

WYOMING COMMUNITY DEVELOPMENT AUTHORITY

REHABILITATION STANDARDS FOR HOUSING REHABILITATION

Introduction

This Guideline is designed to help evaluate the rehabilitation potential of small residential structures that are funded with NSP (Neighborhood Stabilization Program) funds. It may be used by contractors, builders, realtors, home inspectors, and others with a basic knowledge of building construction.

When used in conjunction with the local building code, the guideline can assist in identifying unsafe or hazardous conditions and uncovering functional deficiencies that should be corrected.

Housing that is rehabilitated with federal funds through WCDA must meet all applicable codes, rehabilitation standards, ordinances, and zoning ordinances at the time of completion of the rehabilitation. In the absence of a local code for rehabilitation, the housing must meet state and national building codes.

Preparing for the Inspection

Each property will be evaluated in regard to the following:

- Zoning, setback, height, and building coverage requirements, grandfathered uses and conditions, Homeowner's Association By-laws, Covenants, proffers, liens and applicable fire regulations.
- Year Built
- Seismic Zone
- Site within or partially within a 100 year flood plain?
- Above Ground Storage Tanks visible from site?
- Near a hazardous waste site?
- Noise Determination
 - ✓ 1000 feet of a major roadway
 - ✓ 3000 feet of a railroad
 - ✓ 5 miles of a commercial service airport
 - ✓ 15 miles of a military airfield
- Airport Clear Zones (civil or military)
- Within ¼ mile of a property on or eligible for the National Register of Historic Places?

Every housing project rehabilitated with federal funds through WCDA must first address the items categorized under Level 1 – Health, Safety and Energy before addressing items that fall under Levels 2, 3 & 4. Each items categorized under Level 2 must be meet before addressing items that fall under Level 3 & 4 and so on.

Level 1 – Health, Safety and Energy

1. Code Violations
2. Electrical
3. Plumbing
4. Foundation Repairs
5. Painting – Exterior
6. Painting – Interior

7. Roofing, Gutters, Downspouts and Extensions
8. Fire Safety – smoke detectors, fire escape, etc.
9. Handrails, stairs and Landings
10. Windows and Doors
11. Removal or Repair of Accessory Structures
12. Health & Safety Issues
13. Radon and Termite Inspections
14. Energy Requirements
 - a. Insulation
 - b. Storm Doors
 - c. Storm Windows
 - d. Caulking and weather-stripping
 - e. Heating
 - f. Other
15. Other

Level 2- Upgrading of Essential Mechanical and Structural Systems to Extend Useful Life

1. Foundation Repair
2. City Code Corrections to Electrical and Plumbing
3. Incipient Repairs to roof, water heater, heating system (repairs that don't have to be done now but will need to be completed in the next 5 years)
4. Upgrading of kitchen storage, stove and refrigerator
5. Flooring
6. Exterior Drainage
 - a. Ground Drainage – away from house

Level 3- Rehabilitation Items allowed under specific circumstances.

1. Fencing (safety)
2. Shower / Tub Additions (elderly, disabled)
3. New Siding (un-repairable or energy insulation)
4. Repair of Garage Door (if inoperable)
5. Accessibility Needs
6. Ingress/Egress Requirements

Level 4- General Property Improvements (items that extend useful life and upgrade livability of the property but are not luxury items.)

1. Landscaping
2. Kitchen Upgrading
3. Fencing

PERFORMING THE INSPECTION

Lead

Lead. For all homes built prior to 1978, have a qualified professional conduct a lead based paint inspection and risk assessment. Follow the Environmental Protection Agency's (EPA) lead based paint abatement regulations.

Asbestos

Asbestos. A certified environmental professional should perform the inspection and make the decision whether to enclose, coat, encapsulate or remove deteriorated asbestos containing products. Follow the EPA regulations.

Site

Drainage

Ground Drainage. Observe the drainage pattern of the entire property, as well as that of adjacent properties. The ground should slope away from all sides of the building. The ground should also slope away from window wells, outside basement stairs, and other walkways. Bring the ground up to a slope if it is not draining away from these items.

Downspout Drainage. Because downspouts create concentrated sources of water in the landscape, where they discharge is important. Downspouts should not discharge where water will flow directly on or over a walk, drive, or stairs. The downspouts on a hillside building should discharge on the downhill side of the building. Move the downspouts or install extensions if they discharge in these areas.

Site Improvements

Plantings. Remove any plantings that trap water and edging around planting beds. Note the location and condition of all trees and shrubbery. Those that are overgrown may need pruning or trimming; in some cases they may be so overgrown that they will have to be removed. Have trees or shrubbery that exhibit disease or infestation removed.

Trees. Check where overhanging branches may interfere with the chimney's draft, damage utility wires, or deposit leaves and twigs in roof gutters and drains. Trees and shrubbery that are very close to exterior walls or roofs can cause damage that is sometimes severe, and they can make it difficult to make inspections, do maintenance, and make repairs. Branches in these locations will need to be pruned back.

Cut back any tree roots exposed near the surface. If tree roots are under a footing, cutting down the tree can lead to rotting of the roots and subsequent settling of the foundation.

Lighting. Examine outdoor lighting elements to determine their condition and functional safety. Turn site lighting on, preferably at night, to check its operation and to determine if the light is adequate for its purpose. Replace any inadequate or nonfunctional lighting.

Exposed wiring that is not UV and moisture resistant should be replaced. Underground wiring should be type UF. Replace any fixtures, switches, and outlets that are not protected from moisture penetration.

Aerial Utility. Inspect the electrical service between the street and the main panel board. Follow the electrical guidelines on page 11.

Paved areas. Asphalt, such as driveways or patios, that are not sloped to drain water away from a building should be replaced or removed and area repaired to eliminate negative drainage. Replace any asphalt that has cracks, broken sections, high areas, low areas that trap water, and tripping hazards.

Failed or sunken areas of asphalt drives and walks should be resurfaced or replaced. Check asphalt drives and walks for low areas that hold water and freeze in cold climates. Low areas in asphalt paving should be brought to level with an asphalt overlay.

Concrete areas. Concrete areas; such as sidewalks, stoops, driveways, and walkways; that are not sloped to drain water away from a building should be replaced or removed and area repaired to eliminate negative drainage. Concrete should not be repaired by resurfacing with a thin layer of more concrete.

Concrete cracks greater than one inch thick: Remove and replace entire section.

Concrete cracks smaller than one inch thick: Cut open and seal with flexible sealant compound.

Where there is a difference in elevation in a walk or drive that creates a tripping hazard, the higher portion of concrete may be ground down to the level of the lower portion.

Brick or stone patio. Reset loose bricks or stones in a new mortar bed.

Uneven patio stones set in sand should be taken up, sand added or removed, and the pavers replaced.

Curbs and sidewalks. The maintenance, repair, and replacement of sidewalks, drive aprons, and curb cuts at the street may be the responsibility of the local jurisdiction. Check the property's deed or consult local authorities.

Stairs. Inspect the condition of exterior stairs and railings using the current building code as a guide. Every stair with more than three steps should have a handrail located 34 to 38 inches above the edges of the stair tread. Shake all railings vigorously to check their stability and inspect their fastenings. Stairs that are more than 30 inches above the adjacent grade and walks located more than 30 inches above the grade immediately below should have guards not less than 36 inches high and intermediate rails that will not allow the passage of a sphere 4 inches in diameter. Check wooden steps for proper support and strength and for rot and insect infestation. Inspect steel stairs for rust, strength, and attachment. Deteriorated stairs should be repaired or replaced. Stair treads should be as level as possible without holding water. It is preferable that stairs in walks on site that are accessible to the general public have at least three risers. Stair riser heights and tread depths should be respectively uniform.

Retaining walls. Inspect the construction and condition of retaining walls. Retaining walls more than two feet in height should be backed with drainage material, such as gravel. There should be drains at the bottom of the drainage material. The drains should discharge water either at the end of the wall or through pipes set in the wall itself. Check for bowing (vertical bulges), sweeping (horizontal bulges), and cracking in retaining walls that can be caused by water pressure and insufficient drainage. Failure to drain should be remedied by excavating behind the wall, replacing the drainage material and damaged drainage piping, and backfilling. Significant failure of any kind usually requires rebuilding or replacing all or part of a wall. Failing retaining walls more than two feet in height should be inspected by a structural engineer.

Outbuildings Examine detached garages, storage sheds, and other outbuildings for their condition in the same way that the primary building is inspected. Check also that all doors function properly and that doors and windows provide adequate weather protection and security for the building. Repair or replace all doors and windows that do not provide adequate weather protection or security. Make sure that small outbuildings have sufficient structural strength to sustain the applicable wind loads or seismic forces. Demo any outbuilding that does not have sufficient structural strength.

Building Exterior

Foundation Walls and Piers Foundation walls, including block foundation walls, and piers should be inspected for cracking, deterioration, moisture penetration, and structural adequacy. Repair any minor cracks. If there is significant cracking and failing, have a professional structural engineer inspect the property and perform their recommendations.

Exterior wood elements. Inspect all painted surfaces for peeling, chipping, blistering, and checking. If more than 15% of the wood needs replaced, apply new siding material. If less than 15% of the wood needs replaced, scrape and touch up the areas that are peeling or chipping in accordance with Lead Based Paint Standards if built prior to 1978.

Aluminum and vinyl siding. Check for loose, bent, cracked or broken pieces. Inspect all caulked joints, particularly around window and door trim. If 15% or more of the siding need repaired or replaced, apply new siding to the entire house. If less than 15% of the siding needs repaired or replaced, repair or replace those areas and match the color as closely as possible to the existing color.

Stucco. Check stucco for cracks, crumbling sections, and areas of water infiltration. It is difficult to match the color of stucco repairs to the original stucco, so plan to repaint entire stucco area if repair is needed. If the repairs are less than 3 sf, try to blend/feather the paint. Try to feather and blend the paint for small repairs less than 3 sf.

Brick or stone veneers. Inspect veneers for cracking, mortar deterioration, and spalling. Replace any missing brick or stone. Repair all cracks with mortar of the same type as existing.

Exterior insulation and finish systems (EIFS). Where mildew and mold are evident on exterior cladding or where interior walls are damp, there is the possibility that condensation is occurring in the walls. Use a trained specialist to check for concealed water damage and rot. Refer to their recommendation.

Exterior Windows and Doors

Exterior doors should be examined for their condition, overall operation and fit, and for the functionality of their hardware. Replace any missing weather stripping. If the door is damaged or non-operational install a new exterior door with a 1-5/8" solid core, exterior fiberglass door. Install entrance lock set, and mortised dead bolt keyed alike. Include three 3"x4" butt hinges, interlocking threshold, and weather stripping.

Windows should be examined for their condition, overall operation and fit, and for the functionality of their hardware. Replace any missing weather stripping. Remove and replace any deteriorated weather stripping. Replace any broken panes of glass. If the window is damaged beyond repair, not weather tight,

or non-operational without repair install a new energy efficient double glazed window and jamb including screen, caulk, interior casing and exterior trim. Replace any missing screens.

Garage doors should be examined for operation, weather tightness, overall condition, and fit. Replace any broken panes of glass. Replace any missing weather stripping. If the garage door is damaged beyond repair install a steel overhead door with insulation.

Deck, Porches should be plumb and stable. Make sure that structural connections to the building are secure and protected against corrosion or decay. Inspect the condition of all exterior stairs and railings. Every stair with more than three steps should have a handrail located 34 to 38 inches above the edges of the stair tread. Shake all railings vigorously to check their stability, and inspect their fastenings. Check wooden steps for proper support and strength and for rot and insect infestation. Inspect steel stairs for rust, strength, and attachment. Deteriorated stairs should be repaired or replaced.

Roofing

Asphalt shingles. Replace any missing or torn shingles. Replace the entire roof if it is leaking. If the roof is not leaking but the granular covering is coming off and/or they are starting to curl or crack consult a roofing contractor. If he/she suggests the roof has less than 5 years remaining, replace the entire roof. When installing a new roof remove the existing roof down to the sheathing and replace all defective sheathing. Use new architectural asphalt shingles with at least a 30 year warranty. The underlayment should be at least a single layer of 15-pound asphalt saturated felt.

No asphalt shingle roof should be less steep than 3 in 12. Replace low-slope roofs with at least two felt layers. If ice dam flashing at overhanging eaves is needed or present, make sure it extends three feet beyond the plane of the interior face of the exterior wall below for a low-slope roof and two feet for a normal-slope roof.

Wood shingles or shakes Replace the entire roof when more than one quarter of the shingles show signs of deterioration or are loose. When replacing wood shingles replace with new architectural asphalt shingles with at least a 30 year warranty.

Metal roofing. Inspect metal roofs for signs of rusting or pitting, corrosion due to galvanic action, and loose, open, or leaking seams and joints. If more than one quarter of the roof shows signs of deterioration replace the entire roof with new metal roofing and trim with at least a 50 year warranty.

Gutters and Downspouts

If the roof has no gutters and downspouts install new gutters to roof. Seal all leaks with mastic. Hangers should be placed no more than 18 inches apart. Wherever a gutter is exposed, check the strength of its fastening to the roof fascia or building exterior. Rusted fasteners, rusted and deteriorated gutters and missing hangers should be replaced.

Downspouts should be checked for size. Seven square inches is generally the minimum except for small roofs or canopies. Check downspout attachments; there should be attachments or straps at the top, at the bottom, and at each intermediate joint. Check straps for rust, deformation, and failed or loose fasteners. Check the capacity of the drainage system. At least one downspout is usually needed for each 40 feet of gutter. For roofs with gutters, make sure that downspouts are clear and that they discharge so water will drain away from the foundation. If the roof has no downspouts or they are deteriorated install new downspouts.

Chimneys

Chimneys should project at least two feet above the highest part of a pitched roof and anything else that is within 10 feet. A chimney should project at least three feet from its penetration from the roof (required minimum heights may vary slightly). Flues should not be smaller in size than the discharge of the appliance they serve. The minimum flue area for a chimney connected to a fireplace is normally 50 square inches for round linings, 64 square inches for rectangular linings, and 100 square inches for an unlined chimney. Flues should extend a minimum of four inches above the top of a masonry chimney.

If a masonry chimney is not in use and more than 25% of the brick is deteriorated, remove the chimney to at least 6" below the roof line. Install a permanent cap on remaining portion of chimney. Resheet the hole where chimney is removed with 1/2" CDX plywood. Finish using roofing materials to match existing as closely as possible.

If less than 25% of the chimney is deteriorated, repair the existing chimney

Basement or Crawl Space

Crawl Space Ventilation. Check the ventilation. By measurement and calculation, compare the free area of vents with the plan area of the crawl space. The free vent area to crawl space area ratio should conform to the current International Residential Code or local building code.

Termites. Inspect all foundation walls, piers, columns, joists, beams, and sill plates for signs of termites and other wood inhabiting insects. Have a professional conduct a termite inspection and complete his/her recommended repairs.

Radon. Have a professional conduct a radon inspection and complete his/her recommended repairs.

Thermal Insulation. Add insulation, if missing, in basements and crawl spaces according to the local, state and national building code. Add additional insulation if the existing amount does not meet all local, state, and national building codes.

Structural, electrical, plumbing and HVAC systems. Inspect the following items in the crawl space:

- Locate main support columns and posts, major beams and bearing walls. Foundation walls, including block foundation walls, and piers should be inspected for cracking, deterioration, moisture penetration, and structural adequacy. Repair any minor cracks. If there is significant cracking and/or failing, have a professional structural engineer inspect the property and perform their recommendations.
- If the electrical panel box is in the basement, inspect how the branch circuits are distributed and the type of wiring used. Follow the electrical guidelines on page 11.
- Inspect the path of the main water supply line and check all piping materials. Follow the plumbing guidelines on page 13.
- Inspect the HVAC distribution system, including the ductwork, and follow the guidelines on page 14.

Building Interior

In addition to all interior items below, inspect the plumbing, electrical and HVAC.

Walls and ceilings. Ignoring cosmetic imperfections, look for cracks and peeling paint or wallpaper. Repair cracks with paintable sealant. Repaint walls that are cracking and peeling after sealing the cracks and determining the cause of the cracks.

Exterior walls. Try to determine if the walls are insulated. Add insulation if missing

Wall Paneling. Securely reattach any paneled walls. If more than 25% of the paneled wall is not attached remove paneling and install, hang, tape and texture 1/2" drywall if it is missing.

Suspended Ceilings. If suspended ceiling panels are damaged or discolored, remove panels and grid and hang, tape and texture 1/2" drywall.

Drywall. Repair any holes cracks, nail popping, deteriorated or damaged corner beads in drywall.

For drywall repairs larger than 6" cut back defective gypsum to expose half of the studs on each side of the hole. Cut and tightly fit drywall patch.

For drywall repairs smaller than 6" clean out and expand hole to allow the insertion of a 1/2" gypsum backer board coated with construction adhesive. Screw through drywall face to secure.

Plaster. Replaster or repair all damaged, cracked, loose, or bulging plaster by cutting back damaged plaster. If more than 1/4 of the wall is to be disturbed, remove entire plaster surface and replace with 1/2" drywall.

Floors. Replace any flooring that is a tripping hazard, stained, worn out or contaminated. Replace any carpet that is over twenty years old. If the flooring is to be replaced, check that the underlayment is in good condition, if not replace it.

Interior doors Check door and hardware for finish, wear, and proper functioning. If the door is not damaged make any repairs for proper functioning. If the door is damaged install a hollow core masonite door. Include lockset and hinges.

Outlets and Lighting. Replace any missing, damaged, or unsafe receptacles and switches. Repair or replace light fixtures that are not securely attached, non-functional, inadequate or missing shades.

Egress. Every sleeping room and habitable basement room should have at least one operable window or exterior door for emergency egress or rescue. Check with the local building authority if an egress window needs installed in an existing window.

Closets. Inspect all closets for condition and usability. It is best that they have a clear depth of at least 24 inches. Check all shelving and hanging rods for adequate bracing. Repair or replace any items that are damaged or unsecure.

Trim and finishes. Examine baseboards, sills, moldings, cornices, and other trim. Replace any missing or damaged sections or pieces. Replacement trim may no longer be readily obtainable, so determine if trim can be salvaged from more obscure locations in the building.

HVAC. Inspect the heat source for each room and make sure it is functioning. Replace any damaged or missing registers or grills. Clean out all debris from ductwork. Follow HVAC guidelines on page 14.

Fireplaces. Repair or replace the fireplace if it is deteriorated or damaged. Repair any inoperable dampers. Repair or replace all items, including flues and pipe connections, that do not meet local, state and national building codes.

Bathrooms

Examine bathrooms in accordance with the procedures for other interior rooms, and additionally inspect:

Electrical service. Wherever possible, switches and outlets should not be within arm's reach of the tub or shower, if they are have them moved. Install ground fault interrupters (GFI) in the outlets if there are none.

Ceramic tile. Look for damaged or missing tiles, or tiles that have been scratched, pitted, or dulled by improper cleaning. Check the condition of all grouted and caulked joints. If a portion of the tile is defective or missing, all tile may have to be replaced since finding additional tiles of matching size, color, and texture may be impossible.

Ventilation. The bathroom should be ventilated by a window, an exhaust fan, or a recirculation fan. If there is an exhaust fan, check its operation. It should be properly ducted to an attic vent or the building's exterior.

Plumbing. Examine all exposed plumbing parts for leaking or signs of trouble or deterioration. Inspect the lavatory for secure attachment and support. Check the operation of all fixtures any leaking faucets that cannot be repaired or nonoperational fixtures should be replaced with a metal bodied, dual control faucet with a 15 year drip-free warranty. Include shut-off valve. Replace trap if required to complete installation. Repair or replace any caulking around the tub or sink.

Tub/Shower Enclosures. Replace any surround that is damaged, loose, or contaminated. Repair any chips if possible. Recaulk any deteriorated or cracked caulking.

Tubs. Repair any chips if possible. Recaulk any deteriorated or cracked caulking. Repair or replace any damaged, leaking, or cracking tubs.

Toilets. Repair or replace any damaged, leaking, cracking or nonfunctional toilets.

Kitchens

Examine kitchens in accordance with the inspection procedures for other interior rooms, and additionally inspect:

Counters and cabinetry. Check countertops for cracks or food traps and examine kitchen cabinets carefully for signs of vermin infestation. Look for missing, broken, or damaged hardware and cabinet parts. Check doors and drawers for fit and smooth operation, and wall cabinets for secure attachment. If the cost of replacement is less than the cost of reconditioning the countertop or cabinets then replace them.

Electrical service. A ground fault interrupter (GFI) of at least one 20 amp/120 volt circuit in all outlets over a countertop used for portable kitchen appliances. Separate circuits are also required for each major appliance as follows: Refrigerator 20 amp/120 volt, Dishwasher 20 amp/120 volt, Garbage 20 amp/120 volt disposal, Range 40 to 50 amp/ 240 volt. Follow electrical guidelines on page 11.

Ventilation. See that exhaust fans and range hoods are ducted to the outside and not to a cupboard, attic, crawl space, or wall. If they are not ducted to the outside, vent them so they are. A recirculation range hood fan is acceptable. Check the filter medium. Ducts, hoods, and filters should be free of grease buildup.

Plumbing. Examine all exposed plumbing parts for leaking or signs of trouble or deterioration. Inspect the sink for secure attachment and support. Check the operation of all fixtures any leaking faucets that cannot be repaired or nonoperational fixtures should be replaced with a pull out, single lever, metal bodied faucet with 15 year drip-free guarantee and maximum flow of 2 gallons per minute.

Appliances. Replace any nonoperational appliances with energy efficient appliances if available. Appliances must be permanently affixed to the house. No clothes washers and dryers, swamp coolers, etc.

Storage Spaces

Storage Spaces. Inspect all closets and other storage spaces for cleanliness, functionality and proper lighting.

Stairs and Hallways

Stair handrails and guardrails. Replace a missing or damaged handrail with new handrail on stairs with three or more risers. Repair or replace any missing or unstable guardrails. Guardrails are required on open sides of stairways and should have intermediate rails that will not allow the passage of an object 4 inches in diameter. Shake all railings vigorously to check their stability and inspect their fastenings. Check that all treads are level and secure. Riser heights and tread depths should be, respectively, as uniform as possible. As a guide, stairs in new residential buildings must have a maximum riser of 7-3/4 inches and a minimum tread of 10 inches. Inspect the condition and fastening of all stair coverings. Reattach any stair covering that is loose.

Stair width and clearance. Check that all stairs are structurally sound. Stairs should normally have a minimum headroom of 6'-8" and width of 3'-0".

Lighting. Repair or replace any nonfunctional or missing light fixtures. Stairs and hallways should have 3 way light controls.

Smoke Detectors. Repair or replace any nonfunctional or missing smoke detectors. They should be located at the head of the stairs or in the hallways.

Laundry Rooms

Laundries. Repair any venting that does not exhaust to the outside, clogged or restricted.

Water lines. Follow plumbing guidelines on page 12.

Attic

Roof Leaks. Look for signs of water leakage from the attic and try to locate the source. Follow the roof guidelines on page 6.

Attic Ventilation. Install additional venting if the existing ventilation does not meet local, state and national codes. If additional vents cannot be added economically, consider adding mechanical ventilation. Install new bird screen that is in poor condition. Remove debris from vent openings.

Insulation. Check the local, state and national building codes for thermal resistance and add additional to meet those requirements.

Exhaust ducts and plumbing stacks. Repair or replace any damaged or broken ducts and stacks.

Electrical System

This assessment should be conducted only by a qualified electrician who is experienced in residential electrical work.

All work must meet the requirements of the current City, County, State and National Electric Code.

Main Panel board

Condition. Repair any unsecure covers. Repair or replace any damaged panel boards.

Amperage rating. The amperage rating of the main disconnect should not be higher than the amperage capacity of the service entrance conductor or the panel board. If the rating is higher (indicating unapproved work has been done), more branch circuits may be connected to it than the service entrance conductor is capable of supplying and it needs replacement.

Voltage rating. The voltage rating of the panel board (as marked on the manufacturer's data plate) should match the voltage of the incoming electrical service. If not replace it.

Grounding. Verify that the panel board is properly grounded. Its grounding conductor should run to an exterior grounding electrode or be clamped to the metal water service inlet pipe between the exterior wall and the water meter. If it is attached on the house side of the meter, the meter should be jumpered to ensure proper electrical continuity to the earth. Make sure that the ground conductor is securely and properly clamped to the pipe often it is not, and occasionally it is disconnected altogether. Ensure also that the grounding conductor is not attached to a natural gas pipe, to an inactive pipe that may be cut off on the exterior side of the wall, or to a pipe that is connected to a plastic water service entry line. If the grounding conductor is attached to an exterior grounding electrode driven into the earth, verify that the electrode is installed in accordance with local code. Many older buildings will have the ground connected to the cold water pipe.

If this is the case and the building needs to conform to the current code, an alternate ground is required.

Overcurrent protection. Check the rating of the fuse or circuit breaker for each branch circuit. The amperage of the fuse or circuit breaker should not exceed the capacity of the wiring in the branch circuit it protects. Most household circuits use #14 copper wire, which should have 15 amp protection. There may be one or more circuits with #12 cop-per wire, which should have 20 amp protection. Large appliances,

such as electric water heaters and central air conditioners, may require 30 amp service, which is normally supplied by #10 copper wire. If there is an electric range, it would require a 40 or 50 amp service with #6 copper wire. Central air conditioning equipment will have an overcurrent protection requirement on the nameplate. Aluminum wire must be one size larger than copper wire in each case (e.g., #14 to #12), but it should not be used for 15 and 20 amp circuits.

Overhead Wires. Reattach any wires that are not securely attached to the house. Raise any wires that are lower than 10 feet above the ground. Cut back all tree branches or other items that are in close contact with overhead wires. Spliced connections at the service entrance should be wrapped and bare wires from the street should be replaced by the Utility Company.

Electric Meter. Advise the utility company if the meter is non functional, tampered with, unsecure or other concerns.

Service Entrance Conductor. Repair any splices or insulation. When replacing an overhead service entry, have it replaced with an underground service entry.

Branch Circuits. Replace any knob and tube wiring with new wiring that meets the City, County, State and National Electric Codes.

Receptacles. Do not assume that three-prong plug convenience outlets are connected to ground. Remove each one to observe the presence of a connected ground wire. Check to see whether GFI (ground fault interruption) type receptacles have been installed in laundries, kitchens, and bathrooms, and test their operation. Replace any damaged or missing cover plates.

Wiring. Check for surface mounted lamp cord extension wiring. It is dangerous and must be removed. It is best to remove all unused wiring or wiring that will be abandoned during rehabilitation work to avoid future confusion or misuse.

Smoke Detectors. Check to see if areas have functioning smoke detectors. Detectors should be wired to a power source, and also should contain a battery. Replace any nonfunctional or missing smoke detectors with a UL approved, ceiling mounted smoke and heat detector permanently wired into a receptacle box. Install a battery operated smoke detector in each bedroom if missing.

Assessing Electrical Service Capacity (Ampacity)

To determine the capacity (measured in amperes) of the building's existing electrical service at the main panel board, check the following:

- The ampacity of the service entry conductor, which may be determined by noting the markings (if any) on the conductor cable and finding its rated ampacity in the **National Electrical Code**, Table 310-16, or applicable local code. If the service entry conductor is in conduit, look for markings on the conductor wires as they emerge from the conduit into the panel board. If all conductors are unmarked, have an electrician evaluate them.
- The ampere rating on the panel board or service disconnect switch, as listed on the manufacturer's data plate.
- The ampere rating marked on the main circuit breaker or main building fuse(s). This rating should never be higher than the above two ratings; if it is, the system should not be used until it is evaluated by an electrician.

The building's service capacity is the lowest of the above three figures. Once the service ampacity has been determined, compare it to the estimated ampacity the building will require after rehabilitation. If the

estimated ampacity exceeds the existing ampacity, the building's electrical service will need upgrading. The method for estimating required ampacity is found in the **National Electrical Code**, Article 220.

Plumbing

This assessment should be conducted only by a qualified plumber who is experienced in residential electrical work.

Piping. All piping, regardless of composition, should be checked for wet spots, discoloration, pitting, mineral deposits, and leaking or deteriorated fittings. Pressure test any piping suspected of having leaks. Repair or replace all leaks and deteriorated fittings. Replace all lead or galvanized steel piping throughout the house. If there are signs of deterioration, leakage or restriction of flow to copper piping replace those areas. Replace any brass piping that has signs of deterioration such as white mineral deposits.

Replace any undersized piping, partially closed valves, kinks in the piping or clogs of rust or mineral deposits.

If new fixtures are to be added to the distribution system, have a plumber determine whether the existing piping can carry the additional load by checking the size and condition of the piping and calculating the water demands of the fixtures to be added.

Main Shutoff. Replace the main if it is more than 40 years old.

Main shut off valve. Repair or replace the valve if it is corroded or damaged.

Traps. Replace S-Traps that can cause the loss of the water seal.

Vents. Repair or replace any vents that are obstructed or damaged.

Drain Lines. Replace any undersized drain lines. Secure any runs that are inadequately supported.

Hot Water Heater

Dates of tank manufacture are usually listed on the data plate (often in a simple 1995 code in the serial number; 0595, for instance, would mean manufactured in May 1995), and since water heaters are usually installed within several months of manufacture, the age of the tank often can be approximated. Replace a tank if there are three or less years of life expectancy remaining. Heavy mineral or rust deposits around the tank fittings are usually a sign that the tank is nearing the end of its service life and should be replaced. Replace any leaking tanks.

Water heater capacity is determined by the heater's storage capacity and its recovery rate, or the time it takes to reheat the water in its tank. Recovery rates vary with the type of fuel used. Generally, gas or oil fired heaters have a high recovery rate and electric heaters have a low recovery rate. Low recovery rates can be compensated for by the provision of larger storage capacity.

Water heaters are sized according to the number of people living in the house and the type of heat source used:

Gas

30 gallon (115 L)	3 to 4 people
40 gallon (150 L)	4 to 5 people
50 gallon (190 L)	5 and more people

Electric

40 to 42 gallon (115 to 160 L)	3 to 4 people
50 to 52 gallon (190 to 200 L)	4 to 5 people
65 gallon (250 L)	5 and more people

A qualified plumber or mechanical engineer should determine the size of replacement units based on rehabilitation plans.

If a spa or whirlpool bath is in the house and the water is heated by either gas or electricity, an additional capacity of 10 gallons (40 L) is needed.

HVAC

This assessment should be conducted only by a qualified HVAC contractor who is experienced in residential electrical work.

Thermostats. Repair or replace any un-operational thermostat.

Venting. Repair or replace any items that do not meet the local, state, and national building codes.

HVAC Systems.

Replace any gravity system with at least a 90% efficiency forced air system.

If a steam or hot water system needs replaced, replace with at least a 90% efficiency forced air system.

If a gas or electric wall heater or electric baseboard heater needs replaced, replace with a new or upgraded heater of the same function.

Replace any system if there are three or less years of life expectancy remaining with at least a 90% efficiency forced air system.

Replace nonoperational electric wall/baseboard heaters with new updated electric wall/baseboard heaters.

Replace nonoperational gas wall heaters with new updated gas wall heaters.

Design calculation. An HVAC system's capacity can be more accurately determined by noting its heating or cooling output (in tons or BTUs) from information on the manufacturer's data plate and comparing it to the building's heating and cooling loads. These loads can be calculated using the Air Conditioning Contractors of America's Manual J or similar load calculation guide. A rough estimate of a

building's required heating equipment size in BTUs per hour (BTUH) can be obtained by using the following formula:

$$\text{BTUH} = .33 \times [\text{square footage of building to be heated}] \times [\text{difference between outside and inside design temperatures}]$$
 The factor of .33 in this formula is based on R11 exterior walls, an R19 ceiling at the top floor or roof, and double-glazed windows.

Central Air Conditioning Systems. If there is an existing air conditioning system that needs repaired, repair it. This program does not cover costs to install a new air conditioning system or replace an existing system.