General Considerations & Guidelines for Building Safety Inspections Part of Broward County BORA Policy #05-05

I. SCOPE OF STRUCTURAL INSPECTION

The **fundamental purpose** of the required Building Safety Inspection and report is to confirm in a reasonable fashion that the building or structure under consideration is safe for continued use under its present occupancy. As implied by the title of this document, this is a recommended procedure, and under no circumstances are these minimum recommendations intended to supplant proper professional judgment.

Such inspection shall be for the purpose of determining the general structural condition of the building or structure to the extent reasonably possible of any part, material, or assembly of a building or structure which affects the safety of such building or structure and which supports any dead, live, or wind load.

In general, unless there is obvious overloading or significant deterioration of important structural elements, there is little need to verify the original design. It is obvious that this has been time-tested if still offering satisfactory performance. Rather, it is important that the effects of time with respect to the degradation of the original construction materials be evaluated. It will rarely be possible to visually examine all concealed construction, nor should such be generally necessary. However, a sufficient number of typical structural members should be examined to permit reasonable conclusions to be drawn.

Visual Examination will, in most cases, be considered adequate when executed systematically. The visual examination must be conducted throughout all habitable and non-habitable areas of the building, as deemed necessary, by the inspecting professional to establish compliance. Surface imperfections such as cracks, distortion, sagging, excessive deflections, significant misalignment, signs of leakage, and peeling of finishes should be viewed critically as indications of possible difficulty.

Testing Procedures and quantitative analysis will not generally be required for structural members or systems except for such cases where visual examination has revealed such need, or where apparent loading conditions may be critical.

Manual Procedures such as chipping small areas of concrete and surface finishes for closer examinations are encouraged in preference to sampling and testing where visual examination alone is deemed insufficient. Generally, unfinished areas of buildings, such as utility spaces, maintenance areas, stairwells, and elevator shafts, should be utilized for such purposes. In some cases, to be held to a minimum, ceilings or other construction finishes may have to be opened for selective examination of critical structural elements. In that event, such locations should be carefully located to be least disruptive, most easily repaired, and held to a minimum. In any event, a sufficient number of structural members must be examined to afford reasonable assurances that such are representative of the total structure.

Evaluating an existing structure for the effects of time must take into account two basic considerations: movement of structural components with respect to each other and deterioration of materials.

With respect to the former, volume change considerations, principally from ambient temperature changes and possibly long-time deflections, are likely to be most significant. Foundation movements will frequently be of importance, usually settlement, although upward movement due to expansive soils may occur, although infrequently in this area. Older buildings on spread footings may exhibit continual, even recent settlements if founded on deep unconsolidated fine-grained or cohesive coils, or from subterraneous losses or movements from several possible causes.

With very little qualifications, such as rather rare chemically reactive conditions, deterioration of building materials can only occur in the presence of moisture, largely related to metals and their natural tendency to return to the oxide state in the corrosive process.

In this marine climate, highly aggressive conditions exist year-round. For most of the year, outside relative humidity may frequently be about 90 or 95%, while within an air-conditioned building, relative humidity will normally be about 55% to 60%. Under these conditions moisture vapor pressures ranging from about 1/3 to 1/2 pounds per square inch will exist much of the time. Moisture vapor will migrate to lower-pressure areas. Common building materials, such as stucco,

masonry, and even concrete, are permeable even to these slight pressures. Since most of our local construction does not use vapor barriers, condensation will take place within the enclosed walls of the building. As a result, deterioration is most likely adjacent to exterior walls or wherever else moisture or direct leakage has been permitted to penetrate the building shell.

Structural Deterioration will always require repair. The type of repair, however, will depend upon the importance of the member in the structural system and the degree of deterioration. Cosmetic-type repairs may suffice in certain non-sensitive members, such as tie beams and columns, provided that the remaining sound material is sufficient for the required function. For members carrying assigned gravity or other loads, cosmetic-type repairs will only be permitted if it can be demonstrated by rational analysis that the remaining material if protected from further deterioration, can still perform its assigned function at acceptable stress levels. Failing that, adequate repairs or reinforcement will be considered mandatory.

Written Reports shall be required attesting to each required inspection. Each such report shall note the location of the structure, a description of the type of construction and general magnitude of the structure, the existence of drawings and location thereof, the history of the structure to the extent reasonably known, and a description of the type and manner of the inspection, noting problem areas and recommended repairs, if required to maintain structural integrity. See additional reporting requirements outlined in the foregoing of the Policy.

Each report shall include a statement to the effect that the building or structure is structurally safe, unsafe, safe with qualifications, or has been made safe. It is suggested that each report also include the following information indicating the actual scope of the report and limits of liability. This paragraph may be used:

> *"As a routine matter, in order to avoid possible misunderstanding, nothing in this report should be considered to be a guarantee for any portion of the structure. To the best of my knowledge and ability, this report represents an accurate appraisal of the present condition of the building based upon careful evaluation of observed conditions, to the extent reasonably possible."*

Foundations

If all of the supporting subterranean materials were completely uniform beneath a structure, with no significant variations in grain size, density, moisture content, or other mechanical properties, and if dead load pressures were completely uniform, settlements would probably be uniform and of little practical consequence. In the real world, however, neither is likely. Significant deviations from either of these two idealisms are likely to result in unequal vertical movements.

Monolithic masonry structures are generally incapable of accepting such movement. Since, in most cases, differential shears are involved, cracks will typically be diagonal.

Small movements, in themselves, are most likely to be structurally important only if long-term leakage through fine cracks may have resulted in deterioration. In the event of large movements, contiguous structural elements such as floor and roof systems must be evaluated for possible fracture or loss of bearing.

Pile foundations are, in general, less likely to exhibit such difficulties. Where such does occur, special investigation will be required.

Roofs

Sloping roofs, usually having clay or cement tiles, are of concern in the event that the covered membrane may have deflections if merely resulting from deteriorated rafters or joists, will be of greater import. Valley flashing and base flashing at roof penetration will also be areas of concern.

Flat roofs with built-up membrane roofs will be similarly critical with respect to deflection considerations. Additionally, since they will generally be approaching expected life limits at the age when The Building Safety Inspection is required, careful examination is important. Blisters, wrinkling, alligatoring, and loss of gravel are usual signs of difficulty.

Masonry Bearing Walls

Random cracking, or if discernible, definitive patterns of cracking, will, of course, be of interest. Bulging, sagging, or other signs of misalignment may also indicate related problems in other structural elements. Masonry walls, commonly

constructed of either concrete masonry units or terra-cotta blocks, may have been constructed with either reinforced concrete columns and tie beams or lintels.

Of most probable importance will be the vertical and horizontal cracks where masonry units abut tie columns or other frame elements such as floor slabs. Of interest here is the observation that although the raw materials of which these masonry materials are made may have much the same mechanical properties as the reinforced concrete framing, their actual behavior in the structure, however, is likely to differ with respect to volume change resulting from moisture content and variations in ambient thermal conditions.

Moisture vapor penetration, sometimes abetted by salt-laden aggregate and corroding rebars, will usually be the most common cause of deterioration. Tie columns are rarely structurally sensitive, and a fair amount of deterioration may be tolerated before structural; impairment becomes important. Cosmetic-type repair involving cleaning and parching to effectively seal the member may often suffice. A similar approach may not be unreasonable for tie beams, provided they are not also serving as lintels. In that event, a rudimentary analysis of load capability using the remaining actual rebar area may be required.

Floor and Roof Systems

Cast-in-place reinforced concrete slabs and beams and joists may often show problems due to corroding rebars resulting from cracks or merely inadequate protecting cover of concrete. Patching procedures will usually suffice where such damage has not been extensive. Where corrosion and spalling have been extensive in structurally critical areas, competent analysis with respect to the remaining structural capacity relative to actual supported loads will be necessary. Type and extent of repair will be dependent upon the results of such investigation.

Pre-cast concrete members may present similar deterioration conditions. End support conditions may also be important. Adequacy of bearing, indications of end shear problems, and restraint conditions are important and should be evaluated in at least a few typical locations.

Steel Framing System

Corrosion, obviously enough, will be the determining factor in the deterioration of structural steel. Most likely, suspect areas will be fasteners, welds, and the interface area where bearings are embedded in masonry. Column bases may often be suspect in areas where flooding has been experienced, especially if salt water has been involved. Concrete fireproofing will, if it exists, be the best clue indicating the condition of the steel.

Concrete Framing Systems

Concrete deterioration will, in most cases, similarly be related to rebar corrosion. In this respect, honeycomb areas may contribute adversely to the rate of deterioration. Columns are frequently the most suspect. Extensive honeycombing is most prevalent at the base of columns, where fresh concrete was permitted to segregate, dropping into forms. This type of problem has been known to be compounded in areas where flooding has occurred, especially involving salt water.

Thin cracks usually indicate only minor corrosion, requiring minor patching only. Extensive spalling may indicate a much more serious condition requiring further investigation. In spall areas, chipping away a few small loose samples of concrete may be very revealing especially since loose material will have to be removed even for cosmetic-type repairs, anyway. Fairly reliable quantitative conclusions may be drawn with respect to the quality of the concrete. Even though our cement and local aggregate are essentially derived from the same sources, cement will have a characteristically dark grayish-brown color in contrast to the almost white aggregate. A typically white, almost alabaster-like coloration will usually indicate reasonably good overall strength.

Windows and Doors

Window and door condition is of considerable importance with respect to two considerations. Continued leakage may have resulted in other adjacent damage, and deteriorating anchorage may result in the loss of the entire unit in the event of severe windstorms even short of hurricane velocity. Perimeter sealants, glazing, seals, and latches should be examined with a view toward deterioration of materials and anchorage of units for inward as well as outward (suction) pressure, most importantly in tall buildings.

Wood Framing
Older wood-framed structures, especially those of the industrial type, are of concern in that long-term deflections may have opened important joints, even in the absence of deterioration. Corrosion of ferrous fasteners will, in most cases, be obvious enough. Rot and termite damage are potential sources of damage in wood structures. Penetration with a pointed tool to a depth greater than about 1/8 inch with moderate hand pressure will indicate the possibility of deterioration.

Building Facade
Appurtenances on an exterior wall of a building are elements including, but not limited to, any cladding material, precast appliques, exterior fixtures, ladders to rooftops, flagpoles, signs, railings, copings, guardrails, curtain walls, balcony and terrace enclosures, including greenhouses or solariums, window guards, window air conditioners, flower boxes, satellite dishes, antennae, cell phone towers, and any equipment attached to or protruding from the façade that is mechanically and the adhesive attached.

Loading
It is of importance to note that even in the absence of any observable deterioration, loading conditions must be viewed with caution. Recognizing that there will generally be no need to verify the original design, since it will have already been "time tested", this premise has validity only if loading patterns and conditions **remain unchanged.** Any material changes in type and magnitude or loading in older buildings should be viewed as sufficient justification to examine the load-carrying capability of the affected structural system.

II. SCOPE OF ELECTRICAL INSPECTION

The purpose of the required inspection report is to confirm that the building or structure and all habitable and non-habitable areas, as deemed necessary by the inspecting professional to establish compliance, are safe for continued use under present occupancy. This is a recommended procedure, and under no circumstances are these minimum recommendations intended to supplant proper professional judgment.

Electric Service
A description of the type of service supplying the building or structure shall be provided, stating the amperage, if three (3) phase or single (1) phase, and if the system is protected by fuses or breakers. Proper grounding of the service shall be in good standing. The meter and electric rooms should have sufficient clearance for equipment and for the serviceman to perform both work and inspections. Gutters and electrical panels shall all be in good condition throughout the entire building or structure.

Switchgear, Branch Circuits, etc.
Switchgear, branch circuits, etc., in the building, shall all be identified. A visual inspection and evaluation of the switchgear, conductors, and terminations shall be performed. Proper grounding shall be verified for all equipment used in the building, such as emergency generators, elevators, motors, etc.

Conduit Raceways
All accessible conduits shall be free from excessive corrosion and shall be properly supported.

Fire Alarm System
The fire alarm system shall be in good working condition and shall have an up-to-date system record report.

Emergency Lighting
Exit sign lights and emergency lighting shall all be in good working condition.

III. HISTORICAL DOCUMENTS, PERMITTING, REPAIRS AND REPORTS

An attempt should be made to investigate the existence of documents with the local jurisdiction to assist with the overall inspection of the building.

Understanding the structural system, building components, and intended design may guide the design professional to investigate certain critical areas of the structure.

Violations through the code compliance division of the local jurisdiction should be investigated. Cases on file may lead to issues pre-existing with the building, especially any unsafe structure determinations. Depending on the nature of the violation, Building Safety Inspections may be affected.

Unpermitted activities may also affect the outcome of a Building Safety Inspection, especially with unpermitted additions to the building. The Building Safety Inspection of a building is conducted on the entire structure including the original construction and any subsequent permitted addition. Unpermitted additions found by the Building Safety Inspection process present an unsafe situation and shall be identified in the report, even if found to be properly built. Like a repair process identified by the report, legalizing an unpermitted addition would be a prerequisite to the completion of a successful Building Safety Inspection report. Examples of unpermitted work that may affect Building Safety Inspections include but are not limited to, additions, alterations, balcony enclosures, etc.

Repairs identified in the Building Safety Inspection report will most likely require permits. Once the initial report is completed, it should be submitted to the local jurisdiction for processing. Do not proceed to conduct repairs without permits. Some repairs, for example, changing a bulb in an exit sign, may not require a permit, but most other work will require permits. Proceeding without obtaining repair permits may lead to a violation of the code. Additionally, repairs being conducted under a permit will afford additional time to comply with a complete Building Safety Inspection report.

Completing the reports concisely is vital to the overall understanding of the conditions of the building and the successful completion of the Building Safety Inspection process. The approved report forms provided herein shall be used. Proprietary forms will not be accepted. Such approved forms are to be considered supplemental to and in addition to a detailed written report. Sufficient photos shall be included to adequately convey typical conditions observed, particularly where defects are found. Where provided, photos shall be in color and with sufficient resolution to detail the conditions being shown. Building Safety Inspection reports may be audited, and the subject building may be inspected at the discretion of the Building Official. The Building Official reserves the right to rescind or revoke an approved Building Safety Inspection report.

The **Code in Effect** at the time of the original construction is the baseline for Building Safety Inspections. Subsequent improvements to the original building should be inspected based on the code at the time of permitting. The intent of the Building Safety Inspection is not that buildings must be brought into compliance with current codes.