NREL
NATIONAL RENEWABLE ENERGY LABORATORY

NREL Job Task Analysis: Retrofit Installer Technician

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Technical Report
NREL/TP-7A20-51671
Revised April 2012

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TITLE: NREL Job Task Analysis: Retrofit Installer Technician

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The following corrections were made to this report/document:

1. On page 2, under ***Prepare and maintain job site*** changed line 1 to, Attend job site safety meeting

2. On page 7, under ***Task 3a: Install air sealing measures*** changed line 12 to, How to operate a blower door

3. On page 7, under ***Task 3a: Install air sealing measures*** removed duplicate line 16, Material capability (e.g. temperature limits, width of span of sealant)

4. On page 9, under ***Task 3d: Rough in mechanical ventilation systems*** removed line 4, Rough in electrical components

5. On page 9, under ***Task 3d: Rough in mechanical ventilation systems*** changed line 7, to Install, air seal, and insulate duct

6. On page 11, under ***Task 3h: Install windows and doors*** removed line 5, Install windows and doors

7. On page 11, under ***Task 3h: Install windows and doors*** removed line 14, Building codes

8. On page 11, under ***Task 3i: Identify electrical installation needs (rough-in, fans)*** removed lines 3-6, Provide power to new equipment/appliance • Install or repair circuit • Install or repair lighting • Install or repair controls

9. On page 11, under ***Task 3i: Identify electrical installation needs (rough-in, fans)*** removed line 12, Circuitry

10. On page 12, under ***Task 3i: Identify electrical installation needs (rough-in, fans)*** removed line 22, Wiring

11. On page 12, under ***Task 3j: Identify plumbing installation needs*** removed line 4, Provide hookups

12. On page 12, under ***Task 3j: Identify plumbing installation needs*** removed line 9, Advanced plumbing knowledge

13. On page 12, under ***Task 3j: Identify plumbing installation needs*** removed line 13, Brazing

14. On page 12, under ***Task 3j: Identify plumbing installation needs*** removed line 19, Electrical knowledge

15. On page 12, under ***Task 3j: Identify plumbing installation needs*** removed line 29, Pipe Fitting

16. On page 12, under ***Task 3j: Identify plumbing installation needs*** removed line 31, Piping

17. On page 12, under ***Task 3k: Identify/Install roofing and flashing installation needs*** removed line 20, Live load

18. On page 12, under ***Task 4: Clean as you go (organize)*** removed line 11, Safety knowledge

19. On page 16, under ***E. Implement work scope*** re-ordered numbers 4 & 5, Clean as you go (organize) and Address deviations from work scope

NREL Job Task Analysis–
Retrofit Installer Technician

Introduction

A Job Task Analysis is a foundation for any valid credentialing program and helps identify the core knowledge areas, critical work functions, and/or skills typically found across a representative sampling of current practitioners or job incumbent workers. Empirical results from a job analysis provide examinees and the public with a valid, reliable, fair, and realistic assessment that reflects the skills, knowledge, and abilities required to competently perform a job.

In July of 2010, a group of 12 Subject Matter Experts (SMEs) met to perform the Job Task Analysis and to create an examination blueprint that would serve as the basis for the worker certification. A trained psychometrician facilitated the meeting and helped guide the development of these analyses. In the fall of 2010, an online survey was administered to validate the results of the JTA and to finalize the examination blueprint. More than 100 Retrofit Installer Technicians from across the United States responded to the survey.

This report contains the Retrofit Installer Technician Specifications and a content outline. In addition, the attached Exam Blueprint builds on these specifications by providing the optimum percentage of exam questions that should be asked about each task.

Scope

A Retrofit Installer Technician is a residential energy efficiency professional who installs energy efficiency upgrades in single-family homes, and small multi-family housing (2-4 units). A committee of SMEs considered to be experts in the field created the Retrofit Installer Technician Job Task Analysis.

This document is intended to include all of the tasks a Retrofit Installer Technician may perform, as well as the knowledge, skills, and abilities required to do these tasks.

Please note that certification is not a license to practice. All certificants must comply with applicable federal, state, and local laws and regulations governing the profession.

Content

- A Job Task Analysis for a Retrofit Installer Technician
- An Exam Blueprint for a Retrofit Installer Technician

Retrofit Technician/Installer Specifications and Content Outline

Job Description: A Retrofit Installer/Technician installs energy-efficiency measures to single family or 2-4 unit-homes using a variety of building science best practices to improve, safety, comfort, durability, indoor air quality, and energy efficiency.

Domains/Tasks	
Domain I:	**Maintain safety**
Task 1:	Follow work rules of jurisdiction having authority
Task 2:	Handle materials/equipment according to manufacturer specifications
Task 3:	Handle tools according to manufacturer specifications
Domain II:	**Prepare for the job (before arriving at job site)**
Task 1:	Attend training
Task 2:	Gather materials and supplies
Task 3:	Gather tools
Domain III:	**Prepare and maintain tools and materials on-site**
Task 1:	Set up tools
Task 2:	Set up materials
Domain IV:	**Prepare and maintain job site**
Task 1:	Attend job site safety meeting
Task 2:	Implement safety protocol (rigging, ventilation, blocking)
Task 3:	Use protective barriers (drop cloths)
Task 4:	Report preexisting conditions (that are not in scope)
Task 5:	Protect exterior environment
Domain V:	**Implement work scope**
Task 1:	Locate specific work areas
Task 2:	Verify access to work areas
Task 3a:	Install air sealing measures
Task 3b:	Install loose fill insulation
Task 3c:	Install or patch moisture barriers
Task 3d:	Rough in mechanical ventilation systems
Task 3e:	Identify mechanical systems
Task 3f:	Identify combustion appliance safety hazards
Task 3g:	Install dense pack insulation
Task 3h:	Install windows and doors
Task 3i:	Identify electrical installation needs (rough-in, fans)
Task 3j:	Identify plumbing installation needs
Task 3k:	Identify/install roofing and flashing installation needs
Task 4:	Clean as you go (organize)
Task 5:	Address deviations from work scope
Domain VI:	**Wrap up**
Task 1:	Pick up tools and materials
Task 2:	Clean up and close out
Task 3:	Participate in crew debriefing (after action review, post construction job review)

DOMAIN I: Maintain safety

Task 1: Follow work rules of jurisdiction having authority

Ability to:

- Read or hear safety documents
- Implement safety procedures
- Report safety concerns and violations
- Wear safety equipment
- Attend safety meetings/trainings
- Request safety training
- Install safety guards

Knowledge of:

- Installation procedures
- Manufacturer's specifications
- OSHA
- Safety systems

Task 2: Handle materials/equipment according to manufacturer specifications

Ability to:

- Read or hear manufacturers specifications/MSDS
- Store and maintain materials/equipment according to manufacturers specs/MSDS

Knowledge of:

- Manufacturer's specifications

Task 3: Handle tools according to manufacturer specifications

Ability to:

- Read or hear manufacturers specifications
- Store and maintain tools according to manufacturers specs

Knowledge of:

- Manufacturer's specifications

DOMAIN 2: Prepare for the job (before arriving at job site)

Task 1: Attend training

Ability to:

- Participate in training
- Identify strengths and weaknesses of yourself
- Modify installation practice based on training
- Sign in to training

Knowledge of:

- Existing practice
- Safety procedures

Task 2: Gather materials and supplies

Ability to:

- Review materials list

- Compare materials to work scope
- Verify and protect materials condition
- Organize materials (put in truck, pull from truck, etc.)
- Report missing or deficient material

Knowledge of:

- Compatibility
- Material handling
- Materials
- Materials limits
- MSDS
- Physical limits of materials
- Work scope

Task 3: Gather tools

Ability to:

- Review tool list
- Compare tools to work scope
- Verify and protect tools condition
- Load/unload tools
- Report missing or deficient tool
- Modify tools for specific job requirements (change bits/blades)

Knowledge of:

- Work scope
- Manufacturer's specifications
- Materials handling
- Lifting safety
- Normal tool operations

DOMAIN 3: Prepare and maintain tools and materials on-site

Task 1: Set up tools

Ability to:

- Unload tools from vehicle
- Connect attachments
- Plug in tools
- Verify operational status
- Perform routine maintenance
- Report deficiencies

Knowledge of:

- Carrying techniques
- Double insulated tools
- Electrical safety
- GFCI
- Lifting techniques
- Manufacturer's specifications
- Normal operations
- Tool recognition

- Work scope

Task 2: Set up materials

Ability to:

- Unload materials from vehicle
- Organize materials
- Confirm materials match work specification
- Maintain integrity of materials
- Report deficiencies

Knowledge of:

- Job site
- Lifting techniques
- Materials
- Materials limits and characteristics
- Work scope

DOMAIN 4: Prepare and maintain job site

Task 1: Attend job site safety meeting

Ability to:

- Attend
- Participate
- Sign in

Task 2: Implement safety protocol (rigging, ventilation, blocking)

Ability to:

- Set up safety masking and drop cloths
- Set up ventilation in confined spaces
- Set up task lighting
- Hook up to fall protection
- Set up ladders, scaffolding, climbing equipment
- Put on personal protective equipment
- Lock out/tag out
- Inspect work area for hazards
- Report work area hazards

Knowledge of:

- Combustibles
- Confined spaces
- Electrical Safety
- EPA lead safety
- Equipment operation
- Fall protection
- Fit test
- Hazard recognition
- Lanyards
- Local codes
- Manufacturer's specifications
- Materials

- OSHA
- Personal protection
- Safety protocols
- Ventilation systems and requirements
- Work scope

Task 3: Use protective barriers (drop cloths)

Ability to:

- Move furniture (confirm permission)
- Cover furniture/storage areas/clothes in closets
- Protect furniture
- Protect floors
- Follow safe practices, including lead safe practices (EPA)
- Place drop cloths, tack mats
- Use designated facilities (eating, bathroom, smoke break)

Knowledge of:

- Adjacent characteristics
- Electronics
- EPA lead safety
- Flooring characteristics
- Lifting techniques
- Materials characteristics
- Safe practices
- Work scope

Task 4: Report preexisting conditions (that are not in scope)

Ability to:

- Identify preexisting conditions (aesthetic/structural)
- Report preexisting conditions
- Report difficult to access places (excessive customer stuff, customer behavior issues)

Knowledge of:

- General Construction
- Work scope

Task 5: Protect exterior environment

Ability to:

- Control dust and debris created by equipment from construction activities
- Protect landscaping (covering, using limiting stakes)
- Check for oil leaks
- Report mishaps (spills, cracks)

Knowledge of:

- Work scope
- Retaining walls
- General landscape knowledge
- Containment requirements

DOMAIN 5: Implement work scope

Task 1: Locate specific work areas
Ability to:
• Review the work scope
• Walk the job
• Find mechanicals
Knowledge of:
• General construction
• General mechanical knowledge
• Job site specifics
• Work scope
Task 2: Verify access to work areas
Ability to:
• Confirm approval for start of work
• Work with crew chief to get access to areas (moving personal belongings, getting into crawl space, etc.)
• Remove obstructions for start of work
Knowledge of:
• Work scope
• General construction
• Job site
• Lifting safety
Task 3a: Install air sealing measures
Ability to:
• Identify leaks and bypasses
• Select materials
• Look for fire code violations
• Block large openings
• Hand seal gaps and cracks
• Check the seal is complete
Knowledge of:
• Clearances
• Fire code
• Framing components
• How to operate a blower door
• How to utilize tracer gas
• Leak site
• Material capability (e.g. temperature limits, width of span of sealant)
• Material durability
• Material strength
• Penetrations
• Tolerances

Task 3b: Install loose fill insulation
Ability to:
• Confirm air sealing is complete
• Confirm exhaust fans ducted to outside and insulated
• Confirm HVAC duct work is intact, sealed, supported, and insulated
• Confirm clearance to combustibles
• Confirm clearance to electrical
• Install baffles, blocking, platforms, and insulation dams
• Install vertical insulation (6-sided boxes, kneewalls)
• Install horizontal insulation
• Compare material use to coverage required (bags consumed)
Knowledge of:
• Clearance
• Combustibles
• Component analysis
• Coverage charts
• Depth markers
• Duct requirements
• General carpentry
• How to draw a floor plan
• How to operate a blower
• Insulation requirements
• Manufacturer's specifications for installations
• Materials
• Rigid board types
• R-Values
• Termination requirements
• Thermal barriers
Task 3c: Install or patch moisture barriers
Ability to:
• Confirm positive drainage, or notify of stop work items
• Remove all organic/inorganic materials
• Install moisture barrier and seal joints and seams
• Verify flashing is installed
• Identify and locate moisture sources
• Report bulk moisture concerns
Knowledge of:
• Flashing locations
• Grading issues
• Gravity
• Installation standards
• Materials
• Moisture problems
• Moisture symptoms
• Roof slope changes

- Where to look for moisture

Task 3d: Rough in mechanical ventilation systems

Ability to:

- Uncrate equipment
- Remove old equipment
- Cut openings in building
- Install venting system and vent terminations
- Install, air seal, and insulate duct
- Identify when installation is complete

Knowledge of:

- Building science basics
- Equipment disconnects
- Equipment installation requirements
- Equipment shut offs
- Framing basics
- Hand tool safety
- How to read installation instructions and standards
- Manufacturer's specifications
- Penetration locations and waterproofing
- Protection of materials
- Use of power tools

Task 3e: Identify mechanical systems

Ability to:

- Uncrate equipment
- Assist in removal of old equipment
- Identify electrical components
- Identify plumbing components
- Identify fuel system components
- Rough in openings in building
- Repair, air seal, and insulate ducted distribution systems
- Identify when installation is complete
- Assist in installation of combustion vent system exhaust
- Clean/replace air filters

Knowledge of:

- Asbestos hazards
- Basic equipment requirements
- Basic mechanical code requirements
- Cavity protection
- Duct installation and sealing requirements
- Duct systems and air flow basics
- Electrical circuit testers
- Electrical disconnects and fuel shut-offs
- Framing basics
- General carpentry
- Insulation

- Mastics and duct-sealing materials
- Penetration locations
- Protection of installed insulation
- Protection of materials
- Sheet metal basics
- Slope required for drainage/venting
- Temperature of space
- Use of power tools
- Utility knife safety
- Vent, fuel, and condensate piping

3f: Identify combustion appliance safety hazards

Ability to:

- Identify primary safety issues – ambient CO (gas leaks, system damage)
- Assist with interim combustion safety checks
- Assist with set-up for natural and worst-case depressurization
- Report findings

Knowledge of:

- Combustion appliance exhaust venting systems
- Combustion appliance safety testing
- Draft testing basics
- Natural vs. worst-case conditions
- Safety protocols
- Use of tools
- Ventilation systems

Task 3g: Install dense pack insulation

Ability to:

- Fine tune machine for application (density)
- Locate drill points
- Confirm building component integrity
- Get access to all building cavities, locate all horizontal blocks
- Check for hazards
- Fill first cavity and confirm density stops air leakage
- Readjust machine
- Fill all cavities
- Compare material use to coverage required (bags consumed)
- Plug hole, patch weather barrier, put siding back, seal openings, caulk joints

Knowledge of:

- Basic math skills
- Blower door testing
- Building structures
- Dense pack procedures
- Drill points
- Equipment
- Framing
- General carpentry

- Hazards
- How to probe
- Limitations of components
- Materials
- Smoke testing
- Strength of components
- Testing procedures
- Velocity of materials

Task 3h: Install windows and doors

Ability to:

- Install windows and doors
- Remove old windows and doors
- Check and install waterproofing, flashing
- Install air barrier and ensure drainage
- Verify air tightness and drainage

Knowledge of:

- 1/16 inch accuracy
- Air
- Basic math skills
- Building techniques
- Building codes
- Building practices
- Building science
- Drainage planes
- EPA lead safety
- Fasteners
- Flashing techniques
- General carpentry
- Manufacturer's specifications
- Materials
- Pressure
- Quality installations
- Vapor barriers
- Window and door types

Task 3i: Identify electrical installation needs (rough-in, fans)

Ability to:

- Resolve hazards
- Seal penetrations and replace insulation

Knowledge of:

- Appliance requirements
- Building codes
- Building science
- Clearances
- Efficiency
- Fire code

- Local codes
- Manufacturer's specifications
- Materials
- NEC
- Potential damage
- Trade-specific knowledge

Task 3j: Identify plumbing installation needs

Ability to:

- Remove old equipment
- Resolve hazards
- Seal penetrations and replace insulation
- Check for draft
- Install simple efficiency measures (low-flow fixtures, pipe wrap insulation)

Knowledge of:

- Asbestos
- Basic carpentry
- BPI combustion safety
- Building codes
- Building science
- Combustible clearances
- Domestic water heaters
- Drainage
- Fuel gas code
- Gas fitting
- Gas fitting code
- Gaskets
- Grading
- Interior finish
- Local hazards
- Manufacturer's specifications
- Materials
- Pipe insulation
- Smooth wrench surfaces
- Tapes
- Temperature requirements
- Venting
- Vermin hazards

Task 3k: Identify/Install roofing and flashing installation needs

Ability to:

- Identify leak sources
- Repair leak source
- Remove roofing system
- Insulate roof deck
- Install attic ventilation
- Flash new penetrations

Knowledge of:

- Building science
- Carpentry
- Clearances
- Debris control
- Drainage
- Drainage plane
- Fall protection
- Fasteners
- Flashing
- General carpentry
- Gravity
- Local building codes
- Manufacturer's specifications
- Materials
- Math skills
- Product installations
- Roofing systems
- Tools

Task 4: Clean as you go (organize)

Ability to:

- Return tools to central area
- Pick up material drops
- Return belongings
- Clean work area

Knowledge of:

- Disposable materials
- Dust containment
- EPA lead safety
- Materials MSDS
- Safety requirements
- Solvents
- Tool inventory
- Tool safety

Task 5: Address deviations from work scope

Ability to:

- Identify deviation
- Report deviation
- Request direction for modified work scope
- Implement modified work scope

Knowledge of:

- Work scope

DOMAIN 6: Wrap Up

Task 1: Pick up tools and materials

Ability to:

- Inventory tools and materials used
- Clean tools and materials
- Store tools and materials
- Report lost or broken items

Knowledge of:

- Basic math skills
- Manufacturer's specifications
- Materials
- Solvents
- Tool safety
- Value of materials

Task 2: Clean up and close out

Ability to:

- Break down barriers
- Pick up protective barriers
- Contain hazardous materials
- Contain and dispose of materials and waste
- Dust, vacuum, mop, scrub, rake
- Restore occupant belongings
- Participate in final walk through inside and outside, including restoring mechanical systems
- Report to crew chief for final inspection

Knowledge of:

- Disposal procedures
- EPA Lead safety
- Hazardous materials
- Local codes
- Local facilities
- MSDS
- Safe lifting practices
- Safety procedures
- Work Scope

Task 3: Participate in crew debriefing (after action review, post construction job review)

Ability to:

- Attend meeting
- Report deficient knowledge (more instruction for installer)
- Report what went well and what went wrong
- Discuss homeowner concerns, complaints, and complements
- Offer additional safety suggestions

Knowledge of:
• Safety procedures
• Work scope

Retrofit Installer Technician Exam Blueprint

	Duties and Tasks	Final
A.	**Maintain safety**	**19%**
	Code of conduct	2%
	Professionalism skills	2%
1	Follow work rules of jurisdiction having authority	5%
2	Handle materials/equipment according to manufacturer specifications	5%
3	Handle tools according to manufacturer specifications	5%
B.	**Prepare for the job (before arriving at job site)**	**6%**
1	Attend training	2%
2	Gather materials and supplies	2%
3	Gather tools	2%
C.	**Prepare and maintain tools and materials on-site**	**4%**
1	Set up tools	2%
2	Set up materials	2%
D.	**Prepare and maintain job site**	**11%**
1	Attend job site safety meeting	1%
2	Implement safety protocol (rigging, ventilation, blocking)	3%
3	Use protective barriers (drop cloths)	2%
4	Report preexisting conditions (that are not in scope)	3%
5	Protect exterior environment	2%
E.	**Implement work scope**	**56%**
1	Locate specific work areas	3%
2	Verify access to work areas	3%
3a	Install air sealing measures	7%
3b	Install loose fill insulation	6%
3c	Install or patch moisture barriers	4%
3d	Rough in mechanical ventilation systems	3%
3e	Identify mechanical systems	3%
3f	Identify combustion appliance safety hazards	4%
3g	Install dense pack insulation	5%
3h	Install windows and doors	3%
3i	Install electrical (rough-in, fans)	2%
3j	Install plumbing installation needs	2%
3k	Identify/install roofing and flashing installation needs	3%
4	Clean as you go (organize)	4%
5	Address deviations from work scope	4%
F.	**Wrap up**	**4%**
1	Pick up tools and materials	1%
2	Clean up and close out	2%
3	Participate in crew debriefing (after action review, post construction job review)	1%
		100%