

TABLE OF CONTENTS

<u>GENERAL PROCEDURES</u>	Page 2
Utility Participation.....	Page 2
Combustion Appliance Requirements.....	Page 2
Asbestos.....	Page 2
Pre-installation Inspection.....	Page 3
Materials.....	Page 3
Workmanship & Warranties.....	Page 3
Use of Premises.....	Page 4
Cutting & Patching.....	Page 4
Protection of Work & Property.....	Page 4
Post-installation Procedures.....	Page 4
<u>INSULATION MATERIAL REQUIREMENTS</u>	Page 5
<u>INSTALLATION REQUIREMENTS – CEILINGS UNDER ATTIC</u>	
Prescriptive Air Sealing.....	Page 6
Instructions for Sealing Air Leaks.....	Page 6
Insulation Requirements.....	Page 7
Knob & Tube Wiring Requirements.....	Page 8
Installation Instructions.....	Page 8
Exhaust Fans.....	Page 9
Ventilation Requirements.....	Page 10
Insulation Certificate.....	Page 12
<u>INSTALLATION REQUIREMENTS FOR ROOFS</u>	
Exterior Space.....	Page 13
Interior Space.....	Page 14
<u>INSTALLATION REQUIREMENTS FOR FLOOR INSULATION</u>	
Prescriptive Air Sealing.....	Page 15
Instructions for Sealing Air Leaks.....	Page 15
Insulation Requirements.....	Page 15
Ventilation Requirements.....	Page 15
Support Systems.....	Page 16
Crawl Spaces.....	Page 17
Water Pipes, Underfloor & Enclosed Floor Cavities.....	Page 17
<u>WATER PIPE INSULATION</u>	Page 19
<u>INSTALLATION REQUIREMENTS FOR UNFINISHED WALLS</u>	Page 20
<u>INSTALLATION REQUIREMENTS FOR WALLS – BLOWN-IN-INSULATION</u>	
Insulation Requirements.....	Page 21
Knob & Tube Wiring Requirements.....	Page 21
Wall Plugs, Outlets & Switch Boxes.....	Page 22
Insulation Certificate.....	Page 22
<u>WINDOWS & SLIDING GLASS DOORS</u>	
General Requirements.....	Page 23
General Material Requirements.....	Page 23
General Installation Requirements for Window Products.....	Page 23
<u>INSTALLATION REQUIREMENTS FOR PRIME WINDOW REPLACEMENT</u>	
Installation of Replacement Windows with Nailing Flange Removed.....	Page 25
Installation of Replacement Windows with Nailing Flange Intact.....	Page 26
Glazing Compounds, Sealings & Gaskets.....	Page 26
Caulking.....	Page 26
Final Step.....	Page 26
<u>APPENDIX 1: EXHAUST FAN PRESCRIPTIVE DUCT SIZING TABLE</u>	Page 27

All provisions of the general procedures apply to all sections of these specifications. Each contractor is responsible for informing each of their installers of the requirements and procedures in these specifications and ensure they are followed. Tacoma Power will be referred to as “the utility” throughout this document.

INTRODUCTION

The purpose of these specifications is to assist contractors and/or utility customers in planning, implementing, and installing weatherization products and measures. These products and measures will reduce energy use, provide adequate residential comfort levels, and maintain the structural integrity in residences. Contractors and homeowners need to be aware that improper weatherization methods or poor installation techniques can lead to building component failure years after the work has been completed. It is the intent of this document to help prevent these problems.

1. UTILITY PARTICIPATION

- a. Adoption or use of this specification does not commit Tacoma Power to offer incentives or programs for each measure type. Check with the Tacoma Power for more information on what measures are included.
- b. Tacoma Power may modify performance requirements of materials or allowed materials/installation techniques to better serve the Utility’s customers. These modifications or changes will be sent to participating contractors with 30 days’ notice of changes required unless materials/installations are found to be faulty or hazardous, then immediate action may be taken.

2. CODES

- a. Compliance with federal, locally adopted building codes or regulations affecting work under these specifications shall be required. Where federal, local codes or regulations permit lower standards than required by these specifications, the standards contained herein shall govern. The Utility does not assume responsibility for enforcing or determining compliance with federal codes, local codes, regulations, or interpretations. However, the Utility will reject any work that is found to be in non-compliance with current codes, to include current state energy codes.
- b. Permits are required by most local building code enforcement departments for contracted work. It is the responsibility of the homeowner and the contractor to check with the local code departments for permit requirements.

3. COMBUSTION APPLIANCE REQUIREMENTS

- a. Whenever there is a Combustion Appliance present in the house, garage, or other attached space, a UL listed, C-UL listed, or equivalent carbon monoxide alarm shall be installed in accordance with the carbon monoxide alarm manufacturer’s instructions.

4. ASBESTOS

- a. In cases where asbestos materials are found, by the contractor or anyone in the contractor's employ, the contractor shall comply with all federal, state, and local codes and regulations regarding the handling and disposal of the asbestos material.
- b. In no case shall the contractor allow anyone in his employ to disturb, in any way, asbestos materials that are found on the customer's property. Asbestos handling and removal shall be performed only by certified asbestos workers, per current Washington Administrative Code (WAC).

5. PRE-INSTALLATION INSPECTION

- a. Before any work is started, the contractor shall make a thorough inspection of the residence and inform the customer of any existing conditions which would adversely affect the performance of the measures to be installed.
- b. Structural members and building components shall be free of decay and structurally sound before weatherization Measures are installed.
- c. Personal effects stored by the customer in locations which hinder the efficient application of any weatherization measure must be moved and restoring provisions made by the customer before weatherization of that area can commence.
- d. The homeowner shall be responsible for eliminating the source of dry rot, water leaks, and insect infestation, prior to the installation of insulation.
- e. Structural changes required to install weatherization measures are beyond the scope of this program. Any work beyond the scope of the program must be separately arranged and paid for by the customer.
- f. Where aesthetic or special features inherent in weatherization products are requested by the customer, these costs shall be identified separately and paid for by the customer. Some examples of special features which are the responsibility of the customer are tinted glass, mirrored glass, decorative trim, window grids, iron scrollwork, etc. Some examples which are not special features are fire retardancy of insulation materials or use of vapor permeable building wrap (house wrap) to cover insulation in occupied unconditioned space.

6. MATERIALS

- a. Unless otherwise stipulated, the contractor shall furnish all materials, labor, tools, services, and equipment necessary for the execution and completion of all work under these specifications.
- b. All materials shall be new, and both workmanship and materials shall be of good quality. Materials damaged in shipment or in assembly shall not be used.
- c. The Utility reserves the right to identify and disapprove for use in this program, any weatherization product at any time when it deems the product unsatisfactory for the requirements of this program.

7. WORKMANSHIP AND WARRANTIES

- a. All work shall be done in a workmanlike manner, using craftsmen skilled in their trades. The contractor shall be prompt, on schedule, and complete work in the time frame agreed upon with the customer.
- b. Weatherization materials and labor, for both insulation and windows, shall be warranted by the contractor against failure due to manufacturing and installation defects for a period of at least two years. However, all sealed insulating glass units shall be warranted against failure of the seal for a period of at least five (5) years. Manufacturer's written warranties may be used by contractors to satisfy a part of this requirement where appropriate.

8. USE OF PREMISES

- a. The contractor shall confine his apparatus, the storage of materials, and the operations of his workmen to limits indicated by law, permits, ordinances, and/or directions of the customer and shall not unreasonably encumber the premises with his materials.

9. CUTTING AND PATCHING

- a. The contractor shall do all cutting, patching, or fitting on the existing structure that may be required to complete the work in a professional manner acceptable to the customer and Utility. However, the contractor shall not endanger the existing structure by cutting or otherwise altering the structure and shall not cut or alter the structure without the consent of the customer.

10. PROTECTION OF WORK AND PROPERTY

- a. The contractor shall continuously maintain adequate protection of all his work from damage and shall protect the customer's property from injury and loss arising in connection with his work. He shall work with the customer to make good any such damage, injury, or loss, in a timely manner, except such as may be caused by the customer or due to causes beyond the contractor's control and not to his fault or negligence.

11. POST-INSTALLATION PROCEDURES

- a. The contractor shall keep the premises from accumulation of waste. At the completion of the work, all waste shall be removed from the premises and along with tools, scaffolding, and surplus materials. The work area will be left "broom clean" or its equivalent.

INSULATION MATERIAL REQUIREMENTS

This section covers the requirements for the selection of materials, ventilation, and installation of thermal insulation into existing residences.

Insulation shall be installed in areas of the residence envelope that separate the conditioned living space from unconditioned or outside space (where no insulation exists or the R-value is less than that prescribed in this specification).

1. MATERIAL REQUIREMENTS

- a. The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Handbook of Fundamentals (current edition) is the accepted standard for R-value/U-factor of materials used by contractors. Products that vary from ASHRAE may be acceptable if they comply with current Federal Trade Commission (FTC) certifications, testing and labeling rules, and have independent laboratory testing which indicates the product's thermal value.
- b. Materials used for thermal insulation shall meet the requirements contained in the applicable ASTM International Specification. Certain requirements refer to voluntary standards such as ASTM for specific test methods or physical properties. For purposes of compliance with this weatherization specification, the referenced voluntary standard shall be considered mandatory.
- c. The UL label or equivalent label shall appear on every bag of loose fill cellulose material. The label shall include the file number (R-number) of the manufacturer and the issue number for labels purchased. This ensures adherence to the requirements of CPSC cellulose regulation 16 CFR 1209, which includes radiant flux, smoldering combustion, settled density, and corrosiveness.
- d. Insulation materials, including facings, must meet the ignition protection, flame spread and smoke developed requirements of the International Building Code (IBC) and local building codes.
- e. The use of insulation materials containing Urea-Formaldehyde is not allowed in this program.

INSTALLATION REQUIREMENTS FOR CEILINGS UNDER ATTIC

Insulation shall be installed according to the provisions of the International Building Code and shall include the requirements listed below.

1. PRESCRIPTIVE AIR SEALING

- a. Prescriptive Air Sealing is required before insulation is added.
 - Move insulation as necessary to find and seal all accessible gaps and penetrations between conditioned space and the attic to seal air leaks.
 - The following locations are considered “not accessible:”
 - i. Where building structure or mechanically fastened materials block access.
 - ii. Top plates located adjacent to eave line.

2. INSTRUCTIONS FOR SEALING AIR LEAKS

- a. Follow these instructions to seal air leaks:
 - Attic hatch/door: Install weatherstripping to create an effective air seal between the attic access frame and hatch/door.
 - Pull down stair cover: Install a gasket or weatherstripping between frame and door or install an airtight cover between the stairs and attic.
 - Duct penetrations: Apply mastic, caulk, or other airtight seal around the perimeter of duct boots between the boot and the ceiling.
 - Chases: Install foam, caulking, and rigid barriers to the attic floor or wall. Near heat producing devices, provide clearances to combustible materials and use fire-rated materials as appropriate.
 - Recessed cans (non-IC): Install caulk or other airtight seal between fixture and ceiling. Do not seal openings in the fixture housing. Optional: An airtight drywall box or other non-flammable air-sealed insulation box may be installed. Maintain a 3 inch clearance on all sides and above the fixture. Extend the box above the new insulation and do not cover the top with insulation.
 - Recessed cans (IC): Seal between the interior finish and the fixture. Don't seal over the fixture with spray foam or seal openings in the fixture. An airtight box or prefabricated cover is acceptable. Insulate over the fixture with fibrous insulation.
 - Bath fans: Apply foam, caulk, or other airtight seal around the fixture perimeter.
 - Bath fans w/ heater: Use fire-resistant caulk. If the opening is larger than 1 inch, span the gap with sheet metal.
 - Electrical & plumbing penetrations: Apply foam, caulk or other airtight seal around perimeter of electrical fixtures and plumbing penetrations.
 - Top plates: Seal all accessible drywall-to-top-plate connections wood-to-wood seams, and penetrations through the top plate with foam or caulk.
 - Drop soffits: Install rigid material to close off the soffit from the attic, and seal the rigid material with foam or caulk.
 - Knee wall doors: Attach weatherstripping permanently to create an effective air seal between the attic access frame and the hatch or door. Install a latch or handle if necessary.

- Floor-joist cavities under knee walls: Install rigid material between the joists; then foam or caulk the perimeter of each joist space. Alternatively, roll a fiberglass batt to fit tightly between each joist and cover with foam.
- Open wall cavities: Install foam, caulk, or rigid board at the top of balloon-framed walls and to open walls between split-level attic areas.

3. INSULATION REQUIREMENTS - CEILING

- a. Ceilings shall be insulated to a minimum of R-49 when R-11 or less is present. In the event R-49 cannot be achieved, prior approval from Tacoma Power will be required.
- b. Attic spaces with floors shall be insulated to the highest practical R-value approaching R-49. Install insulation to a consistent depth. Install one insulation depth ruler for every 300 square feet of attic area and spread throughout the attic. Depth rulers shall face the attic entrance.
- c. Walls located in attic areas (knee walls) shall be insulated to a minimum of R-11 in a 2X4 cavity and R21 in a 2X6 cavity. If installed, a vapor retarder shall be installed facing the heated space. Insulation must be covered on the unheated side with a vapor permeable air barrier material to prevent air penetration and to hold the insulation in full contact with the wall. Fasten the air barrier material so that it permanently supports the insulation.
- d. The contractor is responsible for determining that the ceiling system is structurally adequate to support the combined weight of all materials imposed on the ceiling structure. The contractor shall be responsible for ceiling damage incurred during the installation of ceiling insulation and associated work.
- e. Insulation shall not be installed within 3 inches of the sides or top of recessed lighting fixtures (CAN/POT lights), unless the fixture is labeled for direct cover by insulation (rated Type IC). A metal or other non-combustible type open topped enclosure shall be placed around non-rated IC recessed lighting fixtures to provide required clearance to the side, and to prevent loose fill material from blowing into or sloughing onto the fixture. Such enclosures shall be attached to the ceiling structure to prevent their displacement during or after application of insulation. Tops of such enclosures or dams shall extend a minimum of 4 inches vertically above the loose fill insulation.
- f. When insulation is to be installed over a non-rated IC heat producing fixture, the fixture must be protected from the insulation by a cover or enclosure that is rated for such use.
- g. Insulation shall not be introduced into recessed soffits which contain lighting, electrical devices (e.g. doorbell transformers, ventilating fans, and other motors) or flues.
- h. Fan/heater, fan/light/heater, and light/heater combinations may be covered with insulation ONLY IF they are rated "Heater" or "Air Heater" and rated Type IC.
- i. An exhaust only fan may be covered with insulation if all holes and penetrations are sealed with a nonflammable sealant.
- j. Only fluorescent fixtures with appropriate thermal protection shall be covered with insulation.
- k. All combustible insulation materials shall be kept a minimum of 2 inches from all metal flues and masonry chimneys. This can be done by installing a solid, non-combustible retaining wall extending a minimum of 4 inches above the level of loose fill insulation.
- l. Duct systems located in attic areas should have all exposed joints and connections sealed with mastic before any ceiling insulation is applied.

4. KNOB & TUBE WIRING REQUIREMENTS

- a. Knob and tube wiring shall be treated with special care. In any case where installation of insulation is being considered in areas where knob and tube wiring exists, the following conditions shall be met prior to installing the insulation:
 - The wiring shall be inspected by an appropriately licensed and bonded electrical contractor who shall certify that the wiring is in good condition with no evidence of improper over current protection, conductor insulation failure or deterioration, and with no improper connections or splices.
 - The contractor is responsible for informing the customer of the requirement to have the knob and tube inspection performed. This notification must be made to the customer at the time of bid.
 - An inspection report signed by an electrician must be provided to the utility prior to installing the insulation.
 - All knob and tube circuits shall have over-current protection in compliance with the current electrical code.
 - In the event that the insulation is installed prior to the electrical inspection, the contractor shall be liable for the cost of the electrical inspection as well as any consequential repairs needed to pass the inspection, or for the costs of removing the installed insulation.
 - The insulation shall meet Class I specifications as identified in the IBC and a flame spread factor of 25 or less as tested in accordance with current ASTM standard. Foam insulation shall not be used where knob and tube wiring exists.

5. INSTALLATION INSTRUCTIONS – CEILING INSULATION

- a. Provided all of the above conditions are met, insulation may be installed directly around and over wiring to the desired level. If batts are used, they shall be unfaced. However, a more stringent local or state code may preclude the use of the above method. It is highly advisable that the contractor check with the local jurisdiction in the service area to insure that the appropriate codes are adhered to.
- b. Install a dam around the attic hatch opening to maintain the full level of ceiling insulation to the edge of the opening and to prevent insulation from falling into the living space. Comply with the following requirements to build a dam:
 - Frame the opening with dimensional lumber, OSB, or plywood. Permanently attach the framing and extend it at least 4 inches above the final insulation level. Don't use cardboard or foam board.
 - Place a minimum of 15 inch wide insulation batt laid flat, with an R-value equal to that specified for the ceiling, tightly laid around the perimeter of the access opening. Install the dam with no gaps or voids.
- c. Attic access doors (vertical) that open to a heated space shall be insulated to at least R-13 for vertical openings.
- d. Access doors, in heated spaces, which incorporate retractable ladders or similar devices, are required to be insulated by installing an air tight mechanically fastened insulated cover with a minimum of R10 over the opening in the attic.

- e. Attic access covers and doors shall be weather-stripped with appropriate materials if they open to a heated, living space. Horizontal openings require foam-backed, self-adhering tape. Vertical openings require door weatherstripping and shall be mechanically fastened (e.g. turn knob screws). If access cover/door has damage allowing air leaks, these need to be repaired or replaced as part of the insulation requirement.
- f. Water pipe insulation located in attic areas must be insulated as part of the insulation requirement. Water pipes that will be enclosed within installed ceiling insulation are not required to be separately wrapped. See Water Pipe Insulation specification 2.f.
- g. All water shut off valves that are covered by attic insulation shall be identified using a method that allows the valve to be readily located by the customer.

6. EXHAUST FANS

- a. Exhaust fans (except kitchen range exhaust fans) which vent any living space directly into the attic space, or to an unsealed vent cap, shall be extended through to the outside and shall be mechanically attached to a vent cap. Attachment to the vent cap shall be substantially airtight. Tape shall not be acceptable for use as a fastener.
 - Extension material shall be made of metal, be mounted in a secure manner, and of appropriate diameter for the vent opening. Its configuration shall be such that no traps or reversing horizontal runs are present. Plastic/vinyl flex duct shall not be used. If plastic or vinyl flex duct is evident on an existing exhaust fan, it shall be replaced with metal ductwork. Dampened vent caps shall be installed on fans not containing dampers as part of the housing. Exhaust fan assemblies shall have only 1 damper per unit.
 - Exposed duct runs shall be wrapped with insulation at least R-4 in value.
 - Any newly installed exhaust ducts must be sized according to “Exhaust Fan Prescriptive Duct Sizing.” See Appendix 1.
- b. Kitchen hood range exhaust fans shall be connected to a duct of no less than 28 gauge galvanized steel which is substantially airtight throughout and which terminates directly to the outside in a metal vent cap with no more than a 2 foot horizontal run. Duct must be wrapped with non-combustible insulation with a minimum R-4. If existing rigid or flexible metal exhaust ducts may remain if they are free of holes and kinks and are otherwise good condition.
- c. If clothes dryers are found to be vented directly into the attic space, ceiling insulation shall not be installed until the vent is extended directly to the outside of the structure located where exhaust air will not enter the attic. The vent shall terminate in a non-screened vent cap with a damper. Extension material in excess of 6 feet must be metal with a non-ribbed interior and must be mounted in a manner that no traps or reversing horizontal runs are present. The ducting shall not exceed 25 feet and be as straight as practical. An approved flex pipe may be used for extensions of 6 feet or less. Clothes dryer vent caps shall not be screened. Ducting shall be insulated to at least an R-4.
- d. If a vapor barrier is installed with ceiling insulation, it must be placed next to the ceiling between the insulation material and the conditioned, living space. If an existing vapor barrier is not in substantial contact with the ceiling, it must be removed or re-installed in substantial contact with ceiling. A vapor barrier shall not be installed over the top of existing insulation. Slashing of existing or added vapor barriers shall not be allowed.

7. VENTILATION REQUIREMENTS

- a. The total net free ventilating area in attic spaces shall be determined to meet the following

requirements or shall be modified to meet these requirements as an integral part of any ceiling insulation installation. Vent openings shall be protected against the entrance of rain and snow. Also, the attic space shall be properly enclosed to prevent the entry of animals and insects.

- Enclosed attics shall have cross ventilation (over the top of all insulation) for each separate space provided by ventilation openings. The total net free ventilating area of these openings shall be 1 square foot per 150 square feet of attic area (1:150). If there is a 3 foot vertical distance from low to high vents, or if a vapor barrier is present, venting can be reduced to 1 square foot (net free area) per 300 square feet of attic area (1:300). In either case, 50-60% of the ventilation shall be installed as exhaust (high) and 40-50% shall be installed as intake (low).
- Alternative vent placement requests must be approved by the Utility.
- Net free ventilating area is the net effective area of a ventilator after adjusting for its gross ventilating area. Screens and/or louvers reduce net free area by as much as two-thirds. To determine the net free ventilating area of a vent, divide the gross ventilating area of the ventilator by the Area Factor in the following table:

Table 1 Area Factor Chart

Covering	Area Factor
1/4 inch hardware cloth	1.0
1/4 inch hardware cloth w/rain louvers	2.0
#8 mesh screen	1.25
#8 mesh screen w/rain louvers	2.25
#16 mesh screen	2.0
#16 mesh screen w/rain louvers	3.0
Rain louvers only	2.0

- Roof vents shall be installed with sufficient spacing between the vents so as to prevent localized circulation or short circuiting of ventilation.
 - Newly added roof vents and eave/soffit vents must have screen with spacing of no more than 1/8 inch to prevent insect access.
 - Newly installed roof vents to be counted as high venting must be located within 3 feet of the ridge.
 - Roof Jacks shall not be used to provide intake (low) ventilation unless there is no other means to provide intake ventilation.
- b. Eave or soffit vents by themselves, shall not be considered as providing adequate "cross ventilation." Additional means of establishing ventilation by natural convection shall be incorporated.
- c. Ventilation baffling shall be provided and allow a minimum 2 ½ inches measured perpendicular to the sheathing over the full ceiling joist/truss spacing for incoming air from the soffit or eave openings. A shorter distance may be used if the opening defined by the baffle, sheathing, and joist/trusses has a net free ventilating area equal to or greater than the net free ventilating area of the soffit or eave openings.
- d. Ventilation baffles shall be of weather-resistant cardboard or other approved materials. Fiberglass or Rockwool batts of sufficient thickness to adequately baffle and yet maintain the free air clearance are acceptable. All baffles must extend out over the wall top plate. Baffles shall extend above the final insulation level by 4 inches. Roof slopes may dictate that the top of the

insulation be sloped for several feet from the exterior wall line so that the baffle remains visible above the insulation level.

- e. All soffit or eave openings shall be left free of any blockage by insulation or other materials, and such eave systems must remain effective following weatherization.
- f. Sloping ceilings shall be ventilated by maintaining a minimum space of one (1) inch between the top of any insulation material and the bottom of the roof sheathing. Cross ventilation shall be provided by openings at the top and bottom of the space. Exceptions to the ventilation requirement may be allowed if approved by the local building code enforcement office.
- g. Air turbines shall not be installed on a residence to provide for required ventilation. Ventilation provided by existing air turbines may be included by calculating the net free ventilating area of the air turbine in a locked (non-rotating) position.
- h. If ventilation for the attic is supplied through an attached garage, then the net free ventilating area supplied through the garage shall be considered the smallest of either the ventilating area between the attic space and garage (attic opening) or the ventilating area between the garage and the exterior (outside). In this situation, the calculation for the total ceiling area to be ventilated shall include the garage floor area.

8. INSULATION CERTIFICATE

- a. The contractor shall post the insulation certificate and empty insulation bag with coverage chart in the attic; near the access. The contractor is also required to provide the utility with a copy of the certificate of insulation containing the following information:
 - Address of residence
 - Date of installation
 - Name and address of installing contractor
 - Existing R-value before insulation was added
 - Bag count, R-value, & type of insulation installed
 - Area (sq. ft.) of ceiling insulated

1. INSTALLATION REQUIREMENTS

- a. Roof exteriors shall be insulated to a minimum of R-24 or the highest R-value approaching R-30 which is practical.
- b. Because of the structural addition, a building permit will be required in most jurisdictions.
- c. Insulation shall not be applied to roofs which contain ventilated cavities (e.g., vaulted ceilings with ventilated spaces, attics, sloped ceilings connected to attics and/or knee wall spaces, etc.).
Ventilated cavities of flat or sloping roofs shall not be blocked.
- d. Insulation shall be in rigid board form.
- e. A vapor barrier of 1.0 perm or less shall be in place between the insulation and the roof deck. However, if insulation is already present in the roof system, then a vapor barrier shall not be installed.
- f. Roof drainage systems shall function properly after insulation is installed per code requirements.
- g. Roof coverings shall be applied directly over the insulation per code requirements.
- h. All penetrations through the roof covering and all joints between the roof covering and vertical surfaces (e.g., walls, chimneys, etc.) shall be flashed according to code requirements.
- i. The contractor shall contact the Utility and request an "in-progress" inspection by the Utility during the installation.
- j. Other methods of installing exterior roof insulation shall be approved by the Utility, in writing, prior to beginning the work.
- k. Only the costs of insulation materials, installation of the insulation, and associated furring costs shall be covered under the program. Costs associated with providing a weatherproof roof shall not be covered under this program.

1. INSTALLATION REQUIREMENTS

- a. Roof interiors shall be insulated to a minimum of R-24 or the highest R-value approaching R-30 which is practical.
- b. For interior cathedral type ceilings an "in-progress" inspection shall be requested by the contractor after the rigid board has been installed and prior to covering the insulation with a fire rated barrier to verify the insulation board is properly installed and sealed. The "in-progress" inspection shall be documented in the customer's permanent file.
- c. The fire rated barrier shall be taped at all joints and sealed at all edges to ensure air/moisture infiltration paths have been eliminated.
- d. All associated costs (e.g., painting, taping, etc.) of the fire rated barrier (e.g., sheet rock) and its installation are beyond the scope of the program and shall be covered by the homeowner.

1. PRESCRIPTIVE AIR SEALING

- a. Prescriptive Air Sealing is required before insulation is added.

2. INSTRUCTIONS FOR SEALING AIR LEAKS

- a. Follow these instructions to seal air leaks:
 - Crawlspace door: Permanently attach weatherstripping to create an effective air seal between the crawlspace hatch door and its frame. Install rigid framing material and weatherstripping if the hatch isn't supported by a frame on all 4 sides.
 - Chases: Seal with foam, caulk, or rigid moisture-resistant material to the floor or wall. Use fire rated materials at chimneys and flues.
 - Duct penetrations: Seal with mastic, caulk, or other airtight seal around perimeter of duct boots between the boot and the subfloor.
 - Plumbing/electrical Penetrations: Seal with foam or caulk. Use a rigid, moisture resistant material to span gaps larger than 1".
 - Other open cavities: Use rigid material to cover openings greater than 1". Seal rigid material to the floor with caulk.
 - Sill plate/stem wall: Seal heated basement sill plates to stem walls (where accessible) with foam or caulk.
 - Rim joists: Heated basements with exposed rim joists need to foam or caulk perimeter of each rim joist.

3. INSULATION REQUIREMENTS

- a. Floor insulation shall be a minimum of R-30 or the level needed to fill the joist cavity, whichever is less. If any insulation exists, the utility will not fund additional insulation.
- b. The insulation shall be installed in substantial contact with the underfloor.
- c. If any indication of fungal decay or insect infestation is found before or during installation of underfloor insulation, appropriate action shall be taken at the homeowner's expense before any further installation of insulation is done.

4. VENTILATION REQUIREMENTS

- a. Crawl space ventilation shall be 1:150 net free area unless the crawl space is dry, in which case 1:1500 is acceptable. Place vents as close to corners as practical, with the balance evenly distributed along the walls. Place vents on opposing walls for cross ventilation. Where adequate ventilation cannot be obtained, the contractor shall be required to contact the utility (inspector) for approval prior to installing any insulation.
- b. All newly installed crawl space vents shall be covered with ¼ inch screen. All added crawl space vents shall provide at least 50 square inches of net free area. Louvered vents designed for use

in soffits (or similar vents) shall not be used for crawl space ventilation except when requested by the customer and approved by the Utility.

- c. A ground cover moisture barrier shall be in place upon job completion. The new ground cover shall be 6 mil black polyethylene and all seams shall be overlapped 12 inches with sufficient material so that all ground surface area is covered. Ground cover shall be secured to prevent movement and shall not contact wood members of the structure. If there is an existing 4 mil black ground cover and it is in good shape, then a new ground cover would not be required.
- d. If underfloor insulation is installed over an unheated basement and the basement has no exposed soil, then the provisions for a ground cover and ventilation are not required. Any basement with exposed soil shall be treated as a crawl space and the provisions for ventilation shall be required. In addition, a ground cover shall be present which covers the entire area of exposed soil.
- e. If clothes dryers are found vented directly into the crawl space, floor insulation shall not be installed until the vent is extended directly to the outside of the structure. The vent shall terminate in a non-screened vent cap with a damper. Extension material in excess of 6 feet must be metal with a non-ribbed interior and mounted in a manner that no traps or reversing horizontal runs are present. An approved metal flex pipe may be used for extensions of 6 feet or less. Total length of ducting shall not exceed 25 feet. All exposed metal duct shall be insulated to a minimum of R-4.
- f. Downdraft kitchen exhaust fans that are vented to the crawl space shall be ducted through to the exterior of the building in accordance with local codes and the manufacturer's instructions. The vent cap shall have ¼ inch screen to prevent rodents from entering and there must be a back-draft damper in the assembly.

5. SUPPORT SYSTEMS

- a. Support of floor insulation shall be provided in accordance with the floor matrix shown in the following chart:

Spans	Support Requirements	Max Twine Spacing	Acceptable Patterns	Minimum Fastener Type
24" or less	Twine (polypropylene) or Wood Lath	18" O.C.	Straight across joists or zig zag	Corrosion resistant staples
48"	Twine (polypropylene) or Wood Lath	12" O.C.	Straight across joists or zig zag	Corrosion resistant staples
60"	Twine (polypropylene) or Wood Lath	8" O.C.	Straight across joists or zig zag	Corrosion resistant staples
72"	Twine (polypropylene) or Wood Lath	6" O.C.	Straight across joists or zig zag	Corrosion resistant staples

- b. Fasten support systems to the underside of floor joists. Joists may be skipped, but the maximum span of skipped joists cannot exceed 48 inches and the twine spacing must be 12 inches or less.
- c. Support fasteners shall have a minimum penetration depth of 5/8 inch into the joist or beam. Hand stapling isn't allowed.
- d. Support systems for floor insulation shall not compress the insulation material more than 10 percent or otherwise alter the insulation value of the material, except where necessary around the perimeter. Support systems will be allowed to compress floor insulation greater than 10 percent in those cases where an insulation batt of greater R-value is used to fill a joist cavity

which requires a batt of lesser R-value (i.e. Installation of an R-30 batt in place of R-25 in a 2 x 8 joist cavity).

- e. Support for insulation batts shall be provided within 3 inches of the end of each batt.
- f. Vapor barriers, when installed, shall have a perm rating of 1.0 or less, and shall be located between the insulation material and the conditioned living space.

6. CRAWL SPACES

- a. Crawl space access opening must be provided by the customer. Any access door adjacent to a conditioned space shall be insulated to at least R-25 for horizontal openings and to at least R-13 for vertical openings. Insulation shall be permanently attached to the access door.
- b. Crawl space access doors which are adjacent to conditioned space shall be weather-stripped with appropriate materials.
 - Crawl spaces must be properly enclosed to prevent entry of animals which may damage the insulation. Exterior access doors shall be installed in such a manner so as to prevent entry by animals. If new wood material is needed, then it shall consist of pressure treated materials.

7. WATER PIPES, UNDERFLOOR AND ENCLOSED FLOOR CAVITIES

- a. Water pipe insulation shall be part of underfloor insulation. (See [water pipe insulation specifications](#) page 19). All water shut off valves that are covered by floor insulation shall be identified with attached tags that hang below the insulation.
- b. Underfloor insulation in areas which are exposed to environmental elements (wind, rain, etc.) shall be protected after installation with a breathable cover or some type of perimeter system (e.g. skirting).
- c. Enclosed floor cavities, such as a finished ceiling over a garage, may be insulated by drilling holes a minimum of one (1) inch in diameter into the floor cavity between the joists from the underside of the floor and blowing the cavities full. When the cavities are full, plug and spackle the holes. Insulation shall not be blown more than 3 feet in any direction unless the insert tube method is used.
 - When insulating open floors above garages or unheated basements, follow standard support methods. An alternative temporary support system may be used provided the customer agrees, in writing, to cover the insulation with sheetrock or in accordance with local codes. Tacoma Power requires an in progress inspection.
 - Underfloor areas insulated with fiberglass batts subject to routine human contact shall be covered with a breathable material that inhibits the movement of insulation particles but allows water vapor to pass through. It shall have a flame spread rating of 25 or less when tested in accordance with ASTM standards.

WATER PIPE INSULATION

- a. Domestic water pipes shall be insulated whenever they are located in unheated areas (i.e. attics, crawlspaces, garages, unheated basements) and insulate accessible hot & cold pipes (up to 6 feet) connected to an electric water heater regardless of the location. Insulation shall be R3 pre-formed closed cell foam specifically designed for water pipes or flat fiberglass batts and secured every 12 inches and within 3 inches from the ends. All pipe elbows and joints must have foam insulation mitered to ensure coverage to the same thickness as straight runs. Insulation shall have a flame spread rating of 25 or less when tested in accordance with ASTM-E-84-(current). If insulation is installed on piping exposed to the weather, it shall be resistant to degradation from moisture, ultra-violet light, and extremes in temperature, or a jacket or facing shall be installed that protects the insulation from these conditions. Manufacturer's recommendation for outdoor installations shall be followed in all cases.
- b. If fiberglass batts are used, then the batts shall be at least R-7 when flat. After installation, a minimum of R-3 shall be present on any water pipes, including piping for refrigerator ice makers not enclosed within the floor insulation. The insulation shall be permanently attached to the pipe with wire, cable ties, twine, or other Utility approved methods. Waste or drain pipes are excluded from this insulation requirement. Water pipes that are protected by (enclosed within) installed floor insulation are not required to be separately wrapped.

INSTALLATION REQUIREMENTS FOR UNFINISHED WALLS

Only unfinished walls located between unheated spaces and heated living spaces shall be insulated. (For walls located within attic areas see Installation Requirements for Ceilings under Attic section).

1. INSTALLATION REQUIREMENTS

- a. Insulation shall be installed according to the provisions of the IBC and shall include the requirements listed below.
 - Walls shall be completely filled with insulation (minimum of R-13).
 - If a vapor barrier is installed it shall be installed toward the heated living area.
- b. The cost of any electrical wiring, installation, taping, and painting of sheetrock; as well as other finishing, shall be at the homeowner's expense.
- c. A fire rated cover shall be installed that meets ASTM standards. However, if the insulation is noncombustible and the facing/vapor barrier has a flame spread of 25 or less as tested in accordance with ASTM standards, then the cover required above need not be installed.

1. INSULATION REQUIREMENTS

- a. Normal application of insulation materials in walls assumes drilling through the siding and wall material. However, if the customer specifically asks that the siding be removed before drilling, the customer must pay the cost of the work over the amount covered by the Utility or the customer can remove the siding. The contractor will advise the customer in cases where, in the contractor's opinion, the siding cannot be removed without probable damage. For homes with lead paint, Lead Safe Work Practices are required.
- b. When bidding blown-in wall insulation for homes with cedar shake siding, it is advisable to include the cost for removal and replacement of all damaged shakes. Drilling holes through cedar shake siding shall not be allowed unless grooved wooden wall plugs or other methods are compatible with the grooves in the existing shakes. The customer will need to approve of any drilling through the siding before the work is started.
- c. Before drilling exterior walls, check the house structure for sections of balloon type framing (where top or bottom wall plates do not exist).
- d. A minimum of two holes per cavity in vertical spans greater than 48 inches shall be used. The lower hole shall be drilled no higher than 48 inches above the floor level and the upper hole no lower than 12 inches from the top of the wall. Recommend using a chalk line to assure the holes will be in a straight line.
- e. Insulation may be installed in wall cavities that are less than 3 1/2 inches thick.
- f. The hole diameter shall be 2 - 3 inches to access stud cavity. After drilling, probe for fire stops or other obstructions. All wall cavities shall be pressure-filled.
- g. Only non-combustible insulation per ASTM requirements shall be installed in wall cavities adjoining fireplaces and/or chimneys.
- h. Insulation shall not be installed in wall cavities which contain electric wall heaters unless fire stops are present which isolate the heater from all contact with the insulation material. Verification shall be accomplished by removal of the heater after insulation is installed or an In Progress Inspection is acceptable.
- i. Exterior wall cavities that contain water pipes may be insulated at the discretion of the contractor.

2. KNOB & TUBE WIRING REQUIREMENTS

- a. If Knob and Tube wiring is evident in the wall structure, loose-fill insulation may be installed if the wiring is inspected by an appropriately licensed and bonded electrical contractor who shall certify that the wiring is in good condition with no evidence of improper over current protection, conductor insulation failure or deterioration, and with no improper connections or splices.
- b. The contractor is responsible for informing the customer of the requirement to have the knob and tube inspection performed. This notification must be made to the customer at the time of bid, and proper arrangements made for payment of the inspection costs, which are the responsibility of the customer.

- An inspection report signed by a licensed and bonded electrician must be provided to the utility prior to installing the insulation.
 - In the event that the insulation is installed prior to the electrical inspection, the contractor shall be liable for the cost of the electrical inspection as well as any consequential repairs needed to pass the inspection, or for the costs of removing the installed insulation.
 - The insulation shall meet Class I specifications as identified in the IRC, with a flame spread factor of 25 or less as tested in accordance with ASTM standards. Foam insulation shall not be used where knob and tube wiring exists unless approved by the local building official.
 - All knob and tube circuits shall have over current protection in compliance with the National Electrical Code. Over current protection shall be either circuit breakers or type S fuses not greater than 15 amperes (or as certified as a safe ampacity, on the inspection certificate signed by the inspecting electrical contractor).
- c. All holes drilled through walls shall be plugged. Use only wooden plugs which have been recessed and finished with a spackling compound flush with the exterior surface of the siding. In no case shall silicone sealants be used when installing wall plugs. Interior texture finish and all painting are the responsibility of the homeowner.

3. WALL PLUGS, OUTLETS & SWITCH BOXES

- a. After installation, wall plugs must provide a weatherproof seal and shall remain in place for the expected life of the installed insulation.
- b. All electrical wall outlets and switch boxes shall be clear of any insulation material.

4. INSULATION CERTIFICATE

- a. The contractor shall be required to provide the homeowner and utility with a certificate of insulation containing the following information:
 - Address of residence
 - Date of installation
 - Name and address of installing contractor
 - Bag count, R-value, & type of insulation installed
 - Area (sq. ft.) of walls insulated

This section covers the requirements for the selection of window types, construction of windows, and installation of the various window types.

1. GENERAL REQUIREMENTS

- a. Windows on exterior walls adjacent to the outdoors are eligible for replacement. Windows located between the heated space and buffered areas such as garages and unconditioned rooms, are not eligible for program incentives.
- b. New window selection does not allow for Garden style windows and Bay/Bow style windows for installation where none exist.
- c. A building permit will be required in most jurisdictions.

2. GENERAL MATERIAL REQUIREMENTS

- a. Only window types that are National Fenestration Rating Council (NFRC) certified products shall be acceptable for installation under program and have a label attached to the window which indicates the manufacturer, model name, and/or number of the window.
- b. The weighted average of all windows installed shall have a NFRC rated U-value of .30 or lower. All sliding glass doors shall have a NFRC rated U-value of .35 or lower.
- c. Materials damaged in shipment or during installation shall not be used.

3. GENERAL INSTALLATION REQUIREMENTS FOR WINDOW PRODUCTS

- a. Contractor shall insure a weatherproof installation by sealing the structural frame to the window and seal surrounding gaps and cracks.
 - Frame: Install caulk or low-expansion foam between window frame and rough opening. Install backer rod and caulk or non-expanding foam where the gap is greater than 3/8”.
 - Exposed framing components: caulk at exposed wood-to-wood framing cracks; remove sash weights, if applicable, and seal and insulate weight channels.
- b. Cover gaps over 3/8 inch between exterior siding and the window with solid trim material (with owner's consent).
- c. Installations shall not increase the existing rough opening area, except to allow for emergency egress required by code.
- d. After installation, units shall operate properly and smoothly. Hardware shall be durable, function properly, and not create interference.
- e. Any damage caused by contractor to window liners, sills, surrounds, walls or exterior siding shall be repaired by the contractor to pre-installation conditions, unless a prior agreement between the contractor and customer has been arranged.
- f. Safety Glass shall be used where codes require it.
- g. Special consideration is required by code for windows located more than 72 inches above the exterior surface below and have openings where children could crawl out.
- h. No windows shall have exposed burrs, sharp corners or other potential hazardous conditions that could be encountered by the customer during normal use.

- i. All operable windows shall be of sufficient combinations of glass/slider-frame rigidity to prevent bowing after installation.
- j. Sliding glass doors require a solid threshold support from the inside edge of the threshold to a minimum of 1/2" inch of the outside edge. The threshold shall not bow, sag, or distort under normal use conditions.
- k. Pressure/friction controlled sliders shall effectively prevent "free fall".
- l. Security locking mechanisms are required on all prime window replacements. Secondary latches are not required.
- m. Screens are required on all operable windows.
- n. Any bare wood, whether exposed or added, shall be treated with a sealer to prevent future swelling or warping.

INSTALLATION REQUIREMENTS FOR PRIME WINDOW REPLACEMENT

Prime window replacements shall meet the general material and installation requirements for all window types as noted in this specification manual.

1. INSTALLATION OF REPLACEMENT WINDOWS WITH NAILING FLANGE REMOVED

- a. For replacement windows being installed with the nailing flange removed, flashing shall be installed along the top edge of all windows that are not protected by a porch roof, soffit overhang, or eave overhang extending at least 12 inches beyond the header and within 25 inches above the window. Flashing shall overhang the window frame a minimum of 1/4 inch and maximum of 1/2 inch to ensure water runoff. The flashing shall be caulked between the flashing and siding and the flashing and window frame. Alternative methods of flashing, or in lieu of, may be used only if approved by the Utility (in writing) prior to installation.
- b. Replacement window shall be attached with at least #8 pan-head screws through the jamb, perpendicular (90 degrees) to the window track. All screw holes shall be pre-drilled one size larger than the screw being installed, particularly in vinyl extrusion material. Drywall/Sheetrock or any "bugle head" type screws shall not be used in vinyl or flanges. Jamb clips may be used as an alternate method.
- c. Wood sash window replacement shall be installed by one of the following methods: 1) Windows shall be wood stopped in place on each rail of the window with full length stops. Or 2) Windows shall be installed with #8 pan-head screws applied through the replacement window frame directly into the existing wood frame. Sill expanders may be used as part of the installation.
- d. When fastening the window to the jamb, the screws shall be snug but not to cause deflection of the profile (in particular when installing vinyl windows). Do not use nails, or install screws at a 45 degree angle in vinyl or aluminum frame/extrusion to pull the window into the rough opening.
- e. Screws shall not be introduced into the exterior sill extrusion from the top down. It is however, permissible to penetrate the sill extrusion from the lower (bottom) side, provided that the screw used does not penetrate the upper surface of the sill.
- f. Screws shall be installed within four (4) inches of the frame corners with screws spaced evenly along the frames vertical length every 12 inches.
- g. All screw penetrations through extrusions shall be sealed to prevent any water leakage.
- h. The exterior replacement window frame shall not overhang the exterior siding of the structure more than one inch. All screws shall penetrate the wood framing members of the structure to a minimum depth of 1/2 inch. Screws attached only through the siding or screws installed at an angle to penetrate the structure framing member shall not be allowed.
- i. Caulking shall be installed around the interior blind stop prior to inserting the window into the rough opening.
- j. Caulking around the perimeter of the replacement window frames shall adhere to both the frame material as well as the siding and/or trim material. Caulking shall be paintable and have a minimum product life of 15 years, and not shrink or "pull away" from the surfaces to which it is applied.
- k. Any gaps of 3/8 inch or more between the rough opening and the window frame shall be filled with either backer rod, or non-expanding foam before trim work or caulking is installed.

- I. When installing stucco style windows where the existing window frames are left intact. The original window frame shall have the old caulking removed and new caulking applied prior to installing the stucco window. Before the interior trim cap is installed, the gap between the stucco window and the rough opening shall be filled with non-expanding foam or backer rod.

2. INSTALLATION OF REPLACEMENT WINDOWS WITH NAILING FLANGE INTACT

- a. When installing windows using the nailing flange, install polyurethane (or equivalent) caulking between the nailing flange and the rough opening. Nail or screw the windows in place in strict accordance with the manufacturers recommended installation instructions. Sufficient nails or screws shall be used to hold the windows in place without the aid of the trim's support. Drywall/Sheetrock or any "bugle head" type screws shall not be used in vinyl extrusions or flanges.
- b. When using "build-out" material to fill the gap between the nailing flange and the sheathing, the "build-out" material shall be of one piece construction and shall fill the cavity in its entirety. Fasteners through the nail flange shall penetrate beyond the sheathing not less than 1 ½ inches.
- c. Windows shall be fully supported to at least one (1) inch of the exterior vertical edge of the window frame.

3. GLAZING COMPOUNDS, SEALANTS AND GASKETS

- a. Glazing compounds, sealants, and gaskets shall be installed with a slope so as to ensure water run-off. Such compounds shall not contact the seal of the sealed insulating unit or the material used shall be shown to be chemically compatible with the seal of the sealed insulating unit.

4. CAULKING

- a. Caulking around the perimeter of replacement frames must adhere to both the frame material as well as the siding and/or trim material. Caulking shall be paintable, shall have a minimum product life of 15 years, and shall not shrink or "pull away" from the surfaces to which it is applied.
- b. Setting blocks shall be installed at quarter points or as specified in the manufacturer's installation instructions.

5. FINAL STEP

- a. The final step of the installation process shall be the cleaning all glass (inside and out) on the installed window or sliding glass door.

APPENDIX 1: EXHAUST FAN PRESCRIPTIVE DUCT SIZING TABLE

Use the tables below to size new exhaust fan ducts correctly.

NL: No limit
 X: Not Allowed

Tables assume no elbows. Deduct 15ft. from allowable duct length for each elbow.

Rated Fan CFM

	50	80	100	125	150	200	250	300
Duct Diameter	Smooth Hard Duct – Maximum Duct Length in Feet							
3"	5	X	X	X	X	X	X	X
4"	114	31	10	X	X	X	X	X
5"	NL	152	91	51	28	X	X	X
6"	NL	NL	NL	168	112	53	25	9

	Rated Fan CFM							
	50	80	100	125	150	200	250	300
Duct Diameter	HVAC Flex Duct – Maximum Duct Length in Feet							
3"	X	X	X	X	X	X	X	X
4"	56	4	X	X	X	X	X	X
5"	NL	81	42	16	2	X	X	X
6"	NL	NL	158	91	55	18	1	X