

PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT TECHNICAL PROCEDURE

POLICY NO.: Technical Procedure, TECH-108

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POLICY TITLE: Guidelines for Improvements to Non-Conforming Uses

POLICY: The Code of Federal Regulations (CFR) and the Pima County Floodplain and Erosion Hazard Management Ordinance (Ordinance) establish limitations on the extent of repairs or improvements to structures that do not conform to current flood hazard regulations, before these non-conforming structures must be brought into compliance. Often called the Substantial Damage/Substantial Improvement Rules, the purpose of limiting the extent of improvements to non-conforming structures is to minimize the overall flood damage potential and to limit the number and size of claims against the National Flood Insurance Program after a significant flood event. If floodprone structures are improved without limitation, the risk of flood damage is increased, which is contrary to the stated purpose of the National Flood Insurance Program. Although some federal implementation guidelines exist, additional guidance is necessary to determine when the substantial improvement threshold has been reached.

PURPOSE: The purpose of this procedure is to establish a clear and consistent approach for permitting repairs and improvements to non-conforming structures in order to establish when a substantial improvement has occurred, to establish a methodology for calculating cumulative improvements, and to establish an acceptable level of reporting and documentation to demonstrate the value of existing structures and the cost of improvements.

This procedure is available to the public to provide information and assistance to individuals making improvements to non-conforming use structures.

PROCEDURE:

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1 Basics of Improvements to Non-Conforming Uses

For the purpose of this Technical Procedure, an improvement is any attached addition or interior alteration to a structure that increases the value of the existing structure. Such alterations include, but are not limited to, any remodeling, attached decks, upgraded electrical systems, and additions including second floor additions. In general, anything that adds value to a non-conforming structure falls into this category. Detached items such as free-standing garages, detached decks/porches, pools, fences, landscape walls, sheds, etc. are not subject to this procedure.

Substantial improvement, as defined in 44 CFR 59.1, means:

“any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the ‘start of construction’ of the improvement. This term includes structures which have incurred ‘substantial damage’, regardless of the actual repair work performed. The term does not, however, include either:

- (1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions or*
- (2) Any alteration of a ‘historic structure’, provided that the alteration will not preclude the structure’s continued designation as a ‘historic structure’.”*

This limit, commonly referred to as the “50% rule,” limits non-conforming improvements to less than 50% of the value of the original non-conforming structure unless work is performed to bring the structure into compliance with current regulations. Improvements are considered cumulatively, meaning that the total costs of all non-conforming improvements must be less than 50% of the value of the original structure. For this reason, it is necessary for the District to track the cost of all improvements whether or not they meet or exceed 50% of the value of the original structure.

1.1 Structures Constructed in Violation of the Ordinance

Structures that were not constructed in accordance with applicable rules and regulations at the time of construction are not non-conforming uses. These structures are considered violations and are not covered by this policy.

1.2 Applicability

Basic Rule: A structure may be non-conforming due to flood or erosion hazards. If an applicant proposes to improve an existing, non-conforming structure, and the cost of such improvements equals or exceeds 50% of the fair market value of the structure, then the improvements, and possibly the entire building, must be brought into conformance with current floodplain requirements. This may mean elevating the finished floor elevation to the regulatory flood elevation or providing erosion protection.

For the purpose of this Technical Procedure, a non-conforming use is a structure that was constructed in accordance with applicable rules and regulations at the time of construction, but which does not conform to current applicable rules and regulations due to revised floodplain and/or erosion hazard information or due to revised rules and regulations.

Improvements made to a non-conforming use that do not exceed the 50% rule do not have to conform to the Ordinance, but conformance to the ordinance is highly recommended in order to limit the potential damage to the improved structure. In addition, the improvement cannot create a situation that puts the existing improvement or the proposed improvement at greater risk of flooding than that which existed for the existing improvement. Constructing improvements with floodproof materials is also highly recommended. Floodproofing (flood walls, flood resistant materials, flood venting) cannot be used to bring an existing residential structure into compliance, but may be used to bring a commercial structure into compliance.

1.2.1 Roof Mounted Solar Arrays

Since roof mounted solar arrays or panels add to the value of the structure, the cost of this type of improvement must be considered towards the total allowable non-conforming use value, with the following exceptions:

- a) Leased systems, as they are not real property and are owned by the lessor.
 - i. If a leased system is subsequently purchased, it does count towards the 50% rule, therefore a cost estimate for the solar system is required at the time of permitting, but the cost will not be applied towards the 50% rule unless the solar system is purchased.
- b) Systems installed on structures within locally mapped sheetflow floodplains with a flow depth of 6 inches or less.
- c) Systems installed on structures that are completely or partially open-sided, such as shade structures, carports, etc.

See Technical Policy 032 for more information on permitting roof mounted solar panels.

1.3 Exceptions to the Substantial Improvement Rule:

Improvements that are made to correct building code, health or safety violations are not affected by this rule, nor are improvements to registered historic buildings.

1.3.1 Conforming Lateral Additions

A lateral addition does not count towards the 50% rule if the addition:

- a) conforms to current floodplain requirements, and
- b) is not structurally connected as defined in Section 1.4, and
- c) the only modification to the existing structure is to add a doorway in the common wall. There can be no interior or other modifications to the existing structure, such as remodeling, roofing, etc.

See Section 3.2 for exceptions related to the addition of attached garages.

1.3.2 Code, Health and Safety Violations Exemptions:

There are restrictions to exempting certain repairs from the Substantial Improvement and Substantial Damage Rule in regards to code, health and safety violations. They are as follows:

- a) The violations must have been known and recognized as such by the appropriate regulatory official such as a building official, code enforcement officer, fire marshal or health officer.

- b) Such deficiencies in code must be documented previous to the remodel or repair of the structure.
- c) Costs to remedy violations which existed prior to the application for improvements or repair that were undocumented cannot be exempted from the cost estimate.

Costs to remedy violations cannot be exempted from the cost estimate merely because undertaking the improvement project would create or reveal violations. For instance, if during the remodeling process, it is discovered that the electrical systems no longer meet code standards, the cost to replace or repair them cannot be deducted from the cost estimate.

The amount exempted from the Substantial Improvement and Substantial Damage Rule can only be for those specific documented items, and only in like-kind replacement. For instance, if one tread of a stairway needs to be repaired, the cost of one tread may be deducted from the amount calculated as substantial improvement or repair. If the owner chooses to replace the entire stairway, for whatever reason, the cost of the entire stairway minus one tread is added to the cost estimate. If the owner wishes to replace wood treads with platinum treads, only the cost of one wood tread may be deducted from the cost estimate.

1.3.3 Historical Structure Exemption:

There are a few known registered historical structures in unincorporated Pima County. To verify if a structure is registered as historical, contact the following office:

Arizona Historic Preservation Society Arizona State Parks Department
1300 West Washington Street
Phoenix, Arizona 85007

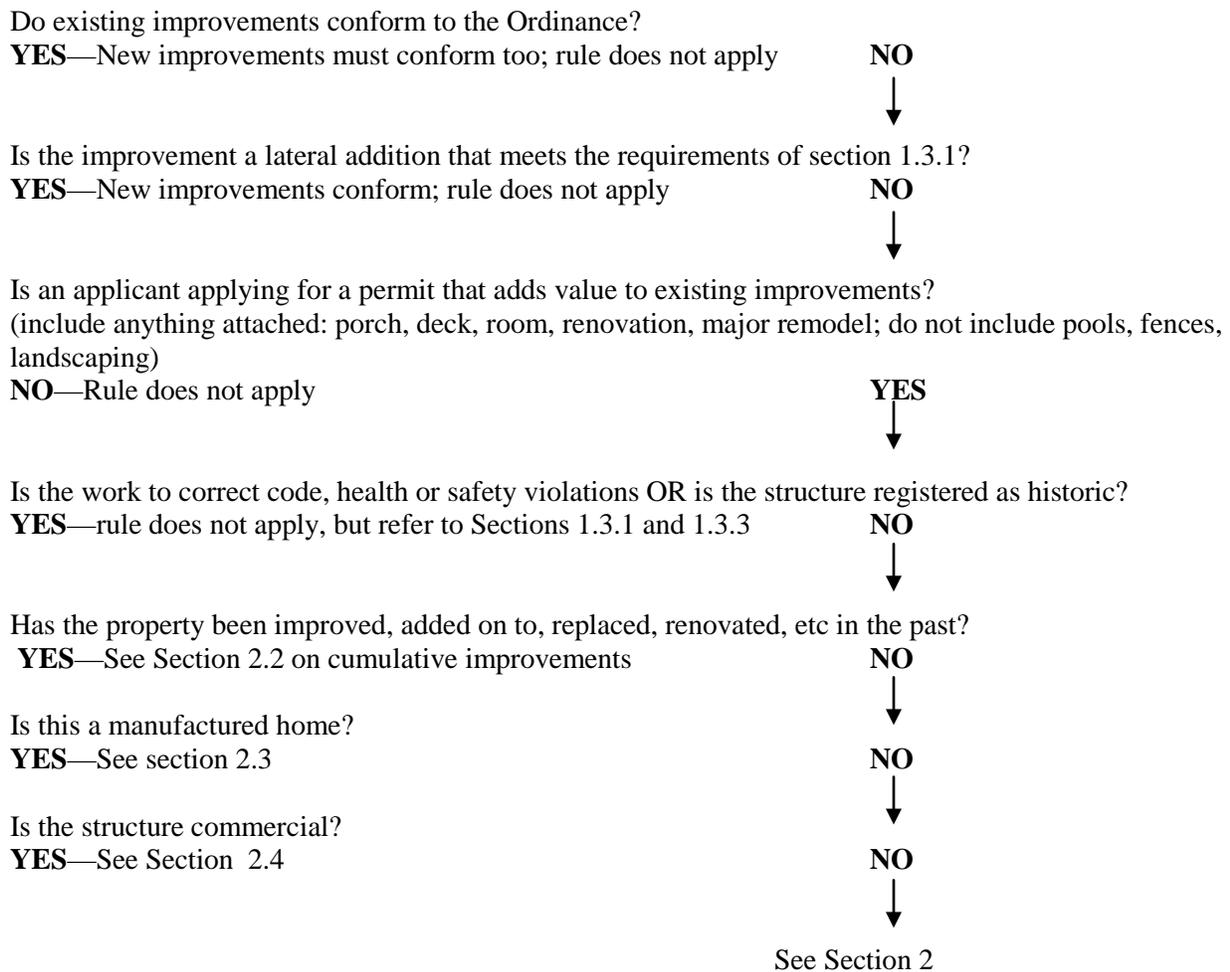
Note that an exemption to the Substantial Improvement and Substantial Damage Rule only applies to registered historic structures. Also note that if the proposed improvements or repairs would cause the structure to lose its historical status, then an exemption is not allowed. While an exemption may be granted, the permittee should still be encouraged to use other flood-proofing methods that do not interfere with the historic value, status, or look of the structure. Refer to the retrofitting manual for guidance. A perimeter berm can protect a structure without touching it.

1.4 Structural Connection and Common Walls

Due to concerns about additions transferring flood loads to the existing building, it may be necessary for a lateral addition to be structurally unconnected. For an addition to be structurally unconnected it must meet the following criteria:

- 1) The load-bearing structure of the existing building is not altered.
- 2) The addition is attached to the existing building with minimal connection. For example, the roof of the addition cannot transfer loads to the existing structure, so while the roof of the addition may be connected to the existing building, the addition must include structural support for the roof.
- 3) The only modification to the common wall is the addition of a doorway. A doorway is considered to be a 3 foot opening.

1.5 Applying the Substantial Improvement Rule: A flow chart



2 Calculation of Improvement Percentage

The calculation to determine substantial improvement depends on whether the improvement is the first improvement, or a subsequent improvement.

2.1 Improvement Percentage Calculation for First Improvement

For the first improvement to a non-conforming use structure, the formula for determining the improvement percentage is:

$$C_i / V_s = R$$

where C_i is the cost of the improvement, V_s is the value of the existing structure, and R is the relative percentage of the cost of the improvement to the value of the structure. If R equals or exceeds 50%, the improvement is a substantial improvement and additional requirements apply, as discussed below.

2.2 Improvement Percentage Calculation for Subsequent Improvements

When applying the 50% improvement rule to subsequent improvements, one must consider the change in home value over time in order to avoid scenarios in which a structure is improved upon indefinitely and in excess of 50% of the value of the original structure. As an example, suppose the value of a structure is \$100,000 and an improvement costing \$25,000 is made. The percent remaining for future improvements would then be 25%. If at some point in the future the home is worth \$250,000, by applying 25% to that new value, the property owner at that time would then have \$62,500 to spend on an improvement at that time; a value that includes an increase

in value due to the first improvement as well as the increase in value of the improvement over time. This is clearly a violation of the intent and spirit of the law. In order to rectify this problem, the following formula shall be used to calculate cumulative improvements. The methodology by which the formula was derived is presented in Attachment A.

To calculate the cumulative value of the structure and discount the value of previous improvements, use:

$$0.5 \leq p_1 + p_2(1 + p_1) + p_3(1 + p_1)(1 + p_2) \dots$$

where p_1 is the ratio of the value of the first improvement to the initial value of the structure, p_2 is the ratio of the value of the second improvement to the new value of the structure minus the initial value of the first improvement, and so forth.

By allowing the value of the structure to increase over time, the formula allows for more improvements to be made while remaining compliant with the 50% rule, as opposed to limiting the value of the structure to its value at the time of the first improvement. However, by discounting any increase in the value of structure due to previous improvements, the formula ensures that extent of improvements is related to the original structure only. It adjusts for inflation as well as appreciating home values, higher prices, etc.

An Excel calculation worksheet has been created at the following location to assist Area Hydrologists in performing these calculations: Z:_Shared Data\Rules_Procedures_etc\Technical Policies and Procedures\Tech 108 supporting docs/Tech 108- calculation worksheet.xls

2.3 Manufactured Home Replacements

Manufactured home replacement is often a simple matter because the entire new structure can be elevated to conform to the Ordinance, and thus the non-conforming use rule does not apply. However, there are locations where new structures of any kind are not permitted, but where existing structures are allowed to remain as non-conforming uses, such as floodways.

Because replacing an existing manufactured home constitutes a "reconstruction," or "rehabilitation" it is allowed under the substantial improvement rule. The substantial improvement rule can be used in these cases to replace a manufactured home, as long as the value of the replacing structure does not exceed 150% of the value of the replaced home.

Value of existing Manufactured Home x 1.5 = amount available for a replacement Manufactured Home.

Example: Current manufactured home value: \$50,000.00

Allowable improvements under the substantial improvement rule (50% of MH): \$25,000

Allowable value of replacement home (1.5x original value): \$75,000

2.3.1 Basic Procedure:

- Check the database for previous Mobile Home Replacement permits. If previous replacements have taken place since the structure became non-conforming, use the cumulative substantial improvement rules.
- Obtain receipts of value for both existing and replacement homes; these must be included in the Floodplain Use Permit File. A Title Certificate that lists the home's value can also be used or one of the methods outlined for fair market value on the previous page can be used. In all cases, newly placed Manufactured Homes must be elevated to at or above the Regulatory Flood Elevation and require an Elevation Certificate.
- In cases where new structures are not normally allowed by the Ordinance, multiply the value of the existing (to be replaced) manufactured Home by 150% (1.50). Any amount under this number can be used for a replacement Manufactured Home.

If the customer wishes in the future to add onto or improve the new manufactured home, they will be limited by whatever is left of the 50% value originally calculated. In this case, see the Section 2.2.

In all cases, the replacement Manufactured Home shall be elevated at or above the Regulatory Flood Elevation, as demonstrated by an Elevation Certificate completed by a registered land surveyor or civil engineer.

Additional requirements, such as re-orienting the structure parallel to flow or prescribing specific construction techniques may be placed on the replacement manufactured home.

2.4 Commercial Structures:

Commercial properties are bound by the same rules for substantial improvement as non-commercial buildings, with one notable exception. Commercial buildings can use flood-proofing as a means of conforming to the Ordinance. A flood-proofing certificate is required if this option is chosen. The flood-proofing certificate must show that all doors and the common wall between the existing structure and improvements are also made water-tight. If a second floor is added and is a substantial improvement, then the entire building must be brought into compliance by either elevating or flood-proofing, both of which require the applicable Certificate.

However, commercial structures may not be allowed to use floodproofing as a means of retrofitting in all cases.

2.5 Information Required to Calculate Non-Conforming Use Rule

In order to accurately determine the value of the improvements in relation to the value of the existing structure, it is necessary to determine the value of the existing structure, and a cost estimate of the improvements.

If the improvement is an addition, information regarding the common wall between new and existing improvements is necessary. FEMA Bulletin 480, page 8-12 states, "If the common wall is demolished as part of the project, then the entire structure must be elevated. If only a doorway is knocked through it and only minimal finishing is done (to the existing structure), then only the addition has to be elevated." For the purposes of this procedure, a doorway is defined as an opening not to exceed three feet in width.

Values of past improvements from previous FPUPs, if any, are also required.

2.5.1 Determining the Value of the Existing Structure

It is necessary to establish the "Fair market value" for the structure, before improvements. Fair Market Value applies only to the value of the structure being improved; not the land, other structures on the property, location of the property, or other improvements on the property, such as pools, landscaping, etc. Fair market value can be obtained in a number of ways:

- An appraisal of the structure performed by a licensed appraiser or other qualified professional, not related to the property owner.
- Assessed value of the structure as listed in the Pima County Assessor's Office. In most cases, this value shall be calculated by multiplying the latest assessed full cash value of the parcel by 0.65.
- A value of the structure based on NFIP claims data.

2.5.2 Determining the Cost of the Proposed Improvements (Cost Estimate)

A complete cost estimate is required. The cost estimate must be completed by a registered contractor or construction estimator not related to the property owner. (Property owners cannot prepare their own cost estimate, even if a licensed contractor.) The cost estimate shall indicate the costs of materials and labor separately and shall include all costs associated with the project at fair market value for both materials and labor. If any materials or labor is donated, performed by the property owner, or offered at a reduced rate, the fair market value of those items shall be used in the cost estimate. Fair market value is the value that the average person would have to pay for materials and labor based on the normal going rate in the local market.

Items to include in calculating the cost of the project:

- a) All structural elements
 - i. Spread or continuous foundation footings and pilings
 - ii. Monolithic or other types of concrete slabs
 - iii. Bearing walls, tie beams, and trusses
 - iv. Floors and ceilings
 - v. Attached decks and porches
 - vi. Interior partition walls
 - vii. Exterior wall finishes
 - viii. Windows and doors
 - ix. Reshingling or retiling a roof
 - x. Hardware

- b) All interior and exterior finishing elements
 - i. Tiling, linoleum, stone, or carpet over subflooring
 - ii. Bathroom tiling and fixtures
 - iii. Wall finishes (paint)
 - iv. Kitchen utility and bathroom cabinets
 - v. Built-in bookcases, cabinets and furniture
 - vi. Built-in appliances
 - vii. Hardware
 - viii. Drywall
 - ix. Paint

- c) All utility and service equipment
 - i. HVAC equipment
 - ii. Plumbing and electrical services
 - iii. Light fixtures and ceiling fans
 - iv. Security systems
 - v. Built-in kitchen appliances
 - vi. Central vacuum systems
 - vii. Water filtration, conditioning and/or recirculation systems
 - viii. For alternative energy systems, the full cost of materials and labor must be provided without the inclusion of any rebates or tax incentives.

- d) Overhead, profits and taxes

- e) Cost to demolish storm-damaged building components

- f) Labor and other costs associated with moving or altering undamaged building components to accommodate improvements or additions

Items to be excluded in calculating the cost of the project:

- i. Plans and specifications
- ii. Survey costs
- iii. Permit fees
- iv. Post-storm debris removal and cleanup (Example: If a tree falls on a roof and smashes it, the cost to remove the tree is not included in the cost estimate, but the cost to demolish and replace the damaged roof is.)
- v. Outside improvements

- vi. Landscaping and irrigation
- vii. Sidewalks
- viii. Fences
- ix. Yard lights
- x. Swimming pools
- xi. Screen pool enclosures
- xii. Detached structures

A sample cost estimate can be found in Attachment A.

3 Rules Applicable to Substantial and Non-Substantial Improvements to Non-Conforming Use Structures

The following rules are applicable to substantial and non-substantial improvements to non-conforming use structures.

3.1 No Increase of Hazard

In addition to the application of the 50 percent rule to improvements to nonconforming uses, the District requires that all such improvements be constructed in a manner which does not increase the flood or erosion damage potential of the structure. This means that the improvements shall have a finished floor elevation that is at least as high as the lowest floor of the nonconforming use, and shall have at least the same level of erosion/scour protection as the non-conforming use, as determined by the location of the improvement(s) with respect to the erosion hazard and the depth of footing of the existing structure. In accordance with this policy:

- a) The floor of the proposed improvement must be elevated, at minimum, to the level of the existing structure, as demonstrated by the site plan and/or building plans. An Elevation Certificate shall be required to demonstrate that the improvements have been constructed in accordance with this standard.
- b) If a structure is only partially within a regulatory floodplain, the addition must be placed outside of the floodplain if practicable.
- c) If the improvement(s) include a garage, the garage may be flood-vented and wet-floodproofed to a height of 1 foot above the base flood elevation. Flood venting shall be on at least two exterior walls with the bottom of the vents within one foot of grade. The total area of flood vents shall be equal to at least one square inch of venting per square foot of enclosed area. Flood-proof materials are those that can be inundated by floodwaters with little or no damage, such as concrete, stone, masonry, pressure-treated lumber, and epoxy paint. Vented and/or flood-proofed areas or structures must remain non-habitable unless brought into compliance. The size and location of flood vents shall be shown on the site plan and/or building plans.
- d) It is necessary to locate the proposed improvements such that they do not further encroach into the erosion hazard area.
- e) The footing of the proposed improvement must extend below grade to a depth that is at least equal to the maximum extension below grade of the footing of the existing structure, as demonstrated by the site plan and/or building plans.
- f) Alternatively, to address the erosion concerns, a report by an Arizona Registered Civil Engineer may be submitted that either demonstrates that the improvements are not at increased hazard from erosion or to design erosion protection for the proposed improvements. This report requires review and approval by the District.
- g) A zero-rise demonstration for structures in the floodway, showing the new improvements will not increase water surface elevations at all.

3.2 Attached Garage Additions

Attached garages are considered to be compliant when they are constructed with flood openings and constructed out of flood damage resistant materials. Attached garages that conform to the Ordinance, either by

flood venting and flood proofing or by elevating, do not count towards the 50% rule. Expansion of existing garages may require modification of the existing garage to make it flood damage resistant.

As with habitable additions, garage additions may not create conditions that increase the hazard to the proposed or existing improvements.

4 Substantial Improvement

If any non-conforming improvement to a non-conforming use exceeds 50% of the value of the structure, as determined using the methods above, the improvement, any future improvements, and in some cases, the entire existing structure, shall be constructed or brought into compliance with the current floodplain requirements.

4.1 Remodeling and Rehabilitation

Any improvements that are substantial and include remodeling or rehabilitating the existing structure requires that both the proposed and existing improvements comply with current floodplain requirements. In most cases, that means that the existing structure must be raised so that the lowest floor is elevated at or above the Regulatory Flood Elevation. Protection of the foundation of the proposed and existing structure is also likely to be required.

4.2 Impact of Lateral Additions on the Non-Conforming Use Structure

For a lateral addition that is a substantial improvement, the treatment of the existing structure depends on whether the addition is structurally connected (see Section 1.4). If the addition is structurally connected, the proposed addition and the existing structure must be made compliant with current floodplain requirements. If the addition is not structurally connected, only the addition must be made compliant with current floodplain regulations.

If the proposed work includes work in the non-conforming use structure or structural modification of the non-conforming use structure, the addition and the non-conforming use structure must be made to conform with current floodplain regulations.

4.3 Unusual cases: second floors, footprints, set-backs, multiple structures

The following examples apply to improvements that constitute a substantial improvement, that is, the cost of repairs or improvement exceeds 50% of the value of the original structure.

- a) If a second floor is being added, the whole structure must be elevated if the improvements are substantial. This is true regardless of how much or how little the footprint changes. Even if no changes to the footprint are made, the value of the structure, and thus the amount of value at risk, would still increase. Additionally, even if only the first floor of a two-story home is damaged, such damage can endanger the structural integrity of the entire house.
- b) If improvements do not add square footage to a structure but are substantial (like a remodeling, refurbishing or renovation), the entire structure must be brought into compliance. Value is being added to the structure, and therefore more value is at risk of flood damage.
- c) If a structure does not conform to the Ordinance because it is within an erosion hazard area, then the structure must either be relocated outside of the erosion hazard area or be protected from erosion by measures designed and as-built by an Arizona registered civil engineer prior to the construction of any substantial improvement.
- d) If multiple non-conforming structures exist on the property, and owners wish to substantially improve them, each is counted separately. An appraisal must be obtained for each separate structure, and the allowable improvements are based on 50% of the value of each respective structure.

5 Substantial Damage Rule

The Code of Federal Regulations defines substantial damage as follows:

"Substantial damage means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred." (44 CFR 59.1)

Any proposed rebuilding of a structure in a regulatory floodplain or erosion hazard area that is substantially damaged must comply with the Floodplain Ordinance regardless of the reason for the damage.

- a) The damage can be from any source: flood, fire, arson, termites, tornado, crime, war, etc.
- b) The substantial damage rule applies to all structures in regulated floodplains, regardless of whether or not the structure was covered by flood insurance.
- c) A structure that is considered to be substantially damaged is automatically a substantial improvement.

5.1 Substantial Damage - Exceptions and Variances:

Exceptions for bringing a damaged structure into compliance with the Floodplain Ordinance are the same as for substantial improvements. That is, exceptions are only granted to registered historic buildings (as long as the building will maintain its historic status through the repairs) and code violations which were on record before the damage occurred. See Section 1.3 for details. The same items that can be left off the cost estimate for substantial improvements apply to cost estimates for substantial damage (see Section 2.5.2).

Variances are rarely, if ever, issued in post-disaster situations. The same criteria that apply to non-disaster variance applications apply to disaster-related variance applications. The purpose of this document is not to cover the specifics of variance cases, however let it suffice to say that "FEMA considers it highly unlikely that variance requests can meet the criteria" necessary to qualify for a variance. (From FEMA publication 213/May 1991, Answers to Questions About Substantially Damaged Buildings, page 19.)

5.2 Substantial Damage - How to process a permit for a damaged building

The formula is similar to the formula for improvements. If the cost to repair the structure is 50% or more of the value of the structure before it was damaged, then the damage is substantial and the entire structure must be brought into conformance, regardless of whether or not the owner chooses to restore the structure to the pre-damage condition.

The process for determining whether or not a building is substantially damaged, and therefore whether or not it must be brought into compliance with the Ordinance, is as follows:

- a) Determine a value for the structure before the damage occurred. See Section 2.5 for details.
- b) Determine a cost to repair the structure to before-damaged condition. This can be obtained from:
 - i. A licensed general contractor, not related to the applicant
 - ii. A professional construction estimator, not related to the applicant
 - iii. Insurance adjustment papers, excluding damage to personal contents (this method is only useful as an estimation tool, rarely as a precise figure)
- c) Check for previous permits. Any previous improvements to non-conforming uses must be added to the total cost. It is possible that even though the damage from the current event is not substantial, when added to the cost of all previous improvements, the project becomes a substantial improvement.
- d) Add #2 + #3 and divide by #1. If this number is equal to or greater than 50%, then it is a substantial improvement and all substantial improvement rules apply. See the section on substantial improvements for the applicable structure type. If it is not substantially damaged, keep the cost estimate on record for future improvements or repairs; at some point it may become a substantial improvement and records must be kept for 15 years.

The cost estimate must be for what is needed to return the structure to before damaged condition, no matter what the owner may choose to do at this or another time. The owner may choose to do the minimum amount of

work to re-occupy the structure, but this amount is irrelevant to the cost estimate. If new improvements are done with the repair, they must be included in the cost estimate and count toward substantial improvements.

5.3 Substantial Damage - Cost Estimates

Cost estimates for damaged structures are required when the amount of damage is unknown and the owner does not wish to bring the building into compliance with the Floodplain Ordinance. Cost estimates for substantial damage must be supplied by a third party licensed contractor or professional construction estimator, or from insurance adjustment papers (see Section 2.5.2). If damage is from a flood, then the following items are likely to also be a part of the total estimate:

- new wall board and insulation and new paint
- replacement of sub- floor and new floor coverings
- new appliances, new doors, new furnace and water heater
- cleaning of duct work
- porch repair, and repair to other attached improvements (but not detached improvements)
- cleaned and/or repaired and inspected plumbing and electrical systems and fixtures

Keep in mind that the cost to repair a flood-damaged structure is usually much higher than expected, since major flood damage can occur from only a few inches of water. Since much of the damage may occur out of sight, it is important to ensure that the cost estimate for repair is complete. Damage such as mold may not be visible at all.

5.4 Repairs that are NOT substantial

If the cost to repair is less than 50%, the cost of the repair must be kept on file and counted against any future improvements or subsequent damage repairs.

5.5 Repairs and Improvements that ARE substantial

It is also possible that an owner may choose to take this opportunity to renovate the house, remodel a part or all of it, or add a second floor. Any and all improvements above and beyond the cost to repair the structure must be added to the cost estimate at this time, since they might well constitute a substantial improvement. Example: \$30,000 in damage is done to a house valued at \$100,000. The owners decide to also put on a second story which will cost \$25,000. The total of repairs and improvements is now \$55,000, and the structure is a substantial improvement and must now comply with the Floodplain Ordinance.

5.6 Disaster - What to do when many structures are damaged at once:

After a catastrophe, many buildings will need to be repaired or outright re-built. Those that are substantially damaged must be built in compliance with the Floodplain Ordinance.

After a catastrophic flood or other event, an emergency response team would be created and would coordinate the department's investigation of affected areas. Whether or not those investigations would include any assessment of buildings' level of damage is not known. However, in light of the Substantial Damage rule, it is good to have some general knowledge in mind before such an event occurs.

At such a time, many homeowners will be applying for permits to re-build right away. The department will be faced with the processing of perhaps hundreds of permits. To waive the determination of whether or not a building's damage is substantial is not an option, as it would be allowing structures to violate the Ordinance, and in the case of a flood, would also be placing those very structures back into the danger which they have just sustained. However, note that owners wishing to repair and/or rebuild in compliance with the Ordinance can be processed simply as new construction.

For all substantial improvements, the plans must show the building will comply with the Ordinance. Structures are placed into one of two categories:

- a) Buildings that have obviously sustained more than substantial damage: When a building has structural damage such as collapsed walls, a roof ripped off, the structure is dislodged from its foundation, or when more than three feet of flooding has occurred, it is likely to be substantially damaged. As it will be some time before the structure can be re-built and re-occupied, and the funds for doing so may not be readily available, these permits may have less priority. However, if the owner is ready to re-build and the plans show it will be in compliance with the Floodplain Ordinance, then a cost estimate is irrelevant and such permits can be processed as new construction.
- b) Buildings for which substantial damage is not easily determined or that have sustained damage that is clearly less than 50% of the value of the structure. If the owner does not wish to bring the structure into compliance with the Ordinance, such permits will have to depend on a detailed cost estimate to justify further non-compliance with the Ordinance. Compliance with the Ordinance should always be encouraged.

6 References

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APPROVED BY:


Suzanne Shields
Director

Date

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**ATTACHMENT A:
EXAMPLE - MINIMUM REQUIREMENT FOR COST ESTIMATE
FOR NON-CONFORMING USE CALCULATION**

COMPANY LETTERHEAD AND CONTRACTORS LICENCE NUMBER

Detailed Cost Estimate				
Item	Labor Cost	Material Cost	Total Cost	Description
Pemits fees	\$500.00	NA	\$500.00	
Plans and drawings	\$500.00	\$100.00	\$600.00	
Demolition and removal	\$5,000.00	NA	\$5,000.00	Includes labor and fees
Foundation concrete	\$2,000.00	\$15,000.00	\$17,000.00	400 sq. ft., includes concrete and materials
Foundation Pretreat	\$1,000.00	NA	\$1,000.00	
Plumbing	\$1,000.00	\$1,500.00	\$2,500.00	Pipes and materials
Plumbing fixtures	\$500.00	\$1,000.00	\$1,500.00	Double sink and toilet
Roofing	\$5,000.00	\$15,000.00	\$20,000.00	Ceramic tile roofing, 450 sq. ft.
Windows	\$1,500.00	\$6,000.00	\$7,500.00	10 double pane windows, 7 slider windows
Electrical (wiring)	\$750.00	\$1,500.00	\$2,250.00	Electrical to addition
Electrical Fixtures (included above)		\$300.00	\$300.00	Ceiling fan, 2 flood lights, porch light
Mechanical	\$1,000.00	\$6,000.00	\$7,000.00	12 Seer A/C unit and ductwork installation
Doors	\$700.00	\$2,000.00	\$2,700.00	5 interior doors, 1 exterior french door, includes hardware
Framing	\$3,500.00	\$10,500.00	\$14,000.00	
Insulation	\$200.00	\$1,200.00	\$1,400.00	Batt Insulation for roof and walls
Sheetrock	\$900.00	\$2,800.00	\$3,700.00	Material, tape and texture
Stucco	\$1,000.00	\$3,500.00	\$4,500.00	Two coat system
Paint	\$750.00	\$1,250.00	\$2,000.00	Paint for addition
Cabinets	\$1,000.00	\$3,000.00	\$4,000.00	
Countertops	\$500.00	\$1,500.00	\$2,000.00	Granite countertops, 50 sq. ft.
Tile	\$200.00	\$300.00	\$500.00	For shower, 30 sq. ft.
Carpeting	\$400.00	\$800.00	\$1,200.00	400 Sq. ft. Carpet for addition. Includes padding.
Miscellaneous fixtures	\$50.00	\$200.00	\$250.00	Bathroom mirror, vents, etc.
Jobsite cleanup	\$1,000.00	NA	\$1,000.00	
Miscellaneous cost	\$600.00	NA	\$600.00	General Contractor profit
TOTALS	\$29,550.00	\$73,450.00	\$103,000.00	
	\$1,000.00	\$100.00	\$1,100.00	Deduct cost of Permit fees, Plans/Drawings
FINAL ESTIMATED COSTS	\$28,550.00	\$73,350.00	\$101,900.00	

NOTE: The above example may include costs not associated with your project. There may be costs associated with your project that are not listed above that must be included. All costs must use fair market value for both materials and labor. Donated materials or labor must be included at fair market value. The costs of permit fees, and the creation of plans and drawings shall be included in the cost estimate, but can be subtracted from the value used to calculate the value of the improvement(s).

NOTE: As the value of the improvement(s) approach 50% of the value of the existing structure, the cost estimate must be more detailed, including such things as the number/type of windows and doors, the square footage of each flooring type, the number of plumbing and electrical fixtures, etc.

New Implementation of Cumulative Substantial Improvement for Noncompliance with NFIP Standards

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Abstract The federal guideline on grandfathered upgrades to building codes requires conformity when the total cost of improvements to the building exceeds 50%. As an example, suppose a new local law in a given flood region states that a new house must be placed on pylons; some pre-code buildings are not on pylons. If improvements are made which exceed $\frac{1}{2}$ the value of the property then the new code must be enforced, according to the federal law (National Flood Insurance Program, 44 CFR 60.3):

A problem with this rule is that it is ambiguous; an unscrupulous owner can evade the spirit of the law by making piecemeal improvements. As the property increases in value, one can indefinitely postpone the day when the building is brought up to code under one interpretation of the federal law. As a concrete example, suppose the value is \$100,000 and a first improvement is made costing just under \$50,000; the owner need not bring the property up to code. Suppose that, after some time, the property doubles in value. Then it is worth \$300,000, and *it might be argued* that under the federal law, the owner can spend an additional \$100,000 on improvements, *again* without having to comply with the new code. Continuing this strategy, the owner can avoid ever bringing the property up to code, which is against the intent and spirit of the law. We rectify this problem with a new interpretation of the 50% rule.

A new look at the federal statute.

Here we interpret the federal statute in a way that the ambiguity is made precise and so that this loophole is eliminated. We suppose that at various times, t_1, t_2, \dots , piecemeal improvements costing I_1, I_2, \dots are made to the building which was originally worth V_1 just before the time, t_1 , of the first improvement. The ratio, ρ_1 , of the value of the improvement to the initial value of the building must satisfy the inequality,

$$\rho_1 = \frac{I_1}{V_1} < \frac{1}{2},$$

in conformity with the federal law.

Just before the second improvement, at time t_2 , is made, assuming that each dollar in the value of the building at time t_1 is now worth $\$R$, the building is worth $V_2 = (V_1 + I_1)R_1$. At time t_2 , the building is again improved at a cost I_2 , but we argue that one should regard the base, or the denominator, of the ratio of the improvement to be not $V_1 + I_1$, but *the original value*, V_1 . Thus we should interpret the federal guideline at time t_2 as

$$\rho_1 + \rho_2^* < \frac{1}{2},$$

where $\rho_2^* = \frac{I_2}{V_2^*}$, where $V_2^* = V_1 R_1$ instead of using $(V_1 + I_1)R_1$, as in the example, where one *benefits* from the cost of the repair. This interpretation of the federal law is consistent with the wording and is in the true spirit of the law. If we define $\rho_2 = \frac{I_2}{V_2}$, then we propose requiring that

$$\rho_1 + \frac{I_2}{V_2^*} = \rho_1 + \frac{I_2}{V_1 \frac{V_2}{V_1 + I_1}} = \rho_1 + \rho_2(1 + \rho_1). \text{ Note we have eliminated the unknown rate}$$

of interest R_1 and have estimated it as $R_1 = \frac{V_2}{V_1 + I_1}$ to calculate how much V_1 would have increased to V_2^* without the improvement, I_1 . This gives $R_1 = \frac{V_2^*}{V_1}$.

Similarly, if at time t_3 we improve the property by I_3 , where we set $V_3 = (V_2 + I_2)R_2$, and if V_3^* is the value at time t_3 due solely to the value V_1 and not to the improvements, then $V_3^* = V_2^*R_2$, and we define $\rho_3 = \frac{I_3}{V_3}$, $\rho_3^* = \frac{I_3}{V_3^*}$, then the law requires that $\rho_1 + \rho_2 + \rho_3^* < \frac{1}{2}$. Note that *adding* $\rho_1^* = \rho_1$ to ρ_2^* , etc. is in the spirit of the law which refers to *cumulative* improvements.

In terms of the ratios $\rho_n = \frac{I_n}{V_n}$, we require that

$$\rho_1 < \frac{1}{2},$$

$$\rho_1 + \rho_2(1 + \rho_1) < \frac{1}{2},$$

$$\rho_1 + \rho_2(1 + \rho_1) + \rho_3(1 + \rho_1)(1 + \rho_2) < \frac{1}{2},$$

and in general,

$$\sum_{i=1}^n \rho_i \prod_{j=1}^{i-1} (1 + \rho_j) < \frac{1}{2}.$$

The loss of piecemeal improvements is not so great.

We next note that the owner who cannot afford to make all his improvements at one time need not regret so much as a consequence of the new rule in that the sum of the *unstarred* ratios,

$$\rho_1 + \dots + \rho_n \geq n\left(\left(\frac{3}{2}\right)^{\frac{1}{n}} - 1\right) = r_n.$$

We will see that $r_2 = \sqrt{6} - 2 = .445\dots$, and r_n decreases in n to $r_\infty = \log \frac{3}{2} = .405\dots$. That is, if one's richer neighbor makes all his improvements at once and gets a sum of improvement ratios $\rho_1 = .5$ the poorer neighbor who makes improvements piecemeal can do no worse than a sum of improvement ratios,

$$\rho_1 + \rho_2 + \dots \geq \log \frac{3}{2} = .405\dots$$

Thus in the worst case, the poorer owner has a cumulative sum at worst only about 20% smaller than that of the richer neighbor who gets the full fraction $\frac{1}{2} = .5$, before having to bring his property up to code.

It is clear that one can only lose if one makes piecemeal improvements because one needs to bring the building up to code earlier than if one made all the improvements at a single time, as follows from the inequality

$$\sum_{i=1}^n \rho_i \leq \sum_{i=1}^n \rho_i \prod_{j < i} (1 + \rho_j).$$

We argue above that one does not lose all that much (less than 20%) if economic necessity forces one into making piecemeal improvements. This is because we can prove, as we do below, that the smallest that the left side of the last inequality can be under any choice of n and any choice of ρ_i , $i = 1, \dots, n$ for which the right side is (greater than or equal to $\frac{1}{2}$) is $\log \frac{3}{2} = .405$. We show that for any fixed n the smallest value that the left side can be, if the right side reaches $\frac{1}{2}$ at time t_n , is when all the ρ 's are equal to a common value which is $\left(\frac{3}{2}\right)^{\frac{1}{n}} - 1$, in which case the sum of the equal ρ 's is

$$n\left(\left(\frac{3}{2}\right)^{\frac{1}{n}} - 1\right) \downarrow \log \frac{3}{2}.$$

This shows that the new interpretation of the federal law should be reasonable and acceptable to reasonable people.

Proof that the loss due to piecemeal improvements is limited.

We prove the above assertion about the minimum value of the sum of the ρ 's given that the sum of the ρ^* 's is greater than a given value. To that end, for $r \geq 0$ and $n = 1, 2, \dots$, let $f_n(r)$ denote the infimum of $\rho_1 + \dots + \rho_n$ given that the sum

$$\rho_1 + \rho_2(1 + \rho_1) + \dots + \rho_n(1 + \rho_1)(1 + \rho_2) \dots (1 + \rho_{n-1}) \geq r.$$

We prove by induction that $f_n(r) = n((1+r)^{\frac{1}{n}} - 1)$ and this value is *uniquely* achieved when

$$\rho_1 = \rho_2 = \dots = \rho_n = (1+r)^{\frac{1}{n}} - 1.$$

Note that this holds for $n = 1$ and all $r \geq 0$. Suppose it is true for n and all $r \geq 0$. To prove it for $n + 1$, note that

$$f_{n+1}(r) \geq \min_{0 \leq \rho_1 \leq r} [\rho_1 + f_n(\frac{r-\rho_1}{1+\rho_1})],$$

because for any $\rho_1 \leq r$, if we set $r' = \frac{r-\rho_1}{1+\rho_1}$,

we have, $\rho_2 + \dots + \rho_{n+1} \leq f_n(r')$, since

$$\rho_2 + \rho_3(1 + \rho_2) + \dots + \rho_{n+1}(1 + \rho_2) \dots (1 + \rho_n) \geq \frac{r-\rho_1}{1+\rho_1} = r' \text{ if}$$

$$\rho_1 + \rho_2(1 + \rho_1) + \dots + \rho_{n+1}(1 + \rho_1) \dots (1 + \rho_n) \geq r.$$

By induction, since $2, 3, \dots, n+1$ has $n+1-1 = n$ elements, the minimum of $f_n(r') = f_n(\frac{r-\rho_1}{1+\rho_1})$ is achieved when

$$\rho_2 = \dots = \rho_{n+1} = (1+r')^{\frac{1}{n}} - 1 = (\frac{1+r}{1+\rho_1})^{\frac{1}{n}} - 1,$$

and then

$$f_n(r') = n((1+r')^{\frac{1}{n}} - 1) = n((\frac{1+r}{1+\rho_1})^{\frac{1}{n}} - 1).$$

But next we observe that the minimum (infimum) of

$$\rho_1 + n((\frac{1+r}{1+\rho_1})^{\frac{1}{n}} - 1),$$

occurs uniquely at that unique point, ρ_1 , where the derivative with respect to ρ_1 is zero, namely where

$$1 - (\frac{1+r}{1+\rho_1})^{\frac{1}{n}-1} \frac{1+r}{(1+\rho_1)^2} = 0,$$

or where $(1 + \rho_1)^{\frac{1}{n}+1} = (1+r)^{\frac{1}{n}}$, i.e., where $\rho_1 = (1+r)^{\frac{1}{n+1}} - 1$, which is the same value as the other ρ 's, $\rho_2, \dots, \rho_{n+1}$, when ρ_1 has this value. Moreover, then we see that

$$f_{n+1}(r) = (1+r)^{\frac{1}{n+1}} - 1 + n((\frac{1+r}{1+\rho_1})^{\frac{1}{n}} - 1)$$

$$= (1+r)^{\frac{1}{n+1}} - 1 + n((1+r)^{\frac{1}{n+1} \cdot \frac{1}{n}} - 1) = (n+1)((1+r)^{\frac{1}{n+1}} - 1).$$

The induction step is complete and the assertion is proved. It is easy to check that for fixed r , $f_n(r)$ decreases in n to the limiting value

$$f_\infty(r) = \log(1+r),$$

as was claimed above for $r = \frac{1}{2}$.