



TEXAS DEPARTMENT OF HOUSING & COMMUNITY AFFAIRS

Building Homes. Strengthening Communities.

Texas Minimum Construction Standards

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Chapter 1: Administration and General Requirements¹

1.1 Definitions

The capitalized terms used herein may be defined in the Single Family Umbrella Rule found in the Texas Administrative Code (TAC), Title 10, Part I, Chapter 20, the specific program rule in Title 10, or in the specific program NOFA, or the applicable federal regulations.

In addition, these standards serve as a starting point for Rehabilitation of Single Family dwellings. Additional and more detailed construction requirements may be outlined in the agreement, Contract or loan documents.

1.2 Background, Purpose, Intent and Disclaimer

The Texas Department of Housing and Community Affairs (TDHCA) developed the Texas Minimum Construction Standards (TMCS) to be the primary document for identifying and correcting substandard conditions in homes to be rehabilitated through TDHCA Single Family Programs.

The purpose of this document is to identify requirements for Rehabilitation while promoting healthy, safe and decent housing for Texas low- to moderate- income households. All single family dwellings being rehabilitated with funding subject to the Construction Requirements of the Single Family Umbrella Rule shall comply with TMCS as well as State and local codes, ordinances, and zoning requirements, as applicable.

The intent of TMCS is to remedy health and safety defects, particularly life threatening deficiencies. TMCS also supports the goals of Texas Government Code 2306 to provide for the housing needs of individuals and families of low, very low, and extremely low income and families of moderate income. TMCS outlines the minimal level of work required, and methods and materials for rehabilitation work in order for the Department to evaluate and determine that rehabilitation work complies with TMCS.

Only items, components, or systems included in the construction contract funded by TDHCA must comply with TMCS.

TMCS is not the only construction standard necessary for Rehabilitation work. TMCS does not include all applicable building codes, materials, accessibility standards or installation methods which apply to Rehabilitation.

TDHCA encourages the reproduction and distribution of this document to all relevant parties participating in Rehabilitation, including staff, general contractors, and subcontractors. TMCS must be included in all procurement documents by reference, but specific sections may be copied directly into bid documents.

1.3 Qualifications and Workmanship

Administrators shall ensure that all persons involved in TDHCA funded single family Rehabilitations are qualified for their tasks. If a homeowner, occupant, or volunteers perform portions of the Rehabilitation, Administrators are responsible for ensuring that they are sufficiently qualified to perform the work identified and completed in a manner consistent with TMCS (a promise with the intent to complete work is not acceptable). If the nature of the work

¹ Code references throughout this document are provided as guidance. All code references are to the 2009 International Residential Code for One- and Two-Family Dwellings found at: <http://publicecodes.cyberregs.com/icod/irc/IC-P-2009-000002.htm?bu2=IC-P-2009-000019>

requires an individual to be licensed or certified, the Administrator must ensure that those contractors meet State licensing requirements. Employing and contracting with qualified and experienced individuals is crucial to success. Administrators must have policies and procedures in place to ensure that those responsible for inspecting homes, preparing work specifications, estimating costs, providing construction management, and contractors that do the work of Rehabilitation are qualified and experienced. Requirement to follow TMCS must be included in all Rehabilitation contracts.

1.4 Initial Inspections

Detailed initial inspections are required as the first step in rehabilitating a home. All substandard conditions must be identified in the initial inspection and accompanied by a sufficient number of photos to clearly identify the deficiency. In addition, conditions in which a future deficiency may develop must also be identified, and where relevant, the housing must be improved to mitigate the impact of potential disasters (e.g., earthquake, hurricanes, flooding, and wildfires) in accordance with State and local codes, ordinances, and requirements. As a general rule, if a system or component is nearing the end of its Useful Life as defined below, it shall be identified as a deficiency on the initial inspection report (e.g. the domestic water heater is still functional but nearly the end of its Useful Life shall be identified as a deficiency and replacement a part of the proposed scope of work). For single family homeownership “Useful Life” is defined as having at least five (5) remaining years of safe and functional operation, for federally funded rental housing projects of less than 15 units it is defined as the time of the federal affordability period.

1.5 Substandard Conditions

The intent of TMCS is to correct substandard conditions so that dwellings are safer, healthier, more durable, more affordable, more energy efficient and more habitable. Rehabilitation must address more than those conditions that threaten the immediate health and safety of occupants and future hazards. Each work specification must address at least one of the following to be considered an eligible expense:

- Remedy health and/or safety deficiencies
- Improve the comfort of one or more occupants, including energy efficiency standards
- Improve accessibility
- Meet local code or ordinances
- Address a critical need for storage or living space
- Protect the structural integrity of the dwelling
- Replacement of systems or components nearing the end of their Useful Life

1.6 Structural Integrity

A home that has sustained substantial structural damage shall be evaluated by a licensed structural engineer to determine the necessary corrective measures. The engineer’s report shall determine if the home’s load bearing elements can be rehabilitated if a home has partially collapsed, moved off its foundation, lacks support of the ground necessary to support it, or if there exists a significant risk of collapse, detachment or dislodgement of any portion. Load bearing elements include any column, girder, beam, joist, truss, rafter, wall, floor or roof decking that supports any vertical load in addition to its own weight or any lateral load.

1.7 Nonessential Improvements and Cosmetic Improvements

A nonessential improvement is an unnecessary item or measure intended solely for convenience or increasing the property value that does not directly relate to the correction of a substandard condition or extending the Useful Life of the property. Non-essential improvements that do not eliminate a hazard or remedy a deficiency shall not become a part of Rehabilitation.

Cosmetic improvements are unnecessary items intended solely to enhance visual appearance or perceived value. Cosmetic improvements often have nothing to do with correcting substandard conditions.

TDHCA expects Administrators to focus Rehabilitation on correcting substandard conditions and to avoid doing work that is classified as nonessential and/or cosmetic improvements. Work items classified as remodeling or redecorating that are not directly connected to correcting substandard conditions shall not be completed with TDHCA funds. TDHCA encourages Administrators to educate applicants as to the purpose of Rehabilitation.

1.8 Lead-Based Paint

All homes built prior to 1978 that will be rehabilitated shall comply with the Environmental Protection Agency's (EPA) Renovation, Repair, and Painting Final Rule (RRP) found at 40 CFR Part 745.² Federally funded Rehabilitations shall also comply with the HUD Lead Safe Housing Rule³ and homeowners cannot opt out of work practice requirements.

An EPA Certified Firm and an EPA Certified Lead Renovator shall be required to work on homes tested for lead-based paint or presumed to have lead-based paint present, regardless of funding sources. Administrators are responsible for requiring RRP and the HUD Rule in bid documents and insuring only qualified individuals and contractors work on pre-1978 homes.

All homes built prior to 1978 should receive a lead-based paint inspection by a qualified inspector, prior to creation of the Rehabilitation scope of work. Inspection results must be appropriately disclosed to the homeowner and TDHCA. A Clearance inspection must be conducted after work is completed on any homes, or part of a home, that has tested positive for lead.

1.9 Asbestos

The Department of State Health Services has responsibility for oversight of asbestos removal from single family residential buildings. Contractors must properly dispose of any known asbestos and associated costs can be included in bid docs as applicable.

1.10 Historic Properties

For properties either listed or eligible to be listed in the National Register of Historic Places or preserved with the Texas Historical Commission, Administrators shall identify, retain, and preserve interior and exterior features and finishes that are important in defining the historic character of the building. The Department of Interior's Rehabilitation Guidelines, codified at 36 CFR Part 67,⁴ shall be utilized when a property fits the definition of a historic property and will be rehabilitated. The Texas Historical Commission is the State Historic Preservation Office (SHPO) and can provide further guidance on historic properties.⁵

² http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr745_main_02.tpl

³ http://portal.hud.gov/hudportal/HUD?src=/program_offices/healthy_homes/enforcement/lshr

⁴ <http://www.nps.gov/tps/standards/rehabilitation/rehab/stand.htm>

⁵ <http://www.thc.state.tx.us/>

1.11 Proposed Scopes of Work and Cost Estimates

Work specifications must include sufficient detail to clearly describe **what** will be installed/repaired/replaced, **how** the work will be completed (installation method), **where** it will be completed (e.g. north wall in master bedroom), and **how many** (e.g. square feet, linear feet, or number of items). Proposed work for Rehabilitation activities must include the materials to be used for rehabilitation work that meets or exceeds TMCS and local code requirements and must be reviewed and approved by TDHCA staff prior to the bidding process.

Cost estimates for each specification shall be prepared prior to the bidding process. Each specification should include per unit pricing and the number of units to be installed/repaired/replaced. An acceptable bid must be within plus or minus 15% of the total cost estimate. Cost estimates shall not be revealed to any bidder.

Additional information and guidance regarding the procurement process for Rehabilitation or construction contractors is available on the TDHCA website.⁶

1.12 Contractor Requirements

In order to meet TDHCA standards, winning bidders must meet the following requirements:

1. Contractors must carry and provide proof of a current general liability policy with the following coverage:
 - Property Damage: \$100,000 each occurrence, \$100,000 aggregate
 - Bodily Injury: \$300,000 each occurrence, \$300,000 aggregate
2. Auto Insurance:
 - Property Damage: \$100,000 each occurrence
 - Bodily Injury: \$300,000 each occurrence, \$300,000 aggregate
3. Worker's Compensation, as required by federal and state law
4. Builder's Risk Insurance for all Rehabilitation activities over \$20,000
5. Contractors must be verified as not being debarred by TDHCA or the federal government⁷
6. Whenever possible, Administrators must give opportunities to Historically Underutilized Businesses (HUBS) and must make an affirmative effort to encourage bids from such contractors
7. Whenever possible, opportunities must be given to locally owned businesses and local low-income residents but may not give procurement preference based on geographic location. This is established in the administrator's Local Opportunity Section 3 Plan
8. As applicable, Contractors must follow all Davis-Bacon and related act requirements
9. Administrators must verify the quality of work references, credit references, and established lines of credit to substantiate qualifications

⁶ <http://www.tdhca.state.tx.us/single-family/training/procurement/index.htm>

⁷ <https://www.sam.gov/portal/SAM/#1>

1.13 General Specifications

The following general specifications apply to all Rehabilitation activities and shall become a part of the construction contract:

1. All products that are capable of earning the Energy Star or WaterSense label shall be installed.
2. Each specification shall be bid separately. Lump sum bids will be rejected as unresponsive.
3. Installation of all products and materials shall be in accordance with the manufacturer's installation instructions and generally accepted industry standards.
4. All products and materials shall be new and/or in unopened containers or packaging. Factory recertified or refurbished products with full "as new" warranties are acceptable.
5. New materials shall be matched as closely as possible with existing materials to be consistent with surrounding surfaces.
6. "Install" means to purchase, deliver, set up, test and warrant a new component.
7. "Replace" means to remove and dispose of a component and purchasing and installing a new component.
8. "Repair" means to return a component to like new condition through replacement of parts, adjustment, and/or recoating of parts.
9. "Reinstall" means to remove, clean, store, and install the same component.
10. Contractor is responsible for complying with all applicable permitting requirements
11. Contractor is responsible for ensuring that all completed work does not encroach on property lines, setbacks, or easements
12. Contractor is responsible for complying with EPA and/or HUD lead-based paint rules. For all pre-1978 homes tested positive for lead or deemed to have lead in existing paint, the contractor shall provide evidence that it is an EPA certified firm and that an EPA certified Lead Renovator will oversee work that disturbs lead-based paint
13. Contractor is responsible for verifying accurate field dimensions, sizes, quantities, square feet, linear feet, etc. prior to submitting a bid. Field dimensions and quantities listed in the bid package are approximate and are for the convenience of the bidder. TDHCA and the Administrator neither make nor imply any guarantee for the accuracy of numbers provided
14. Contractor shall clean construction debris from the dwelling and site to a dumpster or legal landfill at least once a week and leave the property in broom clean condition. In occupied dwellings, construction debris shall be removed daily
15. Contractor shall provide all manufacturers' and suppliers' written warranties covering items furnished to the homeowner prior to release of final payment. Contractor shall remedy all defects due to faulty material or workmanship and pay for all damage to other work resulting there from which appear within one year from an accepted final inspection.
16. Contractor shall not make any promises or side deals with the homeowner outside the scope of an executed construction contract
17. Payment requests shall be based on satisfactory completion of spec items for which payment is sought.

18. All change orders must be approved by TDHCA. Any additional cost due to product or material upgrades is solely at the contractor's expense unless authorized by TDHCA.
19. All electrical work shall comply with the National Electrical Code (NEC) adopted by the city or, for counties, by the state, and be completed by a state licensed electrician
20. All plumbing work shall comply with the International Plumbing Code adopted by the city or, for counties, by the state, and be completed by a state licensed plumber
21. All HVAC work shall comply with International Mechanical Code adopted by the city or, for counties, by the state, and be completed by a state licensed HVAC technician.
22. If digging is required, the contractor is responsible for locating all underground utilities

1.14 Walk Away Policy

Administrators must have a "walk away" policy that describes situations in which walking away from Rehabilitation activity is allowed. If the cost to rehabilitate the dwelling exceeds budgetary limits, and no supplemental sources are available, Rehabilitation must not be attempted. Dwellings that cannot be made to comply with the provisions of TMCS within the parameters of the Administrator's "walk away" policy and program rules and regulations shall not be rehabilitated.

1.15 Useful Life of Major Systems

Major systems include the building structure (including foundations, walls, roofs, doors, windows, etc.), plumbing, electrical, and HVAC. Upon project completion, major systems shall have a Useful Life.

1.16 Authority and Enforcement

Administrators shall ensure that these provisions of TMCS are applied to all single family dwellings receiving rehabilitation assistance approved for assistance. Administrators shall not waive any portion of TMCS without TDHCA's written approval. Waiver requests shall be made in writing and must detail the legal and/or factual basis for the waiver (e.g. a city ordinance prohibits a TMCS requirement or a specific requirement is impossible to meet on a particular dwelling). Waiver requests must clearly describe how the intent of TMCS is still met if a waiver is provided. However, homeowner input cannot be allowed to prevent compliance with TMCS; homeowners cannot refuse measures required by TMCS or receive measures prohibited by TMCS.

If local code requirements meet or exceed TMCS, any conflict will not require the submission of a waiver request.

Administrators are contractually obligated to comply with TMCS. Failure to comply with TMCS or failure to follow actions required to correct non-compliance is considered a violation of the Contract. Non compliance and/or continued failure to comply with TMCS may result in TDHCA suspending or terminating the Contract, or additional penalties.

Administrators or Contractors that violate TMCS requirements may be subject to monetary penalties and/ or debarment from participation in TDHCA programs as provided in 10 TAC 1 and 2.

Chapter 2: Site Work

2.1 General Requirements

Substandard and substandard conditions shall include any condition that threatens the health and/or safety of the occupants. Substandard conditions include any condition which threatens, defeats or will lead to the lack of functional viability of a single feature of a home. These conditions shall include but not be limited to:

1. Accumulated debris, waste, or garbage either in enclosed areas such as storage buildings or on the property.
2. Deteriorated outbuildings, sheds, wells, privies, or other structures which are no longer in use or are made unusable by their condition.
3. Holes, ditches, exposed water meter boxes or other condition which creates a tripping hazard, excluding drainage ditches which are part of a designed drainage system.
4. Rodents, insects, or other infestations.
5. Standing water or depressions which hold water during wet weather.
6. Leaking water supply or leaking sewage system.
7. Exposed pipes, railings or other installations creating tripping hazards.
8. Damaged, missing or deteriorated walkways, steps and decks which create tripping hazards or are otherwise unsafe.
9. Stairways or steps above 30" from the finished grade without a functioning guard rail.

2.2 Debris and Brush Removal

The premises shall be free from accumulations of rubbish and garbage that present health and safety hazards.

The premises shall be free from trees and shrubs that are damaging the dwelling or present a hazard. Tree limbs in danger of falling on roof areas shall be removed.

2.3 Drainage

Surface drainage shall be diverted to a storm sewer or other approved point of collection that does not create a hazard. Lots need to be graded to drain surface water away from the foundation at a minimum slope of 6" within the first 10'. Where lot lines or other physical barriers prohibit this, drains, swales, and/or rain gardens shall be constructed to ensure drainage away from the structure. Use of alternative drainage methods must be approved by TDHCA.

Rain gutters shall be installed if none exist. Gutters shall slope 1" for every 20 linear feet with downspouts installed at a minimum every 40'. Downspouts shall discharge water at least 5' from the foundation. Special care must be taken to not discharge water onto adjacent properties.

2.4 Driveways, Sidewalks and Patios

Paved surfaces shall be free from hazards which can cause tripping and falling. Paved surfaces adjacent to the foundation shall not slope towards the structure so that water can collect or

drain towards the foundation. If tripping hazards and drainage problems exist, the paved surface shall be removed and rebuilt.

Driveways. Following existing driveway demolition, all organic matter shall be removed. Subsoil shall be compacted uniformly and evenly. Forms shall be constructed to provide a minimum slope of 1/8" per foot away from the house and at a depth to provide 4" of concrete. Install either number 4 rebar on 12" centers or 6" x 6" number 10 welded reinforcing wire. Expansion joints shall be installed at all radius points, sidewalk intersections and house slab tie-ins. Concrete mix shall provide a minimum of 3,500 psi at 28 days. If reinforcing steel is not used, control joints shall be sawed in every 10' and be broom finished.

Asphalt or gravel driveways may be installed if concrete is prohibitively expensive due to the length of a driveway.

Sidewalks and Patios. Following existing sidewalk demolition, all organic matter shall be removed. Subsoil shall be compacted uniformly and evenly. Forms shall be constructed to provide a minimum slope of 1/8" per foot away from the house, at a depth to provide 3 1/2" of concrete, and at least 3' wide. Expansion joints shall be installed at all radius points, sidewalk intersections and house slab tie-ins. Control joints shall be sawed in every 5' and be broom finished. If sidewalks and patios are installed and are connected to an entry door, a zero-step entry is required in accordance with §2306.514 of the Texas Government Code.⁸

2.5 Sanitary Drainage

All plumbing fixtures and all other plumbing appliances shall be properly connected to either a public system or to an approved On-Site Sewage System (OSSF), otherwise known as a septic system. Prior to commencing Rehabilitation, if an OSSF was installed more than five (5) years before the date of inspection, all septic systems shall be inspected by a state licensed OSSF inspector to determine if it is functioning as intended. If it is not, repair, replacement, or collapse and fill and connection to a public system shall be included in the Rehabilitation.

2.6 Water Supply

All dwellings shall have adequate, safe, and potable water supplied through a safe plumbing system to all fixtures. Privately owned wells shall be tested by a local health department or other qualified source to determine the water quality prior to commencing Rehabilitation.

2.7 Ramps

If installed, ramps shall have a maximum slope of 1 unit vertical to 16 units horizontal (6.2% slope). However, a slope of 1 to 20 is preferable if site conditions allow. Minimum 5' x 5' landings shall be installed at the top and bottom of ramps, where doors open onto ramps, and where ramps change directions. Handrails shall be installed on at least one side, preferably both, between 34" and 38" above the finished surface. Handrails shall be 1 1/2" to 2" in diameter and must not rotate and be free of sharp edges. Space between the hand rail and walls shall not be less than 1 1/2". If ramps are installed, a zero-step entry is required.

2.8 Vermin and Insects

The premises shall be free from infestations of vermin and wood-boring insects. Inspections shall be performed by state licensed extermination contractors if evidence of infestation exists. Conditions which increase or cause infestation shall be removed (e.g. accumulation of rubbish or

⁸ <http://www.statutes.legis.state.tx.us/Docs/GV/htm/GV.2306.htm>

garbage, unsanitary conditions, presence of consistent moisture, untreated wood in contact with soil, etc.). One or more of the following termite treatments shall be included in the Rehabilitation if infestation is observed; chemical termiticide treatment, termite baiting system installed and maintained according to the manufacturer's label, use of pressure-preservative treated wood, use of naturally durable termite-resistant wood, and/or termite shields.

2.9 Landscaping for New Construction and Additions

When an addition is built, underground utilities run, grade changes made, or the soil is otherwise disturbed, proper compaction and a fine finish grading shall be done and seed, sod or native plants shall be installed matching as closely as possible the existing surrounding yard.

Chapter 3: Foundations⁹

3.1 General Requirements

Foundation work shall be completed in its entirety prior to beginning work on other areas of the house.

Leveling shall be done in such a manner as to provide an acceptable degree of tolerance. When leveling takes place, doors, windows and other openings shall be reasonably plumb, level and easy to operate. Interior wall coverings shall be repaired and plumbing systems shall be inspected to insure the system functions as intended.

Foundation leveling shall include grading of the soil to provide a slope away from the home of at least 6" for the first 10'. If the lot does not allow for this grade, a French drain shall be installed to drain water away from the house, or swales shall be designed and built to control rain water runoff. Refer to the drainage section in Chapter 2: Site Work.

Foundation walls shall be a minimum of 6" above grade or 4" above grade if masonry veneer existing or will be installed.

Underpinning shall be required when foundation leveling is a part of Rehabilitation.

Any room additions shall comply with the 2009 IRC, Chapter 4.

3.2 Determining the Scope of Work

Each of the standards in this chapter shall be used to determine the scope of work. In addition, the requirements of the 2009 International Residential Code (IRC), Chapter 4, related to each standard shall be used as a guide along with the principles of safety, capacity, and convenience.

Safety: The IRC contains provisions considered necessary for safe installation; however, they are the minimum requirements. Providing a safe foundation, leveling, repair, or installation and minimizing hazards can be done by following the principles of foundation construction and stabilization, fully complying with any limitations placed on the use of products and materials and permitting only qualified persons.

Capacity: With foundations, capacity refers to its ability to carry live and dead loads with respect to the soil's plasticity. Unsafe conditions often occur because existing foundations were not properly planned or designed for the soil conditions at the site.

⁹ http://publicecodes.cyberregs.com/icod/irc/2009/icod_irc_2009_4_sec001.htm?bu=IC-P-2009-000002&bu2=IC-P-2009-000019

Convenience: Oftentimes, crawlspaces are too low to the ground making it difficult to access plumbing systems. While raising a home may not be feasible, every effort must be made to increase the crawlspace clearance to a minimum of 12" above grade when leveling a home.

3.3 Substandard Conditions

Hazardous conditions include any condition that threatens the health and safety of occupants and the structural integrity of the home. When the following conditions exist, repair or replacement shall be completed:

1. Evidence of wood destroy insect damage
2. Water and/or fire damage or dry rot to wooden piers, beams, joists, and subfloor
3. Inadequate support of beams, sills, or joists
4. Lack of drainage away from the home
5. Cracked, damaged, buckled skirting
6. Untreated wood in contact with the soil
7. Any other condition which meets the definition of a hazardous or substandard condition

3.4 Slab on Grade

All concrete floors shall be without serious deterioration or conditions that present a falling or tripping hazard. With existing concrete floors, large cracks or missing and uneven sections shall be repaired.

Slab on grade foundations that are failing, as demonstrated by an inspection by a structural engineer, shall not be rehabilitated.

3.5 Pier and Beam

Piers shall have allowable spans between piers or posts. Piers shall support beams which in turn support floor joists. Joists shall not be more than 24" on center and, if not continuous, shall overlap beams be at least 12". If major leveling is required, a structural engineer shall inspect the foundation to determine the number of piers that need to be added, repaired, or replaced.

Newly installed footings shall be a minimum of 12" below undisturbed ground surface and the surface shall be level. Termite shields shall be installed on newly installed posts, regardless of pier material.

Skirting shall extend 4" below and at least 18" above grade or up to the exterior cladding and be lapped and fastened under the cladding material. Access to the crawlspace shall be 18" by 24" and is not allowed to be installed under a door. Venting of the crawlspace shall be 1 square foot per 350 square feet of crawl space area and one vent opening shall be within 3' of each corner. Crawlspace floor shall be covered with 6 mil polyethylene. In flood zones, skirting is not allowed.

Chapter 4: Electrical Systems

4.1 General Requirements

Wiring has a Useful Life span. As wiring ages, insulation becomes brittle, cracked, worn, or frayed while losing its effectiveness. Existing conductors and connections also become corroded

and/or loose over time. Episodes of overheating over its lifetime may have further deteriorated the wiring. Old wiring does not have the capacity that it had when new, and may be unsafe.

Electrical demands have also increased over time. When many systems that we work on were originally installed, many of the electrical appliances and devices that we currently use did not yet exist. This has placed additional demand on old and outdated electrical systems.

Electrical systems therefore take a high priority when rehabilitating a home.

Electrical systems must provide for a safe and adequate supply of electrical current to meet the needs of the occupants. To be safe and effective, the following must exist:

1. The electrical system is properly grounded, free of hazards, and all components are properly secured and covered to prevent contact by the occupants or electric shock
2. The condition of all electrical components is good, without deterioration or outdated, and free of shorts
3. Current and voltage is adequate, consistent, and appropriate at each outlet, fixture, and piece of equipment for its intended use
4. Conductors, fixtures, boxes, and equipment are properly sized and rated for their intended use
5. The system is adequate for current use and takes into consideration occupant behavior and lifestyles
6. Lighting, receptacles, and switches are appropriately located and are of an adequate number

Electricity deficiencies can result in fire, shock, property damage, serious personal injury and even death. Therefore, the safety, capacity, and convenience of the electrical system are primary concerns.

4.2 Determining the Scope of Work

Each of the standards in this chapter shall be used to determine the scope of work. In addition, the requirements of the 2009 IRC, Chapters 34-43,¹⁰ related to each standard shall be used as guidance along with the principles of safety, capacity, and convenience.

Safety: The electrical chapters contain provisions considered necessary for safe operation and installation; however, they are the minimum requirements. Providing a safe electrical installation and minimizing hazards can be accomplished by following the manufacturer's installation instructions, fully complying with any limitations placed on the use of equipment and permitting only qualified persons to perform electrical installations.

Capacity: Adequate capacity reduces the potential to overload circuits. Unsafe conditions often occur because existing electrical systems were not properly planned and outlets were added over time and lead to overloading circuits.

Convenience: Electrical system design needs to consider the placement of switches and outlets for persons with disabilities. If an entire electrical system is replaced, consideration should be given to the heights of electrical components. If possible, outlets should be installed no less than 15" (measured from the lowest outlet to the finished floor) above the finished floor and

¹⁰ <http://publicecodes.cyberregs.com/icod/irc/2009/index.htm?bu=IC-P-2009-000002&bu2=IC-P-2009-000019>

the panel box, switches and the thermostat should be installed no less than 48" above the finished floor (measured from the highest breaker inside the panel).

4.3 Substandard Conditions

Hazardous conditions include any condition that threatens the health and safety of occupants. When the following conditions exist, repair or replacement shall be completed:

1. Inadequate capacity (e.g. excessive use of power strips and/or multiple outlet adaptors)
2. Two-wire systems (lacking grounding)
3. Wiring or components missing, broken, disconnected, loose, burnt or melted, unsupported, corroded, cracked, or split
4. Panel boxes that show evidence of water intrusion or infestation
5. Frayed wiring or wire insulation
6. Circuits, switches, receptacles, or wiring is not compatible with the amperage or other characteristics of the electricity in use
7. Flexible cords are used as permanent wiring
8. Exposed wiring on interior walls or the exterior that are not protected in conduit or raceways
9. Receptacles in bathrooms and kitchens within 6' of a water source and exterior receptacles that are not ground fault circuit interrupter (GFCI) protected
10. Reverse polarity
11. Unlabeled circuits
12. Missing cover plates
13. Components not securely attached to the structure
14. Inadequate lighting in rooms and outside of entry doors
15. Any other condition which meets the definition of a hazardous or substandard condition

4.4 Existing Wiring and Fixtures

If existing electrical service and components are in good and safe conditions and the capacity of the system meets the demand by the occupants, the system does not need to be replaced.

At a minimum, all services shall be 100 amps. For larger homes and homes with large families, a 200 amp service is required (refer to Sizing of Service and All Electric Homes in Section 4.5 below).

All overloaded circuits shall be addressed by separating the load and adding an adequate number of circuits to carry the load.

Secure Fastening of Fixtures and Equipment: All components shall be securely fastened to framing members by mechanical means. No fixture or socket shall hang by unsupported wiring. All existing receptacles, switches, and junction boxes shall contain a proper cover plate. In no case shall the structural integrity of the home be compromised.

New Wiring: New wiring shall be installed in a neat and workmanlike manner with all wiring run inside of walls. If wall or ceiling cavities are not accessible, wiring shall be run in properly sized and rate raceway or wire mold, secured along the walls with proper fasteners, flush to the surface and straight.

Aluminum Wiring: All aluminum wiring in homes to be rehabilitated shall be replaced with a 3-wire system and in accordance with the requirements of this chapter. Properly sized service aluminum entry wiring is not required to be replaced.

Knob and Tube Wiring: Knob and tube wiring shall be replaced with a 3-wire system and in accordance with the requirements of this chapter.

4.5 **Sizing of Service and All Electric Homes**

The minimum service entrance shall be 100 amperes with a 3-wire, 120/240 volt, single-phase service with a grounded neutral. The nominal size of wire used with a 100 amp service shall be No. 4 copper; for a 200 amp service, the nominal size shall be No. 2 copper.

The service entrance cable shall have the same rating (amperage) as the meter base and the service equipment.

If the service entrance is to be replaced, a calculation of the usage or load within the dwelling shall be completed to assist in determining the appropriate size. The service entrance shall be properly sized for after Rehabilitation capacity. Room-by-room specifications noting electrical outlets and fixtures shall be included in the scope of work. Nameplate ratings of all appliances shall be reviewed for actual VA ratings. If the calculation falls at or near 100 amps, the service shall be increased to 200 amps.

All Electric Homes: Homes equipped with all electric appliances shall be equipped with no less than a 200 amp service.

Main Service Panel: Panels shall be in proper working condition with no evidence of overheating, arcing, corrosion, or failure. The panel shall bear the UL label and shall be marked as suitable for service equipment. Any panels identified as substandard by the U.S. Consumer Product Safety Commission shall be replaced. Panels with evidence of malfunction or deterioration shall be replaced.

4.6 **Material and Equipment Installation**

All materials, components, and equipment shall be listed or labeled by a qualified electrical products testing laboratory such as "UL" or "CSA."

Listed materials, components, and equipment shall be installed per the intended use and location and per the manufacturer's installation instructions.

4.7 **Grounding**

All electrical systems shall consist of a single phase 3-wire grounded neutral service entrance and shall provide system grounding and equipment grounding protection.

The service panel shall be connected to the grounding electrode system and to an 8' galvanized or copper clad steel ground rod. All electrical panels shall meet the bonding requirements of the National Electrical Code (NEC).

Where present, metal water pipes shall be bonded to the grounding electrode systems as a means of grounding the plumbing system to prevent pipes and fixtures from become energized and hazardous.

All wiring and equipment shall be grounded in accordance with the grounding requirements of the NEC.

4.8 Overcurrent Protection

The number of circuits installed shall not exceed the rating on the panel and the selection of a panel shall permit room for future expansion. Tandem breakers shall only be used in panels designed for them. The use of tandem breakers in order to exceed the 16 circuits permitted on a 100 amp panel shall not be permitted.

All circuits shall be clearly, accurately, and permanently labeled with tags provided and all unused openings shall be properly plugged, capped or sealed with listed materials.

Panel board over-current devices shall be properly sized and located at the exterior in a subpanel if the main service panel is in the interior. All existing circuits shall be load tested for tripping. Service equipment containing fuse over-current protection shall be replaced with properly rated circuit breaker type over-current protection devices.

4.9 Service Panel and Sub-panel Connections

All existing or new service panels shall be securely fastened to the dwelling and not be within 3' of doors or operable windows. All panel boxes shall be listed and enclosed in 16 gauge sheet steel cabinets with doors and catches. Conductors entering the service shall have proper connectors and shall be securely and neatly attached at terminals. Wires shall not have any obvious nicks in the insulation and shall be properly bonded. Service panels shall not be located in bathrooms or closets. The design and location of the service panel shall be considered and in conjunction with occupants' needs and desires when replacement is necessary. All circuits shall be marked and identified inside the panel box and any sub-panels.

New panel boxes and subpanels shall be installed 48" AFF, where the measurement is taken from the main shut off switch or to the highest breaker in the box. If local code requirements conflict with this requirement, the local code shall be followed.

Weather head: Weather heads shall be at least 12' above the finished grade.

Sub-panels: Sub-panels, add-on boxes, or disconnects to existing services for additional circuits shall be allowed only if the existing service equipment is listed and designed for such extension and the installation is in compliance with the NEC. Sub-panels are allowed if the existing service panel has adequate capacity but no available expansion slots.

Service Disconnect: The main disconnect shall be accessible and clearly marked as a service disconnect.

4.10 Branch Circuits

Protection against physical damage of exposed electrical equipment shall be provided throughout Rehabilitation.

Dedicated Circuits: No less than one dedicated 20 amp circuit shall be present for each bathroom and no less than two 20 amp small appliance branch circuits serving the kitchen. A dedicated circuit shall not serve other receptacles. All 240 volt appliances or equipment shall be on separate circuits.

The number of small appliances used by the occupants shall be taken into consideration when planning the circuit loads and placement of receptacles to avoid overloading a circuit and to eliminate the use of extension cords or multiplex outlets. Additional circuits may be necessary and are allowed.

Dedicated circuits for the following appliances shall be provided. These circuits shall be sized per the manufacturer's instructions.

1. Refrigerators
2. Separate freezers
3. Electric range or cook top
4. Electric oven
5. Clothes dryer
6. Electric water heater
7. Electric furnace/air handler
8. Microwave oven
9. Air conditioner
10. Sump pumps and water wells
11. Septic system aerators
12. Any other major electric appliance

Circuit Load Distribution: All circuit wiring shall be properly sized to serve the load. The loads shall be divided among various circuits to attain a close balance of probable or calculated load. #12 wire shall be used with 20 amp circuits and #12 wire shall be used for 15 amp circuits.

Two-wire Systems: All 2-wire, ungrounded wiring shall be replaced with 3-wire, grounded wiring.

Unused Switches, Receptacles, Fixtures, Conductors and Openings: All unused switches, receptacles, fixtures, and conductors, where accessible, shall be removed.

All unused openings in outlets, devices, junction boxes, conduit bodies and fittings, raceways, cabinets, and equipment cases or housings shall be effectively closed with knockout seals to prevent vermin, insects, and building materials from coming into contact with wiring.

Wire Splices: All splices shall be placed in accessible and listed junction boxes that are properly covered.

AFCI Protected Circuits: All newly installed branch circuits that supply 15 and 20 amp receptacles installed in family rooms, dining rooms, living rooms, parlors, libraries, dens, sun rooms, recreational rooms, closets, hallways and similar rooms or areas shall be protected by a combination type arc-fault circuit interrupter installed to provide protection of the branch circuit.

4.11 Receptacles

All replacement receptacles shall be listed or labeled and installed per manufacturer's instructions. All boxes shall be specifically designed for the purpose, properly sized (rated for

the size of the circuit), mechanically fastened and have attached cover plates installed. Receptacles located in damp or wet areas shall be weatherproof and the wiring shall be run in boxes, conduit and fittings listed for wet locations. All replacement receptacles shall be tamper resistant.

Receptacle Locations in All Rooms: All habitable spaces shall have receptacles. In each family room, dining room, living room, parlor, library, den, sun room, bedroom, recreation room, or similar room or area, receptacles shall be installed so that at a minimum each wall has at least one receptacle. Receptacles shall be spaced so that at no point along the perimeter of the floor is more than 6' from a receptacle. Where rooms are not regularly used by the occupants, the minimum number of receptacles per room shall be one. If possible, receptacles should be located not lower than 15" above the finished floor.

Receptacle Locations in Bathrooms: All bathrooms shall have at least one dedicated 20 amp receptacle outlet, be GFCI protected, and at least 3' from the outside edge of the sink. The receptacle shall be located not lower than 30" and not higher than 48" above the finished floor. Receptacles shall not be located within or directly over a bathtub or shower stall, and shall be at least 12" from the outer edge of the bathtub or shower opening.

Receptacle location in Kitchens: The kitchen shall have GFCI protected duplex receptacles on at least two separate 20 amp appliance circuits at the kitchen counter top spaced not more than 48" from each other. A separate dedicated, non-GFCI protected receptacle shall be required for each refrigerator and electric range or cook top, located directly behind it.

Receptacle location for the Exterior: Exterior receptacles shall be GFCI protected and enclosed in a listed or labeled weatherproof box. One shall be required at the front of the house and one at the back.

GFCI Protection: Receptacles located in bathrooms, kitchens, in a garage, at the exterior, and anywhere else located within 6' of a sink, shall be GFCI protected. Single use, dedicated receptacles for use by equipment and appliances such as washing machines and sump pumps shall not be GFCI protected, and shall be single, rather than duplex, receptacles when replaced.

4.12 **Fixtures and Switches**

All replacement fixtures shall be listed or labeled, Energy Star qualified, and shall be installed in accordance with the manufacturer's installation instructions. No fixture or receptacle shall hang from a base by unsupported wiring. If existing fixtures are in a good and safe condition, securely fastened to framing members, replacement is not required.

Fixture and Switch Locations: A permanently installed lighting fixture controlled by a wall switch shall be required to be located in each room of the structure. Switches shall not be located in tub or shower areas or behind the swing of a door. All new wall switches shall be located for convenience and accessible use.

Closet Fixtures: All light fixtures installed in closets shall be surface mounted or recessed can lights. Recessed can lights shall be Insulation Contact Air Tight (ICAT) rated. Closet fixtures shall be a minimum 6" away from any storage, clothing, or other items, and have a protective cover over the bulb.

Lamps (light bulbs): All replacement lamps shall be Energy Star qualified Compact Florescent Lamps (CFLs) or Light Emitting Diodes (LEDs).

4.13 Smoke and Carbon Monoxide Detectors

Smoke Detectors: Each dwelling shall have listed or labeled smoke detectors installed in each bedroom and in the hallway immediately adjacent to bedrooms. Smoke detectors shall draw their primary power from the electrical system, with battery backup, and without interruption except for over current protection. Smoke detectors shall be interconnected so that all detectors sound the alarm when any one senses smoke. An often used circuit, such as one serving a bathroom, shall be used for smoke detectors.

Photoelectric smoke alarms must be installed. Ionization and combination smoke alarms are not allowed.

Carbon Monoxide Detectors: In dwellings with attached garages and/or fuel-fired appliances, carbon monoxide detectors shall be installed. CO detectors shall be listed as complying with UL 2075 and installed outside the immediate vicinity of bedrooms. CO detectors shall be permanently installed and hard wired to the electrical system with battery backup.

Chapter 5: Plumbing Systems

5.1 General Requirements

The plumbing system must provide for a safe and adequate supply of potable water and provide for a safe and sanitary method of disposing of wastewater. All piping, fittings, devices, faucets, containers and receptacles that are used to supply, distribute, receive or transport potable water and wastewater are part of the plumbing system. To be effective the following basic plumbing principles must be followed:

1. Sewer gases cannot be allowed to enter the home
2. Sewer leaks must be identified, repaired, or replaced and improper disposal methods must be discontinued
3. Water leaks must be identified, repaired, or replaced
4. Water must be free from hazardous contaminants and safe for drinking, bathing and other uses
5. An adequate supply of water must be made available for all water needs, including adequate pressure at each fixture
6. Supply, drain, waste, and vent pipes shall not interfere with the structural integrity of the home. Notching and drilling of structural members shall comply with the requirements of the 2009 IRC, Figure R602.6(1) and (2).¹¹
7. Plumbing work shall be performed by state licensed individuals. Plumbing inspections shall be performed by qualified individuals who are experienced in working on plumbing systems and knowledgeable in the field

5.2 Determining the Scope of Work

Each of the standards in this chapter shall be used to determine the scope of work. In addition, the requirements of the 2009 International Residential Code, Chapters 25-33,¹² related to each standard shall be used as a guide along with the principles of safety, capacity, and convenience.

¹¹ http://publicecodes.cyberregs.com/icod/irc/2009/icod_irc_2009_6_par020.htm?bu=IC-P-2009-000002&bu2=IC-P-2009-000019

Safety: The plumbing chapters contain provisions considered necessary for safe operation and installation; however, they are the minimum requirements. Providing a safe plumbing installation and minimizing hazards can be done by following the manufacturer's installation instructions, fully complying with any limitations placed on the use of equipment and permitting only qualified persons to perform plumbing installations.

Capacity: Adequate capacity of potable water is crucial to meet the health needs of occupants. Unsafe and/or inadequate conditions often occur because existing plumbing systems were not properly planned and repairs were made over time using dissimilar materials, improper fittings, and improper installation methods. All of these things affect the capacity to deliver the necessary water.

Convenience: Plumbing system design needs to consider the placement and height of new fixtures, cabinets and vanities for persons with disabilities. Shut off valves also need to be in locations that make it easy to access.

5.3 Substandard Conditions

Hazardous conditions include any condition that threatens the health and safety of occupants. When the following conditions exist, repair or replacement shall be completed:

1. Lack of a continuous sanitary water supply
2. Lack of a continuously functioning sanitary waste water disposal system
3. Septic system not performing as intended
4. Lack of at least one functioning toilet, bathroom sink, and/or tub/shower
5. Lack of a functioning kitchen sink
6. Deteriorated, corroded, and/or leaky supply or drain pipes
7. Supply and/or drain piping consists of a mixture of a variety of different types of piping or fittings or that is run in an inefficient manner
8. Missing or blocked vent pipes
9. Natural gas domestic water heaters (DWH) located in bathrooms, bedrooms, closets or utility rooms where a clothes dryer is present
10. Missing gas shut off valve on natural gas DWH
11. Missing or improperly installed temperature and pressure-relief valve (TPRV) on DWH
12. Natural gas DWH combustion air taken from conditioned space
13. Inadequate natural gas DHW vent (not double walled or skirted at roof penetrations)
14. Rusted or corroded DHW pipes or storage tanks
15. Missing shut off valves at the water meter, each toilet, each sink, DWH, and shower/tub locations
16. Plumbing fixtures not performing as intended
17. Any other condition which meets the definition of a hazardous or substandard condition

¹² <http://publicecodes.cyberregs.com/icod/irc/2009/index.htm?bu=IC-P-2009-000002&bu2=IC-P-2009-000019>

5.4 Water Supply

All water service lines shall be properly connected to either a public system or an approved and functioning as intended private water supply system. If connected to a private system, appropriate corrective measures shall be taken if privately supplied water is not suitable for use. Testing of water quality in private wells is highly encouraged. All newly installed supply lines shall be flushed and fittings shall be tested.

Water Quality: Supply systems shall provide for the delivery of potable water through a safe system of piping, free from leaks and other defects and not subject to the hazards of backflow. If supplied water is not free of bacteria, chemicals, excessive minerals, relatively free of odor, taste, color and turbidity, corrective measures to improve water quality (e.g. water softening, water filtering) should be considered.

Exterior Pipe Protection: All newly installed exterior water lines shall be buried at a minimum depth of 6" below the final grade.

Hose Bibs: At least one exterior hose bib shall be present at the completion of Rehabilitation. If none exists, one shall be installed in a location convenient to occupants. All hose bibs in exterior locations shall have an anti-siphon device installed if none exists.

Water Pressure: The average static pressure at the building entrance shall be between 40-80 psi. If pressure exceeds 80 psi, an approved pressure reducing device shall be installed. If pressure is less than 40 psi, a thorough evaluation shall be conducted to determine the reason(s) for low pressure and appropriate corrective measures shall be completed.

Pipes: New supply water piping shall be type "L" copper tubing with wrought copper solder joint fittings, PEX, or CPVC. All fittings shall be compatible with pipe material. Joints between dissimilar metals shall be made with dielectric fittings to prevent joint deterioration due to electrolysis. All piping shall be adequately supported to prevent sagging and/or breakage.

Valves: The main water line shall have an accessible service shut-off valve located near the entrance of the water service into the home. All hot and cold water supply lines feeding all plumbing fixtures shall be equipped with functional and accessible shut-off valves. Access panels for shower/tub enclosures shall be provided for access to valves and maintenance. All valves shall be tested for leaks.

5.5 Sanitary Drainage

The sanitary drainage system consists of the pipes designed to provide adequate circulation of air, exhaust of sewer gasses, prevent loss of water seals in traps and assist with wastewater flowing out of the home and into an approved sewage disposal system. All fixtures shall be connected to an approved sewage disposal system and free of leaks. New sewage disposal systems shall comply with EPA and Texas Commission on Environmental Quality (TCEQ)¹³ requirements.

Unapproved Private Systems: Unapproved systems include pit privies, cesspools, ponds, lakes, streams and rivers. If any of these systems are in use, they must be abandoned and the home must be connected to an approved sewer disposal system.

¹³ <http://www.tceq.state.tx.us/licensing/ossf/on-site.html>

On-Site Sewage Facilities (OSSF): Prior to conducting Rehabilitation, all OSSF systems shall be inspected by a licensed OSSF inspector. If an existing OSSF system is not performing as intended, one of the following activities shall take place:

1. **Repair:** If repair is suitable, the tank shall be drained and all components tested and repaired or replaced. Special attention must be given to the drainage field; tree cutting and site clearing of the field may be required and replacement made. The drainage field must be designed for the existing soil conditions and the water table at the site and installed by a licensed installer
2. **Abandonment:** If a public system is available to connect to, and the existing OSSF system has reached the end of its Useful Life, abandonment is required. The existing tank shall be pumped, collapsed, and filled. A licensed plumber shall connect the home to a public system and include a clean out close to the home

Replacement and Installation Details: Newly installed plumbing systems, piping, and fittings shall be properly installed, connected, free flowing and free from leakage and corrosion of water or sewer gases.

Traps: Bell traps, "S" traps, and drum traps are prohibited. If any of these exist, they shall be replaced with a "P" trap. All fixtures shall be trapped and conform to the following:

1. All waste lines shall be trapped by a water seal trap as near to the fixture as possible but in no case more than 24" from the fixture
2. All traps shall be set level with respect to their water seals and sink traps shall be protected from contact and damage if sinks are made accessible for individuals using wheelchairs
3. Trap size shall not be less than the following inside diameters: 1 ¼" for lavatories; 1 ½" for tubs, showers, kitchen sinks and dishwashers; 2" for clothes washers and; and 3" for floor drains in utility rooms
4. No trap shall be larger than the drainage pipe coming from a fixture
5. Access panels shall be provided to enclosed traps and concealed connections
6. Wall and ceiling openings for plumbing shall be air sealed with caulk (gap less than ¼") or expanding foam (gaps more than ¼")

Vents: Plumbing systems shall be designed to prevent sewer gases from entering the home and to allow waste to adequately drain into an approved sewer system and shall be vented to the exterior so that water released from fixtures may draw in air to allow for smooth and even drainage. All vents shall conform to the following:

1. All plumbing systems shall have at least one main vent stack, running from the main drain through the roof, terminating to the exterior. If only one main vent is existing, it shall be no less than 3" inside diameter from top to bottom
2. Plumbing vent systems shall only be used for the purpose of venting the system
3. Existing vents shall be at a minimum 6" above the high side of the roof penetration. Newly installed vents shall be a minimum 12" above the high side. Through the roof vent penetrations shall be flashed and sealed to provide a positive drainage plain
4. All vent stacks terminating in an attic shall be extended or replaced. No vent stacks shall terminate near any window or door or under soffits

5. Air admittance valves are allowed as long as they are American Society of Sanitary Engineering (ASSE) 1051-2009 approved and installed in accordance with the manufacturer's installation instructions

5.6 Plumbing Fixtures

Existing fixtures shall be free of leaks or defects which interfere with their ability to perform as intended. If existing fixtures are in good working order, they do not need to be repaired or replaced. Plumbing fixtures include toilets, urinals, bidets, faucets, lavatories, sinks, showers, bathtubs, and floor drains. Plumbing appliances include washing machines, dishwashers, domestic water heaters, garbage disposals, and water softeners.

Construction and Installation: If plumbing fixtures or appliances require replacement, the following shall apply. All plumbing fixtures and appliances shall be installed per the manufacturer's installation instructions, including water sealing.

1. All replacement fixtures shall be WaterSense qualified products. Kitchen faucets requiring replacement shall provide 2.2 gallons per minute (GPM) and a 15-year drip free warranty. The scope of work must identify the height of a toilet and whether it is round or elongated and whether a new faucet is single lever or not.
2. All replacement plumbing appliances shall be Energy Star qualified products
3. All replacement shower fixtures shall use anti-scald control devices. Access panels shall be provided to these valves
4. All fixtures shall be supported and securely attached in a manner consistent with normal installation methods and installed level
5. All faucets shall have the hot water line on the left side of the faucet. Existing supply lines that are reversed shall be changed
6. If existing garbage disposals are not performing as intended or are not hardwired to the electrical system, they shall be removed, repaired or replaced. New garbage disposals shall be hard wired and switched in an accessible location as close as possible to the kitchen sink
7. All repaired or replacement fixtures and appliances shall be tested for leaks and proper operation

5.7 Domestic Water Heaters (DWH)

Replacement DWHs shall be Energy Star Qualified Products.¹⁴

General Requirements: All DWHs shall have a minimum 30 Gal. storage capacity and be able to supply a continuous flow of hot water of at least 102 degrees F, with gas or electric shut-off valves as well as cold water supply shut-off valves installed and functioning as intended. Larger capacity DWHs may be installed if necessary to serve larger households

Temperature and Pressure Release Valve (TPRV): Each unit shall be equipped with a TPRV must capable of releasing pressure at 150 psi and/or 210 degrees F. Water release shall extend to the exterior of the home

DWH Enclosure: Each unit shall be enclosed, in a sealed closet designed for this purpose with combustion air drawn from outside the conditioned space for gas DWHs. Gas DWHs inside the

¹⁴ http://www.energystar.gov/certified-products/certified-products?c=products.pr_find_es_products&s=footer

conditioned space shall be in a separate closet and not in the same room as the clothes dryer or any type of exhaust vent. All DWHs installed in a garage shall be installed at a minimum 18" AFF with primary drainage draining to the exterior. DWHs in other locations shall be supported by a minimum of 3" concrete base.

Energy Factors (EF): Replacement DWHs shall comply with the following table identifying the EF for each size:

Storage Size in Gallons	Gas DWH EF	Electric DWH EF
30	0.63	0.94
40	0.61	0.93
50	0.59	0.92
60	0.57	0.91
70	0.55	0.90
80	0.53	0.89

Chapter 6: Heating, Ventilation, and Air Conditioning Systems (HVAC)

6.1 General Requirements

The HVAC system of the house, in conjunction with other systems, is responsible for providing a comfortable living environment for occupants. To be effective, the HVAC system must accomplish the following:

1. Provide a reliable source of heated or cooled air, at a comfortable temperature, for all habitable rooms
2. Control ventilation and indoor air quality
3. Be free of contaminants that negatively affect indoor air quality

All systems in a home work together, and changing any one element affects others. For example, air infiltration and insulation levels greatly affect the HVAC system and its ability to provide for a comfortable living environment. When rehabilitating a home, one must look at all systems and their effects on others, and particularly when it comes to the HVAC system.

6.2 Determining the Scope of Work

Existing equipment shall be inspected to determine if it is operating safely and efficiently. Deficiencies noted through the inspection shall be corrected in Rehabilitation through repairing, cleaning and tuning, or replacement of the system.

Each of the standards in this chapter shall be used to determine the scope of work. In addition, the requirements of the 2009 IRC, Chapters 12-23,¹⁵ related to each standard shall be used as a guide along with the principles of safety, capacity, and convenience.

Safety: The mechanical systems chapters contain provisions considered necessary for safe operation and installation; however, they are the minimum requirements. Providing a safe

¹⁵ <http://publicecodes.cyberregs.com/icod/irc/2009/index.htm?bu=IC-P-2009-000002&bu2=IC-P-2009-000019>

mechanical installation and minimizing hazards can be done by following the manufacturer's installation instructions, fully complying with any limitations placed on the use of equipment and permitting only qualified persons to perform HVAC installations.

Capacity: Adequate capacity of heating, cooling and ventilating equipment is crucial to meet the needs of occupants. Unsafe and/or inadequate conditions often occur because existing mechanical systems were not properly sized, selected and planned and repairs were made over time using improper connections and improper installation methods. All of these things affect the system's ability to provide the heating and cooling needs of occupants.

Convenience: Mechanical system design needs to consider the placement and accessibility of equipment for ease of inspecting, maintaining, and repairing in the future.

6.3 Substandard Conditions

Hazardous conditions include any condition that threatens the health and safety of occupants. When the following conditions exist, repair or replacement shall be completed:

1. Lack of a steady and dependable source of heating and cooling to all living areas
2. Gas-fired air handler inside the conditioned space which draws combustion air from the interior
3. Combustion gases not venting to the exterior
4. Leaking, damaged, or cracked heat exchanger
5. Leaking, corroded or damaged gas supply pipe
6. Lack of a functioning pilot or electric start
7. Inadequate duct system that does not supply necessary conditioned air to all living areas
8. Deficiencies are too numerous to justify repair expenses
9. Unvented gas-fired wall heaters in enclosed rooms. If existing, the wall unit shall be removed and the gas line capped
10. Gas-fired kitchen stoves and/or ovens without ventilation to the exterior
11. Lack of a functioning carbon-monoxide detector in homes with gas-fired appliances or equipment

6.4 Sizing and Selecting a New System

Replacement heating and cooling equipment shall be sized in accordance with the current version of the Air Conditioning Contractors of America (ACCA)¹⁶ Manual J or other approved methodology. Equipment selection shall comply with the current version of ACCA Manual S or other approved methodology. Data for heating and cooling loads shall be calculated based on post-rehabilitation conditions.

Cooling Equipment: Cooling equipment in Climate Zones 2 and 3 shall be 14.5 Seasonal Energy Efficiency Ratio (SEER)/12 Energy Efficiency Ratio (EER) Energy Star qualified or a heat pump. Cooling equipment in Climate Zone 4 shall be 13 SEER or a heat pump. Additional information on heat pumps is in the heating equipment section below.

¹⁶ <http://www.acca.org/>

If the indoor air handler is being replaced, the outdoor coil shall also be replaced and it shall be matched to the indoor air handler, unless the outdoor coil is in good working condition and is compatible and properly sized to the new indoor air handler.

Heating Equipment: Heating equipment in Climate Zones 2 and 3 shall be one of the following:

1. Greater than or equal to 80% AFUE gas furnace
2. Greater than or equal to 8.2 HSPF/14.5 SEER/12 EER air-source heat pump, Energy Star qualified with electric backup
3. Ground-source heat pump, Energy Star qualified

Heating equipment in Climate Zone 4 shall be one of the following:

1. Greater than or equal to 90% AFUE gas furnace
2. Greater than or equal to 8.5 HSPF/14.5 SEER/12 EER air-source heat pump, Energy Star qualified with electric backup
3. Ground-source heat pump, Energy Star qualified

Installation: Installation of new systems shall comply with the manufacturer's installation instructions, as appropriate for the fuel source. All replacement equipment shall have a permanent electrical receptacle, switch, light fixture near the equipment, and installed in an accessible manner so that future inspecting, maintaining, and repairing the system can be completed.

Programmable Thermostat: A programmable thermostat shall be installed when a new heating and cooling system is installed. Upon installation, the temperature settings shall be done by the contractor, the occupants shall be educated on using the thermostat and the instructions and warranty shall be provided to the occupants. The location of the thermostat shall be in a central location and not within 3' of doors, windows, appliances, or televisions and installed not higher than 48" AFF, measured from the center of the thermostat.

6.5 Distribution System

The distribution system (ductwork) shall provide an adequate supply of conditioned air to each habitable room and shall provide an adequate amount of return air. Newly installed distribution systems shall be sized with the current version of ACCA Manual D or other approved methodology.

Inspection: The distribution system shall be inspected to determine if it is operating effectively and that adequate conditioned air is supplied to habitable rooms. The inspection shall also determine if the distribution system is properly balanced.

Duct Cleaning: If the distribution system is dirty, but is otherwise operating effectively, duct cleaning shall be completed. In addition, complete duct sealing by mechanical means and with duct mastic shall be completed to eliminate the source of dirt and debris entering the system. Duct cleaning will include dryer vents.

Location: When replacing a system, every effort should be made to relocate the distribution system to the conditioned space through the installation of dropped soffits. If this is not possible, locating the distribution system in the attic shall require mechanical fastening, sealed with duct mastic, and insulated to R-8. Distribution systems shall not be located at the exterior of the home exposing the system to the elements.

Installation: Connections and routing of new ductwork shall be completed without kinks or sharp bends and without excessive coiled or looped flexible ductwork. All connections shall be mechanically fastened, sealed with mastic, and properly supported. Runs shall be insulated to R-8 if installed in unconditioned space.

Room Pressurization: Many homes do not have room pressure balancing systems in place. When the distribution system is not balanced, transfer grills or jumper ducts shall be installed to provide balance with rooms when doors are closed with respect to the rest of the home. Undercutting doors is not allowed.

6.6 Ventilation and Indoor Air Quality

At a minimum, exhaust fans shall be installed in each full bathroom (half baths not required to have an exhaust fan) and in the kitchen if not existing or operational. Exhaust fans shall comply with the 2009 IRC, Chapter 15.¹⁷ If an operable window is present in a bathroom, an exhaust fan is not required.

Bathroom Exhaust Fans: Exhaust fans shall be Energy Star qualified. If a continuous fan is installed, it shall be greater than or equal to 20 cfm. Intermittent fans shall be greater than or equal to 50 cfm. Either fan cannot exceed 1.5 sones. All fans shall exhaust to the exterior, either through the roof or a gable wall, be mechanically fastened, sealed with duct mastic, insulated to R-6, and have a mechanical damper. Bathroom exhaust fans shall be installed on a dedicated GFCI protected circuit. Flashing shall be installed to provide a positive drainage plain. Flex duct terminating at a gable vent is not allowed.

Light kit, night light, and/or a heating element may be included with exhaust fans in conjunction with the desires of the occupants. Combustion appliances venting to the exterior shall not be located in bathrooms.

Kitchen Exhaust Fans: Exhaust fans shall be Energy Star qualified. If a continuous fan is installed, it shall be greater than or equal to 5 cfm. Intermittent fans shall be greater than or equal to 100 cfm. All fans shall exhaust to the exterior, either through the roof or a gable wall, be mechanically fastened, sealed with duct mastic, insulated to R-6, and have a mechanical damper. Flashing shall be installed to provide a positive drainage plain. Flex duct terminating at a gable vent is not allowed.

Garage Exhaust Fans: If a garage is attached to home, sharing a common wall, a UL listed exhaust fan shall be installed in the garage and connected to the operation of the garage door, turning on when the door is opened and off after 20 minutes.

Supply Air: If supply air is installed and connected to the return plenum, the following shall apply:

1. Supply air inlets shall not be located within 10 linear feet from known contamination sources such as stacks, vents, exhaust hood, or vehicle exhaust
2. Rodent and insect screens shall be installed
3. Ventilation shall come directly from the outdoors and not from adjacent dwelling units, garages, crawlspaces, or attics

¹⁷ http://publicecodes.cyberregs.com/icod/irc/2009/icod_irc_2009_15_sec001.htm?bu=IC-P-2009-000002&bu2=IC-P-2009-000019

4. The duct shall be mechanically fastened, sealed with duct mastic, insulated to R-6, and have a mechanical damper

Chapter 7: Roofing Systems and Attics

7.1 General Requirements

The roof system, including trusses, rafters, ridge beams, collar ties, ceiling joists, top plates of walls, sheathing, and the roof covering shall safely support the loads imposed. Framing and decking shall be structurally sound, properly fastened, and form a sound base for attaching the roof covering. The roof system shall be configured to provide a positive drainage plane.

Deteriorated, missing or loose framing or sheathing shall be corrected. Roof systems that are incapable of safely supporting the load or provide for adequate drainage shall be repaired or replaced.

7.2 Determining the Scope of Work

The roof structure and covering shall be inspected to determine if it is functioning as intended. Deficiencies noted through the inspection shall be corrected in Rehabilitation through repair or replacement.

Each of the standards in this chapter shall be used to determine the scope of work. In addition, the requirements of the International Residential Code (IRC), Chapters 8-9,¹⁸ related to each standard shall be used as a guide along with the principles of safety and capacity.

Safety: Providing proper installation of the roof structure and covering and minimizing hazards can be accomplished by following the manufacturer's installation instructions for the roof covering, fully complying with any limitations placed on the use of products and permitting only qualified persons to perform installations.

Capacity: Unsafe and/or inadequate conditions often occur because the existing roof was poorly constructed and repairs were made over time using improper materials and improper installation methods. Patching and flashing repairs oftentimes do not provide for a positive drainage plain allowing water to enter the home.

7.3 Substandard Conditions

Hazardous conditions include any condition that threatens the health and safety of occupants. When the following conditions exist, repair or replacement shall be completed:

1. Multiple layers of roof covering materials (more than two)
2. Water damage caused by leaks through the roofing system
3. Missing, worn, or upturned shingles
4. Damaged, missing, or improperly installed roof jacks, flashings, drip edges on both rakes and eaves
5. Exposed nails or other fasteners
6. Structural damage to trusses
7. Extensive patchwork and repairs

¹⁸ <http://publicecodes.cyberregs.com/icod/irc/2009/index.htm?bu=IC-P-2009-000002&bu2=IC-P-2009-000019>

8. Missing, damaged, loose, leaking, blocked, improperly sloped gutters and downspouts
9. Wear and tear leading to a failed system within 5 years from the initial inspection
10. Any other condition which meets the definition of a hazardous or substandard condition

7.4 Structure

Roof structures incapable of safely supporting the load or providing adequate slope for drainage shall be repaired or replaced. Sagging roofs shall be replaced or stabilized. Stabilization of sagging roofs that will not be replaced shall be designed by a structural engineer.

Truss Design for Replacement Roofs: Truss designs for replacement roofs shall comply with wood roof framing in Section R802¹⁹ of the 2009 IRC which includes; slope, span, and spacing; location of all joints, required bearing widths; design loads; joint connector type and description; lumber size, species, and grade; connection requirements; bracing locations; and roof tie-downs and uplift resistance details for high wind areas.

Roof Framing for Replacement Roofs: Purlin support braces shall be installed every 4' O.C. Continuous purlins shall be installed between support braces. Purlins shall be a minimum of 2" x 4" studs. Ceiling joists shall comply with Span Tables R802.4(1) and R802.4(2).²⁰

Sheathing Replacement: 5/8" CDX plywood shall be installed with clips spaced O.C. between rafters for rafter spacing of 24". Rafter spacing exceeding 24" shall have 1½" tongue and groove sheathing installed. All sheathing edges shall be nailed or screwed into a rafter.

Ventilation: Unconditioned attics shall be cross ventilated. A one to one ratio shall be installed; for every one foot of soffit vent area there shall be one foot of ridge, gable, or turtle vent area. Soffit vents shall have baffles installed providing at least 1" of airspace to prevent wind washing and/or attic insulation blocking soffit vents. All vents shall be provided with corrosion-resistant wire cloth screening or similar material.

Powered attic vents, whether connected to the home's electrical system or powered by photovoltaic, are not allowed.

7.5 Roof Covering

Materials: Asphalt shingles shall be fastened to solidly sheathed decks. Asphalt shingles shall be used only on roof slopes of 2:12 or greater. 2:12 up to 4:12 slopes shall require double underlayment. Slopes less than 2:12 shall require mineral-surfaced roll roofing installed according to the manufacturer's installation instructions. Metal roof panels shall be naturally corrosion resistant or provided with corrosion resistance in accordance with the manufacturer. Metal roofs shall only be installed on slopes of 3:12 (for lapped, nonsoldered-seam), ½:12 (for lapped, nonsoldered-seam panels with applied lap sealant), or ¼:12 (for standing-seam roof systems).

Flashings: Flashings shall be installed in a manner that prevents moisture from entering walls or the roof through penetrations, at eaves and rakes, at wall/roof intersections, wherever there is a change in roof slope or direction and around roof openings. Wall/roof intersections extending to eaves shall be provided with kick-out flashing. All wall/roof intersections shall have step

¹⁹ http://publicecodes.cyberregs.com/icod/irc/2009/icod_irc_2009_8_sec002.htm?bu=IC-P-2009-000002&bu2=IC-P-2009-000019

²⁰ http://publicecodes.cyberregs.com/icod/irc/2009/icod_irc_2009_8_sec002.htm?bu=IC-P-2009-000002&bu2=IC-P-2009-000019

flashing with at least 1" space between the roof covering and the adjacent wall cladding. Metal flashings shall be a No. 26 galvanized sheet metal and corrosion resistant. A cricket or saddle shall be installed on the ridge side of any chimney or penetration greater than 30" wide.

Valley Flashings: Closed valleys (covered with asphalt shingles) shall be lined with one ply of smooth roof roofing or self-adhering polymer modified bitumen underlayment prior to asphalt shingle installation.

7.6 Gutters and Downspouts

Gutters and downspouts shall be installed or replaced on all Rehabilitations. Gutters shall have a slope no less than 1:20 and all seams shall be made weather tight, if applicable. Downspouts shall be installed at a minimum every 40' and shall discharge water at least 5' from the foundation. Drainage 5' away from the foundation may be accomplished through the installation of a French drain, swales, or other means of directing water away from the foundation. Water shall not be discharged onto an adjoining property.

Gutters shall be equipped with screens to allow leaves and other debris to be washed off the roof. Rain barrels are an allowable expense, but they are not required.

Chapter 8: Walls and Ceilings

8.1 General Requirements

On exterior walls, all defects or deterioration that would allow the elements to enter wall cavities shall be corrected through Rehabilitation.

Replacement of sections of walls and ceilings shall match adjoining materials as closely as possible (e.g. thickness of the existing material).

When replacement of entire wall or ceiling coverings or sections of them is replaced, priming and painting of the entire wall or ceiling shall be completed.

8.2 Determining the Scope of Work

Interior and exterior walls and ceilings shall be inspected to determine if it is functioning as intended. Deficiencies noted through the inspection shall be corrected in Rehabilitation through repairing or replacement.

Each of the standards in this chapter shall be used to determine the scope of work. In addition, the requirements of the International Residential Code, Chapters 6-8,²¹ related to each standard shall be used as a guide along with the principles of safety and capacity.

Safety: Providing proper installation of walls and ceilings and minimizing hazards can be done by following the manufacturer's installation instructions, fully complying with any limitations placed on the use of products and permitting only qualified persons to perform installations.

Capacity: Unsafe and/or inadequate conditions often occur because existing walls and ceilings were poorly constructed and repairs were made over time using improper materials and improper installation methods.

²¹ <http://publicecodes.cyberregs.com/icod/irc/2009/index.htm?bu=IC-P-2009-000002&bu2=IC-P-2009-000019>

8.3 Substandard Conditions

Hazardous conditions include any condition that threatens the health and safety of occupants. When the following conditions exist, repair or replacement shall be completed:

1. Water damage or dry rot of siding, trim, or interior wall coverings
2. Exposed nails or popped seams
3. Peeling or chipped paint, holes, cracks, or gaps in interior wall coverings or exterior cladding
4. Broken, fire damaged or missing exterior cladding
5. Sagging or missing ceiling sections
6. Wood destroying insect damage in exterior cladding
7. Any other condition which meets the definition of a hazardous or substandard condition

8.4 Walls

Exterior Walls: If removing the exterior cladding, deteriorated exterior wall sheathing, studs, and bottom and top plates shall be replaced. Deteriorated or missing insulation shall be replaced and wall cavities shall be insulated to a minimum R-13.

Masonry repair or replacement shall match existing masonry as closely as possible, installed plumb, true, and in line with existing courses. If weep holes are filled or nonexistent, they shall be provided at least every 3' at the slab and at least 1 above each window.

Siding repair or replacement shall match existing siding as close as possible and provide for a positive drainage plain. All joints and seams shall fall on center of wall framing. Overlap and water sealing shall be completed in accordance with the manufacturer's installation instructions.

Interior Walls: A structural engineer shall inspect interior bearing walls that are proposed to be moved. Non bearing walls do not require a structural engineer. Moved or newly installed walls shall be constructed with 2x4 studs with the bottom plate securely fastened to the floor and the top plate securely fastened to ceiling joists.

All new gypsum board shall be installed according the manufacturer's installation instructions and shall be installed a minimum of ½" above the finished floor, taped, floated, and feathered prior to painting. New wall coverings shall not show noticeable blemishes or dents and tape shall not show after painting.

Bathroom Walls: Bathroom walls that are to be replaced shall be replaced with appropriate backer board. If tile will be installed in the shower/tub area, concrete board, or equivalent, shall be installed. Green board shall be installed in the rest of the bathroom. Bathroom wall coverings shall be installed a minimum of ½" above the finished floor, taped, floated, and feathered prior to painting. New wall coverings shall not show noticeable blemishes or dents and tape shall not show after painting. All bathroom walls shall be painted with a semi- or high-gloss paint No Volatile Organic Compound (VOC) paint.

8.5 Ceilings

For ceiling structure, see the Roofing Chapter.

Replacement of ceiling coverings shall be with 5/8" Type X gypsum board. Fastening shall be in accordance with the manufacturer's installation instructions. All new gypsum board shall be

taped, floated, feathered, primed, and painted with 2 coats of paint with the color chosen by occupants. If existing ceiling texture is desired by the occupants, closely matching the texture shall be a part of Rehabilitation.

When ceilings are replaced, all ceiling fixtures removed and reinstalled for replacement shall be air sealed.

8.6 Painting and Finishes

All areas not to be painted shall either be removed and reinstalled or completely covered to prevent overspray or splatter. Receptacle and switch plates shall be removed and reinstalled.

Interior Walls: All walls that were repaired or replaced shall be painted with two coats of No (VOC) paint. Color shall be chosen by the occupants. The contractor may limit the available choices of paint color. The sheen of the paint shall be decided by the occupants. Bathroom walls shall have a semi- or high-gloss sheen.

Exterior Walls: Replaced or repaired exterior cladding, with the exception of brick veneer, shall be painted with 2 coats of exterior grade paint. Existing exterior walls that were not replaced or repaired but will be painted shall comply with the following:

1. The ground shall be protected with a drop cloth. For pre 1978 homes determined or assumed to have lead-based paint, all scraped paint shall be disposed of in accordance with EPA and/or HUD guidelines.
2. Peeling and chipped paint shall be scraped loose.
3. The entire area to be painted shall be power washed prior to painting.
4. All areas not to be painted (e.g. windows, doors and their trim, exterior lighting fixtures, etc.) shall be covered to prevent overspray.

Trim and Baseboards: All installed trim around doors, windows, and floors shall be painted with one coat of No VOC paint on both sides (except for baseboard trim). Color shall be chosen by the occupants.

Chapter 9: Flooring

9.1 General Requirements

Deteriorated, inadequate, and weakened floor framing and subfloors can be the result of poor initial construction, foundation settling or failure, careless remodeling, water, or wood boring insects.

A thorough inspection shall be conducted to identify all subfloor and flooring deficiencies.

Floors are not expected to be perfectly level. However, severely sloped or uneven floors shall be repaired through appropriate corrective measures. All flooring shall be free from tripping hazards.

When floor coverings are replaced, the subfloor or concrete shall be dry, clean, smooth, and free from paint, varnish, wax, oils, solvents or other foreign matter.

If foundation work is a part of Rehabilitation, it shall be completed prior to repairing or replacing flooring.

9.2 Determining the Scope of Work

The floor covering and subfloor shall be inspected to determine if it is functioning as intended. Deficiencies noted through the inspection shall be corrected in Rehabilitation through repairing or replacement.

Each of the standards in this chapter shall be used to determine the scope of work. Additionally, the requirements of the 2009 IRC, Chapter 5,²² related to each standard shall be applied along with the principles of safety, capacity, and convenience.

Safety: Flooring can be a tripping hazard. Providing proper installation of flooring and minimizing hazards can be done by following the manufacturer's installation instructions, fully complying with any limitations placed on the use of products and permitting only qualified persons to perform installations. Often times, flooring deficiencies are due to foundation problems.

Capacity: Unsafe and/or inadequate conditions often occur because existing flooring and the subfloor was poorly constructed and repairs were made over time using improper materials and improper installation methods.

Convenience: Flooring, including transitions between rooms, must be relatively level and free of tripping hazards.

9.3 Substandard Conditions

Hazardous conditions include any condition that threatens the health and safety of occupants. When the following conditions exist, repair or replacement shall be completed:

1. Damaged, rotted, loose, weak or otherwise deteriorated subfloor
2. Torn, missing, broken, or otherwise damaged floor covering that creates a tripping hazard
3. Missing baseboards, shoe molding, or transition strips
4. Any other condition which meets the definition of a hazardous or substandard condition

9.4 Subfloor

The floor of a home is only as good as the subfloor beneath it. In pier and beam foundations, subflooring may become warped or have edge swelling due to moisture, which can also lead to weakening the floor system and cause squeaking.

Concrete Slab: If the concrete slab foundation is functioning as intended and is relatively level, no additional subfloor preparation is required. If it is functioning as intended, but not relatively level and/or has settlement cracks, self-leveling flooring compound shall be installed prior to installation of the floor covering.

Bathrooms, Kitchens, and High Traffic Areas: When replacing subflooring in bathrooms, kitchens, and high traffic areas (e.g. hallways) in houses with pier and beam foundations, the newly installed subfloor shall be 19/32" high performance paneling or 3/4" CDX plywood. All subfloor installations shall include subfloor caulking adhesive and nails or screws.

²² http://publicecodes.cyberregs.com/icod/irc/2009/icod_irc_2009_5_sec001.htm?bu=IC-P-2009-000002&bu2=IC-P-2009-000019

Other Habitable Rooms: Other habitable rooms requiring subfloor replacement shall have 3/4" CDX plywood installed as the subfloor with floor joists not more than 24" on center. All subfloor installations shall include subfloor caulking adhesive and nails or screws.

9.5 Floor Coverings

Kitchens and Bathrooms: Replacement floor coverings in kitchens, bathrooms, laundry rooms, and utility rooms shall be water resistant. Transitions between rooms shall match the new floor covering or match as closely as possible existing floor covering that is left in place. Sheet vinyl and VCT shall not be used in rooms with plumbing fixtures in a pier and beam home. Replacement floor coverings shall be selected for durability, safety, and ease of maintenance.

Other Habitable Rooms: Replacement flooring in other habitable rooms may include VCT, however laminate planks or ceramic tile is preferred (if ceramic tile is installed on a pier and beam foundation, the floor system may need to be structurally reinforced to support the extra load). Transitions between rooms shall match the new floor covering or match as closely as possible existing floor covering that is left in place. Sheet vinyl shall not be installed. Replacement floor coverings shall be selected for durability, safety, and ease of maintenance.

Vinyl Composition Tile (VCT): VCT shall be 12" x 12" x 1/8" and stored inside a conditioned space for a minimum of 48 hours prior to installation to allow materials to condition to the inside environment. VCT shall be fitted tightly, with no gaps showing at walls, doors, or trim. Full cover shall be achieved. Base boards or shoe molding shall be installed.

Laminate Planks: Laminate flooring shall be stored inside a conditioned space for a minimum of 48 hours prior to installation to allow materials to condition to the inside environment, and installed in accordance with the manufacturer's instructions. Door trim may need to be cut to fit planks seamlessly between rooms. Laminate planks shall be fitted tightly, with no gaps showing at walls, doors, or trim. Full cover shall be achieved, but it shall not fit tightly against walls so that it is allowed to "float." Base boards or shoe molding shall be installed.

Carpeting: While carpet is generally discouraged, homeowners may prefer that some areas of their home are carpeted. In this instance, care must be taken to insure that the carpet is of good quality, and properly installed over appropriate pad. Low pile carpet is preferable. In no instance may carpet be installed in kitchens or bathrooms. Replacement floor coverings shall be selected for durability, safety, and ease of maintenance.

When Not To Replace: Floor coverings that are dirty or slightly worn but is still effective and free from tripping hazards shall not be replaced, unless replacement is necessary for accessibility purposes. New floor coverings shall only be installed because the existing floor covering is ineffective, there are obvious trip hazards, because the subfloor was replaced, or because other work requires it, such as increasing the square footage of a room.

Chapter 10: Doors and Windows

10.1 General Requirements

If foundation work is a part of Rehabilitation, it shall be completed prior to repairing or replacing doors and windows.

Each habitable room that contains a window shall have at least one window that is in operable condition and capable of being held in the open condition without assistance or device. Habitable bedrooms must have a minimum one window that meets egress requirements.

Bathrooms, bedrooms and utility rooms shall have a door that is easily operable condition and fitted with functioning hardware that tightly latches the door.

10.2 Determining the Scope of Work

Existing doors and windows shall be inspected to determine if they are operating safely and effectively. Deficiencies noted through the inspection shall be corrected in Rehabilitation through repairing or replacement.

Each of the standards in this chapter shall be used to determine the scope of work. In addition, the principles of safety, capacity, and convenience shall be applied.

Safety: Providing proper installation of doors and windows and minimizing hazards can be done by following the manufacturer's installation instructions, fully complying with any limitations placed on the use of products and permitting only qualified persons to perform installations.

Capacity: Unsafe and/or inadequate conditions often occur because existing door and window repairs were made over time using improper materials and improper installation methods. Improper repairs affect a door or window's ability to operate effectively. Foundation settling and failure are also a cause of doors and windows to not function as intended.

Convenience: Doors and windows must be easy to operate for occupants, regardless of age or ability.

10.3 Substandard Conditions

Hazardous conditions include any condition that threatens the health and safety of occupants. When the following conditions exist, repair or replacement shall be completed:

1. Broken, missing or cracked window panes
2. Rotten or deteriorated sills, frames or trim
3. Missing seal or sealant or dried, cracked or missing putty or caulking around window panes
4. Windows painted shut, inoperable or difficult to open and close
5. Security bars that do not open from the inside without any special knowledge or tools
6. Windows and exterior doors that do not lock
7. Broken, damaged, or deteriorated doors
8. Doors that do not shut and latch or lock smoothly with the strike plate
9. Exterior doors that are not listed as exterior doors
10. Rotted, deteriorated or damaged thresholds, jambs, frames, or trim
11. Any other condition which meets the definition of a hazardous or substandard condition

10.4 Doors

Interior Doors: Interior doors shall be in good operating order, easy to open, close and latch. If replacement is required, the new door shall be a hollow core door, installed true and plumb, with trim installed on both sides. Bathroom doors shall be able to be locked. Hardware style (knob, lever handle, passage, etc.) and finish (chrome, brushed nickel, satin, etc.) shall be identified in scope of work. All doors that come into contact with interior walls when opened shall have base board mounted, rubber tipped door stops installed.

Exterior Doors: Exterior doors, including doors connecting the conditioned space with an attached garage, shall be in good operating order, easy to open, close, latch, and lock. If replacement is required, the new door shall be an Energy Star qualified pre-hung double bore exterior door, installed true and plumb, with trim installed on both sides. Doors connecting the conditioned space to an attached garage shall also be a fire rated door. Hardware style (knob, lever handle, passage, etc.), finish (chrome, brushed nickel, satin, etc.), peep hole, and any glazing shall be identified in scope of work. All exterior doors shall be keyed alike and a sufficient number of key copies provided to the occupants. All doors that come into contact with interior walls when opened shall have rubber tipped door stops installed

Accessibility and Universal Design: Accessible doors may be required depending on the Household. Universal design principles state that homes should be built to accommodate any person regardless of age or physical ability. The following is not required for every Rehabilitation, but consultation with the Household shall be made to determine if they are necessary:

1. At least one exterior door is widened to accommodate a 36" door and have a zero-step entry. If not feasible due to structural constraints, clear swing hinges can be installed
2. Heavily used Interior doors widened to accommodate a 36" door and have a threshold no higher than 1/8". If not feasible due to structural constraints, clear swing hinges can be installed
3. Automatic door openers can be installed
4. Lever handles shall be installed on all doors

10.5 Windows

All windows shall be in good operating order, easy to open, close, latch, and lock. If windows cannot be repaired, replacement shall take place. Flashing materials shall provide a positive drainage plane.

Performance: Replacement windows shall be Energy Star qualified and shall perform as follows:

Performance Measure	CZ2	CZ3	CZ4
U-Factor	0.65	0.50	0.35
SHGC	0.35	0.35	Not Required

Impact resistant windows, as required for windstorm compliance, the following shall apply:

Performance Measure	CZ2	CZ3	CZ4
U-Factor	0.75	0.65	0.35
SHGC	0.40	0.40	Not Required

Egress: Egress windows are required in habitable bedrooms. An egress window is defined as a window with a net clear opening of 5.0 square feet for a first floor window that is less than or equal to 4' from the sill to the finished grade. Windows that are higher than 4' above the finished grade as measured from the sill must have a net clear opening of 5.7 square feet.

10.6 Painting and Finishes

Doors: All doors shall be painted with two coats of No VOC paint on both sides. Color shall be chosen by the occupants.

Trim: All installed trim around doors and windows shall be painted with two coats of No VOC paint on both sides. Color shall be chosen by the occupants.

Chapter 11: Energy Efficiency

Minimum Energy Efficiency Requirements for Single Family Construction Activities are published at 10 TAC Chapter 21²³ and are only summarized below.

11.1 Rehabilitation

All Rehabilitation activities shall include at least 6 of the following measures in the scope of work. If one or more of the following are existing and performing as intended, it may count as one or more of the six required measures. See 10 TAC 21.6²⁴ for detailed requirements of each measure below:

1. Airsealing of the building envelop
2. Duct sealing
3. Attic insulation
4. Attic access insulation and sealing
5. Ceiling fans in habitable rooms
6. Window replacement with Energy Star qualified windows
7. Solar shades on east and west facing windows
8. Overhangs on south facing windows
9. Exterior door replacement with an Energy Star qualified doors
10. Replacing incandescent light bulbs with Energy Star qualified bulbs
11. Replacing showerheads with WaterSense qualified products
12. Replacing bath faucets with WaterSense qualified products
13. Installing Energy Star qualified exhaust fans in bathrooms
14. HVAC replacement
15. Weatherstripping operable doors and windows
16. DWH replacement

²³ [http://info.sos.state.tx.us/pls/pub/readtac\\$ext.ViewTAC?tac_view=4&ti=10&pt=1&ch=21&rl=Y](http://info.sos.state.tx.us/pls/pub/readtac$ext.ViewTAC?tac_view=4&ti=10&pt=1&ch=21&rl=Y)

²⁴

[http://info.sos.state.tx.us/pls/pub/readtac\\$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=10&pt=1&ch=21&rl=6](http://info.sos.state.tx.us/pls/pub/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=10&pt=1&ch=21&rl=6)

Chapter 12: Miscellaneous

12.1 Kitchens

Appliances: All kitchens shall have safe and operating stoves, cook tops, refrigerator, and an exhaust vent. Style, size, and color shall be provided in the scope of work and in consultation with the occupants; installed appliances shall be reasonably priced.

Countertops and Cabinets: Cabinets shall be level. All doors and pull out drawers functioning as intended. Handles or knobs appropriate to the needs of occupants. Countertops shall be level and at a height appropriate to the needs of occupants. Countertop replacement shall be of a material that is easily maintained. Luxury countertops, such as granite, are not allowed. Tile backsplash is allowable, be installed in accordance with the manufacturer's installation instructions, and shall not allow water to enter walls.