QWIKCHECK 2-SECOND	3	0	3	ea	6.34000	ea	19.02
10	el34 3/4 LT 90 ELL W02728	2	0	2	ea	2.87000	ea	5.74
11	c34 3/4 OD COUPLING W01028	2	0	2	ea	1.36000	ea	2.72
12	c38 3/8 OD COUPLING W01009	2	0	2	ea	0.44000	ea	0.88
10	Lines	Shipped	Total	18		Total		1,111.26
	11.11 Cash Discount					Invoice Total		1,111.26

*Ron Smith*  
 11001-4640-74121

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# CREDIT MEMO



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BRANCH	INVOICE DATE	INVOICE NUMBER
039	07/23/13	39413109-00
P.O. NO.	CUST. NO.	PAGE #
83874	437131	1 of 1
INVOICE AMOUNT		AMOUNT PAID
-113.63		
For questions concerning this invoice please contact the credit office:		
11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197		
Phone: (800) 852-5132		Fax: (215) 673-3429

**BILL TO:**

E0125X 10292 D740109080 P1536813 0001:0003



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FED I.D. NO.: 23-1307731

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BRANCH LOCATION				SHIP TO			INSTRUCTIONS		
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605							REFERENCE INVOICE #		
							e COMMERCE ORDER #		
				0-00					
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE		
07/23/13	39413109-00	83874	437131	1% 10thprox	JIM	PICK-UP	07/23/13		

LINE NO.	PRODUCT / DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	20X20X1FME40	3	0	3	ea	3.79000	ea	11.37
2	HE40 20X20X1 PLEATED 35-40% EFFICIENT MERV 8	-1	0	-1	ea	125.00000	ea	-125.00
3	RC50HPR	-29	0	-29	ea	0.00000	ea	0.00
	REF RECLAIM 50LB HP CYL DEPOSIT RETURN							
	R22DISP							
	RECOVERED R22 HANDLING							
3	Lines	Shipped Total		3	Total			-113.63
	0.00 Cash Discount				Invoice Total			-113.63
CREDIT - DO NOT PAY =====								

Rogin Duff  
 71001-4640-74121

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BRANCH	INVOICE DATE	INVOICE NUMBER
039	07/22/13	39400512-00
P.O. NO.	CUST. NO.	PAGE #
83874	437131	1 of 1
INVOICE AMOUNT	AMOUNT PAID	
1,000.61		

For questions concerning this invoice please contact the credit office:  
 11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197  
 Phone: (800) 852-5132 Fax: (215) 673-3429

**BILL TO:**

E0097X I0236 D739209454 P1535287 0001:0001



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FED I.D. NO.: 23-1307731

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BRANCH LOCATION		SHIP TO			INSTRUCTIONS		
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605					REFERENCE INVOICE # e COMMERCE ORDER #		
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE
07/22/13	39400512-00	83874	437131	1% 10thprox	KEVIN	PICK-UP	07/22/13

LINE NO.	PRODUCT/DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	RC50HP REF RECLAIM 50# HIGH PRESSURE CYL DEPOSIT	1	0	1	ea	125.00000	ea	125.00
2	RCFEE RECOVERY SERVICE FEE	1	0	1	ea	35.00000	ea	35.00
3	3OR22 R-22 REFRIGERANT 30LB CYLINDER ***** HAZARDOUS MATERIAL *****	1	0	1	ea	385.00000	ea	385.00
4	93560 RITCHIE 6 CFM VACUUM PUMP ***** All Recovered Refrigerant Returned With Less Than 98% Purity Will Be Charged a \$3/lb Handling Fee. *****	1	0	1	ea	455.61000	ea	455.61
4	Lines 10.01 Cash Discount		Shipped Total	4		Total Invoice Total		1,000.61 1,000.61

*Prox Smith*  
 11001-4640-74121

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BRANCH	INVOICE DATE	INVOICE NUMBER
039	07/25/13	39450007-00
P.O. NO.	CUST. NO.	PAGE #
83874	437131	1 of 1
INVOICE AMOUNT	AMOUNT PAID	
35.00		

For questions concerning this invoice please contact the credit office:

11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197

Phone: (800) 852-5132

Fax: (215) 673-3429

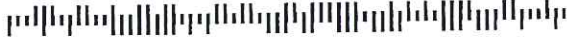
FED I.D. NO.: 23-1307731

REMIT TO:

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BILL TO:

52 1 AB 0.384 E0010X I0018 D741890784 P1539437 0001:0002



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 WORCESTER MA 01609-2280

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BRANCH LOCATION		SHIP TO			INSTRUCTIONS		
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605					REFERENCE INVOICE # 0-00		
					e-COMMERCE ORDER #		
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE
07/25/13	39450007-00	83874	437131	1% 10thprox	KEVIN	PICK-UP	07/25/13

LINE NO.	PRODUCT / DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	RC30 REF RECLAIM 30LB CLY DEP	1	0	1	ea	100.00000	ea	100.00
2	RCFEE RECOVERY SERVICE FEE	1	0	1	ea	35.00000	ea	35.00
3	RC30R REF RECLAIM 30# CYL DEPOSIT RETURN	-1	0	-1	ea	100.00000	ea	-100.00
4	R22DISP RECOVERED R22 HANDLING	-9	0	-9	ea	0.00000	ea	0.00
***** All Recovered Refrigerant Returned With Less Than 98% Purity Will Be Charged a \$3/lb Handling Fee. *****		Shipped Total		2	Total			35.00
4	Lines 0.35 Cash Discount				Invoice Total			35.00

*Regan Smith*  
 11001-4640-74121  
 maximo #  
 14-101169

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# CREDIT MEMO



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BRANCH	INVOICE DATE	INVOICE NUMBER
039	08/05/13	39583889-00
P.O. NO.	CUST. NO.	PAGE #:
83874	437131	1 of 1
INVOICE AMOUNT	AMOUNT PAID	
-234.42		

For questions concerning this invoice please contact the credit office:  
 11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197  
 Phone: (800) 852-5132 Fax: (215) 673-3429

**BILL TO:**

E0087X I0225 D750488818 P1557921 0001:0002



FED I.D. NO.: 23-1307731

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BRANCH LOCATION			SHIP TO			INSTRUCTIONS		
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605						REFERENCE INVOICE #		e.COMMERCE ORDER #
						39531463-00		
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE	
08/05/13	39583889-00	83874	437131	1% 10thprox	JIM	PICK-UP	08/05/13	

LINE NO.	PRODUCT / DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	12X24X2SSP 12X24X2 KEY PLEAT 35-40% SELF-SUPPORT	4	0	4	ea	3.27000	ea	13.08
3	SI301 SAUERMANN CONDENSATE PUMP SI3000SIUS11 120V	-1	0	-1	ea	97.50000	ea	-97.50
4	RC30R REF RECLAIM 30# CYL DEPOSIT RETURN	-1	0	-1	ea	75.00000	ea	-75.00
5	R22DISP RECOVERED R22 HANDLING	-28	0	-28	ea	0.00000	ea	0.00
6	RC40R REF RECLAIM 40# CYL DEPOSIT RETURN	-1	0	-1	ea	75.00000	ea	-75.00
7	R22DISP RECOVERED R22 HANDLING	-27	0	-27	ea	0.00000	ea	0.00
6	Lines 0.00 Cash Discount		Shipped Total	4		Total Invoice Total		-234.42 -234.42

CREDIT - DO NOT PAY  
 =====

SD-569

Rogger Juffe  
 11001-4640-74121

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# INVOICE



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BRANCH	INVOICE DATE	INVOICE NUMBER
039	08/05/13	39593030-00
P.O. NO.	CUST. NO.	PAGE #.
83874	437131	1 of 1
INVOICE AMOUNT		AMOUNT PAID
480.00		

For questions concerning this invoice please contact the credit office:  
 11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197  
 Phone: (800) 852-5132 Fax: (215) 673-3429

**BILL TO:**

E0087 10226 D750488820 P1557921 0002:0002



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 WORCESTER MA 01609-2280

FED I.D. NO.: 23-1307731

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BRANCH LOCATION				SHIP TO			INSTRUCTIONS		
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605							REFERENCE INVOICE #    e COMMERCE ORDER #		
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE		
08/05/13	39593030-00	83874	437131	1% 10thprox	JIM	PICK-UP	08/05/13		

LINE NO.	PRODUCT / DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	RC50HP REF RECLAIM 50# HIGH PRESSURE CYL DEPOSIT	3	0	3	ea	125.00000	ea	375.00
2	RCFEE RECOVERY SERVICE FEE	3	0	3	ea	35.00000	ea	105.00
***** All Recovered Refrigerant Returned With Less Than 98% Purity Will Be Charged a \$3/lb Handling Fee. *****								
2	Lines 4.80 Cash Discount		Shipped Total	6		Total Invoice Total		480.00 480.00

*SD-569*

*Logan Smith*  
 11001-4040-74121

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BRANCH	INVOICE DATE	INVOICE NUMBER
039	08/07/13	39512825-00
P.O. NO.	CUST. NO.	PAGE #:
83874	437131	1 of 1
INVOICE AMOUNT	AMOUNT PAID	
203.60		

For questions concerning this invoice please contact the credit office:

11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197

Phone: (800) 852-5132

Fax: (215) 673-3429

FED I.D. NO.: 23-1307731

**BILL TO:**

46 1 AB 0.384 E0007 I0016 D752237990 P1562089 0002:0003



WORCESTER POLYTECHNIC INS  
 Office of Facilities  
 100 INSTITUTE RD  
 WORCESTER MA 01609-2280

**REMIT TO:**

UNITED REFRIGERATION, INC.  
 PO BOX 82-0100  
 PHILADELPHIA, PA 19182-0100

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BRANCH LOCATION		SHIP TO		INSTRUCTIONS			
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605				REFERENCE INVOICE #	e COMMERCE ORDER #		
				0-00			
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE
08/07/13	39512825-00	83874	437131	1% 10thprox	JIM	PICK-UP	08/07/13

LINE NO.	PRODUCT / DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	102540004	4	0	4	ea	113.40000	ea	453.60
	WITT / RUSSELL 3I 1/20HP 208 230V 1550RPM 4P CWSE							
4	RC50HPR	-2	0	-2	ea	125.00000	ea	-250.00
	REF RECLAIM 50LB HP CYL DEPOSIT RETURN							
5	R22DISP	-36	0	-36	ea	0.00000	ea	0.00
	RECOVERED R22 HANDLING							
3	Lines	Shipped Total		4		Total		203.60
	2.04 Cash Discount					Invoice Total		203.60

STOCK  
**APPROVED**  
 1100 1-4690-74121  
 AUG 21 2013

Thank you for your Business!

# INVOICE



**UNITED REFRIGERATION INC.**  
 REFRIGERATION • AIR CONDITIONING • HEATING SUPPLIES • EQUIPMENT  
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BRANCH	INVOICE DATE	INVOICE NUMBER
039	08/08/13	39608000-00
P.O. NO.	CUST. NO.	PAGE #
83874	437131	1 of 1
INVOICE AMOUNT	AMOUNT PAID	
520.22		

For questions concerning this invoice please contact the credit office:

11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197

Phone: (800) 852-5132

Fax: (215) 673-3429

FED I.D. NO.: 23-1307731

REMIT TO:

UNITED REFRIGERATION, INC.  
 PO BOX 82-0100  
 PHILADELPHIA, PA 19182-0100

BILL TO:  
 46 1 AB 0.384 E0007 10017 D753032271 P1562089 0003:0003



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BRANCH LOCATION		SHIP TO			INSTRUCTIONS		
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605					REFERENCE INVOICE #		e COMMERCE ORDER #
					0-00		
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE
08/08/13	39608000-00	83874	437131	1% 10thprox	KEVIN	PICK-UP	08/06/13

LINE NO.	PRODUCT/DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	30R22 R-22 REFRIGERANT 30LB CYLINDER ***** HAZARDOUS MATERIAL *****	1	0	1	ea	356.00000	ea	356.00
2	C25DNF330T C/H CONTACTOR DP 30A 3P 24V COIL OPN	1	0	1	ea	20.45000	ea	20.45
3	69721 RITCHIE 2-PK UNIVERSAL UV DYE INJECTORS	1	0	1	ea	43.63000	ea	43.63
4	RC50HPR REF RECLAIM 50LB HP CYL DEPOSIT RETURN	-3	0	-3	ea	125.00000	ea	-375.00
5	R22DISP RECOVERED R22 HANDLING	-76	0	-76	ea	0.00000	ea	0.00
6	RC50HP REF RECLAIM 50# HIGH PRESSURE CYL DEPOSIT	2	0	2	ea	125.00000	ea	250.00
7	RCFEE RECOVERY SERVICE FEE	2	0	2	ea	35.00000	ea	70.00
8	RC30 REF RECLAIM 30LB CLY DEP	1	0	1	ea	100.00000	ea	100.00
9	RCFEE RECOVERY SERVICE FEE	1	0	1	ea	35.00000	ea	35.00
10	CBT78 CBT78 IRP 7/8ODS TEE ACC FTG 1/PK=1 QTY	1	0	1	ea	5.97000	ea	5.97
11	CTE316 CTE316 IRP 3/16OD TUBE ACC FTG 5/PK= 1 QTY	1	0	1	ea	6.45000	ea	6.45
12	A31006 J/B 3/8OD COPPER TUBE EXTENSION 5/PK=1QTY ***** All Recovered Refrigerant Returned With Less Than 98% Purity Will Be Charged a \$3/lb Handling Fee. *****	1	0	1	ea	7.72000	ea	7.72
12	Lines	Shipped Total			12	Total		520.22
	5.20 Cash Discount					Invoice Total		520.22

**APPROVED**

11001-4640-74121

AUG 21 2013

*Ray Griffin*



# INVOICE



## UNITED REFRIGERATION INC.

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COPY

BRANCH	INVOICE DATE	INVOICE NUMBER
039	09/20/13	40128520-00
P.O. NO.	CUST. NO.	PAGE #:
83874	437131	1 of 1
INVOICE AMOUNT	AMOUNT PAID	
425.67		

For questions concerning this invoice please contact the credit office:

11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197

Phone: (800) 852-5132

Fax: (215) 673-3429

FED I.D. NO.: 23-1307731

**BILL TO:**

E0061X I0131 D781474901 P1615596 0001:0004



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BRANCH LOCATION		SHIP TO			INSTRUCTIONS		
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605					REFERENCE INVOICE # e COMMERCE ORDER #		
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE
09/20/13	40128520-00	83874	437131	1% 10thprox	KEVIN	PICK-UP	09/20/13

LINE NO.	PRODUCT/DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	AE4440YAA1A SWT TPCO 1/3HP R134A HT COMP 115V SWT AE1C22E-212-J7 Superseded Prod: AEA4440YXAJ9 Serial #: 51A241343000459	1	0	1	ea	163.19000	ea	163.19
2	N5 NRP FOAM INSULATION TAPE 2"W X 1/8" THICK X 30'L	3	0	3	ea	12.35000	ea	37.05
3	C083S SPORLAN 3/8" OD DRIER 400503	1	0	1	ea	17.44000	ea	17.44
4	NRP1 NRP CORK INSULATION TAPE	1	0	1	ea	15.20000	ea	15.20
5	CR35X370 35 MFD @ 370V OVAL RUN CAPACITOR	1	0	1	ea	7.65000	ea	7.65
6	C032CAPT SPORLAN CATCH-ALL CAP TUBE SYSTEM 400072	1	0	1	ea	18.98000	ea	18.98
7	C38 3/8 OD COUPLING W01009	4	0	4	ea	0.44000	ea	1.76
8	C516 5/16 OD COUPLING W010142	4	0	4	ea	0.57000	ea	2.28
9	C14 1/4 OD COUPLING W01003	4	0	4	ea	0.53000	ea	2.12
10	30R134A R134A REFRIGERANT 30LB CYLINDER *****HAZARDOUS MATERIAL*****	1	0	1	ea	160.00000	ea	160.00
10	Lines 4.26 Cash Discount		Shipped Total	21		Total Invoice Total		425.67 425.67

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 11001-4640-74121

SEP 25 2013

Thank you for your Business!

*Reggie Sullivan*

# INVOICE



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BRANCH	INVOICE DATE	INVOICE NUMBER
039	09/17/13	40084563-00
P.O. NO.	CUST. NO.	PAGE #
83874	437131	1 of 1
INVOICE AMOUNT		AMOUNT PAID
35.00		

For questions concerning this invoice please contact the credit office:

11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197

Phone: (800) 852-5132

Fax: (215) 673-3429

FED I.D. NO.: 23-1307731

BILL TO:

E0010 I0085 D778963504 P1613345 0005:0008



REMIT TO:

UNITED REFRIGERATION, INC.  
 PO BOX 82-0100  
 PHILADELPHIA, PA 19182-0100

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BRANCH LOCATION		SHIP TO			INSTRUCTIONS		
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605					REFERENCE INVOICE # 0-00		
					e COMMERCE ORDER #		
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE
09/17/13	40084563-00	83874	437131	1% 10thprox	JIM	PICK-UP	09/17/13

LINE NO.	PRODUCT / DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	RC40R REF RECLAIM 40# CYL DEPOSIT RETURN	-1	0	-1	ea	100.00000	ea	-100.00
2	R22DISP RECOVERED R22 HANDLING	-24	0	-24	ea	0.00000	ea	0.00
3	RC30 REF RECLAIM 30LB CLY DEP	1	0	1	ea	100.00000	ea	100.00
4	RCFEE RECOVERY SERVICE FEE	1	0	1	ea	35.00000	ea	35.00
***** All Recovered Refrigerant Returned With Less Than 98% Purity Will Be Charged a \$3/lb Handling Fee. *****								
4	Lines 0.35 Cash Discount	Shipped Total		2	Total Invoice Total			35.00 35.00

SHOP STOCK  
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 11001-4640-74121  
 SEP 25 2013

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BRANCH	INVOICE DATE	INVOICE NUMBER
039	07/24/13	39447015-00
P.O. NO.	CUST. NO.	PAGE #:
83874	437131	1 of 1
INVOICE AMOUNT	AMOUNT PAID	
1,155.00		

For questions concerning this invoice please contact the credit office:

11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197

Phone: (800) 852-5132

Fax: (215) 673-3429

FED I.D. NO.: 23-1307731

REMIT TO:

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 PHILADELPHIA, PA 19182-0100

BILL TO:

E0122 I0318 D740950983 P1538014 0003:0003



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BRANCH LOCATION		SHIP TO			INSTRUCTIONS		
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605					REFERENCE INVOICE # e COMMERCE ORDER #		
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE
07/24/13	39447015-00	83874	437131	1% 10thprox	JIM	PICK-UP	07/24/13

LINE NO.	PRODUCT / DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	30R22 R-22 REFRIGERANT 30LB CYLINDER ***** HAZARDOUS MATERIAL *****	3	0	3	ea	385.00000	ea	1,155.00
1	Lines 11.55 Cash Discount	Shipped	Total	3		Total Invoice Total		1,155.00 1,155.00

*Rep Jeff*  
 11001-4640-74121

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OCT 28 2013



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**BILL TO:**

830 1 MB 0.405 E0028X 10040 D805163811 P1661118 0001:0001



WORCESTER POLYTECHNIC INS  
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 WORCESTER MA 01609-2280

BRANCH	INVOICE DATE	INVOICE NUMBER
039	10/24/13	40472257-00
P.O. NO.	CUST. NO.	PAGE #:
83874	437131	1 of 1
INVOICE AMOUNT		AMOUNT PAID
123.00		

For questions concerning this invoice please contact the credit office:  
 11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197  
 Phone: (800) 852-5132 Fax: (215) 673-3429

FED I.D. NO.: 23-1307731

**REMIT TO:**

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 PO BOX 82-0100  
 PHILADELPHIA, PA 19182-0100

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BRANCH LOCATION		SHIP TO		INSTRUCTIONS			
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605				REFERENCE INVOICE #	e COMMERCE ORDER #		
				0-00			
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE
10/24/13	40472257-00	83874	437131	1% 10thprox	DAVE	PICK-UP	10/24/13

LINE NO.	PRODUCT / DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	RC50HP REF RECLAIM 50# HIGH PRESSURE CYL DEPOSIT	2	0	2	ea	125.00000	ea	250.00
2	RCFEE RECOVERY SERVICE FEE	2	0	2	ea	35.00000	ea	70.00
5	RC125R REF RECLAIM 125# CYL DEPOSIT RETURN	-1	0	-1	ea	200.00000	ea	-200.00
6	MIXEDDISP REFRIGERANT DISPOSAL MIXED	-1	0	-1	ea	0.00000	ea	0.00
7	DISPOSAL MIXED REFRIG DISPOSAL	1	0	1	ea	3.00000	ea	3.00
***** All Recovered Refrigerant Returned With Less Than 98% Purity Will Be Charged a \$3/lb Handling Fee. *****								
5	Lines	Shipped	Total	5		Total		123.00
	1.23 Cash Discount					Invoice Total		123.00

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 11001-4640-74121  
 NOV 2013

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JAN 15 2014



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**COPY**

BRANCH	INVOICE DATE	INVOICE NUMBER
039	01/09/14	41129383-00
P.O. NO.	CUST. NO.	PAGE #:
83784	437131	1 of 1
INVOICE AMOUNT		AMOUNT PAID
757.48		

For questions concerning this invoice please contact the credit office:  
 11401 ROOSEVELT BOULEVARD PHILADELPHIA, PA 19154-2197  
 Phone: (800) 852-5132 Fax: (215) 673-3429

**BILL TO:**

697 1 MB 0.405 E0032 I0049 D863298321 P1773398 0004:0005



WORCESTER POLYTECHNIC INS  
 Office of Facilities  
 100 INSTITUTE RD  
 WORCESTER MA 01609-2280

FED I.D. NO.: 23-1307731

**REMIT TO:**

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 PO BOX 82-0100  
 PHILADELPHIA, PA 19182-0100

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BRANCH LOCATION		SHIP TO			INSTRUCTIONS			
WORC UNITED REFRIGERATION 25 Crescent Street Worcester, MA 01605					REFERENCE INVOICE # e COMMERCE ORDER #			
INVOICE DATE	INVOICE NO.	PO NUMBER	CUSTOMER NUMBER	TERMS	PICKUP NAME	VIA	SHIP DATE	
01/09/14	41129383-00	83784	437131	1% 10thprox	DAVE	PICK-UP	01/09/14	

LINE NO.	PRODUCT / DESCRIPTION	QUANTITY ORDERED	QUANTITY B.O.	QUANTITY SHIPPED	QTY UOM	UNIT PRICE	PRICE UOM	AMOUNT (NET)
1	30R22 R-22 REFRIGERANT 30LB CYLINDER ***** HAZARDOUS MATERIAL *****	2	0	2	ea	356.00000	ea	712.00
2	20X20X1FME40 HE40 20X20X1 PLEATED 35-40% EFFICIENT MERV 8	12	0	12	ea	3.79000	ea	45.48
2	Lines 7.57 Cash Discount	Shipped Total		14	Total Invoice Total			757.48 757.48

**APPROVED**  
 11001-4040-74121  
 JAN 15 2014  
*Roger Griffin*

**Thank you for your Business!**

**Worcester Polytechnic Institute  
Worcester, MA  
Greenhouse Gas Emissions Report**

**Summary of Sources of GHG Emissions Operating in 2013**

EU#	Emission Unit	Fuel	Quantity Used	Unit of Measure	Quantity Used	Unit of Measure	Emission Factor (EF) <sup>(1)</sup>	Unit of Measure	EF Source	Metric-Tons of CO2 Emitted <sup>(2)</sup>	Short-Tons of CO2 Emitted <sup>(3)</sup>
<b>DIRECT EMISSIONS SCOPE 1</b>											
<b>Carbon Dioxide CO<sub>2</sub> - GWP 1</b>											
<b>Stationary Fuel Combustion</b>											
EU # 4	Founders Equip. Boiler # 4	N. G.	48,859	Therms	4,885.90	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	258.51	284.959
EU # 7	Generator # 1 Daniels Hall, Kohler	N.G.	0.0263	MMCF	27.04	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	1.4305	1.577
EU # 8	Generator # 2 Founders Hall, CPI	N.G.	0.0291	MMCF	29.91	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	1.5828	1.745
EU # 9	Generator # 3 Harrington, Onan	N.G.	0.0056	MMCF	5.76	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	0.3046	0.336
EU # 10	Generator # 4 Salisbury, Olympian	N.G.	0.5872	MMCF	603.64	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	31.9387	35.206
EU # 11	Generator # 5 Security, Honda	N.G.	-	MMCF	0.00	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	0.0000	0.000
EU # 12	Generator # 6 Fuller #1 Roof, Superior	diesel	0.0780	1000 gallons	78.00	gallons	10.21	kg/gallon	GRP Table 12.1	0.7964	0.878
EU # 13	Generator # 7 Fuller #2 Caterpillar	diesel	0.2080	1000 gallons	208.00	gallons	10.21	kg/gallon	GRP Table 12.1	2.1237	2.341
EU # 14	Generator # 8, Power Plant,SR-4 Caterpillar	diesel	0.9360	1000 gallons	936.00	gallons	10.21	kg/gallon	GRP Table 12.1	9.5566	10.534
EU # 28	Generator #9 Gateway, Kohler	diesel	1.3653	1000 gallons	1,365.30	gallons	10.21	kg/gallon	GRP Table 12.1	13.9397	15.366
EU # 29	Generator #10 East Hall, Kohler	diesel	0.3240	1000 gallons	324.00	gallons	10.21	kg/gallon	GRP Table 12.1	3.3080	3.646
EU # 30	Generator # 11 Goddard, Olympian	N.G.	0.0058	MMCF	5.96	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	0.3155	0.348
EU # 31	Generator #12 Gateway Garage, Caterpillar	diesel	0.0899	1000 gallons	89.90	gallons	10.21	kg/gallon	GRP Table 12.1	0.9179	1.012
EU # 32	Generator #13 Gateway 2 Generator	diesel	0.5405	1000 gallons	540.50	gallons	10.21	kg/gallon	GRP Table 12.1	5.5185	6.083
EU # 33	Generator #12 Rec Center Generator	diesel	1.1675	1000 gallons	1,167.50	gallons	10.21	kg/gallon	GRP Table 12.1	11.9202	13.140
EU # 15	Power House New Boiler #1	N. G.	348,571.5185	Therms	34,857.15	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	1,844.29	2,033
		#2 Oil	-	1000 gallons	0.00	gallons	10.21	kg/gallon	GRP Table 12.1	0.00	0
EU # 16	Power House New Boiler #2	N.G.	277,623.3330	Therms	27,762.33	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	1,468.91	1,619
EU # 17	Power House New Boiler #3	N.G.	289,962.1481	Therms	28,996.21	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	1,534.19	1,691
		#2 Oil	0.0155	1000 gallons	0.000000	gallons	10.21	kg/gallon	GRP Table 12.1	0.00	0
EU # 20	Off Campus Residences (group)	N.G.	171,900	Therms	17,190.00	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	909.52	1,003
EU # 21	On-Campus Miscell. 1st set	N.G.	43,491	Therms	4,349.10	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	230.11	254
EU # 22	On-Campus Miscell. 2nd set	N.G.	91,006	Therms	9,100.60	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	481.51	531
EU # 23	On-Campus Miscell. 3rd set	N.G.	38,640	Therms	3,864.00	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	204.44	225
EU # 24	Off-Campus Residences Oil	#2 Oil	10,5830	1000 gallons	10,583.00	gallons	10.21	kg/gallon	GRP Table 12.1	108.05	119
EU # 27	Gateway Cleaver Brooks Boilers (2)	N.G.	170,723.6000	Therms	17,072.36	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	903.30	996
EU # 26	Gateway Lattern Boilers (2)	N.G.	47,660.4000	Therms	4,766.04	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	252.17	278
	Salisbury Estates Heating	N.G.	141,433	Therms	14,143.30	MMBTU	52.91	Kg CO2/MMBTU	GRP Table 12.1	748.32	825
<b>Mobile Fuel Combustion</b>											
	Non-highway Motor Vehicles	diesel			0	gallons	10.21	Kg CO2/gallon	GRP Table 12.1	0.00	0
	Tier 0 - Light Trucks	gasoline			0	gallons	8.78	Kg CO2/gallon	GRP Table 12.1	0.00	0
	Tier 1 - Light Trucks	gasoline			2,793	gallons	8.78	Kg CO2/gallon	GRP Table 12.1	24.52	27
	Tier 2 - Light Trucks	gasoline			39,446	gallons	8.78	Kg CO2/gallon	GRP Table 12.1	346.34	382
	Tier 2 - Passenger Cars	gasoline			15,391	gallons	8.78	Kg CO2/gallon	GRP Table 12.1	135.13	149

**Worcester Polytechnic Institute  
Worcester, MA  
Greenhouse Gas Emissions Report**

**Summary of Sources of GHG Emissions Operating in 2013**

EU#	Emission Unit	Fuel	Quantity Used	Unit of Measure	Quantity Used	Unit of Measure	Emission Factor (EF) <sup>(1)</sup>	Unit of Measure	EF Source	Metric-Tons of CO2 Emitted <sup>(2)</sup>	Short-Tons of CO2 Emitted <sup>(3)</sup>
<b>Methane CH<sub>4</sub> - GWP 21</b>											
<b>Stationary Fuel Combustion</b>											
EU # 4	Founders Equip. Boiler # 4	N. G.	48,859	Therms	4,885.90	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0044	0.0048
EU # 7	Generator # 1 Daniels Hall, Kohler	N.G.	0.0263	MMCF	27.04	MMBTU	658	g/MMBTU	GRP Table 12.7	0.0178	0.0196
EU # 8	Generator # 2 Founders Hall, CPI	N.G.	0.0291	MMCF	29.91	MMBTU	658	g/MMBTU	GRP Table 12.7	0.0197	0.0217
EU # 9	Generator # 3 Harrington, Onan	N.G.	0.0056	MMCF	5.76	MMBTU	658	g/MMBTU	GRP Table 12.7	0.0038	0.0042
EU # 10	Generator # 4 Salisbury, Olympian	N.G.	0.5872	MMCF	603.64	MMBTU	658	g/MMBTU	GRP Table 12.7	0.3972	0.4378
EU # 11	Generator # 5 Security, Honda	N.G.	-	MMCF	0.00	MMBTU	658	g/MMBTU	GRP Table 12.7	0.0000	0.0000
EU # 12	Generator # 6 Fuller #1 Roof, Superior	diesel	0.0780	1000 gallons	78.00	gallons	0.003	Kg/MMBTU	GRP Table 12.9	0.0000	0.0000
EU # 13	Generator # 7 Fuller #2 Caterpillar	diesel	0.2080	1000 gallons	208.00	gallons	0.003	Kg/MMBTU	GRP Table 12.9	0.0001	0.0001
EU # 14	Generator # 8, Power Plant, Caterpillar	diesel	0.9360	1000 gallons	936.00	gallons	0.003	Kg/MMBTU	GRP Table 12.9	0.0004	0.0004
EU # 28	Generator #9 Gateway, Kohler	diesel	1.3653	1000 gallons	1,365.30	gallons	0.003	Kg/MMBTU	GRP Table 12.9	0.0006	0.0006
EU # 29	Generator #10 East Hall, Kohler	diesel	0.3240	1000 gallons	324.00	gallons	0.003	Kg/MMBTU	GRP Table 12.9	0.0001	0.0001
EU # 30	Generator # 11 Goddard, Olympian	N.G.	0.0058	MMCF	5.96	MMBTU	658	g/MMBTU	GRP Table 12.7	0.0039	0.0043
EU # 31	Generator #12 Gateway Garage, Caterpillar	diesel	0.0899	1000 gallons	89.90	gallons	0.003	Kg/MMBTU	GRP Table 12.9	0.0000	0.0000
EU # 32	Generator #13 Gateway 2 Generator	diesel	0.5405	1000 gallons	540.50	gallons	0.003	Kg/MMBTU	GRP Table 12.9	0.0002	0.0002
EU # 33	Generator #12 Rec Center Generator	diesel	1.1675	1000 gallons	1,167.50	gallons	0.003	Kg/MMBTU	GRP Table 12.9	0.0005	0.0005
EU # 15	Power House New Boiler #1	N. G.	348,571.5185	Therms	34,857.15	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0314	0.0346
		#2 Oil	-	1000 gallons	0.00	gallons	0.2	g/MMBTU	GRP Table 12.9	0.0000	0.0000
EU # 16	Power House New Boiler #2	N.G.	277,623.3330	Therms	27,762.33	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0250	0.0275
EU # 17	Power House New Boiler #3	N.G.	289,962.1481	Therms	28,996.21	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0261	0.0288
		#2 Oil	0.0155	1000 gallons	0.000000	gallons	0.2	g/MMBTU	GRP Table 12.9	0.0000	0.0000
EU # 20	Off Campus Residences (group)	N.G.	171,900	Therms	17,190.00	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0155	0.0171
EU # 21	On-Campus Miscell. 1st set	N.G.	43,491	Therms	4,349.10	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0039	0.0043
EU # 22	On-Campus Miscell. 2nd set	N.G.	91,006	Therms	9,100.60	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0082	0.0090
EU # 23	On-Campus Miscell. 3rd set	N.G.	38,640	Therms	3,864.00	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0035	0.0038
EU # 24	Off-Campus Residences Oil	#2 Oil	10.5830	1000 gallons	10,583.00	gallons	0.0030	Kg/MMBTU	GRP Table 12.9	0.0317	0.0350
EU # 27	Gateway Cleaver Brooks Boilers (2)	N.G.	170,723.6000	Therms	17,072.36	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0154	0.0169
EU # 26	Gateway Lattern Boilers (2)	N.G.	47,660.4000	Therms	4,766.04	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0043	0.0047
	Salisbury Estates Heating	N.G.	141,433	Therms	14,143.30	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0132	0.0145
<b>Mobile Fuel Combustion</b>											
	Non-highway Motor Vehicles	diesel			0	gallons	1.44	g/gal	GRP Table 13.7	0.0000	0.0000
	Tier 0 - Light Trucks	gasoline			0	miles	0.0776	g/mi	GRP Table 13.4	0.0000	0.0000
	Tier 1 - Light Trucks	gasoline			38,530	miles	0.0452	g/mi	GRP Table 13.4	0.0017	0.0019
	Tier 2 - Light Trucks	gasoline			188,228	miles	0.0163	g/mi	GRP Table 13.4	0.0031	0.0034
	Tier 2 - Passenger Cars	gasoline			28,115	miles	0.0704	g/mi	GRP Table 13.4	0.0020	0.0022

**Worcester Polytechnic Institute  
Worcester, MA  
Greenhouse Gas Emissions Report**

**Summary of Sources of GHG Emissions Operating in 2013**

EU#	Emission Unit	Fuel	Quantity Used	Unit of Measure	Quantity Used	Unit of Measure	Emission Factor (EF) <sup>(1)</sup>	Unit of Measure	EF Source	Metric-Tons of CO2 Emitted <sup>(2)</sup>	Short-Tons of CO2 Emitted <sup>(3)</sup>
<b>Nitrous Oxide N<sub>2</sub>O - GWP 310</b>											
<b>Stationary Fuel Combustion</b>											
EU # 4	Founders Equip. Boiler # 4	N. G.	48,859	Therms	4,885.90	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0044	0.0048
EU # 7	Generator # 1 Daniels Hall, Kohler	N.G.	0.0263	MMCF	27.04	MMBTU	0.0001	Kg/MMBTU	GRP Table 12.7	0.0000	0.0000
EU # 8	Generator # 2 Founders Hall, CPI	N.G.	0.0291	MMCF	29.91	MMBTU	0.0001	Kg/MMBTU	GRP Table 12.7	0.0000	0.0000
EU # 9	Generator # 3 Harrington, Onan	N.G.	0.0056	MMCF	5.76	MMBTU	0.0001	Kg/MMBTU	GRP Table 12.7	0.0000	0.0000
EU # 10	Generator # 4 Salisbury, Olympian	N.G.	0.5872	MMCF	603.64	MMBTU	0.0001	Kg/MMBTU	GRP Table 12.7	0.0001	0.0001
EU # 11	Generator # 5 Security, Honda	N.G.	-	MMCF	0.00	MMBTU	0.0001	Kg/MMBTU	GRP Table 12.7	0.0000	0.0000
EU # 12	Generator # 6 Fuller #1 Roof, Superior	diesel	0.0780	1000 gallons	78.00	gallons	0.0006	Kg/MMBTU	GRP Table 12.9	0.0000	0.0001
EU # 13	Generator # 7 Fuller #2 Olympian	diesel	0.2080	1000 gallons	208.00	gallons	0.0006	Kg/MMBTU	GRP Table 12.9	0.0001	0.0001
EU # 14	Generator # 8, Power Plant, Caterpillar	diesel	0.9360	1000 gallons	936.00	gallons	0.0006	Kg/MMBTU	GRP Table 12.9	0.0006	0.0006
EU # 28	Generator #9 Gateway, Kohler	diesel	1.3653	1000 gallons	1,365.30	gallons	0.0006	Kg/MMBTU	GRP Table 12.9	0.0008	0.0009
EU # 29	Generator #10 East Hall, Kohler	diesel	0.3240	1000 gallons	324.00	gallons	0.0006	Kg/MMBTU	GRP Table 12.9	0.0002	0.0002
EU # 30	Generator # 11 Goddard, Olympian	N.G.	0.0058	MMCF	5.96	MMBTU	0.0001	Kg/MMBTU	GRP Table 12.7	0.0000	0.0000
EU # 31	Generator #12 Gateway Garage, Caterpillar	diesel	0.0899	1000 gallons	89.90	gallons	0.0006	Kg/MMBTU	GRP Table 12.9	0.00005	0.0001
EU # 32	Generator #13 Gateway 2 Generator	diesel	0.5405	1000 gallons	540.50	gallons	0.0006	Kg/MMBTU	GRP Table 12.9	0.00032	0.0004
EU # 33	Generator #12 Rec Center Generator	diesel	1.1675	1000 gallons	1,167.50	gallons	0.0006	Kg/MMBTU	GRP Table 12.9	0.00070	0.0008
EU # 15	Power House New Boiler #1	N. G.	348,571.5185	Therms	34,857.15	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0314	0.0346
		#2 Oil	-	1000 gallons	0.00	gallons	0.4	g/MMBTU	GRP Table 12.9	0.0000	0.0000
EU # 16	Power House New Boiler #2	N.G.	277,623.3330	Therms	27,762.33	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0250	0.0275
EU # 17	Power House New Boiler #3	N.G.	289,962.1481	Therms	28,996.21	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0261	0.0288
		#2 Oil	0.0155	1000 gallons	0.000000	gallons	0.4	g/MMBTU	GRP Table 12.9	0.0000	0.0000
EU # 20	Off Campus Residences (group)	N.G.	171,900	Therms	17,190.00	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0155	0.0171
EU # 21	On-Campus Miscell. 1st set	N.G.	43,491	Therms	4,349.10	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0039	0.0043
EU # 22	On-Campus Miscell. 2nd set	N.G.	91,006	Therms	9,100.60	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0082	0.0090
EU # 23	On-Campus Miscell. 3rd set	N.G.	38,640	Therms	3,864.00	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0035	0.0038
EU # 24	Off-Campus Residences Oil	#2 Oil	10.5830	1000 gallons	10,583.00	gallons	0.0	kg/MMBTU	GRP Table 12.9	0.0063	0.0070
EU # 27	Gateway Cleaver Brooks Boilers (2)	N.G.	170,723.6000	Therms	17,072.36	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0154	0.0169
EU # 26	Gateway Lattern Boilers (2)	N.G.	47,660.4000	Therms	4,766.04	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0043	0.0047
	Salisbury Estates Heating	N.G.	141,433	Therms	14,143.30	MMBTU	0.9	g/MMBTU	GRP Table 12.7	0.0127	0.0140
<b>Mobile Fuel Combustion</b>											
	Non-highway Motor Vehicles	diesel			0	gallons	0.26	g/gal	GRP Table 13.7	0.0000	0.0000
	Tier 0 - Light Trucks	gasoline			0	miles	0.1056	g/mi	GRP Table 13.4	0.0000	0.0000
	Tier 1 - Light Trucks	gasoline			38,530	miles	0.0871	g/mi	GRP Table 13.4	0.0034	0.0037
	Tier 2 - Light Trucks	gasoline			188,228	miles	0.0066	g/mi	GRP Table 13.4	0.0012	0.0014
	Tier 2 - Passenger Cars	gasoline			28,115	miles	0.0646	g/mi	GRP Table 13.4	0.0018	0.0020
<b>REFRIGERATION R134A<sup>(5)</sup> - GWP 1300</b>											
	HVAC Units - Facility Wide	R134A	240.0000	pounds	0.1200	tons	1,300	GWP		156	172
<b>REFRIGERATION Acetylene - GWP 1300</b>											
		Acetylene			10	cubic feet	0.1043	kg CO2 / CF	GRP Chapter 12.4 P72	0.001043	0.00115
<b>REFRIGERATION R410A<sup>(5)</sup> - GWP 1725</b>											
		R410A			0.0000	tons				0	0
<b>REFRIGERATION R404A<sup>(5)</sup> - GWP 3260</b>											
		R404A			0.0000	tons				0	0
<b>VEHICLE REFRIGERATION R134A<sup>(6)</sup> - GWP 1300</b>											
		R134A	21.3500		0.0107	tons				12	14
<b>TOTAL</b>										<b>9,702</b>	<b>10,695</b>

<sup>(1)</sup> Based on General Reporting Protocol 1.1 last updated on 1/14/2011. Nat Gas heat content used is 1028 MMBTU/MMCFper 40 CFR 98 Subpart C Table C-1

<sup>(2)</sup> Threshold for reporting GHGs all facilities exceeding 5,000 short-tons of CO2 emissions.

<sup>(3)</sup> Threshold for reporting GHGs to USEPA: all facilities exceeding 25,000 metric-tons of CO<sub>2</sub> emissions.

<sup>(4)</sup> Fuel usage was provided by WPI Chief Engineer

<sup>(5)</sup> Reporting of refrigerant was based on purchasing records for 2012

<sup>(6)</sup> Reporting of refrigerant was based on vehicle refrigerant capacity and operating emission factor of 20%