



LEED v4.1 Residential: Single Family

Step 1.

Ensure this project is registered in LEED Online.

Step 2.

Enable macros

Note: This workbook is for use with Excel for Mac 2011 and Excel 2007 or later.

Step 3.

Unit of measure

Step 4.

Project rating system

Market Classification

Total homes in submittal

Construction type

Subdivision/Development Name

Project team leader name

Project team leader organization name

Builder (if different than team leader org)

Project team leader Email address

Provider Organization name

Green rater

Green rater

Energy Rater

Provider QAD

Mid-construction visit date(s)

ex: 1/1/2015, 2/27/2015

Date final visit completed

ex: 3/31/2016

Step 5.

The following information must be consistent with project details in LEED Online:

Individual Project Information

Project ID #	#####
Project name	
Project address	
City	Grand Rapids
State	Michigan
Country	United State
Zip Code	49507
Building type	Single family detached
Number of stories	2
Number of bedrooms	3
Adjusted conditioned floor area used for LEED (see comment) (sq ft)	2320
Conditioned floor area removed from the total due to the ENERGY STAR basement exclusion, where applicable (sq ft)	
Total conditioned floor area (sq ft)	2320



Additional Resources

- Resources & Tools section of the Homes Guide to Certification (<http://www.usgbc.org/cert-guide/homes#tools>)

Scorecard (ID: 1000134431)

Project Address , Grand Rapids, Michigan 49507, United State

Note: The information on this tab is READ-ONLY. To edit this information, see the Credit Category tabs.

	Integrative Process	Preliminary	Y	0 of 2	M	0	Verified	0
	IPc Integrative Process			0 of 2		0		
	Location and Transportation	Preliminary	Y	0 of 10	M	0	Verified	10
	LTp Floodplain Avoidance			Required			Verified	
	LTc LEED for Neighborhood Development			0 of 10		0		
	LTc Site Selection			0 of 6		0		6
	LTc Compact Development			0 of 1		0		1
	LTc Community Resources			0 of 1		0		1
	LTc Access to Transit			0 of 2		0		2
	Sustainable Sites	Preliminary	Y	0 of 5	M	0	Verified	0
	SSp Construction Activity Pollution Prevention			Required			Verified	
	SSc Heat Island Reduction			0 of 1		0		
	SSc Rainwater Management			0 of 2		0		
	SSc Nontoxic Pest Control			0 of 2		0		
	Water Efficiency	Preliminary	Y	0 of 15	M	0	Verified	5
	WEp Water Use			Required			Verified	
	WEp Water Metering			Required			Verified	
	WEc Total Water Use			0 of 15		0		
	WEc Indoor Water Use			0 of 11		0		5
	WEc Outdoor Water Use			0 of 4		0		
	Energy and Atmosphere	Preliminary	Y	0 of 40	M	0	Verified	24
	EAp Minimum Energy Performance			Required			Verified	
	EAp Energy Metering			Required			Verified	
	EAp Education of the Homeowner, Tenant or Building Manager			Required			Verified	
	EAc Annual Energy Use			0 of 36		0		23
	EAc Efficient Hot Water Distribution System			0 of 2		0		
	EAc HVAC Start-Up Credentialing			0 of 1		0		
	EAc Refrigerant Management			0 of 1		0		1
	Materials and Resources	Preliminary	Y	0 of 12	M	0	Verified	2
	MRp Certified Tropical Wood			Required			Verified	
	MRp Durability Management			Required			Verified	
	MRC Durability Management Verification			0 of 3		0		2
	MRC Environmentally Preferable Products			0 of 5		0		
	MRC Construction Waste Management			0 of 2		0		
	MRC Material-Efficient Framing			0 of 2		0		
	Indoor Environmental Quality	Preliminary	Y	0 of 16	M	0	Verified	5
	EQp Ventilation			Required			Verified	
	EQp Combustion Venting			Required			Verified	
	EQp Garage Pollutant Protection			Required			Verified	
	EQp Radon-Resistant Construction			Required			Verified	
	EQp Air Filtering			Required			Verified	
	EQp Compartmentalization			Required			Not Verified	
	EQc Enhanced Ventilation			0 of 3		0		2
	EQc Contaminant Control			0 of 3		0		3
	EQc Balancing of Heating and Cooling Distribution Systems			0 of 6		0		
	EQc Low-Emitting Products			0 of 4		0		
	Innovation	Preliminary	Y	0 of 6	M	0	Verified	3
	INp Preliminary Rating			Required			Verified	
	INc Innovation			0 of 5		0		3
	INc LEED Accredited Professional			0 of 1		0		
	Regional Priority	Preliminary	Y	0 of 4	M	0	Verified	3
	RPc Regional Priority			0 of 4		0		3
Total		Preliminary	Y	0 of 110	M	0	Verified	52.0

Certification Thresholds Certified: 40-49, Silver: 50-59, Gold: 60-79, Platinum: 80-110

Location and Transportation

Preliminary Y 0 Maybe 0 Verified 10

LT Prerequisite Floodplain Avoidance

Required Required Verified Y

Select one of the following:

- True The project is not built on land within a flood hazard area.
- (Select one) The project is built on land within a flood hazard area and in accordance with flood provisions.
- (Select one) The project is built on land within a flood hazard area and is a previously developed building and hardscape.

LT Credit LEED for Neighborhood Development

10 points Preliminary Y M 0 Verified 0

LT Credit Site Selection

Up to 6 points Preliminary Y 0 M 0 Verified 6

Exemplary Performance: Earn more than the maximum 6 points

AND/OR

Option 6. Existing Infrastructure (1 point) Y M V 1

Yes Lot is within 1/2 mile of existing water service and sewer service lines

AND/OR

Option 7. Sidewalks (1 point) Y M V 1

Yes Lot has qualifying sidewalks

LT Credit Compact Development

1 point Preliminary Y 0 M 0 Verified 1

Exemplary Performance: 12 DU/acre (30 DU/hectare)

LT Credit Community Resources

1 point Preliminary Y 0 M 0 Verified 1

Exemplary Performance: ≥ 7 uses

LT Credit Access to Transit

Up to 2 points Preliminary Y 0 M 0 Verified 2

Exemplary Performance: For multiple transit types, 144 weekday trips and 108 weekend trips

Sustainable Sites

Preliminary Y 0

Maybe 0

Verified 0

SS Prerequisite Construction Activity Pollution Prevention

Required

Required

Verified

Y

Confirm all of the following measures were implemented on the project, as applicable:

- True Stockpiled and protected disturbed topsoil from erosion.
- True Controlled the path and velocity of runoff with silt fencing or comparable measures.
- True Protected on-site storm sewer inlets, streams, and lakes with straw bales, silt fencing, silt sacks, rock filters, or comparable measures.
- True Provided swales to divert surface water from hillsides.
- True Used tiers, erosion blankets, compost blankets, filter socks, berms, or comparable measures to stabilize soils in any area with a slope of 15% (6.6:1) or more that was disturbed during construction.
- (Select one) Prevented air pollution from dust and particulate matter.

OR

Select one of the following:

- (Select one) The project team created an implemented an Erosion and Sedimentation Control (ESC) plan that conforms to the requirements of the 2017 U.S. Environmental Protection Agency (EPA) Construction General Permit (CGP).
- (Select one) The project team created an implemented an Erosion and Sedimentation Control (ESC) plan that conforms to local standards and codes, which are as or more stringent than the 2017 U.S. Environmental Protection Agency (EPA) Construction General Permit (CGP).

Water Efficiency

Preliminary Y 0 Maybe 0 Verified 5

WE Prerequisite Water Use

Required Required Verified

Option 1. Total Water Use

Reduce total indoor and outdoor water consumption by at least 20% over standard practices

Total reduction of indoor and outdoor water consumption as calculated in the [Water Reduction Calculator](#) (%)

OR

Option 2. Indoor and Outdoor Water Use

Achieve 3 points in WE credit Indoor Water Use and/or WE credit Outdoor Water Use

Total points in WE credit Indoor Water Use and WE credit Outdoor Water Use

WE Prerequisite Water Metering

Required Required Verified

Select one of the following:

A whole-house water meter is installed.

The house uses only well water and is not connected to a municipal water system.

WE Credit Total Water Use

3 to 15 points Preliminary Y M Verified

Exemplary Performance: 85% reduction of indoor and outdoor water consumption

Total reduction of indoor and outdoor water consumption as calculated in the [Water Reduction Calculator](#) (%)

The water pressure has been tested. There are no detectable water leaks. Any installed water softeners are demand initiated.

WE Credit Indoor Water Use

Up to 11 points Preliminary Y M Verified

The water pressure has been tested. There are no detectable water leaks. Any installed water softeners are demand initiated.

Meet any of the following:

Lavatory Faucet (2-3 points)

All installed lavatory faucets and/or faucet aerators are WaterSense labeled.

Average rated flow volume across all lavatory faucets (gpm)

Showerheads (1-3 points)

All installed showerhead fixtures and fittings are WaterSense labeled.

Total rated flow volume per shower compartment, averaged across all shower compartments (gpm)

Toilets (1-3 points)

All installed toilet fixtures and fittings are WaterSense labeled.

Average rated flush volume across all toilets (gpf)

Clothes Washers (2 points)

All clothes washers are ENERGY STAR qualified or performance equivalent

Energy and Atmosphere

Preliminary Y 0 Maybe 0 Verified 24

EA Prerequisite Minimum Energy Performance

Required Required Verified Y

1. ENERGY STAR for Homes version 3

<input type="checkbox"/> True	ENERGY STAR version 3 checklists are complete
<input type="text" value="55"/>	HERS Index Rating
<input type="text" value="68"/>	ENERGY STAR HERS Index Target (SAF Adjusted)

2. ENERGY STAR Qualified Appliances

Select at least one of the following:

<input type="checkbox"/> True	ENERGY STAR refrigerator is installed.
<input type="checkbox"/> (Select one)	ENERGY STAR dishwasher is installed.
<input type="checkbox"/> (Select one)	ENERGY STAR clothes washer is installed.

3. Duct Runs

<input type="checkbox"/> True	All duct runs are fully ducted.
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EA Prerequisite Energy Metering

Required Required Verified Y

<input type="checkbox"/> True	A whole-house electric meter is installed.
<input type="checkbox"/> True	A whole-house gas meter is installed.

EA Prerequisite Education of Homeowner, Tenant, or Building Manager

Required Required Verified Y

<input type="checkbox"/> True	An operations and maintenance manual, binder, or CD has been/will be provided to all individuals or organizations responsible for the maintenance of the home.
<input type="checkbox"/> True	A minimum one-hour walkthrough of the home with the occupants has been conducted.

EA Credit Annual Energy Use

Up to 36 points Preliminary Y 0 M 0 Verified 23

Exemplary Performance: For Option 1, 100% reduction; For Option 2, -10 HERS Index Rating.

Option 1. LEED Energy Budget (1-36 points) Y M V

<input type="text" value="166.00"/>	LEED Reference Energy Budget (MMBtu/year)
<input type="text" value="131.00"/>	As Designed Energy Budget (MMBtu/year)
<input type="text" value="21%"/>	Percent reduction below LEED Energy Budget (%)
<input type="text" value="21"/>	Total Points

OR

Option 2. HERS Index (SAF Adjusted) (1-36 points) Y M V

Case 1: New Construction

<input type="text" value="55"/>	HERS Index Rating
<input type="text" value="0.99"/>	Size Adjustment Factor (SAF) from the ENERGY STAR for Homes Report
<input type="text" value="56"/>	HERS Index (SAF Adjusted)
<input type="text" value="23"/>	Points for achieving HERS Index Rating
<input type="text" value="68"/>	ENERGY STAR HERS Index Target (SAF Adjusted)
<input type="text" value="56"/>	HERS Index (SAF Adjusted)
<input type="text" value="12"/>	HERS Index points below ENERGY STAR HERS Index Target (SAF Adjusted)
<input type="text" value="22"/>	Points for HERS points below ENERGY STAR HERS Index Target (SAF Adjusted)

EA Credit Refrigerant Management

1 point

Preliminary Y M Verified

Exemplary Performance: Do not use refrigerants, or use only refrigerants that have an ozone depletion potential (ODP) of zero and a global warming potential (GWP) of less than 50.

Option 1. Refrigerant Selection

Refrigerant used

OR

Option 2. Calculation Approach

<input type="text"/>	System type
<input type="text"/>	Refrigerant
<input type="text"/>	Maximum refrigerant charge or weighted average ratio of refrigerant charge

Materials and Resources

Preliminary Y 0 Maybe 0 Verified 2

MR Prerequisite Certified Tropical Wood

Required Required Verified

All wood in the building is nontropical, reused or reclaimed, or certified by the Forest Stewardship Council, or USGBC-approved equivalent.

MR Prerequisite Durability Management

Required Required Verified

ENERGY STAR for Homes, version 3, water management system builder requirements are met.

Confirm all of the following have been implemented on the project:

Nonpaper-faced backer board, or a product or coating over wallboard that meets standard ASTM D 3273 standard, was installed on the area above bathtub, spa or shower, and in areas behind fiberglass enclosures where wallboard is installed.

Water-resistant flooring was installed in the kitchen, bathroom(s), laundry room, spa area(s). No carpet was installed in these areas.

Water-resistant flooring was installed in entryways within 3 feet of exterior door(s).

A drain and drain pan, drain pan and automatic water shut-off or flow restrictors, or floor drain with floor sloped to drain was installed for all tank water heaters in or over living space.

A braided washer hose, drain and drain pan, drain pan and automatic water shut-off or flow restrictors, or floor drain with floor sloped to drain was installed for clothes washer in or over living space.

Conventional clothes dryers exhaust directly to outdoors.

After completion of construction, test to verify that there are no detectable water leaks.

MR Credit Durability Management Verification

Up to 3 points Preliminary Y M Verified

Option 1: Water Management System (1 point) Y M V

Each measure in the ENERGY STAR for Homes, version 3, water management system builder requirements were verified by the verification team.

AND/OR **Option 2. Overhangs (1 point)** Y M V

Each exterior door is protected by compliant overhang, roof or awning

AND/OR **Option 3. Plumbing Condensation Control (1 point)** Y M V

Select one of the following:

R-4 insulation install on all domestic cold water piping in unconditioned space

OR

No cold water piping installed in unconditioned spaces

Indoor Environmental Quality

Preliminary Y 0

Maybe 0

Verified 5

EQ Prerequisite Ventilation

Required

Required

Verified

Y

False

The project has earned the EPA Indoor airPLUS label

V

OR

Local Exhaust

Confirm all of the following have been implemented on the project:

True

Local exhaust systems designed and third-party tested to meet the requirements of ASHRAE Standard 62.2-2016, Sections 5 and 7 or local equivalent, whichever is more stringent, were installed in all bathrooms (including half-baths) and the kitchen.

True

Local exhaust systems exhaust air directly to the outdoors.

True

All bathroom exhaust fans are ENERGY STAR-labeled or an HRV or ERV is used.

N/A

For exhaust hood systems capable of exhausting in excess of 400 cubic feet per minute (188 liters per second), makeup air is provided at a rate approximately equal to the exhaust air rate. Makeup air systems have a means of closure and can be automatically controlled to start and operate simultaneously with the exhaust system.

V

Y

AND

Whole House Mechanical Ventilation

(Select one)

The building is designed and third-party tested to meet ASHRAE Standard 62.2-2016 Sections 4, 6.7 and 6.8 or local equivalent, whichever is more stringent.

(Select one)

Whole house ventilation fans must be rated for sound at a maximum of 1.0 sone per ASHRAE 62.2-2016, Section 7.2.1. Remote mounted fans need not meet these sound requirements.

EQ Prerequisite Combustion Venting

Required

Required

Verified

Y

The project has earned the EPA Indoor airPLUS label
OR

No unvented combustion appliances were installed (ovens and ranges excluded).

A carbon monoxide (CO) monitor is installed on each floor, hard-wired with a battery backup.

For projects with fireplaces or woodstoves installed

Provide doors that close or a solid glass enclosure.

For projects where space and water heating equipment involving combustion are installed

Select one of the following:

Equipment is installed with closed combustion (i.e. sealed supply air and exhaust ducting)

Equipment is installed with power-vented exhaust

Equipment is located in a detached utility building or open-air facility

EQ Prerequisite Garage Pollutant Protection

Required

Required

Verified

Y

The project has earned the EPA Indoor airPLUS label
OR

All air-handling equipment and ductwork is placed outside the fire-rated envelope of the garage.

Shared surfaces between the garage and conditioned spaces are tightly sealed.

Conditioned Spaces Above Garage

All penetrations and all connecting floor and ceiling joist bays are sealed.

Conditioned Spaces Next to Garage

All doors are weather-stripped.

Carbon monoxide detectors are installed in rooms that share a door with the garage

All penetrations and all cracks at the base of the walls are sealed.

EQ Prerequisite Radon-Resistant Construction

Required Required Verified
Exemplary Performance: For projects in radon zones 2 and 3, install a qualifying passive radon ventilation system.

EPA Indoor airPLUS label V

The project has earned the EPA Indoor airPLUS label

OR

Case 1. New Construction V

EPA radon zone

For projects in EPA radon zone 1

There is a capillary break per the Indoor airPLUS specifications.

An electrical outlet has been provided near vent piping in the attic to facilitate future fan installation.

A gas-tight vertical vent pipe extending up through the conditioned spaces and terminating above the roof opening has been installed.

OR

The house is elevated by at least 2 feet (600 millimeters) with open air space between building and ground or there is a garage under the building.

OR

Case 2. Renovation of Existing Building V

EPA radon zone

For renovation projects in EPA radon zone 1 with no slab work being performed

Radon test results (pCi/L)

If results are greater than 4 pCi/L, an active ventilation system has been installed.

EQ Prerequisite Air Filtering

Required Required Verified

The project has earned the EPA Indoor airPLUS label

OR

MERV rating of filters on recirculating space conditioning systems

MERV rating of filters on mechanically supplied outdoor air systems with 10 ft (3 m) or more of ductwork

EQ Prerequisite Compartmentalization

Required Required Verified

For attached single-family projects

Each residential unit has sealed penetrations through walls, ceilings, and floors and vertical chases adjacent to units.

All doors in the residential units leading to common hallways have weather-stripping.

All exterior doors and operable windows have weather-stripping.

Blower door test results (cfm50)

Envelope enclosure area (sq ft)

Leakage per area of enclosure (cfm50/sq ft)

EQ Credit Enhanced Ventilation

Up to 3 points Preliminary Y M Verified
Exemplary Performance: Earn more than the maximum 3 points

Option 1. Enhanced Local Exhaust (1 point) Y M V

Bathroom exhaust fan control type in every bathroom with a shower, bathtub, or spa

AND/OR

Option 2. Enhanced Whole-House Ventilation (2 points) Y M V

A balanced whole-house ventilation system was designed and installed that meets ASHRAE 62.2-2016 Section 4 in each home or unit.

AND/OR

Option 3. Humidity Control (1 point) Y M V

Dehumidification controls installed for the whole-house ventilation system.

EQ Credit Contaminant Control

Up to 3 points

Preliminary Y M Verified

Exemplary Performance: Earn more than the maximum 3 points

Option 1. Walk-off Mats (1 point)

Y M V

For all primary entryways, a permanent walk-off mat that is at least 4 feet (1.2 meters) long and allows access for cleaning has been installed.

AND/OR

Option 2. Shoe Removal and Storage (1 point)

Y M V

A shoe removal and storage space is near the primary entryway.

No conventional carpet is installed in shoe removal and storage area.

AND/OR

Option 3. Preoccupancy Flush (1 point)

Y M V

The project has earned the EPA Indoor airPLUS label

OR

At installation, all permanent ducts and vents were sealed to minimize contamination from construction.

After construction ends and before occupancy

Any dust and debris was removed from ducts.

The home was flushed out for 48 hours, with all windows open, a fan run continuously or all HVAC fans and exhaust fans.

AND/OR

Option 4. Exhaust Fan in Laundry Room, Utility Room or Garage (1 point)

Y M V

Meet one of the following:

Case 1. Garage Exhaust

Y M V

The project has earned the EPA Indoor airPLUS label

OR

75 cfm exhaust installed that meets ENERGY STAR cfm/w performance requirements.

Qualifying fan control is installed

OR

Case 2. No attached garage

Y M V

Do not construct a garage.

Install a detached garage, defined as a structure that does not share a wall with the home.

Install a carport, defined as an open-air space with one complete wall, which may be shared with the home.

OR

Case 3. Utility room exhaust

Y M V

Energy star qualified exhaust fan installed in the laundry or utility room.

AND/OR

Option 5. Filtration (1 point)

Y M V

MERV 10 or higher filters installed on all recirculating space conditioning systems.

Air filter housings are airtight to prevent bypass or leakage.

AND/OR

Option 6. Enhanced Combustion Venting Measures (1 point)

Y M V

Meet one of the following:

The project has earned the EPA Indoor airPLUS label

No fireplaces or woodstoves have been installed.

EPA qualified wood- or pellet-burning fireplaces with either power or direct venting have been installed.

A natural gas, propane, or alcohol stove approved by a safety testing facility and has power or direct venting has been installed.

A natural gas, propane, or alcohol stove has a permanently fixed glass front or gasketed door and an electronic pilot.

Innovation

Preliminary Y 0 Maybe 0 Verified 3

IN Prerequisite Preliminary Rating

Required Required Verified

Preliminary rating and meeting are complete.

IN Credit Innovation

To achieve all five innovation points, a project team must achieve at least one pilot credit, at least one innovation credit and no more than two exemplary performance credits.

Up to 5 points Preliminary Y M Verified

Option 1. Innovation (1 point) Y M V

Describe the intent of the proposed innovation credit.

AND/OR

Option 2. Pilot (1 point) Y M V

Pilot credit name

AND/OR

Option 3. Additional Strategies (1-3 points) Y M V

Exemplary Performance: 1-2 points

Exemplary Performance	Strategy
LT Community Resources >=7	Credit name

Exemplary Performance	Strategy
LT Site Selection -6 points met	Credit name

Regional Priority

Preliminary Y 0

Maybe 0

Verified 3

RP Credit Regional Priority

Up to 4 points

Preliminary Y

0

M

0

Verified

3

Regional priority credits may be found on www.usgbc.org/rpc. Alternative Regional Priority Credits can be used if justification is provided.

Regional Priority Credit Name	Point Threshold
LT - Site Selection, maxed category	3 as listed
EA - Annual Energy Use	3 as listed (50% of 40 req)
LT - Community Resources, meets 1 of 1 available	2 listed - 100%

Home Energy Rating Certificate

Property

LINC UP Non Profit Housing
Grand Rapids, MI 49507

HERS

Rating Type: Confirmed
Rating Date: 2020-04-09
Registry ID: 526040933

Certified Energy Rater: David Meeder
Rating Number: 20-0615-01

HERS Index: 55

General Information

Conditioned Area	2320 sq. ft.	House Type	Single-family detached
Conditioned Volume	18343 cubic ft.	Foundation	Conditioned basement
Bedrooms	3		

Mechanical Systems Features

Heating:	Fuel-fired air distribution, Natural gas, 96.1 AFUE.
Cooling:	Air conditioner, Electric, 13.0 SEER.
Water Heating:	Conventional, Natural gas, 0.62 EF, 40.0 Gal.
Duct Leakage to Outside	70.00 CFM25.
Ventilation System	Balanced: HRV, 77 cfm, 31.0 watts.
Programmable Thermostat	Heat=No; Cool=No

Building Shell Features

Ceiling Flat	R-60.0	Slab	R-0.0 Edge, R-0.0 Under
Sealed Attic	NA	Exposed Floor	NA
Vaulted Ceiling	NA	Window Type	U-Value: 0.300, SHGC: 0.450
Above Grade Walls	R-20.0	Infiltration Rate	Htg: 906 Clg: 906 CFM50
Foundation Walls	R-19.0	Method	Blower door

Lights and Appliance Features

Interior Fluor Lighting (%)	0.0	Range/Oven Fuel	Natural gas
Interior LED Lighting (%)	100.0	Clothes Dryer Fuel	Natural gas
Refrigerator (kWh/yr)	396	Clothes Dryer CEF	2.32
Dishwasher (kWh/yr)	290	Ceiling Fan (cfm/Watt)	0.00

Estimated Annual Energy Cost

Use	MMBtu	Cost	Percent
Heating	46.5	\$25	4%
Cooling	2.7	\$76	12%
Hot Water	16.3	\$1	0%
Lights/Appliances	21.5	\$416	65%
Photovoltaics	-0.0	\$-0	-0%
Service Charges		\$120	19%
Total	87.1	\$638	100%

Criteria

This home meets or exceeds the minimum criteria for the following:

TITLE
Company
Address
City, State, Zip
Phone #
Fax #

REM/Rate - Residential Energy Analysis and Rating Software v15.8

This information does not constitute any warranty of energy costs or savings. © 1985-2019 NORESKO, Boulder, Colorado.
The Home Energy Rating Standard Disclosure for this home is available from the rating provider.

ENERGY STAR v3.0 Home Report

Property
LINC UP Non Profit Housing
Grand Rapids, MI 49507

Organization
Custom Home Energy Services
517.256.1839
David Meeder

HERS
Confirmed
2020-04-09
Rating No:20-0615-01
Rater ID:5382385

Weather:Grand Rapids, MI

0410-0010-C1_LINC_UP_1000_Uni
on_Ave_SE_HERS_HERI_QAD.blg

Builder
LINC UP

Normalized, Modified End-Use Loads (MMBtu/yr)

	ENERGY STAR	As Designed
Heating	33.6	25.8
Cooling	9.0	8.0
Water Heating	10.4	9.0
Lights and Appliances	23.7	21.5
Total	76.8	64.3

HERS Index of Reference Design Home	69	55 HERS Index w/o PV
HERS Index Target (SAF Adjusted)	68	55 HERS Index
Size Adjustment Factor	0.99	

HERS Index w/o PV <= HERS Index of Reference Design Home AND HERS Index <= HERS Index Target to comply.

ENERGY STAR v3.0 Mandatory Requirements

X	Duct leakage at post construction better than or equal to ENERGY STAR v3/3.1 requirements.
X	Envelope insulation levels meet or exceed ENERGY STAR v3/3.1 requirements.
X	Slab on Grade Insulation is EXEMPT based on EPA slab insulation exemption rules.
X	Envelope insulation achieves RESNET Grade I installation, or Grade II with insulated sheathing.
X	Windows meet the 2009 IECC Requirements - Table 402.1.1.
X	Duct insulation meets the EPA minimum requirements of R-6.
X	Mechanical ventilation system has been measured in the home.
X	ENERGY STAR Checklists fully verified and complete.



This home **MEETS** or **EXCEEDS** the energy efficiency requirements for designation as an EPA ENERGY STAR Version 3 Certified Home.

Pollution Prevented

Type of Emissions	Reduction
Carbon Dioxide (CO2) - tons/yr	6.0
Sulfur Dioxide (SO2) - lbs/yr	18.9
Nitrogen Oxides (NOx) - lbs/yr	14.3

Energy Cost Savings

	\$/yr
Heating	43
Cooling	59
Water Heating	0
Lights & Appliances	254
Total	356

The energy savings and pollution prevented are calculated by comparing the Rated Home to the Reference Home as defined in the Mortgage Industry National Home Energy Rating Systems Standards as promulgated by the Residential Energy Services Network (RESNET) . In accordance with these guidelines, building inputs affecting setpoints, infiltration rates, window shading and the existence of mechanical systems may have been changed prior to calculating loads.

REM/Rate - Residential Energy Analysis and Rating Software v15.8

This information does not constitute any warranty of energy costs or savings.

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LEED for HOMES V4

Property

LINC UP Non Profit Housing
Grand Rapids, MI 49507

Weather: Grand Rapids, MI

0410-0010-
C1_LINC_UP_1000_Uni
on_Ave_SE_HERS_HERI_QAD.blg

Organization

Custom Home Energy Services
517.256.1839
David Meeder

Builder

LINC UP

HERS

Confirmed
2020-04-09
Rating No: 20-0615-01
Rater ID: 5382385

This home uses 21% less energy than the LEED Reference Home.

Source Energy Consumption (MMBtu/yr)

	LEED	
	Reference	As Designed
Heating	73.8	50.6
Cooling	12.6	8.7
Water Heating	20.1	17.1
Lights & Appliances	60.3	54.8
Photovoltaics	0.0	0.0
Total	166.8	131.2

This home uses 21% less energy than the LEED Reference Home and meets section 1 of the Minimum Energy Performance prerequisite.

Design consumption is based on the following dominant features:

Number of Bedrooms: 3

Ceiling Flat: R-60.0

Vaulted Ceiling: NA

Sealed Ceiling: NA

Above Grade Walls: R-20.0

Foundation Walls: R-19.0

Exposed Floor: NA

Slab: R-0.0 Edge, R-0.0 Under

Window Type: U-Value: 0.30, SHGC: 0.45

Infiltration: Blower door Htg: 906 Clg: 906 CFM50

Heating: Fuel-fired air distribution, Natural gas, 96.1 AFUE.

Cooling: Air conditioner, Electric, 13.0 SEER.

Water Heating: Conventional, Natural gas, 0.62 EF, 40.0 Gal.

Duct Leakage to Outside: 70.00 CFM25.

Ventilation System: Balanced: HRV, 77 cfm, 31.0 watts.

Programmable Thermostat: Heat=No; Cool=No

REM/Rate - Residential Energy Analysis and Rating Software v15.8

This information does not constitute any warranty of energy costs or savings.

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National Rater Field Checklist

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City: Grand Rapids State: MI Permit Date: _____

Home Address: Thermal Enclosure System	Must Correct	Builder Verified ¹	Rater Verified ²	N/A ³
1. High-Performance Fenestration & Insulation				
1.1 Fenestration meets or exceeds specification in Item 2.1 of the National Rater Design Review Checklist.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-
1.2 Insulation meets or exceeds specification in Item 3.1 of the National Rater Design Review Checklist. ⁴	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-
1.3 All insulation achieves Grade I install. per ANSI / RESNET / ICC Std. 301. Alternatives in Footnote 5. ^{5,6}	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-
2. Fully-Aligned Air Barriers ⁷ - At each insulated location below, a complete air barrier is provided that is fully aligned as follows:				
Ceilings: At interior or exterior horizontal surface of ceiling insulation in Climate Zones 1-3; at interior horizontal surface of ceiling insulation in Climate Zones 4-8. Also, at exterior vertical surface of ceiling insulation in all climate zones (e.g., using a wind baffle that extends to the full height of the insulation in every bay or a tabbed baffle in each bay with a soffit vent that prevents wind washing in adjacent bays). ⁸				
2.1 Dropped ceilings / soffits below unconditioned attics, and all other ceilings.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Walls: At exterior vertical surface of wall insulation in all climate zones; also at interior vertical surface of wall insulation in Climate Zones 4-8. ⁹				
2.2 Walls behind showers, tubs, staircases, and fireplaces.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.3 Attic knee walls and skylight shaft walls. ¹⁰	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.4 Walls adjoining porch roofs or garages.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.5 Double-walls and all other exterior walls.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-
Floors: At exterior vertical surface of floor insulation in all climate zones and, if over unconditioned space, also at interior horizontal surface including supports to ensure alignment. Alternatives in Footnotes 12 & 13. ^{11,12,13}				
2.6 Floors above garages, floors above unconditioned basements or crawlspaces, and cantilevered floors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.7 All other floors adjoining unconditioned space (e.g., rim / band joists at exterior wall or at porch roof).	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3. Reduced Thermal Bridging				
3.1 For insulated ceilings with attic space above (i.e., non-cathedralized), Grade I insulation extends to the inside face of the exterior wall below and is $\geq R-21$ in CZ 1-5; $\geq R-30$ in CZ 6-8. ¹⁴	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3.2 For slabs on grade in CZ 4-8, 100% of slab edge insulated to $\geq R-5$ at the depth specified by the 2009 IECC and aligned with the thermal boundary of the walls. ^{15,16}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.3 Insulation beneath attic platforms (e.g., HVAC platforms, walkways) $\geq R-21$ in CZ 1-5; $\geq R-30$ in CZ 6-8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.4 At above-grade walls separating conditioned from unconditioned space, one of the following options used (rim / band joists exempted): ¹⁷				
3.4.1 Continuous rigid insulation, insulated siding, or combination of the two is: $\geq R-3$ in CZ 1-4; $\geq R-5$ in CZ 5-8 ^{18,19,20} OR ;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.4.2 Structural Insulated Panels OR ; Insulated Concrete Forms OR ; Double-wall framing OR ; ^{18,21}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.4.3 Advanced framing, including all of the Items below: ²²				
3.4.3a Corners insulated $\geq R-6$ to edge ²³ AND ;	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3.4.3b Headers above windows & doors insulated $\geq R-3$ for 2x4 framing or equivalent cavity width, and $\geq R-5$ for all other assemblies (e.g., with 2x6 framing) ²⁴ AND ;	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3.4.3c Framing limited at all windows & doors to one pair of king studs, plus one pair of jack studs per window opening to support the header and sill, AND ;	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3.4.3d Interior / exterior wall intersections insulated to same R-value as rest of exterior wall, ²⁵ AND ;	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3.4.3e Minimum stud spacing of 16 in. o.c. for 2x4 framing in all Climate Zones and, in CZ 6-8, 24 in. o.c. for 2x6 framing. ²⁶	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4. Air Sealing (Unless otherwise noted below, "sealed" indicates the use of caulk, foam, or equivalent material)				
4.1 Ducts, flues, shafts, plumbing, piping, wiring, exhaust fans, & other penetrations to unconditioned space sealed, with blocking / flashing as needed.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-
4.2 Recessed lighting fixtures adjacent to unconditioned space ICAT labeled and gasketed. Also, if in insulated ceiling without attic above, exterior surface of fixture insulated to $\geq R-10$ in CZ 4-8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.3 Above-grade sill plates adjacent to conditioned space sealed to foundation or sub-floor. Gasket also placed beneath above-grade sill plate if resting atop concrete / masonry & adjacent to cond. space. ^{27,28}	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4.4 Continuous top plate or blocking is at top of walls adjoining unconditioned space, and sealed.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4.5 Drywall sealed to top plate at all unconditioned attic / wall interfaces using caulk, foam, drywall adhesive (but not other construction adhesives), or equivalent material. Either apply sealant directly between drywall and top plate or to the seam between the two from the attic above.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.6 Rough opening around windows & exterior doors sealed. ²⁹	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-
4.7 Walls that separate attached garages from occupiable space sealed and, also, an air barrier installed and sealed at floor cavities aligned with these walls.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.8 In multifamily buildings, the gap between the common wall (e.g. the drywall shaft wall) and the structural framing between units sealed at all exterior boundaries.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.9 Doors adjacent to unconditioned space (e.g., attics, garages, basements) or ambient conditions made substantially air-tight with weatherstripping or equivalent gasket.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4.10 Attic access panels, drop-down stairs, & whole-house fans equipped with durable $\geq R-10$ cover that is gasketed (i.e., not caulked). Fan covers either installed on house side or mechanically operated. ³⁰	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



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HVAC System ³¹ (National HVAC Design Report Item # in parenthesis)			Must Correct	Rater Verified ²	N/A ³
5. Heating & Cooling Equipment - Complete Path A - HVAC Grading³² or Path B - HVAC Credential					
Path A	5a.1 Blower fan volumetric airflow is Grade I or II per ANSI / RESNET / ACCA Std. 310.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	-
	5a.2 Blower fan watt draw is Grade I or II per ANSI / RESNET / ACCA Std. 310.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	5a.3 Refrigerant charge is Grade I per ANSI / RESNET / ACCA Std. 310. See Footnote 33 for exemptions. ³³		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Path B	5b.1 HVAC manufacturer & model number on installed equipment matches either of the following (check box): ³⁴ <input type="checkbox"/> National HVAC Design Report (4.3, 4.4, & 4.17) <input type="checkbox"/> Written approval received from designer		<input type="checkbox"/>	<input type="checkbox"/>	-
	5b.2 External static pressure measured by Rater at contractor-provided test locations and documented below: ³⁵ Return-Side External Static Pressure: _____ IWC Supply-Side External Static Pressure: _____ IWC		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5b.3 Permitted, but not required: National HVAC Commissioning Checklist collected, with no items left blank.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Duct Quality Installation (Applies to Heating, Cooling, Ventilation, Exhaust, & Pressure Balancing Ducts, Unless Noted in Footnote)					
6.1 Ductwork installed without kinks, sharp bends, compressions, or excessive coiled flexible ductwork. ³⁶			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6.2 Bedrooms pressure-balanced (e.g., using transfer grilles, jump ducts, dedicated return ducts, undercut doors) to achieve a Rater-measured pressure differential ≥ -3 Pa and $\leq +3$ Pa with respect to the main body of the house when all air handlers are operating. Test configuration and an alternative compliance option in Footnote 37. ³⁷			<input type="checkbox"/>	<input checked="" type="checkbox"/>	-
6.3 All supply and return ducts in unconditioned space, including connections to trunk ducts, are insulated to $\geq R-6$ ³⁸			<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6.4 Rater-measured total duct leakage meets one of the following two options. Alternative in Footnote 40: ^{39, 40, 41}					
6.4.1 Rough-in: The greater of ≤ 4 CFM25 per 100 sq. ft. of CFA or ≤ 40 CFM25, with air handler & all ducts, building cavities used as ducts, & duct boots installed. In addition, <u>all</u> duct boots sealed to finished surface, Rater-verified at final. ⁴²			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.4.2 Final: The greater of ≤ 8 CFM25 per 100 sq. ft. of CFA or ≤ 80 CFM25, with the air handler & all ducts, bldg. cavities used as ducts, duct boots, & register grilles atop the finished surface (e.g., drywall, floor) installed. ⁴³			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6.5 Rater-measured duct leakage to outdoors the greater of ≤ 4 CFM25 per 100 sq. ft. of CFA or ≤ 40 CFM25. ^{39, 44}			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7. Whole-House Mechanical Ventilation System					
7.1 Rater-measured ventilation rate is within either ± 15 CFM or $\pm 15\%$ of design value (2.3). ⁴⁵			<input type="checkbox"/>	<input checked="" type="checkbox"/>	-
7.2 A readily-accessible ventilation override control installed and also labeled if its function is not obvious (e.g., a label is required for a standalone wall switch, but not for a switch that's on the ventilation equipment). ⁴⁶ breaker panel			<input type="checkbox"/>	<input type="checkbox"/>	-
7.3 No outdoor air intakes connected to return side of the HVAC system, unless controls are installed to operate intermittently & automatically based on a timer and to restrict intake when not in use (e.g., motorized damper).			<input type="checkbox"/>	<input checked="" type="checkbox"/>	-
7.4 System fan rated ≤ 3 sones if intermittent and ≤ 1 sone if continuous, or exempted. ⁴⁷			<input type="checkbox"/>	<input checked="" type="checkbox"/>	-
7.5 If system utilizes the HVAC fan, then the specified fan type is ECM / ICM (4.7), or the controls will reduce the standalone ventilation run-time by accounting for hours when the HVAC system is heating or cooling.			<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7.6 Bathroom fans are ENERGY STAR certified if used as part of the whole-house system. ⁴⁸			<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7.7 Air inlet location (Complete if ventilation air inlet location was specified (2.12, 2.13); otherwise check "N/A"): ^{49, 50}			-	-	<input type="checkbox"/>
7.7.1 Inlet pulls ventilation air directly from outdoors and not from attic, crawlspace, garage, or adjacent dwelling unit.			<input type="checkbox"/>	<input checked="" type="checkbox"/>	-
7.7.2 Inlet is ≥ 2 ft. above grade or roof deck; ≥ 10 ft. of stretched-string distance from known contamination sources not exiting the roof, and ≥ 3 ft. distance from dryer exhausts and sources exiting the roof. ⁵¹			<input type="checkbox"/>	<input checked="" type="checkbox"/>	-
7.7.3 Inlet is provided with rodent / insect screen with ≤ 0.5 inch mesh.			<input type="checkbox"/>	<input checked="" type="checkbox"/>	-
8. Local Mechanical Exhaust - In each kitchen and bathroom, a system is installed that exhausts directly to the outdoors and meets one of the following Rater-measured airflow and manufacturer-rated sound level standards:^{45, 52}					
8.1 Kitchen	Location	Continuous Rate	Intermittent Rate ⁵³		
	Airflow	≥ 5 ACH, based on kitchen volume ^{54, 55}	≥ 100 CFM and, if not integrated with range, also ≥ 5 ACH based on kitchen volume ^{54, 55, 56}		
8.2 Bathroom	Sound	Recommended: ≤ 1 sone	Recommended: ≤ 3 sones		
	Airflow	≥ 20 CFM	≥ 50 CFM		
8.2 Bathroom	Sound	Required: ≤ 1 sone	Recommended: ≤ 3 sones		
			<input checked="" type="checkbox"/>	<input type="checkbox"/>	-
			<input checked="" type="checkbox"/>	<input type="checkbox"/>	-
9. Filtration					
9.1 MERV 6+ filter(s) installed in each ducted mech. system, located to facilitate occupant access & regular service. ⁵⁷			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.2 Filter access panel includes gasket and fits snugly against exposed edge of filter when closed to prevent bypass. ⁵⁸			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
9.3 All return air and mechanically supplied outdoor air passes through filter prior to conditioning.			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10. Combustion Appliances					
10.1 Furnaces, boilers, & water heaters are mechanically drafted or direct-vented. Alternatives in Footnote 61. ^{59, 60, 61}			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10.2 Fireplaces are mechanically drafted or direct-vented. Alternatives in Footnote 62. ^{59, 60, 62}			<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
10.3 If unvented combustion appliances other than cooking ranges or ovens are located inside the home's pressure boundary, the Rater has followed Section 802 of RESNET's Standards, encompassing ANSI/ACCA 12 QH-2014, Appendix A, Section A3 (Carbon Monoxide Test), and verified the equipment meets the limits defined within. ^{59, 63}			<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Rater Name: David Meeder		Rater Pre-Drywall Inspection Date: 12/5/2019		Rater Initials: DM	
Rater Name: David Meeder		Rater Final Inspection Date: 4/0/2020		Rater Initials: DM	
Builder Employee: LNC VP Nonprofit Housing		Builder Inspection Date: 4/22/20		Builder Initials: AUL	



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Footnotes

1. At the discretion of the Rater, the builder may verify up to eight items in Sections 1-4 of this Checklist. When exercised, the builder's responsibility will be formally acknowledged by the builder signing off on the checklist for the item(s) that they verified. However, if a quality assurance review indicates that Items have not been successfully completed, the Rater will be responsible for facilitating corrective action.
2. The term 'Rater' refers to the person(s) completing the third-party verification required for certification. The person(s) shall: a) be a Certified Rater, Approved Inspector, or an equivalent designation as determined by a Verification Oversight Organization such as RESNET; and, b) have attended and successfully completed an EPA-recognized training class. See www.energystar.gov/newhomestraining.
3. The column titled "N/A," which denotes items that are "not applicable," should be used when the checklist Item is not present in the home or conflicts with local requirements.
4. In addition, the infiltration shall not exceed the limits specified in Item 3.1.2 of the National Rater Design Review Checklist, if this option has been used to comply with Item 3.1.
5. Two alternatives are provided: a) Grade II cavity insulation is permitted to be used for assemblies that contain a layer of continuous, air impermeable insulation $\geq R-3$ in Climate Zones 1 to 4, $\geq R-5$ in Climate Zones 5 to 8; b) Grade II batts are permitted to be used in floors if they fill the full width and depth of the floor cavity, even when compression occurs due to excess insulation, as long as the R-value of the batts has been appropriately assessed based on manufacturer guidance and the only defect preventing the insulation from achieving Grade I is the compression caused by the excess insulation.
6. Ensure compliance with this requirement using ANSI / RESNET / ICC Std. 301 including all Addenda and Normative Appendices, with new versions and Addenda implemented according to the Effective Date and Transition Period End Date defined by RESNET. RESNET interpretations of Standard 301 shall also be followed.
7. For purposes of this Checklist, an air barrier is defined as any durable solid material that blocks air flow between conditioned space and unconditioned space, including necessary sealing to block excessive air flow at edges and seams and adequate support to resist positive and negative pressures without displacement or damage. EPA recommends, but does not require, rigid air barriers.
Open-cell or closed-cell foam shall have a finished thickness ≥ 5.5 in. or 1.5 in., respectively, to qualify as an air barrier unless the manufacturer indicates otherwise.
If flexible air barriers such as house wrap are used, they shall be fully sealed at all seams and edges and supported using fasteners with caps or heads ≥ 1 in. diameter unless otherwise indicated by the manufacturer. Flexible air barriers shall not be made of kraft paper, paper-based products, or other materials that are easily torn. If polyethylene is used, its thickness shall be ≥ 6 mil.
8. All insulated ceiling surfaces, regardless of slope (e.g., cathedral ceilings, tray ceilings, conditioned attic roof decks, flat ceilings, sloped ceilings), must meet the requirements for ceilings.
9. All insulated vertical surfaces are considered walls (e.g., above and below grade exterior walls, knee walls) and must meet the air barrier requirements for walls. The following exceptions apply: air barriers recommended, but not required, in adiabatic walls in multifamily dwellings; and, in Climate Zones 4 through 8, an air barrier at the interior vertical surface of insulation is recommended but not required in basement walls or crawlspace walls. For the purpose of these exceptions, a basement or crawlspace is a space for which $\geq 40\%$ of the total gross wall area is below-grade.
10. Exterior air barriers are not required for attic knee walls that are ≤ 24 in. in height if an interior air barrier is provided and insulation extends in all directions from the top of this interior air barrier into unconditioned space at the following levels: CZ 1-5: $\geq R-21$; CZ 6-8: $\geq R-30$.
11. EPA highly recommends, but does not require, an air barrier at the interior vertical surface of floor insulation in Climate Zones 4-8.
12. Examples of supports necessary for permanent contact include staves for batt insulation or netting for blown-in insulation. Alternatively, supports are not required if batts fill the full depth of the floor cavity, even when compression occurs due to excess insulation, as long as the R-value of the batts has been appropriately assessed based on manufacturer guidance and the only defect preventing the insulation from achieving the required installation grade is the compression caused by the excess insulation.
13. Alternatively, an air barrier is permitted to be installed at the exterior horizontal surface of the floor insulation if the insulation is installed in contact with this air barrier, the exterior vertical surfaces of the floor cavity are also insulated, and air barriers are included at the exterior vertical surfaces of this insulation.
14. The minimum designated R-values must be achieved regardless of the trade-offs determined using an equivalent U-factor or UA alternative calculation. Note that if the minimum designated values are used, then higher insulation values may be needed elsewhere to meet Item 1.2. Also, note that these requirements can be met by using any available strategy, such as a raised-heel truss, alternate framing that provides adequate space, and / or high-density insulation.
15. Consistent with the 2009 IECC, slab edge insulation is only required for slab-on-grade floors with a floor surface less than 12 inches below grade. Slab insulation shall extend to the top of the slab to provide a complete thermal break. If the top edge of the insulation is installed between the exterior wall and the edge of the interior slab, it shall be permitted to be cut at a 45-degree angle away from the exterior wall. Alternatively, the thermal break is permitted to be created using $\geq R-3$ rigid insulation on top of an existing slab (e.g., in a home undergoing a gut rehabilitation). In such cases, up to 10% of the slab surface is permitted to not be insulated (e.g., for sleepers, for sill plates). Insulation installed on top of slab shall be covered by a durable floor surface (e.g., hardwood, tile, carpet).
16. Where an insulated wall separates a garage, patio, porch, or other unconditioned space from the conditioned space of the house, slab insulation shall also be installed at this interface to provide a thermal break between the conditioned and unconditioned slab. Where specific details cannot meet this requirement, partners shall provide the detail to EPA to request an exemption prior to the home's certification. EPA will compile exempted details and work with industry to develop feasible details for use in future revisions to the program. A list of currently exempted details is available at: energystar.gov/slabeledge.
17. Mass walls utilized as the thermal mass component of a passive solar design (e.g., a Trombe wall) are exempt from this Item. To be eligible for this exemption, the passive solar design shall be comprised of the following five components: an aperture or collector, an absorber, thermal mass, a distribution system, and a control system. For more information, see: energy.gov/sites/prod/files/guide_to_passive_solar_home_design.pdf.



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Mass walls that are not part of a passive solar design (e.g., CMU block or log home enclosure) shall either utilize the strategies outlined in Item 3.4 or the pathway in the assembly with the least thermal resistance, as determined using a method consistent with the 2013 ASHRAE Handbook of Fundamentals, shall provide $\geq 50\%$ of the applicable assembly resistance, defined as the reciprocal of the mass wall equivalent U-factor in the 2009 IECC Table 402.1.3. Documentation identifying the pathway with the least thermal resistance and its resistance value shall be collected by the Rater and any Builder Verified or Rater Verified box under Item 3.4 shall be checked.

18. Up to 10% of the total exterior wall surface area is exempted from the reduced thermal bridging requirements to accommodate intentional designed details (e.g., architectural details such as thermal fins, wing walls, or masonry fireplaces; structural details, such as steel columns). It shall be apparent to the Rater that the exempted areas are intentional designed details or the exempted area shall be documented in a plan provided by the builder, architect, or engineer. The Rater need not evaluate the necessity of the designed detail to certify the home.
19. If used, insulated siding shall be attached directly over a water-resistive barrier and sheathing. In addition, it shall provide the required R-value as demonstrated through either testing in accordance with ASTM C 1363 or by attaining the required R-value at its minimum thickness. Insulated sheathing rated for water protection can be used as a water resistant barrier if all seams are taped and sealed. If non-insulated structural sheathing is used at corners, the advanced framing details listed in Item 3.4.3 shall be met for those wall sections.
20. Steel framing shall meet the reduced thermal bridging requirements by complying with Item 3.4.1 of the Checklist.
21. Double-wall framing is defined as any framing method that ensures a continuous layer of insulation covering the studs to at least the R-value required in Item 3.4.1 of the Checklist, such as offset double-stud walls, aligned double-stud walls with continuous insulation between the adjacent stud faces, or single-stud walls with 2x2 or 2x3 cross-framing. In all cases, insulation shall fill the entire wall cavity from the interior to exterior sheathing except at windows, doors and other penetrations.
22. All advanced framing details shall be met except where the builder, architect, or engineer provides a framing plan that encompasses the details in question, indicating that structural members are required at these locations and including the rationale for these members (e.g., full-depth solid framing is required at wall corners or interior / exterior wall intersections for shear strength, a full-depth solid header is required above a window to transfer load to jacks studs, additional jack studs are required to support transferred loads, additional cripple studs are required to maintain on-center spacing, or stud spacing must be reduced to support multiple stories in a multifamily building). The Rater shall retain a copy of the detail and rationale for their records, but need not evaluate the rationale to certify the home.
23. All exterior corners shall be constructed to allow access for the installation of $\geq R-6$ insulation that extends to the exterior wall sheathing. Examples of compliance options include standard-density insulation with alternative framing techniques, such as using three studs per corner, or high-density insulation (e.g., spray foam) with standard framing techniques.
24. Compliance options include continuous rigid insulation sheathing, SIP headers, other prefabricated insulated headers, single-member or two-member headers with insulation either in between or on one side, or an equivalent assembly. R-value requirement refers to manufacturer's nominal insulation value.
25. Insulation shall run behind interior / exterior wall intersections using ladder blocking, full length 2x6 or 1x6 furring behind the first partition stud, drywall clips, or other equivalent alternative.
26. In Climate Zones 6 - 8, a minimum stud spacing of 16 in. o.c. is permitted to be used with 2x6 framing if $\geq R-20.0$ wall cavity insulation is achieved. However, all 2x6 framing with stud spacing of 16 in. o.c. in Climate Zones 6 - 8 shall have $\geq R-20.0$ wall cavity insulation installed regardless of any framing plan or alternative equivalent total UA calculation.
27. Existing sill plates (e.g., in a home undergoing a gut rehabilitation) on the interior side of structural masonry or monolithic walls are exempt from this Item. In addition, other existing sill plates resting atop concrete or masonry and adjacent to conditioned space are permitted, in lieu of using a gasket, to be sealed with caulk, foam, or equivalent material at both the interior seam between the sill plate and the subfloor and the seam between the top of the sill plate and the sheathing.
28. In Climate Zones 1 through 3, a continuous stucco cladding system adjacent to sill and bottom plates is permitted to be used in lieu of sealing plates to foundation or sub-floor with caulk, foam, or equivalent material.
29. In Climate Zones 1 through 3, a continuous stucco cladding system sealed to windows and doors is permitted to be used in lieu of sealing rough openings with caulk or foam.
30. Examples of durable covers include, but are not limited to, pre-fabricated covers with integral insulation, rigid foam adhered to cover with adhesive, or batt insulation mechanically fastened to the cover (e.g., using bolts, metal wire, or metal strapping).
31. This Checklist is designed to meet the requirements of ASHRAE 62.2-2010 / 2013 / 2016, and ANSI / ACCA's 5 QI-2015 protocol, thereby improving the performance of HVAC equipment in new homes when compared to homes built to minimum code. However, these features alone cannot prevent all ventilation, indoor air quality, and HVAC problems, (e.g., those caused by a lack of maintenance by occupants). Therefore, this Checklist is not a guarantee of proper ventilation, indoor air quality, or HVAC performance.
32. Path A – HVAC Grading shall not be used until an Effective Date has been defined by RESNET for ANSI / RESNET / ACCA Std. 310. Path A – HVAC Grading shall then use ANSI / RESNET / ACCA Std. 310 including all Addenda and Normative Appendices, with new versions and Addenda implemented according to the Effective Date and Transition Period End Date defined by RESNET. RESNET interpretations of Standard 310 shall also be followed. For Path A, all unitary HVAC Systems including air conditioners and heat pumps up to 65 kBtu/h shall comply with 5a.1 through 5a.3 for the home to be certified.
33. If the non-invasive procedure in ANSI / RESNET / ACCA Std. 310 is not permitted to be used during the final inspection of a home (i.e., due to the equipment type or to outdoor air temperatures that do not meet the requirements of the non-invasive method), then the home is permitted to be certified with a default refrigerant charge designation of Grade III. Note that in these circumstances, the weigh-in method procedure in ANSI / RESNET / ACCA Std. 310 may still be used to pursue a Grade I designation.
34. If installed equipment does not match the National HVAC Design Report, then prior to certification the Rater shall obtain written approval from the designer (e.g., email, updated National HVAC Design Report) confirming that the installed equipment meets the requirements of the National HVAC Design Report. In addition, if "N/A" was selected for Item 1.2 of the National Rater Design Review Checklist, then the Rater shall verify that all installed equipment is an exempted type per Footnote 9 of that Checklist or, if not an exempted type, shall re-review the National Rater Design Review Checklist to ensure compliance with all requirements (e.g., contractor credential, full completion of HVAC Design Report, HVAC design tolerances).



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In cases where the condenser unit is installed after the time of inspection by the Rater, the HVAC manufacturer and model numbers on installed equipment can be documented through the use of photographs provided by the HVAC Contractor after installation is complete.

35. The Rater shall measure and record the external static pressure in the return-side and supply-side of the system using the contractor-provided test locations. However, at this time, the Rater need not assess whether these values are within a specific range to certify the home.
36. Kinks are to be avoided and are caused when ducts are bent across sharp corners such as framing members. Sharp bends are to be avoided and occur when the radius of the turn in the duct is less than one duct diameter. Compression is to be avoided and occurs when flexible ducts in unconditioned space are installed in cavities smaller than the outer duct diameter and ducts in conditioned space are installed in cavities smaller than inner duct diameter. Ducts shall not include coils or loops except to the extent needed for acoustical control.
37. Item 6.2 does not apply to ventilation ducts, exhaust ducts, or non-ducted systems. For an HVAC system with a multi-speed fan, the highest design fan speed shall be used when verifying this requirement. When verifying this requirement, doors separating bedrooms from the main body of the house (e.g., a door between a bedroom and a hallway) shall be closed and doors to rooms that can only be entered from the bedroom (e.g., a closet, a bathroom) shall be open. As an alternative to the ± 3 Pa limit, a Rater-measured pressure differential ≥ -5 Pa and $\leq +5$ Pa is permitted to be used for bedrooms with a design airflow ≥ 150 CFM. The Rater-measured pressure shall be rounded to the nearest whole number to assess compliance.
38. Item 6.3 does not apply to ducts that are a part of local mechanical exhaust and exhaust-only whole-house ventilation systems. EPA recommends, but does not require, that all metal ductwork not encompassed by Section 6 (e.g., exhaust ducts, duct boots, ducts in conditioned space) also be insulated and that insulation be sealed to duct boots to prevent condensation.
39. Items 6.4 and 6.5 only apply to heating, cooling, and balanced ventilation ducts. Duct leakage shall be determined and documented by a Rater using ANSI / RESNET / ICC Std. 380 including all Addenda and Normative Appendices, with new versions and Addenda implemented according to the Effective Date and Transition Period End Date defined by RESNET. RESNET interpretations of Standard 380 shall also be followed. Leakage limits shall be assessed on a per-system, rather than per-home, basis. For balanced ventilation ducts that are not connected to space heating or cooling systems, a Rater is permitted to visually verify, in lieu of duct leakage testing, that all seams and connections are sealed with mastic or metal tape and all duct boots are sealed to floor, wall, or ceiling using caulk, foam, or mastic tape.
40. For a duct system with three or more returns, the total Rater-measured duct leakage is permitted to be the greater of ≤ 6 CFM25 per 100 sq. ft. of CFA or ≤ 60 CFM25 at 'rough-in' or the greater of ≤ 12 CFM25 per 100 sq. ft. of CFA or ≤ 120 CFM25 at 'final'.
41. Note that compliance with Item 6.4.1 or 6.4.2 in conjunction with Section 4a of the National Rater Design Review Checklist automatically achieves Grade I total duct leakage per ANSI / RESNET / ACCA Std. 310.
42. Cabinets (e.g., kitchen, bath, multimedia) or ducts that connect duct boots to toe-kick registers are not required to be in place during the 'rough-in' test.
43. Registers atop carpets are permitted to be removed and the face of the duct boot temporarily sealed during testing. In such cases, the Rater shall visually verify that the boot has been durably sealed to the subfloor (e.g., using duct mastic or caulk) to prevent leakage during normal operation.
44. Testing of duct leakage to the outdoors can be waived in accordance with the 2nd or 3rd alternative of ANSI / RESNET / ICC Std. 301, Table 4.2.2 (1), footnote (w). Alternatively, testing of duct leakage to outdoors can be waived in accordance with Section 5.5.2 of ANSI / RESNET / ICC Std. 380 if total duct leakage, at rough-in or final, is ≤ 4 CFM25 per 100 sq. ft. of conditioned floor area or 40 CFM25, whichever is larger. Guidance to assist partners with these alternatives, including modeling inputs, is available at <http://www.energystar.gov/newhomesguidance>.
45. The whole-house ventilation air flow and local exhaust air flows shall be determined and documented by a Rater using ANSI / RESNET / ICC Std. 380 including all Addenda and Normative Appendices, with new versions and Addenda implemented according to the Effective Date and Transition Period End Date defined by RESNET. RESNET interpretations of Standard 380 shall also be followed.
46. For an attached dwelling unit, excluding units in dwellings (i.e., duplex) and townhomes, the override control is not required to be readily accessible to the occupant. However, in such cases, EPA recommends but does not require that the control be readily accessible to others (e.g., building maintenance staff) in lieu of the occupant.
47. Whole-house mechanical ventilation fans shall be rated for sound at no less than the airflow rate in Item 2.3 of the National HVAC Design Report. Fans exempted from this requirement include HVAC air handler fans, remote-mounted fans, and intermittent fans rated ≥ 400 CFM. To be considered for this exemption, a remote-mounted fan must be mounted outside the habitable spaces, bathrooms, toilets, and hallways and there shall be ≥ 4 ft. ductwork between the fan and intake grill. Per ASHRAE 62.2-2010, habitable spaces are intended for continual human occupancy; such space generally includes areas used for living, sleeping, dining, and cooking but does not generally include bathrooms, toilets, hallways, storage areas, closets, or utility rooms.
48. Bathroom fans with a rated flow rate ≥ 500 CFM are exempted from the requirement to be ENERGY STAR certified.
49. Ventilation air inlets that are only visible via rooftop access are exempted from Item 7.7 and the Rater shall mark "n/a". The outlet and inlet of balanced ventilation systems shall meet these spacing requirements unless manufacturer instructions indicate that a smaller distance may be used. However, if this occurs the manufacturer's instructions shall be collected for documentation purposes.
50. Without proper maintenance, ventilation air inlet screens often become filled with debris. Therefore, EPA recommends, but does not require, that these ventilation air inlets be located so as to facilitate access and regular service by the occupant.
51. Known contamination sources include, but are not limited to, stacks, vents, exhausts, and vehicles.
52. Continuous bathroom local mechanical exhaust fans shall be rated for sound at no less than the airflow rate in Item 8.2. Intermittent bathroom and both intermittent and continuous kitchen local mechanical exhaust fans are recommended, but not required, to be rated for sound at no less than the airflow rate in Items 8.1 and 8.2. Per ASHRAE 62.2-2010, an exhaust system is one or more fans that remove air from the building, causing outdoor air to enter by ventilation inlets or normal leakage paths through the building envelope (e.g., bath exhaust fans, range hoods, clothes dryers). Per ASHRAE 62.2-2010, a bathroom is any room containing a bathtub, shower, spa, or similar source of moisture.
53. An intermittent mechanical exhaust system, where provided, shall be designed to operate as needed by the occupant. Control devices shall not impede occupant control in intermittent systems.



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54. Kitchen volume shall be determined by drawing the smallest possible rectangle on the floor plan that encompasses all cabinets, pantries, islands, peninsulas, ranges / ovens, and the kitchen exhaust fan, and multiplying by the average ceiling height for this area. In addition, the continuous kitchen exhaust rate shall be ≥ 25 CFM, per 2009 IRC Table M1507.3, regardless of the rate calculated using the kitchen volume. Cabinet volume shall be included in the kitchen volume.
55. Homes shall meet this Item. Alternatively, the prescriptive duct sizing requirements in Table 5.3 of ASHRAE 62.2-2010 / 2013 / 2016 are permitted to be used for kitchen exhaust fans based upon the rated airflow of the fan at 0.25 IWC. If the rated airflow is unknown, ≥ 6 in. smooth duct shall be used, with a rectangular to round duct transition as needed. Guidance to assist partners with these alternatives is available at <http://www.energystar.gov/newhomesguidance>. As an alternative to Item 8.1, homes are permitted to use a continuous kitchen exhaust rate of 25 CFM per 2009 IRC Table M1507.3, if they are either a) PHius+ or PHI certified, or b) provide both whole-house ventilation and local mechanical kitchen exhaust using a balanced system, and have a Rater-verified whole-building infiltration rate ≤ 0.05 CFM50 per sq. ft. of Enclosure Area, and a Rater-verified dwelling unit compartmentalization rate ≤ 0.30 CFM50 per sq. ft. of Enclosure Area if multiple dwelling units are present in the building. 'Enclosure Area' is defined as the area of the surfaces that bound the volume being pressurized / depressurized during the test.
56. All intermittent kitchen exhaust fans must be capable of exhausting at least 100 CFM. In addition, if the fan is not part of a vented range hood or appliance-range hood combination (i.e., if the fan is not integrated with the range), then it must also be capable of exhausting ≥ 5 ACH, based on the kitchen volume.
57. Based upon ASHRAE 62.2-2010, ducted mechanical systems are those that supply air to an occupiable space with a total amount of supply ductwork exceeding 10 ft. in length and through a thermal conditioning component, except for evaporative coolers. Systems that do not meet this definition are exempt from this requirement. While filters are recommended for mini-split systems, HRV's and ERV's, these systems, ducted or not, typically do not have MERV-rated filters available for use and are, therefore, also exempted under this version of the requirements. HVAC filters located in the attic shall be considered accessible to the occupant if either 1) drop-down stairs provide access to attic and a permanently installed walkway has been provided between the attic access location and the filter or 2) the filter location enables arm-length access from a portable ladder without the need to step into the attic and the ceiling height where access is provided is ≤ 12 ft.
58. Sealing mechanisms comparable to a gasket are also permitted to be used. The filter media box (i.e., the component in the HVAC system that houses the filter) may be either site-fabricated by the installer or pre-fabricated by the manufacturer to meet this requirement. These requirements only apply when the filter is installed in a filter media box located in the HVAC system, not when the filter is installed flush with the return grill.
59. The pressure boundary is the primary enclosure boundary separating indoor and outdoor air. For example, a volume that has more leakage to outside than to conditioned space would be outside the pressure boundary.
60. Per the 2009 International Mechanical Code, a direct-vent appliance is one that is constructed and installed so that all air for combustion is derived from the outdoor atmosphere and all flue gases are discharged to the outside atmosphere; a mechanical draft system is a venting system designed to remove flue or vent gases by mechanical means consisting of an induced draft portion under non-positive static pressure or a forced draft portion under positive static pressure; and a natural draft system is a venting system designed to remove flue or vent gases under nonpositive static vent pressure entirely by natural draft.
61. This item only applies to furnaces, boilers, and water heaters located within the home's pressure boundary. Naturally drafted equipment is allowed within the home's pressure boundary in Climate Zones 1-3 if the Rater has followed Section 802 of RESNET's Standards, encompassing ANSI / ACCA 12 QH-2014, Appendix A, Sections A3 (Carbon Monoxide Test) and A4 (Depressurization Test for the Combustion Appliance Zone), and verified that the equipment meets the limits defined within.
62. This item only applies to fireplaces located within the home's pressure boundary. Naturally drafted fireplaces are allowed within the home's pressure boundary if the Rater has verified that the total net rated exhaust flow of the two largest exhaust fans (excluding summer cooling fans) is ≤ 15 CFM per 100 sq. ft. of occupiable space when at full capacity. If the net exhaust flow exceeds the allowable limit, it shall be reduced or compensating outdoor airflow provided. Per ASHRAE 62.2-2010, the term "net rated exhaust flow" is defined as flow through an exhaust fan minus the compensating outdoor airflow through any supply fan that is interlocked to the exhaust fan. Per ASHRAE 62.2-2010, the term "occupiable space" is defined as any enclosed space inside the pressure boundary and intended for human activities, including, but not limited to, all habitable spaces, toilets, closets, halls, storage and utility areas, and laundry areas. See Footnote 47 for the definition of "habitable spaces".
63. The minimum volume of combustion air required for safe operation by the manufacturer and / or code shall be met or exceeded. Also, in accordance with the National Fuel Gas Code, ANSI Z223.1 / NFPA54, unvented room heaters shall not be installed in bathrooms or bedrooms.



National Water Management System Builder Requirements¹ ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 10)

Builder Responsibilities:

- It is the exclusive responsibility of builders to ensure that each certified home is constructed to meet these requirements.
- While builders are not required to maintain documentation demonstrating compliance for each individual certified home, builders are required to develop a process to ensure compliance for each certified home (e.g., incorporate these requirements into the Scope of Work for relevant sub-contractors, require the site supervisor to inspect each home for these requirements, and / or sub-contract the verification of these requirements to a Rater²).
- In the event that the EPA determines that a certified home was constructed without meeting these requirements, the home may be decertified.

1. Water-Managed Site and Foundation

- 1.1 Patio slabs, porch slabs, walks, and driveways sloped ≥ 0.25 in. per ft. away from home to edge of surface or 10 ft., whichever is less.³
- 1.2 Back-fill has been tamped and final grade sloped ≥ 0.5 in. per ft. away from home for ≥ 10 ft. Alternatives in Footnote.³
- 1.3 Capillary break beneath all slabs (e.g., slab on grade, basement slab) except crawlspace slabs using either: ≥ 6 mil polyethylene sheeting, lapped 6-12 in., or ≥ 1 in. extruded polystyrene insulation with taped joints.^{4, 5, 6}
- 1.4 Capillary break at all crawlspace floors using ≥ 6 mil polyethylene sheeting, lapped 6-12 in., & installed using one of the following:^{4, 5, 6}
 - 1.4.1 Placed beneath a concrete slab; OR,
 - 1.4.2 Lapped up each wall or pier and fastened with furring strips or equivalent; OR,
 - 1.4.3 Secured in the ground at the perimeter using stakes.
- 1.5 Exterior surface of below-grade walls of basements & unvented crawlspaces finished as follows:
 - a) For poured concrete, masonry, & insulated concrete forms, finish with damp-proofing coating.⁷
 - b) For wood framed walls, finish with polyethylene and adhesive or other equivalent waterproofing.
- 1.6 Class 1 vapor retarder not installed on interior side of air permeable insulation in exterior below-grade walls.⁸
- 1.7 Sump pump covers mechanically attached with full gasket seal or equivalent.
- 1.8 Drain tile installed at basement and crawlspace walls, with the top of the drain tile pipe below the bottom of the concrete slab or crawlspace floor. Drain tile surrounded with ≥ 6 in. of $\frac{1}{2}$ to $\frac{3}{4}$ in. washed or clean gravel and with gravel layer fully wrapped with fabric cloth. Drain tile level or sloped to discharge to outside grade (daylight) or to a sump pump. If drain tile is on interior side of footing, then channel provided through footing to exterior side.⁹

2. Water-Managed Wall Assembly

- 2.1 Flashing at bottom of exterior walls with weep holes included for masonry veneer and weep screed for stucco cladding systems, or equivalent drainage system.¹⁰
- 2.2 Fully sealed continuous drainage plane behind exterior cladding that laps over flashing in Item 2.1 and fully sealed at all penetrations. Additional bond-break drainage plane layer provided behind all stucco and non-structural masonry cladding wall assemblies.^{10, 11}
- 2.3 Window and door openings fully flashed.¹²

3. Water-Managed Roof Assembly

- 3.1 Step and kick-out flashing at all roof-wall intersections, extending ≥ 4 " on wall surface above roof deck and integrated shingle-style with drainage plane above; boot / collar flashing at all roof penetrations.¹³
- 3.2 For homes that don't have a slab-on-grade foundation and do have expansive or collapsible soils, gutters & downspouts provided that empty to lateral piping that discharges water on sloping final grade ≥ 5 ft. from foundation, or to underground catchment system not connected to the foundation drain system that discharges water ≥ 10 ft. from foundation. Alternatives & exemptions in Footnote.^{4, 14, 15}
- 3.3 Self-adhering polymer-modified bituminous membrane at all valleys & roof deck penetrations.^{4, 16}
- 3.4 In 2009 IECC Climate Zones 5 & higher, self-adhering polymer-modified bituminous membrane over sheathing at eaves from the edge of the roof line to > 2 ft. up roof deck from the interior plane of the exterior wall.^{4, 16}

4. Water-Managed Building Materials

- 4.1 Wall-to-wall carpet *not* installed within 2.5 ft. of toilets, tubs, and showers.
- 4.2 Cement board or equivalent moisture-resistant backing material installed on all walls behind tub and shower enclosures composed of tile or panel assemblies with caulked joints. Paper-faced backerboard shall not be used.¹⁷
- 4.3 In Warm-Humid climates, Class 1 vapor retarders not installed on the interior side of air permeable insulation in above-grade walls, except at shower and tub walls.⁸
- 4.4 Building materials with visible signs of water damage or mold *not* installed or allowed to remain.¹⁸
- 4.5 Framing members & insulation products having high moisture content *not* enclosed (e.g., with drywall).¹⁹
- 4.6 For each condensate-producing HVAC component, corrosion-resistant drain pan (e.g., galvanized steel, plastic) included that drains to a conspicuous point of disposal in case of blockage. Backflow prevention valve included if connected to a shared drainage system.

Footnotes:

1. These requirements are designed to improve moisture control in homes. However, these features alone cannot prevent all moisture problems. For example, leaky pipes or overflowing baths can lead to moisture issues and negatively impact the performance of the home.
2. The term 'Rater' refers to the person(s) completing the third-party verification required for certification. The person(s) shall: a) be a Certified Rater, Approved Inspector, or an equivalent designation as determined by a Verification Oversight Organization such as RESNET; and, b) have attended and successfully completed an EPA-recognized training class. See www.energystar.gov/newhomestraining.



National Water Management System Builder Requirements¹

ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 10)

3. Swales or drains designed to carry water from foundation are permitted to be provided as an alternative to the slope requirements for any home, and shall be provided for a home where setbacks limit space to less than 10 ft. Also, tamping of back-fill is not required if either: proper drainage can be achieved using non-settling compact soils, as determined by a certified hydrologist, soil scientist, or engineer; OR, the builder has scheduled a site visit to provide in-fill and final grading after settling has occurred (e.g., after the first rainy season).
4. Not required in Dry (B) climates as shown in 2009 IECC Figure 301.1 and Table 301.1.
5. Not required for raised pier foundations with no walls. To earn the ENERGY STAR, EPA recommends, but does not require, that radon-resistant features be included in homes built in EPA Radon Zones 1, 2 & 3. For more information, see www.epa.gov/indoorairplus.
6. For an existing slab (e.g., in a home undergoing a gut rehabilitation), in lieu of a capillary break beneath the slab, a continuous and sealed Class I or Class II Vapor Retarder (per Footnote 7) is permitted to be installed on top of the entire slab. In such cases, up to 10% of the slab surface is permitted to be exempted from this requirement (e.g., for sill plates). In addition, for existing slabs in occupiable space, the Vapor Retarder shall be, or shall be protected by, a durable floor surface. If Class I Vapor Retarders are installed, they shall not be installed on the interior side of air permeable insulation or materials prone to moisture damage.
7. Interior surface of an existing below-grade wall (e.g., in a home undergoing a gut rehab.) listed in Item 1.5a is permitted to be finished by:
 - Installing a continuous and sealed drainage plane, capillary break, Class I Vapor Retarder (per Footnote 8) and air barrier that terminates into a foundation drainage system as specified in Item 1.8; OR
 - If a drain tile is not required as specified in Footnote 9, adhering a capillary break and Class I Vapor Retarder (per Footnote 8) directly to the wall with the edges taped/sealed to make it continuous.

Note that no alternative compliance option is provided for existing below-grade wood-framed walls in Item 1.5b.

8. The 2009 IRC defines Class I vapor retarders as a material or assembly with a rating of ≤ 0.1 perm, using the desiccant method with Proc. A of ASTM E 96. The following materials are typically ≤ 0.1 perm and shall not be used on the interior side of air permeable insulation in above-grade exterior walls in warm-humid climates or below-grade exterior walls in any climate: rubber membranes, polyethylene film, glass, aluminum foil, sheet metal, and foil-faced insulating / non-insulating sheathings. These materials can be used on the interior side of walls if air permeable insulation is not present (e.g., foil-faced rigid foam board adjacent to a below-grade concrete foundation wall is permitted).

Note that this list is not comprehensive and other materials with a perm rating ≤ 0.1 also shall not be used. Also, if mfr. spec.'s for a product indicate a perm rating ≥ 0.1 , then it may be used, even if it is in this list. Also note that open-cell and closed-cell foam generally have ratings above this limit and may be used unless mfr. spec.'s indicate a perm rating ≤ 0.1 . Several exemptions to these requirements apply:

- Class I vapor retarders, such as ceramic tile, may be used at shower and tub walls;
 - Class I vapor retarders, such as mirrors, may be used if mounted with clips or other spacers that allow air to circulate behind them.
9. Alternatively, either a drain tile that is pre-wrapped with a fabric filter or a Composite Foundation Drainage System (CFDS) that has been evaluated by ICC-ES per AC 243 are permitted to be used. Note that the CFDS must include a soil strip drain or another ICC-ES evaluated perimeter drainage system to be eligible for use. In an existing home (e.g. in a home undergoing a gut rehab.) a drain tile installed only on the interior side of the footing without a channel is permitted. Additionally, a drain tile is not required when a certified hydrologist, soil scientist, or engineer has determined that a crawlspace foundation, or an existing basement foundation (e.g., in a home undergoing a gut rehab.), is installed in Group I Soils (i.e. well-drained ground or sand-gravel mixtures), as defined by 2009 IRC Table R405.1.
 10. These Items not required for existing structural masonry walls (e.g., in a home undergoing a gut rehabilitation). Note this exemption does not extend to existing wall assemblies with masonry veneers.
 11. Any of the following systems may be used: a monolithic weather-resistant barrier (i.e., house wrap) shingled at horizontal joints and sealed or taped at all joints; weather resistant sheathings (e.g., faced rigid insulation) fully taped at all "butt" joints; lapped shingle-style building paper or felts; or other water-resistive barrier recognized by ICC-ES or other accredited agency.
 12. Apply pan flashing over the rough sill framing, inclusive of the corners of the sill framing; side flashing that extends over pan flashing; and top flashing that extends over side flashing or equivalent details for structural masonry walls or structural concrete walls.
 13. Intersecting wall siding shall terminate 1 in. above the roof or higher, per manufacturer's recommendations. Continuous flashing shall be installed in place of step flashing for metal and rubber membrane roofs.
 14. The assessment of whether the soil is expansive or collapsible shall be completed by a certified hydrologist, soil scientist, or engineer.
 15. Any of the following are permitted to be used as alternatives to Item 3.2: a) a roof design that deposits rainwater to a grade-level rock bed with a waterproof liner and a lateral drain pipe that meets discharge requirements per Item 3.2; b) a rainwater harvesting system that drains overflow to meet discharge requirements per Item 3.2; or c) a continuous rubber membrane (e.g. EPDM) that is aligned with the foundation wall from final grade to ≥ 8 in. below grade and then slopes ≥ 0.5 in. per ft. away from the home for at least 5 ft., with Group I Soils (as defined in Footnote 9) covering the membrane to within 3 in. of final grade.
 16. As an alternative, any applicable option in 2009 IRC Section R905.2.8.2 is permitted to be used to meet Item 3.3 and any option in 2009 IRC Section R905.2.7.1 is permitted to be used to meet Item 3.4. EPA recommends, but does not require, that products meet ASTM D1970. In addition, any option in 2009 IRC Section R905.13 is permitted to be used to meet either Item 3.3 or 3.4.
 17. In addition to cement board, materials that have been evaluated by ICC-ES per AC 115 may also be used to meet this requirement. Monolithic tub and shower enclosures (e.g., fiberglass with no seams) are exempt from this backing material requirement unless required by the manufacturer. Paper-faced backerboard may only be used behind monolithic enclosures or waterproof membranes that have been evaluated by ICC-ES per AC 115, and then only if it meets ASTM mold-resistant standards ASTM D3273 or ASTM D6329.
 18. If mold is present, effort should be made to remove all visible signs of mold (e.g., by damp wipe with water and detergent). If removal methods are not effective, then the material shall be replaced. However, stains that remain after damp wipe are acceptable. Lumber with "sap stain fungi" is exempt from this Item as long as the lumber is structurally intact.
 19. For wet-applied insulation, follow manufacturer's drying recommendations. EPA recommends that lumber moisture content be $\leq 18\%$.



National HVAC Design Report ¹

ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 10)

HVAC Designer Responsibilities:

- Complete one National HVAC Design Report for each system design for a house plan, created for either the specific plan configuration (i.e., elevation, option, orientation, & county) of the home to be certified or for a plan that is intended to be built with different configurations (i.e., different elevations, options, and/or orientations). Visit www.energystar.gov/newhomeshvacdesign and see Footnote 2 for more information. ²
- Obtain efficiency features (e.g., window performance, insulation levels, and infiltration rate) from the builder or Rater. ³
- Provide the completed National HVAC Design Report to the builder or credentialed HVAC contractor and to the Rater.

1. Design Overview

1.1 Designer name: Trevor Montag Designer company: Williams Distributing Date: 11/18/2019

1.2 Select which party you are providing these design services to: Builder or Credentialed HVAC contractor

1.3 Name of company you are providing these design services to (if different than Item 1.1): 1 Legacy Heating & Cooling

1.4 Area that system serves: Whole-house Upper-level Lower-level Other _____

1.5 Is cooling system for a temporary occupant load? ⁴ Yes No

1.6 House plan: _____ Check box to indicate whether the system design is site-specific or part of a group: ²

Site-specific design. Option(s) & elevation(s) modeled: _____

Group design. Group #: _____ out of _____ total groups for this house plan. Configuration modeled: _____

2. Whole-House Mechanical Ventilation Design ^{5, 6}

Designer Verified

Airflow:

2.1 Ventilation airflow design rate & run-time meet the requirements of ASHRAE 62.2-2010, 2013, or 2016. ⁷

2.2 Ventilation airflow rate required by 62.2 for a continuous system: _____ CFM -

2.3 Design for this system: Vent. airflow rate: .41 CFM Run-time per cycle: _____ minutes Cycle time: _____ minutes -

System Type & Controls:

2.4 Specified system type: Supply Exhaust Balanced -

2.5 Specified control location: _____ (e.g., Master bath, utility room) -

2.6 Specified controls allow the system to operate automatically, without occupant intervention.

2.7 Specified controls include a readily-accessible ventilation override and a label has also been specified if its function is not obvious (e.g., a label is required for a standalone wall switch, but not for a switch that's on the ventilation equipment).

2.8 No outdoor air intakes designed to connect to the return side of the HVAC system, unless specified controls operate intermittently and automatically based on a timer and restrict intake when not in use (e.g., motorized damper). ⁸

Sound: 2.9 The fan of the specified system is rated ≤ 3 sones if intermittent and ≤ 1 sone if continuous, or exempted. ⁹

Efficiency:

2.10 If system utilizes the HVAC fan, then the specified fan type in Item 4.7 is ECM / ICM, or the specified controls will reduce the standalone ventilation run-time by accounting for hours when the HVAC system is heating or cooling.

2.11 If bathroom fans are specified as part of the system, then they are ENERGY STAR certified. ¹⁰

Air Inlet Location: (Complete this section if system has a specified air inlet location; otherwise check "N/A"). ¹¹ N/A

2.12 Inlet pulls ventilation air directly from outdoors and not from attic, crawlspace, garage, or adjacent dwelling unit.

2.13 Inlet is ≥ 2 ft. above grade or roof deck; ≥ 10 ft. of stretched-string distance from known contamination sources (e.g., stack, vent, exhaust, vehicles) not exiting the roof, and ≥ 3 ft. from known sources exiting the roof.

3. Room-by-Room Heating & Cooling Loads

3.1 Room-by-room loads calculated using: Unabridged ACCA Manual J v8 2013 ASHRAE Fundamentals Other per AHJ ¹² -

3.2 Indoor design temperatures used in loads are 70°F for heating and 75°F for cooling.

3.3 Outdoor design temperatures used in loads: (See Footnote 13 and energystar.gov/hvacdesigntemps) ¹³ -

County & State, or US Territory, selected: Kent, MI Cooling season: 87 °F Heating season: 7 °F

3.4 Number of occupants used in loads: ¹⁴ 4 -

3.5 Conditioned floor area used in loads: ¹⁵ 2187 Sq. Ft. -

3.6 Window area used in loads: ¹⁶ 231 Sq. Ft. -

3.7 Predominant window SHGC used in loads: ¹⁷ .28 -

3.8 Infiltration rate used in loads: ¹⁸ Summer: .41 Winter: .21 -

3.9 Mechanical ventilation rate used in loads: ⁹⁰ _____ CFM -

Loads At Design Conditions (kBtuh)		N	NE	E	SE	S	SW	W	NW	
Cooling	3.10 Sensible heat gain (By orientation ¹⁹):					15,125				-
	3.11 Latent heat gain (Not by orientation):	2,110								-
	3.12 Total heat gain (By orientation ¹⁹):	17,235								-
	3.13 Maximum – minimum total heat gain (Item 3.12) across orientations = _____ kBtuh	Variation is ≤ 6 kBtuh. ^{19, 20}								<input type="checkbox"/>
Heating	3.14 Total heat loss (Not by orientation):	27,123								-



National HVAC Design Report ¹

ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 10)

4. Heating & Cooling Equipment Selection				Designer Verified	
4.1 Equipment selected per ACCA Manual S (see Footnote 21 & 22). ^{21, 22}				<input checked="" type="checkbox"/>	
Air Conditioner / Heat Pump (Complete if air conditioner or heat pump will be installed; otherwise check "N/A")				<input type="checkbox"/> N/A	
4.2 Equipment type: <input checked="" type="checkbox"/> Cooling-only air conditioner or <input type="checkbox"/> Cooling & heating heat pump				-	
4.3 Condenser manufacturer & model: <u>GSX130241E</u>				-	
4.4 Evaporator / fan coil manufacturer & model: <u>CAPF1824B6D+GMSS960402BNA</u>				-	
4.5 AHRI reference #: ²³ <u>201388267</u>				-	
4.6 AHRI listed efficiency: ¹⁴ _____ / _____ EER / SEER Air-source heat pump: _____ HSPF Ground-source heat pump: _____ COP				-	
4.7 Evaporator fan type: <input checked="" type="checkbox"/> PSC <input type="checkbox"/> ECM / ICM <input type="checkbox"/> Other: _____				-	
4.8 Compressor type: <input checked="" type="checkbox"/> Single-speed <input type="checkbox"/> Two-speed <input type="checkbox"/> Variable-speed				-	
4.9 Latent capacity at design conditions, from OEM expanded performance data: _____ kBtuh				-	
4.10 Sensible capacity at design conditions, from OEM expanded performance data: _____ kBtuh				-	
4.11 Total capacity at design conditions, from OEM expanded performance data: _____ kBtuh				-	
4.12 Air-source heat pump capacity: At 17°F: _____ kBtuh At 47°F: _____ kBtuh <input type="checkbox"/> N/A				-	
4.13 Cooling sizing % = Total capacity (Item 4.11) divided by maximum total heat gain (Item 3.12): _____ %				-	
4.14 Complete this Item if Condition B Climate will be used to select sizing limit in Item 4.15. Otherwise, check "N/A": ²⁴ <input type="checkbox"/> N/A				-	
4.14.1 Load sensible heat ratio = Max. sensible heat gain (Item 3.10) / Max. total heat gain (Item 3.12) = _____ %				-	
4.14.2 HDD / CDD ratio (Visit energystar.gov/hvacdesigntemps to determine this value for the design location) = _____				-	
4.15 Check box of applicable cooling sizing limit from chart below: ^{21, 22}				-	
Equipment Type (Per Item 4.2) & Climate Condition (Per Item 4.14)	Compressor Type (Per Item 4.8)				
	Single-Speed	Two-Speed	Variable-Speed		
For Cooling-Only Equipment or For Cooling Mode of Heat Pump in Condition A Climate	<input checked="" type="checkbox"/> Recommended: 90 – 115% Allowed: 90 – 130%	<input type="checkbox"/> Recommended: 90 – 120% Allowed: 90 – 140%	<input type="checkbox"/> Recommended: 90 – 130% Allowed: 90 – 160%		
For Cooling Mode of Heat Pump in Condition B Climate	<input type="checkbox"/> 90% - 100%, plus 15 kBtuh	<input type="checkbox"/> 90% - 100%, plus 15 kBtuh	<input type="checkbox"/> 90% - 100%, plus 15 kBtuh		
4.16 Cooling sizing % (4.13) is within cooling sizing limit (4.15).				<input checked="" type="checkbox"/>	
Furnace (Complete if furnace will be installed; otherwise check "N/A").				<input type="checkbox"/> N/A	
4.17 Furnace manufacturer & model: <u>Goodman GMSS960402BN</u>				-	
4.18 Listed efficiency: <u>96%</u> AFUE				-	
4.19 Total capacity: <u>40000</u> kBtuh				-	
4.20 Heating sizing % = Total capacity (Item 4.19) divided by total heat loss (Item 3.14): ¹⁴⁷ _____ %				-	
4.21 Check box of applicable heating sizing limit from chart below:				-	
When Used for Heating Only		When Paired With Cooling			
<input checked="" type="checkbox"/> 100 – 140%		<input checked="" type="checkbox"/> Recommended: 100 – 140% Allowed: 100 – 400%			
4.22 Heating sizing % (4.20) is within heating sizing limit (4.21).				<input checked="" type="checkbox"/>	
5. Duct Design (Complete if heating or cooling equipment will be installed with ducts; otherwise check "N/A").				<input checked="" type="checkbox"/> N/A	
5.1 Duct system designed for the equipment selected in Section 4, per ACCA Manual D.				<input type="checkbox"/>	
5.2 Design HVAC fan airflow: ²⁵		Cooling mode _____ CFM	Heating mode _____ CFM	-	
5.3 Design HVAC fan speed setting (e.g., low, medium, high): ²⁶		Cooling mode _____	Heating mode _____	-	
5.4 Design total external static pressure (corresponding to the mode with the higher airflow in Item 5.2): ²⁷ _____ IWC				-	
5.5 Room-by-room design airflows documented below (which must sum to the mode with the higher airflow in Item 5.2): ^{28, 29}				-	
Room Name	Design Airflow (CFM)	Room Name	Design Airflow (CFM)	Room Name	Design Airflow (CFM)
1		12		23	
2		13		24	
3		14		25	
4		15		26	
5		16		27	
6		17		28	
7		18		29	
8		19		30	
9		20		31	
10		21		32	
11		22		Total for all rooms	



National HVAC Commissioning Checklist ^{1, 2}

ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 10)

HVAC Commissioning Contractor Responsibilities:

- The commissioning contractor must be credentialed by an HVAC oversight organization to complete this checklist. One checklist must be completed and signed by the commissioning contractor for each HVAC system that is commissioned.
- The completed checklist for each commissioned system, along with the corresponding National HVAC Design Report, shall be retained by the contractor for a minimum of three years for quality assurance purposes. Furthermore, the contractor shall provide the completed checklist to the builder, the Rater ³ responsible for certifying the home, and the HVAC oversight organization upon request.
- Visit www.energystar.gov/newhomeshvac for information about the credential requirement and this checklist.

1. Commissioning Overview

1.1 Contractor name Kevin Holman Contractor company Legacy HVAC Date 4/5/20

1.2 Organization that your company is credentialed with: ACCA Advanced Energy NYSERDA

1.3 Builder client name: _____

1.4 Home address: _____ City: Grand Rapids State: MI Zip code: 49507

1.5 National HVAC Design Report corresponding to this system has been collected from designer or builder. Contractor-verified

1.6 Area that system serves, per Item 1.4 of National HVAC Design Report: Whole-house Upper-level Lower-level Other _____

1.7 House plan, per Item 1.6 of National HVAC Design Report: _____ Site-specific design Group design #: _____

2. Refrigerant Charge - Run system for 15 minutes before testing. If outdoor ambient temperature at the condenser is $\leq 55^{\circ}\text{F}$ or, if known, below the manufacturer-recommended minimum operating temperature for the cooling cycle, then the system shall include a TXV, the outdoor temperature shall be recorded in Item 2.1, and the contractor shall check "N/A" in this Section. ⁴

	Contractor Verified	N/A
2.1 Outdoor ambient temperature at condenser: <u>61</u> °F DB	-	-
2.2 Return-side air temperature inside duct near evaporator, during cooling mode: <u>64</u> °F WB	-	<input type="checkbox"/>
2.3 Liquid line pressure: <u>212</u> psig	-	<input type="checkbox"/>
2.4 Liquid line temperature: <u>64</u> °F DB	-	<input type="checkbox"/>
2.5 Suction line pressure: <u>106</u> psig	-	<input type="checkbox"/>
2.6 Suction line temperature: <u>45</u> °F DB	-	<input type="checkbox"/>

For System with Thermal Expansion Valve (TXV):

2.7 Condenser saturation temperature: _____ °F DB (Using Item 2.3)	-	<input checked="" type="checkbox"/>
2.8 Subcooling value: _____ °F DB (Item 2.7 - Item 2.4)	-	<input checked="" type="checkbox"/>
2.9 OEM subcooling goal: _____ °F DB	-	<input checked="" type="checkbox"/>
2.10 Subcooling deviation: _____ °F DB (Item 2.8 - Item 2.9)	-	<input checked="" type="checkbox"/>

For System with Fixed Orifice:

2.11 Evaporator saturation temperature: <u>35</u> °F DB (Using Item 2.5)	-	<input type="checkbox"/>
2.12 Superheat value: <u>10</u> °F DB (Item 2.6 - Item 2.11)	-	<input type="checkbox"/>
2.13 OEM superheat goal: <u>11</u> °F DB (Using superheat tables and Items 2.1 & 2.2)	-	<input type="checkbox"/>
2.14 Superheat deviation: <u>1</u> °F DB (Item 2.12 - Item 2.13)	-	<input type="checkbox"/>
2.15 Item 2.10 is $\pm 3^{\circ}\text{F}$ or Item 2.14 is $\pm 5^{\circ}\text{F}$	<input type="checkbox"/>	<input type="checkbox"/>
2.16 An OEM test procedure (e.g., as defined for a ground-source heat pump) has been used in place of the sub-cooling or super-heat process and documentation has been attached that defines this procedure.	<input type="checkbox"/>	<input type="checkbox"/>

3. Indoor HVAC Fan Airflow

3.1 The mode with the higher design HVAC fan airflow used, per Item 5.2 of National HVAC Design Report: <input type="checkbox"/> Heating <input type="checkbox"/> Cooling	<input type="checkbox"/>	-
3.2 Static pressure test holes have been created, and test hole locations are well-marked and accessible. Test hole location for return external static pressure: <input type="checkbox"/> Plenum <input checked="" type="checkbox"/> Cabinet <input type="checkbox"/> Transition <input type="checkbox"/> Other: _____ Test hole location for supply external static pressure: <input type="checkbox"/> Plenum <input checked="" type="checkbox"/> Cabinet <input type="checkbox"/> Transition <input type="checkbox"/> Other: _____	<input type="checkbox"/>	-
3.3 Measured return external static pressure (Enter value only, without negative sign): <u>.49</u> IWC	-	-
3.4 Measured supply external static pressure (Enter value only, without positive sign): <u>.36</u> IWC	-	-
3.5 Measured total external static pressure = Value-only from Item 3.3 + Value-only from Item 3.4 = <u>.85</u> IWC	-	-
3.6 Measured (Item 3.5) - Design (Item 5.4 on National HVAC Design Report) total external static pressure = _____ IWC	-	-
3.7 Measured HVAC fan airflow, using Item 3.5 and fan speed setting: _____ CFM	-	-
3.8 Measured HVAC fan airflow (Item 3.7) is $\pm 15\%$ of design HVAC fan airflow (Item 5.2 on National HVAC Design Report).	<input type="checkbox"/>	-

4. Air Balancing of Supply Registers & Return Grilles (Recommended, but not Required) ⁵

4.1 Balancing report attached with room-by-room design airflows from Item 5.5 on National HVAC Design Report, and contractor-measured airflow using ANSI / ACCA 5 QI-2015 protocol.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.2 Room-by-room airflows verified by contractor to be within the greater of $\pm 20\%$ or 25 CFM of design airflow.	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Building Summary

Property

LINC UP Non Profit Housing
Grand Rapids, MI 49507

Weather:Grand Rapids, MI

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Organization

Custom Home Energy Services
517.256.1839
David Meeder

Builder

LINC UP

HERS

Confirmed
2020-04-09
Rating No:20-0615-01
Rater ID:5382385

Property/Builder Information

Building Name	
Owner's Name	LINC UP Non Profit Housing
Property Address	Grand Rapids, MI 49507
City, St, Zip	616-648-3853
Phone Number	
	LINC UP
Builder's Name	616-648-3853
Phone Number	adam@lincrev.org
Email Address	2floor,3 bedroom
Plan/Model Name	
Community/Development Identifier/Other	

Organization Information

Organization Name	Custom Home Energy Services
Address	PO Box 237
City, St, Zip	Bath, MI 48808
Phone Number	517.256.1839
Website	

Rating/RESNET Information

Provider ID	1998-146
Sample Set ID	00000000
Registry ID	526040933
Registry Date Registered	06/18/2020
Rater's Name	David Meeder
Rater's ID	5382385
Rater's Email	davidwmeeder@gmail.com
Last Field Insp	2020-04-09
Rating Type	Confirmed
Reason for Rating	New Home
Rating Number	20-0615-01
Rating Permit Date	12/13/2019

REM/Rate - Residential Energy Analysis and Rating Software v15.8

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Builder

LINC UP

General Building Information

Area of Conditioned. Space(sq ft)	2320
Volume of Conditioned. Space	18343
Year Built	2019
Housing Type	Single-family detached
Level Type(Apartments Only)	None
Floors on or Above-Grade	2
Number of Bedrooms	3
Foundation Type	Conditioned basement
Foundation is w/in Infiltration Volume:	N/A
Enclosed Crawl Space Type	N/A
Number of Stories Including Conditioned Basement	3
Thermal Boundary Location	N/A

Foundation Wall Information

Name	Library Entry	Location	Length(ft)	Total Height(ft)	Depth Below Grade(ft)	Height Above Grade(ft)	Uo Value Combo*	Uo Value (wall only)
Basement Wall	R-19 Finished*****0*	Cond->ambient/grn	115.0	8.0	6.5	1.5	0.053	0.075

* Uo Value Combo combines wall, airfilm, and soil path

Foundation Wall Library List

Foundation Wall: R-19 Finished*****0*

Type	Solid concrete or stone
Thickness(in)	8.0
Studs	Wood, 2x4, 16" o.c.
Interior Insulation	
Continuous R-Value	0.0
Frame Cavity R-Value	19.0
Cavity Insulation Grade	1
Ins top	0.0 ft from top of wall
Ins Bottom	0.0 ft from bottom of wall
Exterior Insulation	
R-Value	0.0

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Foundation Wall Library List

Ins top	0.0 ft from top of wall
Ins bottom	0.0 ft below grade
Note	Fg batts with 1.5" cc foam sprayed in bays

Slab Floor Information

Name	Library Entry	Area(sq ft)	Depth Below Grade(ft)	Full Perimeter(ft)	Exposed Perimeter(ft)	On-Grade Perimeter(ft)
Basement Floor	Uninsulated**0*	730	6.5	115	115	0

Slab Floor Library List

Slab Floor: Uninsulated**0*

Slab Covering	Carpet
Perimeter Insulation (R-Value)	0.0
Perimeter Insulation Depth (ft)	0.0
Under-Slab Insulation (R-Value)	0.0
Under-Slab Insulation Width (ft)	0.0
Slab Insulation Grade	1
Radiant Slab	No
Note	

Rim and Band Joist Information

Name	Location	Area(sq ft)	Continuous Ins	Framed Cavity Ins	Cavity Ins Thk(in)	Joist Spacing	Insulation Grade	Uo Value
Basement/1	Cond -> ambient	115.00	0.0	13.0	2.0	16.0	1	0.078
1/2	Cond -> ambient	115.00	0.0	19.0	3.0	16.0	1	0.058

Above-Grade Wall

Name	Library Entry	Location	Exterior Color	Area(sq ft)	Uo Value
Floor 1	R-20 16" O.C. *****0*	Cond -> ambient	Medium	1035.00	0.059
Floor2	R-20 16" O.C. *****0*	Cond -> ambient	Medium	1035.00	0.059

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Above-Grade Wall Library List

Above-Grade Wall: R-20 16" O.C.*****0*

Information From Quick Fill Screen

Wall Construction Type	Standard Wood Frame
Continuous Insulation (R-Value)	0.0
Frame Cavity Insulation (R-Value)	20.0
Frame Cavity Insulation Thickness (in)	5.5
Frame Cavity Insulation Grade	1
Stud Size (w x d, in)	1.5 x 5.5
Stud Spacing (in o.c.)	16.0
Framing Factor - (default)	0.2300
Gypsum Thickness (in)	0.6
Note	

Window Information

Name	Wall Assignment	Orient	U-Value	SHGC	Area (sqft)	Overhang			Interior		Adjacent	
						Depth (ft)	To Top (ft)	To Btm (ft)	Winter Shading	Summer Shading	Winter Shading	Summer Shading
Front 2 1.5,4.8,10	AGWall 2	West	0.300	0.450	31.42	1.5	4.8	10.0	0.85	0.70	None	None
Front 2 1.5,4.8,10	AGWall 2	West	0.300	0.450	31.42	1.5	4.8	10.0	0.85	0.70	None	None
Front 2 1.5,4.8,10	AGWall 2	West	0.300	0.450	8.27	1.5	3.8	6.9	0.85	0.70	None	None
Front 15,1.75,7.5	AGWall 1	West	0.300	0.450	31.42	5.0	1.8	7.5	0.85	0.70	None	None
Front D 15,1.75,7.5	AGWall 1	West	0.300	0.450	7.75	5.0	1.8	7.5	0.85	0.70	None	None
Left 1.5, Left	AGWall 2	North	0.300	0.450	28.00	1.5	0.8	6.0	0.85	0.70	None	None
Left	AGWall 2	North	0.300	0.450	22.31	0.0	0.0	0.0	0.85	0.70	None	None
Back 2	AGWall 2	East	0.300	0.450	9.95	1.5	3.9	7.1	0.85	0.70	None	None
Back1	AGWall 1	East	0.300	0.450	14.04	0.0	0.0	0.0	0.85	0.70	None	None
Back B	FndWall 1	East	0.460	0.600	16.00	0.0	0.0	0.0	0.85	0.70	None	None
Right 2	AGWall 2	South	0.300	0.450	42.12	1.5	1.0	5.8	0.85	0.70	None	None
Right 1	AGWall 1	South	0.300	0.450	8.50	0.0	0.0	0.0	0.85	0.70	None	None

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Organization

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Weather:Grand Rapids, MI

Builder

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LINC UP

Door Information

Name	Library Entry	Wall Assignment	Opaque Area(sq ft)	Uo Value	R-Value of Opaque Area	Storm Door
Exterior	Steel-polyurethane**0*	AGWall 1	40.7	0.283	2.6	No

Roof Information

Name	Library Entry	Ceiling Area(sq ft)	Roof Area(sq ft)	Exterior Color	Radiant Barrier	Type	Uo Value	Cement or Clay Tiles	Roof Tile Ventilation
Flat Attic Unc	R-60 Blown, Attic*****0*	738.00	923.00	Medium	No	Attic	0.016	No	No

Roof Library List

Ceiling: R-60 Blown, Attic*****0*

Information From Quick Fill Screen

Continous Insulation (R-Value)	48.4
Cavity Insulation (R-Value)	11.6
Cavity Insulation Thickness (in)	3.5
Cavity Insulation Grade	1
Gypsum Thickness (in)	0.500
Insulated Framing Size(w x h, in)	1.5 x 3.5
Insulated Framing Spacing (in o.c.)	24.0
Framing Factor - (default)	0.1100
Ceiling Type	Attic

Note

Building Summary

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Mechanical Equipment

Number of Mechanical Systems	3
Heating SetPoint(F)	68.0
Heating Setback Thermostat	Not Present
Cooling SetPoint(F)	78.0
Cooling Setup Thermostat	Not Present
DHW SetPoint(F)	125.0

Heat: 96.1 Gas Furn 38k*****0*

SystemType	Fuel-fired air distribution
Fuel Type	Natural gas
Rated Output Capacity (kBtuh)	38.0
Seasonal Equipment Efficiency	96.1 AFUE
Auxiliary Electric	261 Eae
Note	Goodman AHRI 7365095
Number Of Units	1
Location	Conditioned area
Performance Adjustment	100
Percent Load Served	100

Cool: 13SEER A/C 1.5 ton**0*

System Type	Air conditioner
Fuel Type	Electric
Rated Output Capacity (kBtuh)	18.0
Seasonal Equipment Efficiency	13.0 SEER
Sensible Heat Fraction (SHF)	0.70
Note	
Number Of Units	1
Location	Conditioned area
Performance Adjustment	100
Percent Load Served	100

DHW: 40 gal. 0.62EF Gas**0*

Water Heater Type	Conventional
-------------------	--------------

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Mechanical Equipment

Fuel Type	Natural gas
Energy Factor	0.62
Recovery Efficiency	0.80
Water Tank Size (gallons)	40
Extra Tank Insulation (R-Value)	0.0
Note	
Number Of Units	1
Location	Conditioned area
Performance Adjustment	100
Percent Load Served	100

DHW Efficiencies

All bath faucets & showers <= 2gpm	true
All DHW pipes fully insulated >= R-3	false
Recirculation type	None (standard system)
Farthest fixture to DHW heater	32
TOTAL Pipelength for longest DHW run	62
DWHR unit present?	false

DHW Diagnostics

dhwGpd	47.17
peRatio	0.72
dishwasherGpd	4.32
clothesWasherHotWaterGPD	3.89
EDef	0.96
ewaste	25.38
tmains	53.90
dwhrWhInletTempAdj	0.00
pumpConsKwh	0.00
pumpConsMmbtu	0.00

Building Summary

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Weather:Grand Rapids, MI

Builder

LINC UP

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Duct Systems

Name	Ducts
Conditioned Floor Area(sq ft)	2320.0
# of Returns	4
Heating System	96.1 Gas Furn 38k*****0*
Cooling System	13SEER A/C 1.5 ton**0*
Supply Duct Surface Area(sq ft)	469.8
Return Duct Surface Area(sq ft)	348.0
No bldg cavities used as ducts	FALSE

Type	Location	Percent Location	R-Value
Supply	Conditioned space	100.0	0.0
Return	Conditioned space	100.0	0.0

Test Exemptions

IECC	TRUE
RESNET 2019	FALSE
ENERGY STAR LtO	FALSE

Duct Leakage

Input Type	Measured
Test Type	Leakage to Outside

	LtO (Leakage to Outside)	Total Duct Leakage
Supply & Return	70.00 CFM @ 25 Pascals	Not Applicable
Supply Only	Not Applicable	
Return Only	Not Applicable	

Building Summary

Property

LINC UP Non Profit Housing
Grand Rapids, MI 49507

Weather:Grand Rapids, MI

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Organization

Custom Home Energy Services
517.256.1839
David Meeder

Builder

LINC UP

HERS

Confirmed
2020-04-09
Rating No:20-0615-01
Rater ID:5382385

Infiltration and Mechanical Ventilation

Whole Dwelling Infiltration

Input Type	Blower door
Heating Season Infiltration Value	906 CFM @ 50 Pascals
Cooling Season Infiltration Value	906 CFM @ 50 Pascals
Shelter Class	4
Code Verification	Tested

Mechanical Ventilation for IAQ

Type	Balanced
Unable to Measure Mechanical Ventilation	FALSE
Rate(cfm)	77
Adjusted Sensible Recovery Efficiency(%)	66.00
Adjusted Total Recovery Efficiency(%)	36.00
Hours per Day	24.0
Fan Power (watts)	31.00
ECM Fan Motor	true

Ventilation Strategy for Cooling

Cooling Season Ventilation	Natural Ventilation
----------------------------	---------------------

Good Air Exchange for Multi-Family

NA

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Lights and Appliances

Rating/RESNET audit

Ceiling Fan CFM / Watt	0.00
Refrigerator kWh/yr	396
Refrigerator Location	Conditioned
Range/Oven Fuel Type	Natural gas
Induction Range	No
Convection Oven	No

Dishwasher

Energy Factor	0.46
Dishwasher kWh/yr	290
Place Setting Capacity	12

Clothes Dryer

Fuel Type	Natural gas
Location	Conditioned
Moisture Sensing	No
CEF	2.32

Clothes Washer

Location	Conditioned
LER (kWh/yr)	704
IMEF	0.331
Capacity (CU.Ft)	2.874
Electricity Rate	0.08
Gas Rate	0.58
Annual Gas Cost	23.00

Qualifying Light Fixtures

Interior Lights %	0.0
Exterior Lights %	0.0
Garage Lights %	0.0
Interior LEDs %	100.0
Exterior LEDs %	100.0
Garage LEDs %	100.0

REM/Rate - Residential Energy Analysis and Rating Software v15.8

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Mandatory Requirements

IECC Requirements

Verified IECC 06	false
Verified IECC 09	false
Verified IECC 12	false
Verified IECC 15	false
Verified IECC 18	false
Verified NY-ECCC 2016	false
Verified IECC MI	true
Verified IECC NC 2018	false

EPA Requirements

Rater certifies that the home complies with the following requirements for:

ENERGY STAR v3.0

Rater Design Review Checklist

Rater Field Checklist

HVAC Design Report

HVAC Commissioning Checklist (optional)

ENERGY STAR Version 3 Appliances	Amount
Refrigerators	1
Ceiling Fans	0
Exhaust Fans	5
Dishwashers	0

ENERGY STAR Multi-Family Checks

Clothes washer is in a category with no ENERGY STAR options.	NA
Clothes dryer is in a category with no ENERGY STAR options.	NA
Apt or Townhome uses 'Class AW' Windows.	NA

ENERGY STAR Version 3 Basements

Basement Wall Area 50% Below Grad:	false
Basement Floor Area	0.00
Slab Insulation Exemption:	true
Indoor airPlus Verification Checklist	false

EPA Field App ID

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DOE Zero Energy Ready Home

Home Builder ID Number

Mandatory Requirements

Verified Fenestration	false
Verified Insulation	false
Verified Duct Location	false
Verified Appliance	false
Verified Lighting	false
Verified Fan Efficiency	false
Verified Water Efficiency	false
Verified EPA Indoor airPLUS	false
Verified Renewable Energy Ready Solar Electric	false

Optional Home Builder Commitments for Recognition

Certified under the EPA WaterSense for New Homes Program	No
Certified under the IBHS fortified for Safer Living Program	No
Followed the DOE Zero Energy Ready Home Quality Management Guidelines	No
The buyer of this home signed a waiver giving DOE Zero Energy Ready Home access to utility bill data for one year.	No

Active Solar

System Type	None
Collector Loop Type	None
Collector Type	None
Collector Orientation	None
Area(sq ft)	0.0
Tilt(degrees)	0.0
Volume(cu ft/gal)	0.0

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LINC UP

Notes

PU 06-18-20 QA Comments: Confirmed print permissions enabled for this HERS rating.

Furnace Goodman GMSS960402BNAA AHRI#7365095
Bradford White RG1PV40S*N AHRI Ref# 200094404

Goodman AC outdoor Unit GSX130241FA

Goodman AC indoor unit: CAPF1824BGDE

Both discontinued -no AHRI certificate for this AC combination. SEER 13 rated for worst case performance.

Two exhaust fans in use: 1.) ERV Panasonic FV-04VE1 power consumption 23watts measured output 50 cfm
2) Panasonic FV0510VS1 power consumption 7.5 watts 24hours continous measured output =27cfm