

# HOME AND BUILDING INSPECTION

## HOME AND BUILDING INSPECTION SCOPE OF WORK IN PUERTO RICO

NABIE ANNUAL CONFERENCE-2014  
WESTIN HOTEL AT DALLAS-FORT WORTH  
IRVIN, TEXAS  
2/22/2014

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# HOME AND BUILDING INSPECTION SCOPE OF WORK IN PUERTO RICO

- INTRODUCTION
- THE BEST WAY FOR HOME INSPECTION
- OBJECTIVES
- HOME AND BUILDING INSPECTION DEFINITIONS

# INTRODUCTION

The home and building inspection outcome depends on an assignment scope of work and the professionalism to judge soundness based on visual evidence.

The experience and training are crucial elements for the effectiveness and accuracy during the identification of defects and causes based on visual observations and techniques that help to determine defect's in order to recommend corrective actions and cost of repairs.

professional engineer engaged in building inspection shall be able to utilize a systematic inspection process in order to assure that most amount of defects are correctly found and identified.

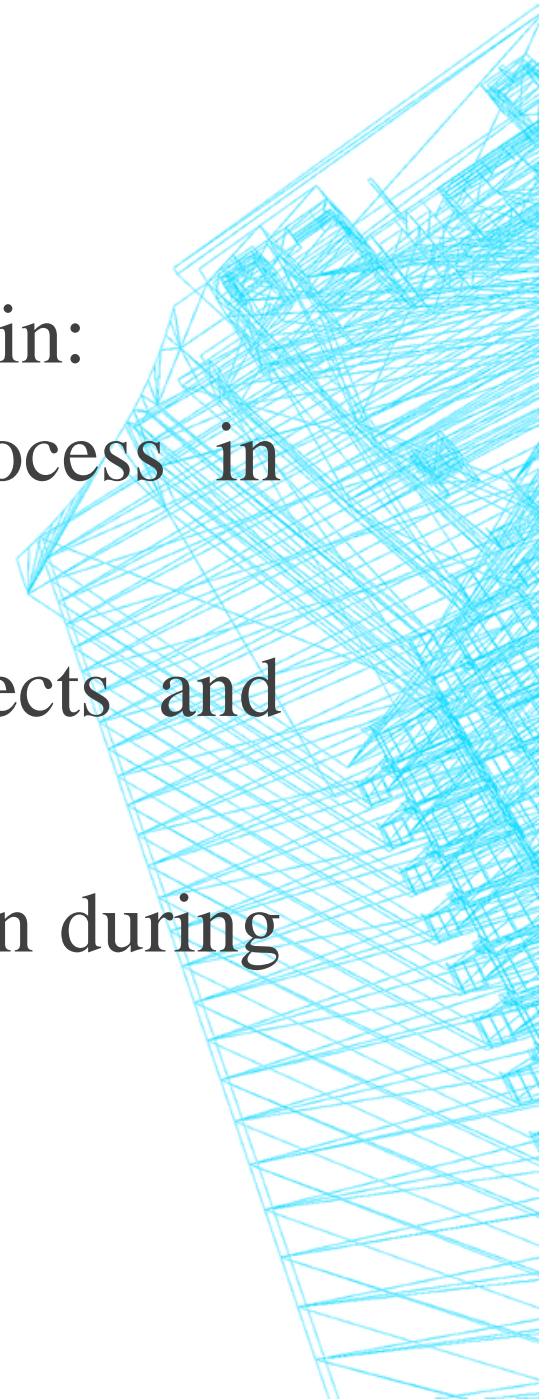




# OBJECTIVES OF THIS PRESENTATION

This presentation objectives will be mostly focused in:

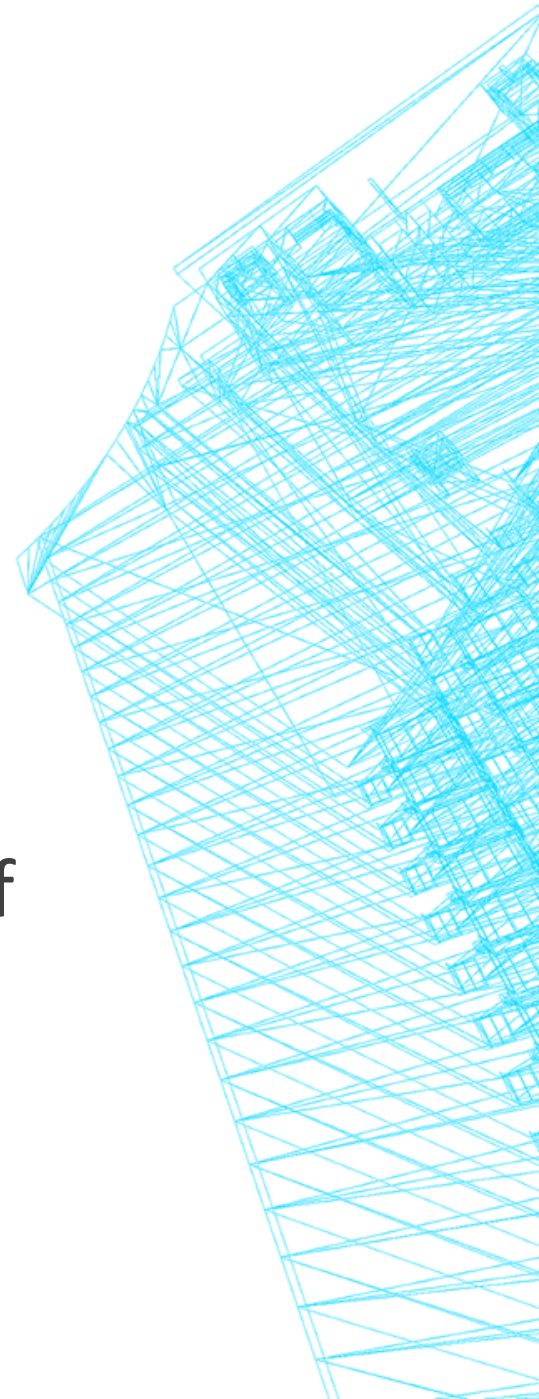
- To provide an overview of the inspection process in Puerto Rico.
- To identify and discuss common building defects and corrective action.
- To provide an overview of action plan preparation during storm season.



# OBJECTIVES OF THIS PRESENTATION

To analyze how detrimental condition affect building condition and it's functional utility

To discuss the difference and similarity between inspection report and expert report and how a professional engineer could be violating the code of ethic.

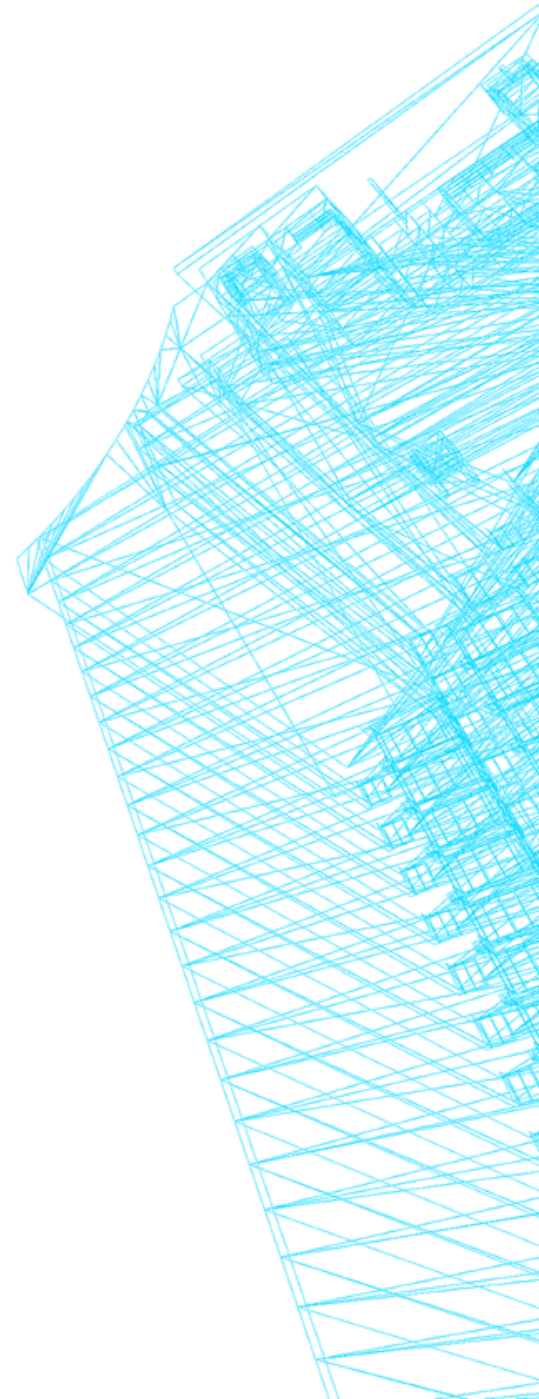


# THE BEST WAY FOR HOME AND BUILDING INSPECTION

What is the best way to perform a home or building inspection in professional manner?

The best way to practice the home and building inspection is utilizing a systematic and proof method that allows that all findings are properly identified and classified for further analysis and correcting actions.

ESTABLISHING THE SCOPE OF WORK IS ESSENTIAL  
IMPORTANT



# SCOPE OF WORK TYPICAL INSPECTION

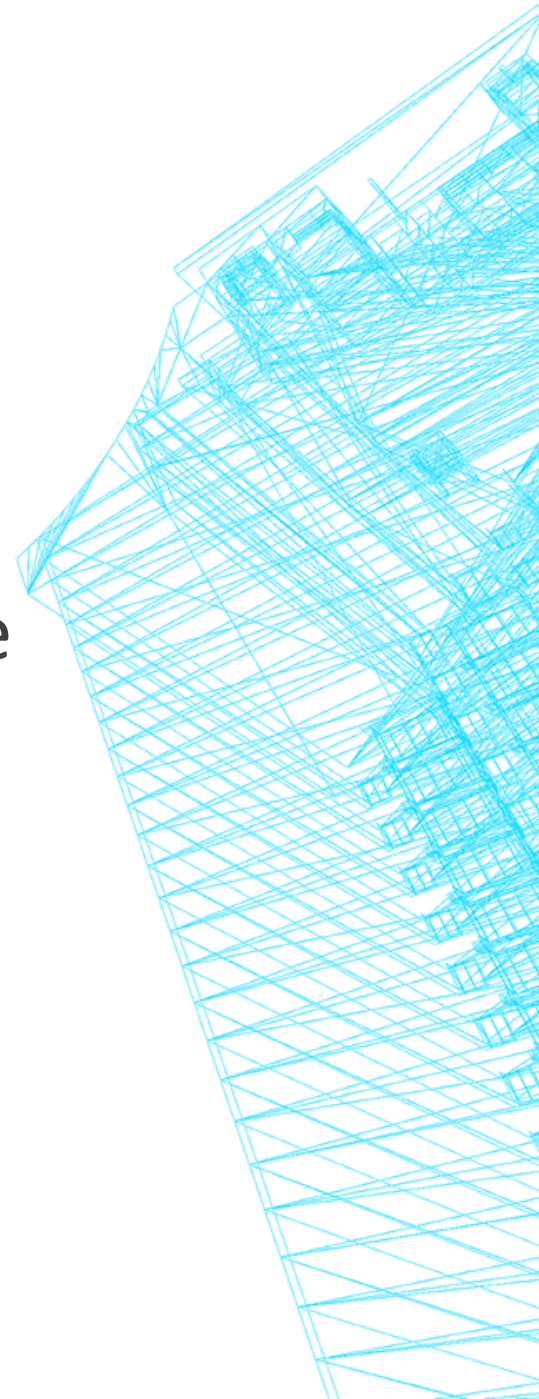
Determine the condition of entire building:

industrial, commercial or residential dwelling

Examination of the current condition of the entire dwelling: home inspection

Examination of the observable code violations

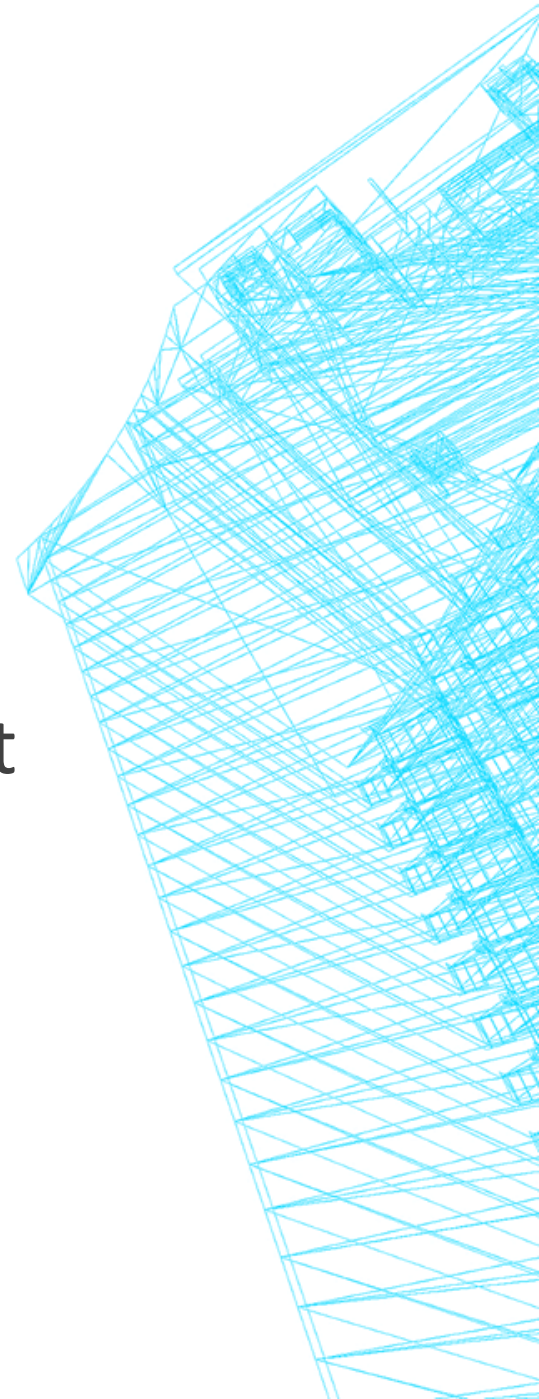
Examination of all observable safety hazard





# SCOPE OF WORK TYPICAL INSPECTION

Examination of all observable environmental detrimental condition: internal or external:  
Flood, Mold and insect examination, Soil, noise, traffic, abandoned house and vacant lot adjacent to the subject and access



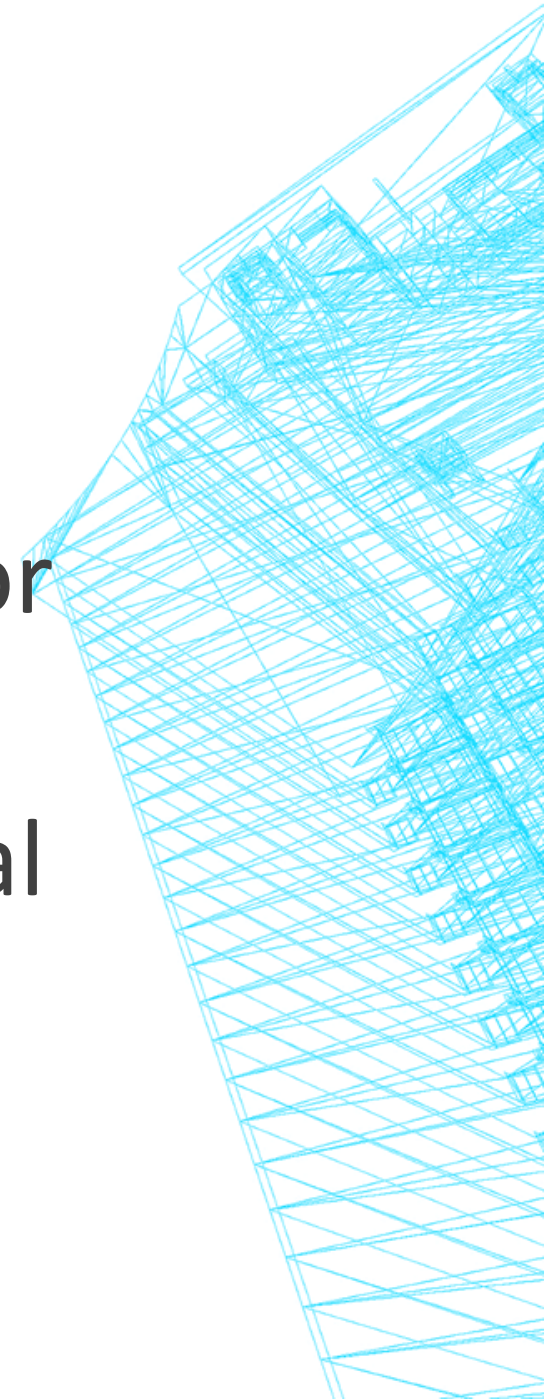


## SCOPE OF WORK TYPICAL INSPECTION

Existence of lead painting, for alert only

Asbestos examination or determination, for alert only

ADA compliance, most time for commercial and institutional building only



# SPECIALIZE INSPECTION

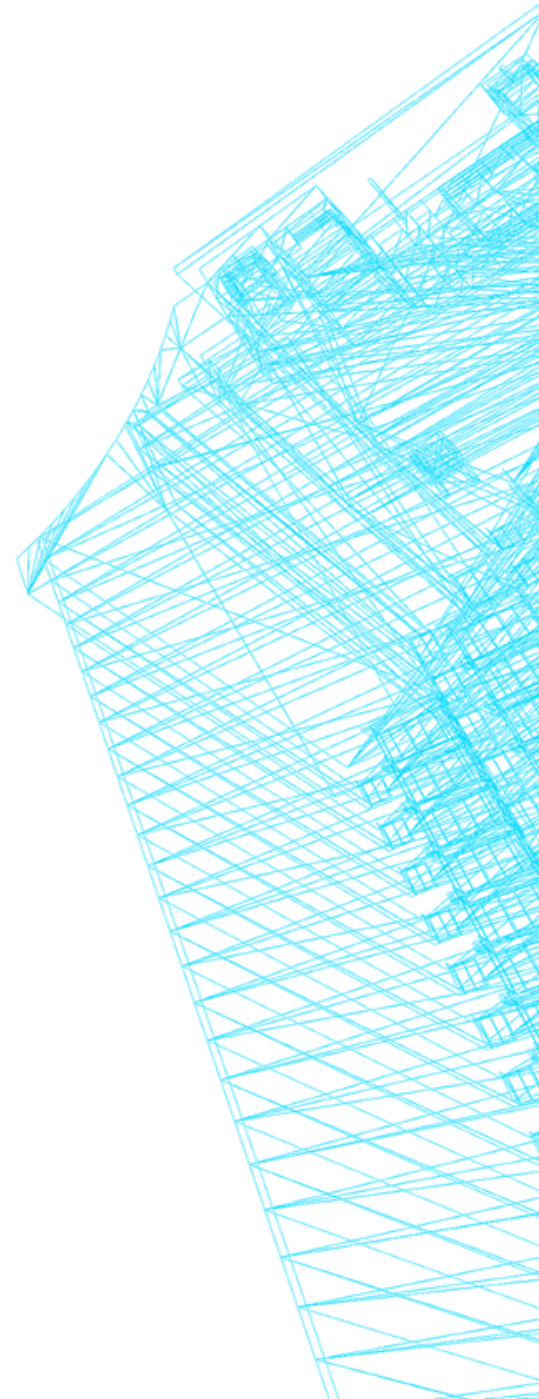
Fire protection

Sick building assesstment

Ventilation and cooling

Building code compliance

Building premizes risk analysis



# EXPERT WITNESS

Cause & origin of defects

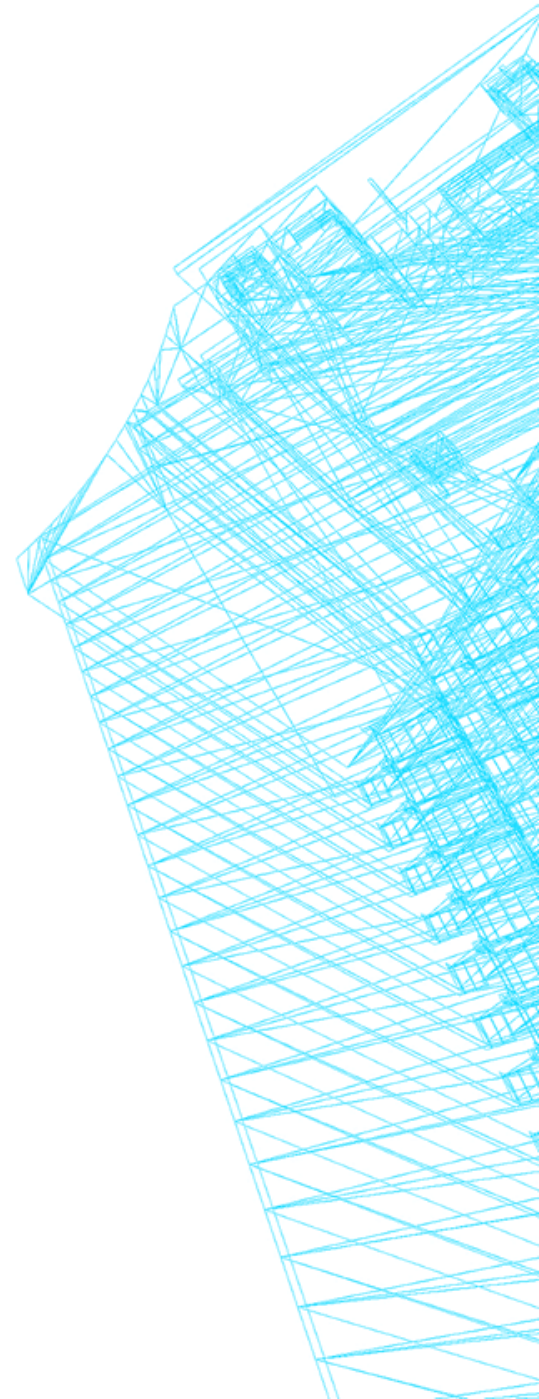
Sick building investigation and analysis

Construction compliance: drawing and specifications and code and standard

Laboratory of testing material

Structural analysis (invasive explorative process for cause determination)

Hidden defect investigation and analysis for root cause determination

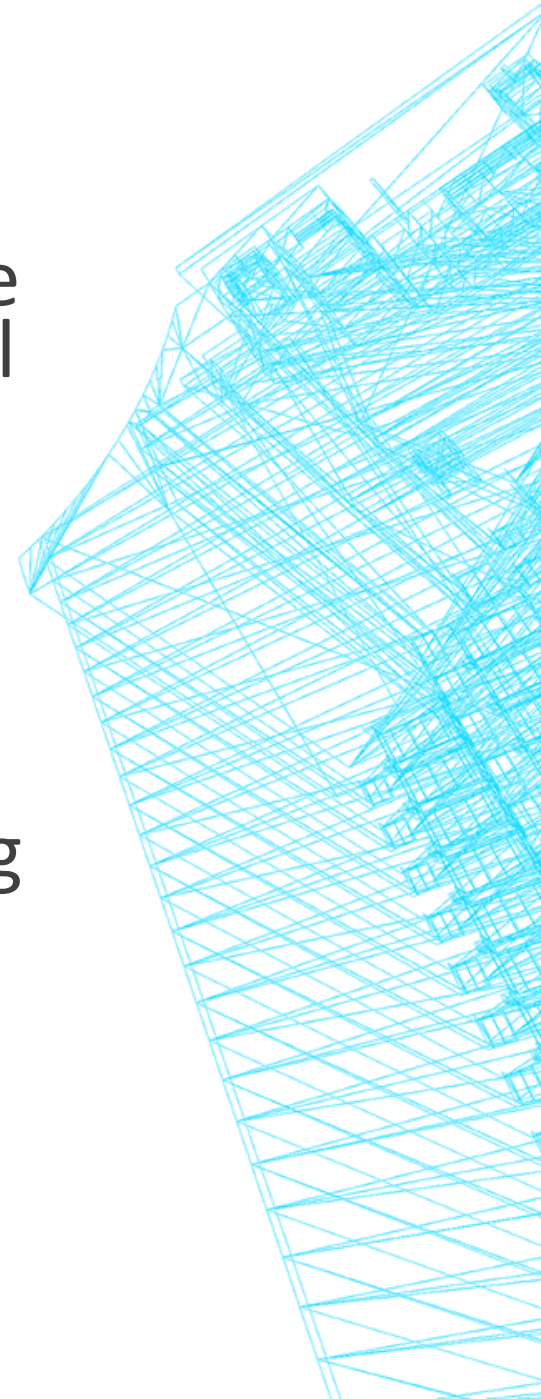


# HOME INSPECTION AS PER 93 LAW OF MAY 16, 2006

The objective of a home inspection is to provide the client the result of fact and findings base on a visual inspection.

This Law specifically regulated the inspection requirement for Real Estate transaction in the case that a Real Estate Agent is engage. All parties must be aware of property condition before the mortgage process with a mortgage bank is financing the loan.

A written report must be submitted





# HOME INSPECTION AS PER 93 LAW OF MAY 16, 2006

## BUILDING IDENTIFICATION

Client identification:

Intended user

Intended used

Public Record Number

Plot number

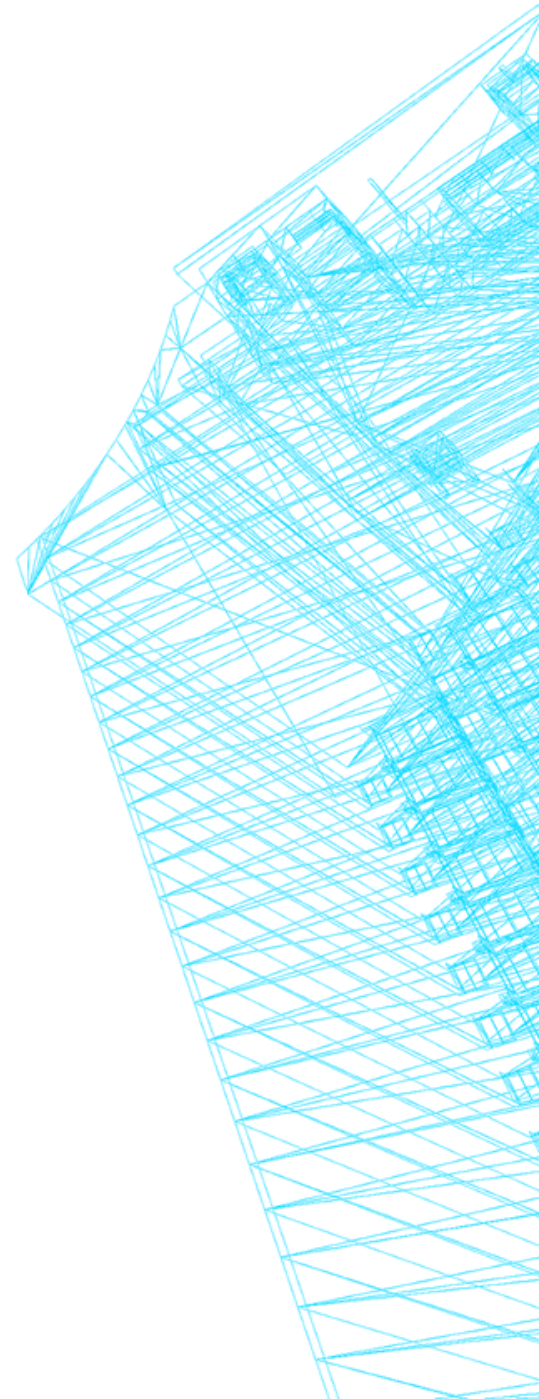
Tax ID number

Public record identifications

Physical address

GPS & Lambert coordinate

Location map and Plat map



# HOME INSPECTION AS PER 93 LAW OF MAY 16, 2006

CODE & STANDARD AND LEGAL REQUIREMENTS:

Accessibility (Code & legal)- UBC-97, IBC-2009

Electrical (Code)- NEC 70

Zoning according to Regulation # 4 & LAW 161 of 2011 and the latest amendmended, LAW 151-2014

Encroachment

Area easement

Eminent Domain

Building Code: UBC-97, IBC- 2009

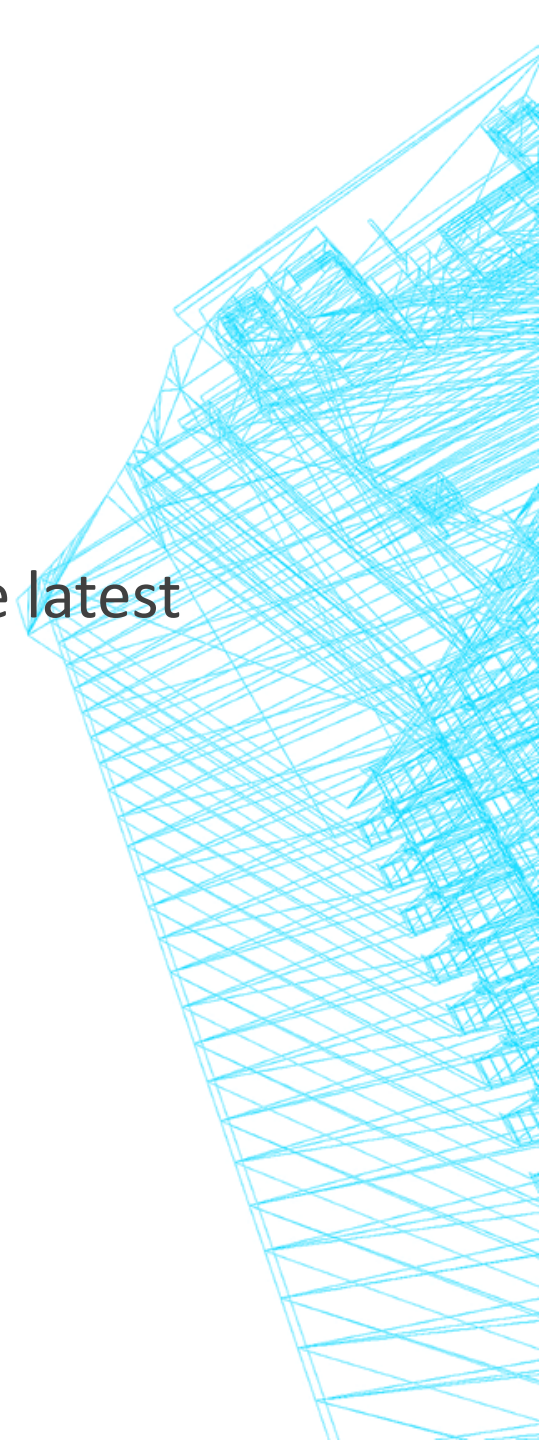
Electrical Code

Mechanical Code

Zoning compliance:

Living area Vs site area

Front, lateral & rear patios





# HOME INSPECTION AS PER LA 93 OF MAY 16, 2006

Physical Incurable

Safety hazard

Utilities: water, electricity and sewage system availability

Environmental issues

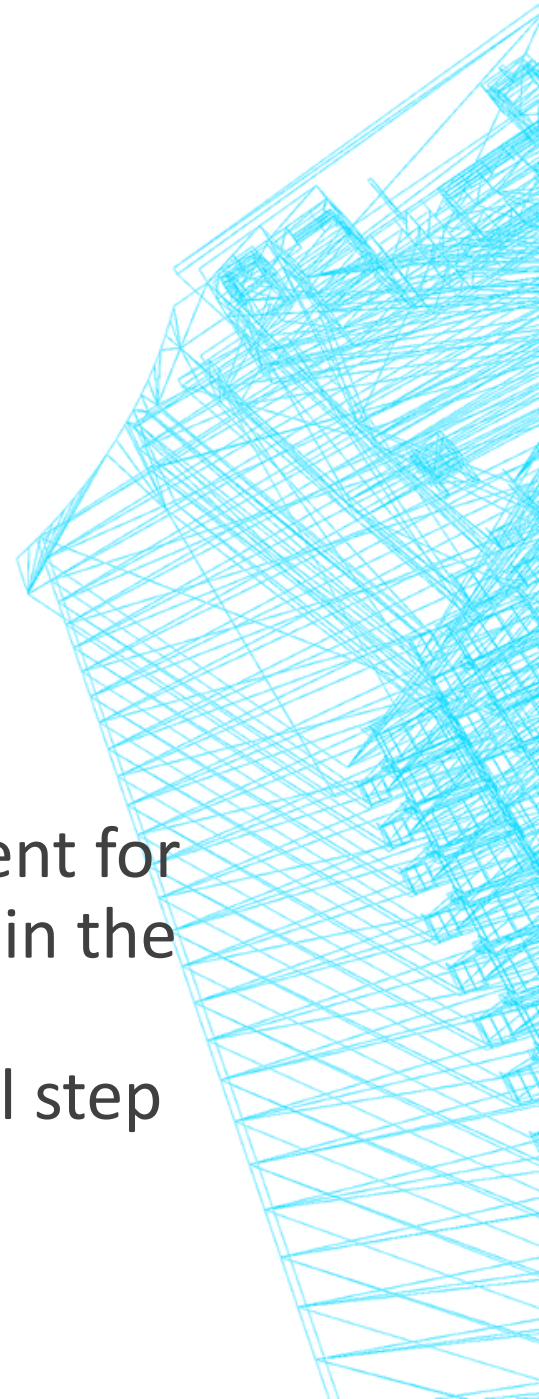
Structural issues

Others detrimental conditions

Itemized cost

Summary of defective items with estimated cost and a statement for soundness, obsolescence and safety of the property base only in the visual inspection.

Narrative final statement about the findings should be the final step of the assignment





# BUILDING INSPECTION ENGINEERING

## BUILDING INSPECTION ENGINEERING:

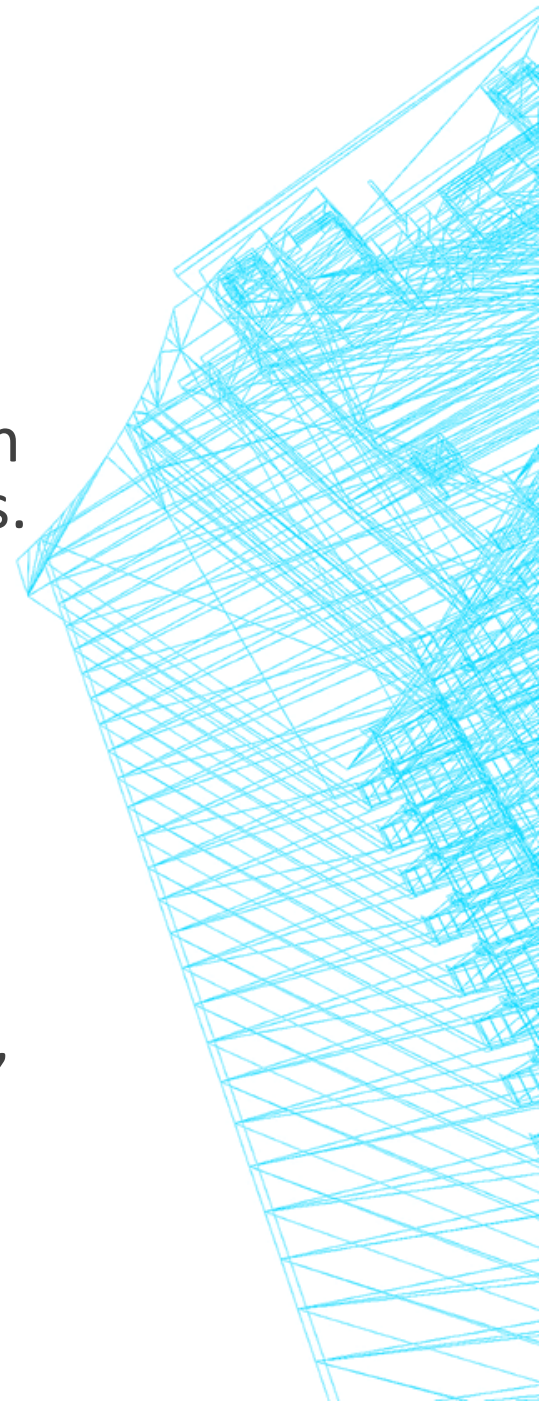
The building inspection engineering can be performed based on the type of property or building and the building characteristics.

INDUSTRIAL

COMMERICAL

HOME- RESIDENTIAL DWELLING

SPECIALIZE AREAS: roof only, soil condition, mechanical system, electrical system, code compliance, fire prevention, sanitary compliance, etc.



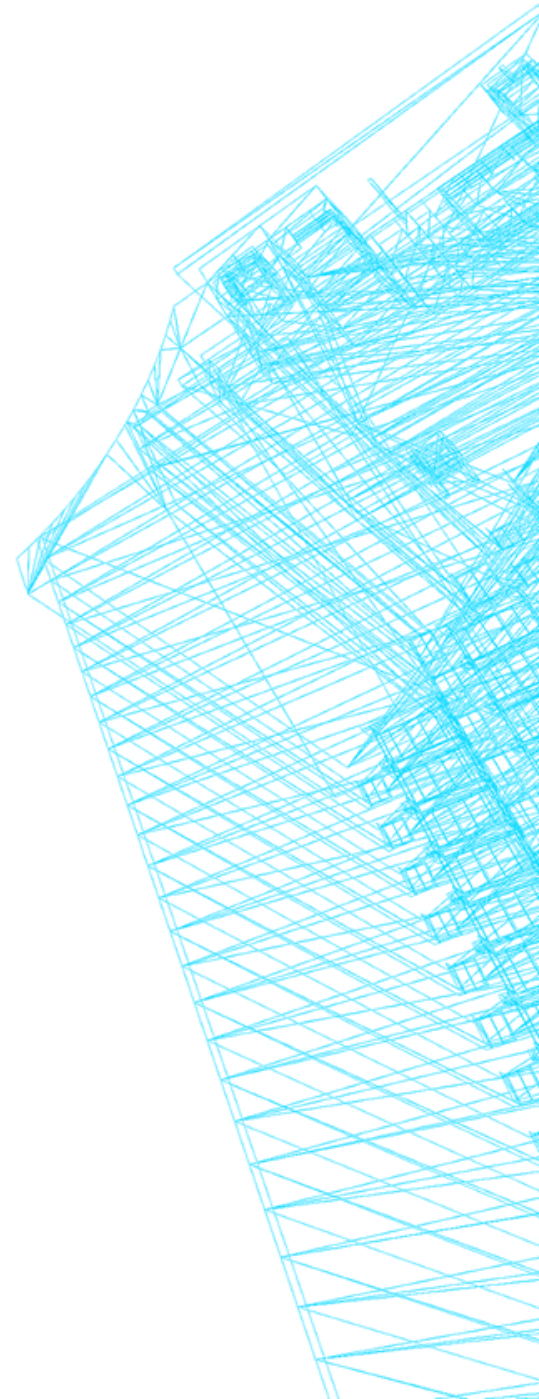
# BASE ON CLIENT REQUIREMENTS

BASED ON CLIENT REQUIREMENTS:

BUILDING INSPECTOR ( VISUAL INSPECTION ONLY )

SPECIALIZE AREAS AS STATED IN PREVIOUS PAGE  
CONDITION

EXPERT WITNESS



# PROFESSIONAL CREDENTIAL

## PROFESSIONAL CREDENTIAL:

Licensed Professional Engineer, PE

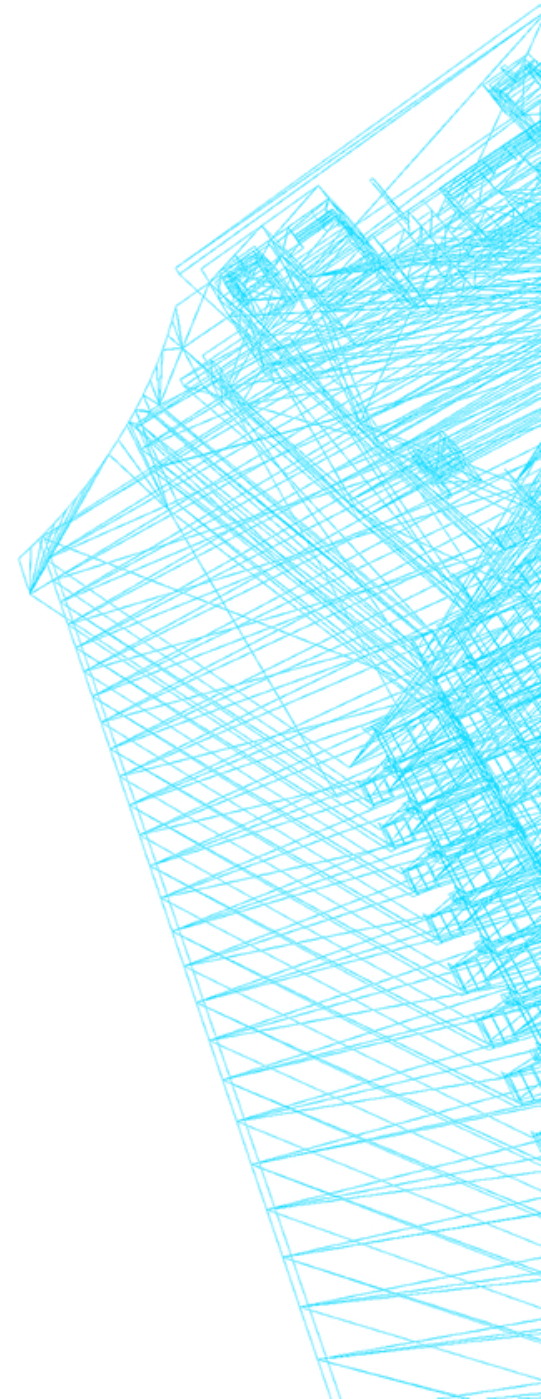
Licensed Professional Architect

With Special Training and is Certified for an Accredited Organization, such NABIE

## Specialized and License Technician:

1. AC Technician, certified by the stated
2. Licensed Electrician, certified by the stated
3. Certified Asbestos Technician, certified by EPA
4. Certified Mold Technician. Certified by EPA & HUD
5. Environmental Technician, certified by EPA
6. Master Plumbing, Licensed by the state ,
7. Licensed Insect Control Technician, Licensed by the AHJ in PR

COLLEGE OF ENGINEERS AND LAND SURVEYORS- CIAPR IS THE GATE KEEPER FOR PROFESSIONAL PRACTICE IN PUERTO RICO BASED ON MY BOOK



# INSPECTION PROCESS

EXTERIOR:

GROUND AND LANDSCAPING: CONDITION: soil, sub-soil, topography, etc.

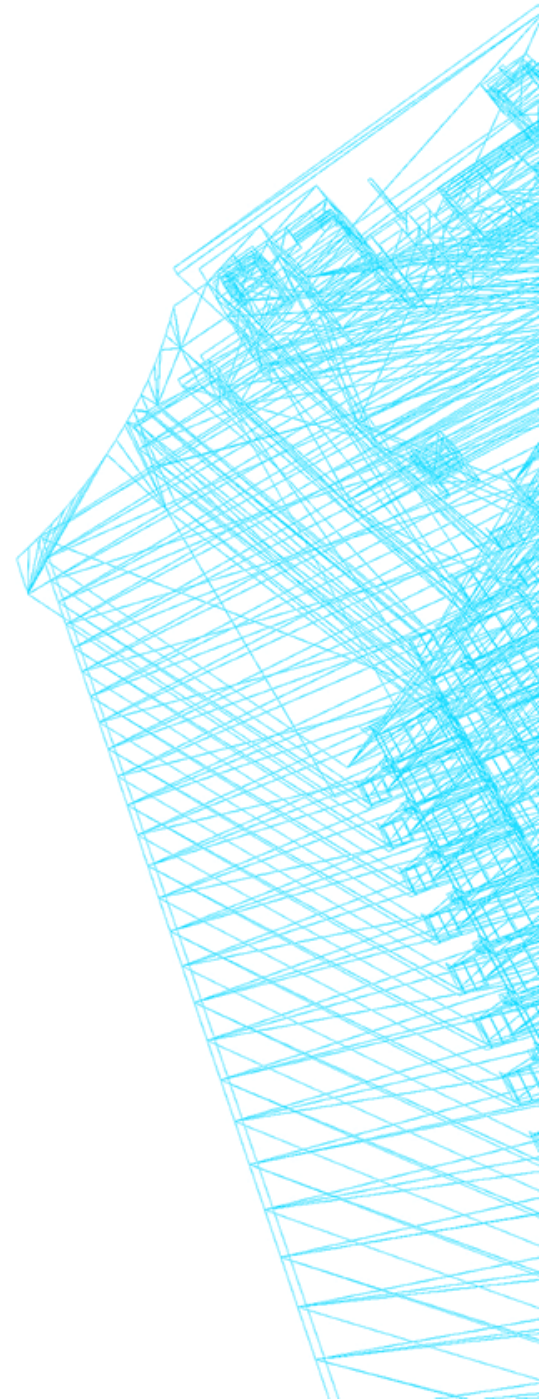
PATIOS: CONDITION AND CHARACTERISTICS

FENCES: MATERIAL, CODE AND CONDITION

RETAINING WALL: TYPE, MATERIAL AND CONDITION

PAVED AREA: MATERIAL AND CONDITION

DRAINAGE: CODE, CONDITION





# INSPECTION PROCESS

BUILDING COMPONENTS MUST BE INSPECTED FROM OUTSIDE:  
INSIDE BASED ON MY EXPERIENCE:

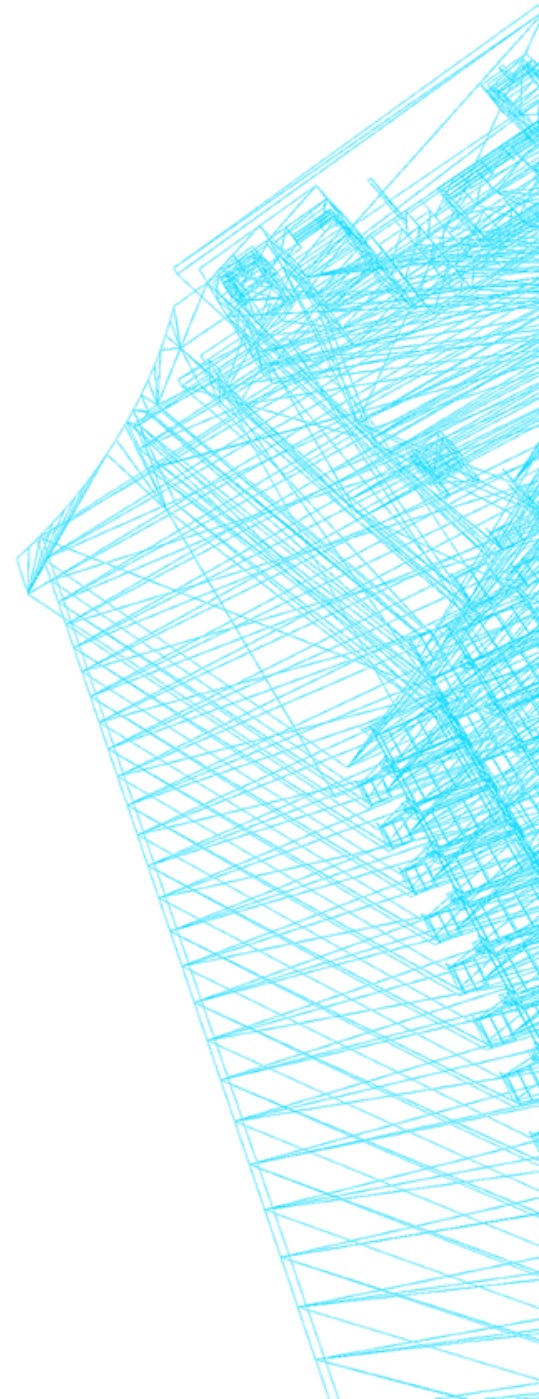
WALLS AND OVERHANG

DOORS AND WINDOWS

ATTACHED ACCESSORIES

FOUNDATION, FOOTING

BALCONY AND DECK AND PORCH



# BUILDING ENVELOPES ( BUILDING SYSTEM

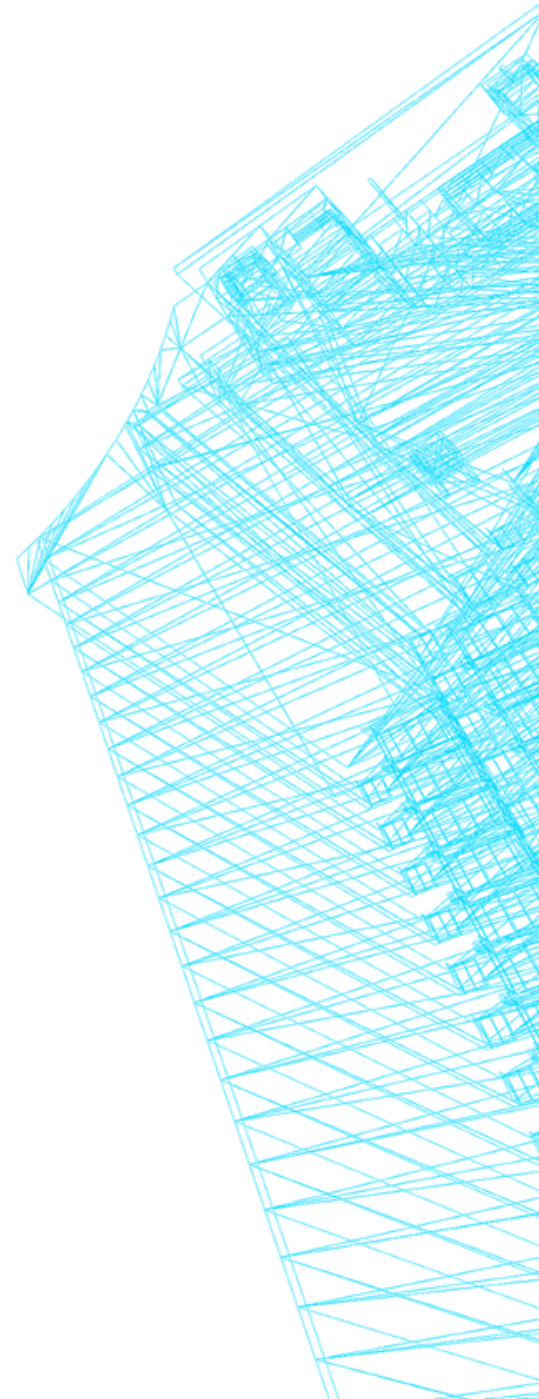
BUILDING ENVELOPES ( BUILDING SYSTEM ) :

EXTERIOR WALLS

ROOF ( SPECIAL ATTENTION MUST BE PUT ON THE  
FLAT ROOF)

FAÇADE

FASCIA AND SIDING



# BUILDING SAFETY & HEALTH

BUILDING SAFETY AND HEALTH

ACCESSIBILITY: CODE, CONDITION

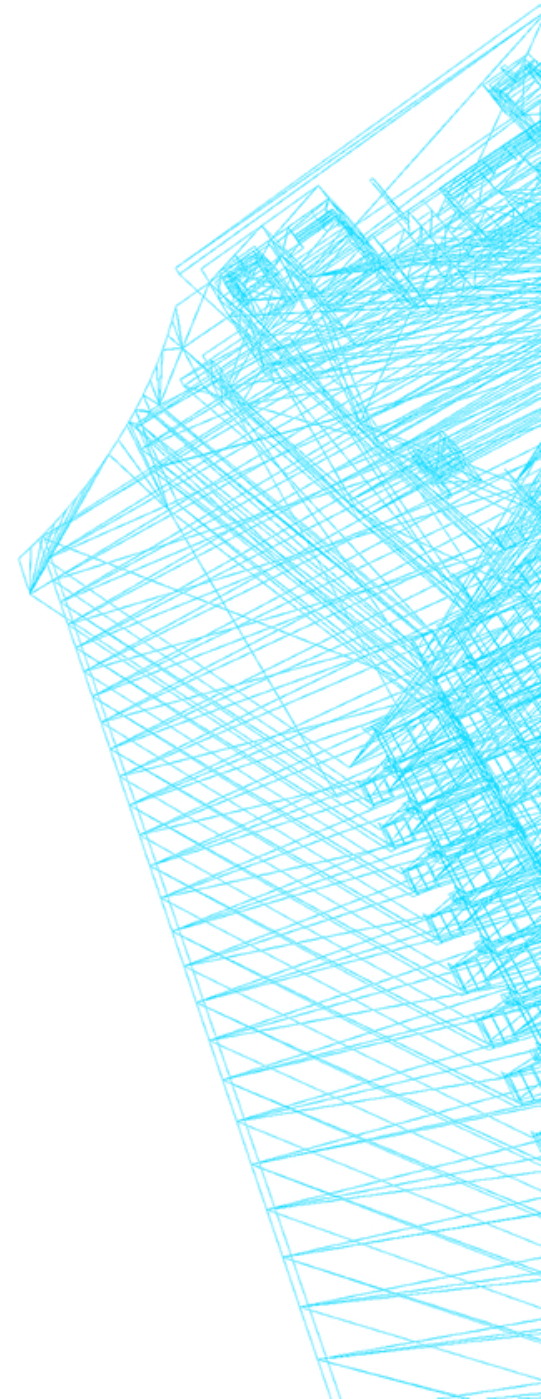
ELECTRICAL HAZARD ( EXTERIOR )

LEAD PAINTING ( ENVIRONMENTAL )

ASBESTOS ( ENVIRONMENTAL )

ADA ACT ( IGUAL OPPORTUNITY ACT- 1990 )

STRUCTURAL HAZARD ( EXTERIOR )

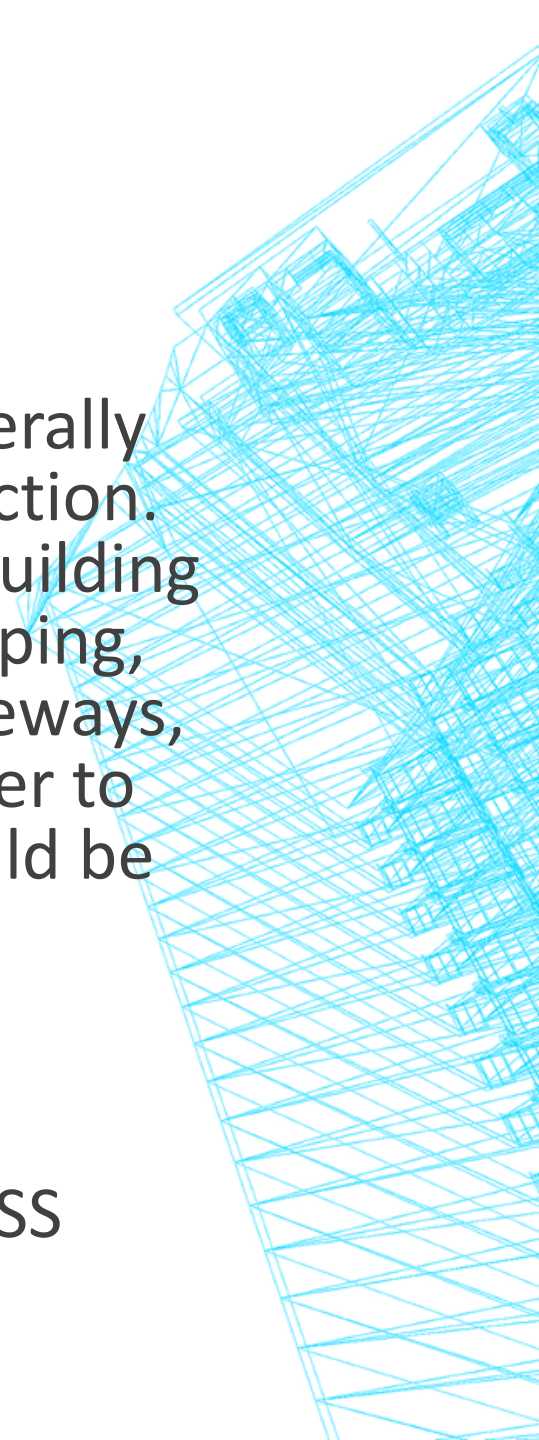


# SITE, SOIL AND CHARACTERISTICS

## GRADING AND DRAINAGE:

The grading and the drainage around the property are generally matters of great importance for the building exterior inspection. Grading must have a pitch away from the perimeter of the building not less than  $\frac{1}{2}$  inch per foot in all four directions. Landscaping, trees, and grading improvement, such as paved areas, driveways, fences and retaining walls required special attention in order to detect any ground or soil detrimental conditions which could be the cause for most home and building defects, specially for concrete building.

SOIL CHARACTERISTICS AND CONDITION IS THE MOST IMPORTANT FACTOR FOR HOME AND BUILDING SOUNDNESS





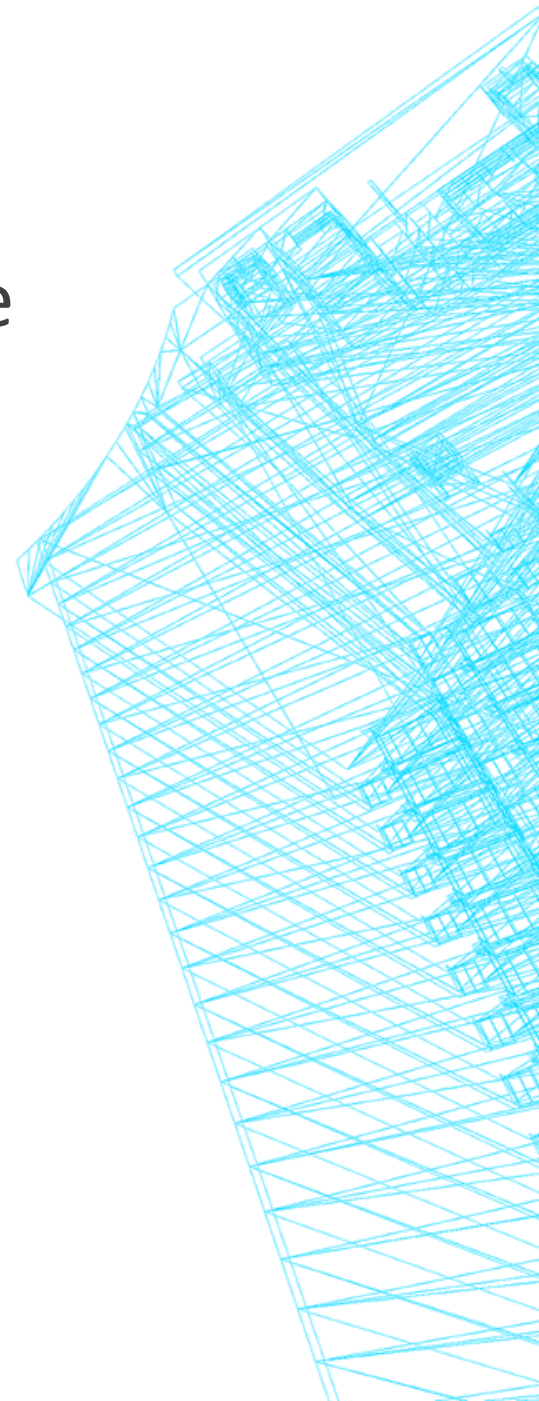
# FOOTING AND FOUNDATION

## FOOTING AND FOUNDATION:

The foundation along with the soil load capacity are fundamental to support the structure which is capable to withstand all typical forces; wind, dead weight, seismic, dynamic load, weather variation (hot & cold).

Foundation is describe for type of material: reinforce concrete, filled concrete block in stacked, and foundation walls.

Description must include type of foundation: foundation walls, slab on grade, the condition of foundation and common defect found, such as cracks, movement, settlement, water seepage, etc.



# FOOTING AND FOUNDATION

MOST COMMON DEFECTS ARE:

Walls cracks

Basement cracks due to hydrostatic pressure

Displacement of concrete block walls

Horizontal cracks

Rotational settlement

Differential Settlement

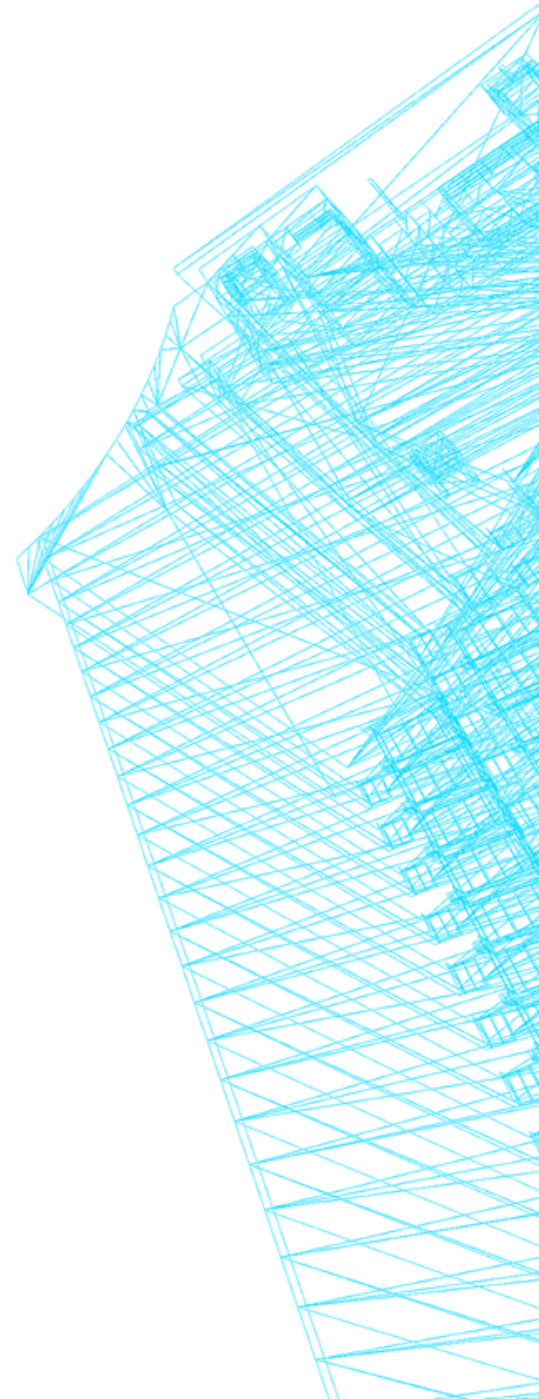
Bowed concrete wall

Heaving soil

Cracks in the masonry foundation walls

Footing cracks

SOIL IS THE MOST IMPORTANT FACTOR IN THIS SECTION



# EXTERIOR MOST COMMON DEFECTS:

## MOST COMMON DEFECTS:

Common defects or Deficiencies for exterior

Balcony without railing (safety hazards)

Exterior stair step & railing (safety hazards)

Driveway service walk

Settling cradles

Unleveled of service walks, Patio , Driveways and holes in the Landscaping

Trees affecting foundations

High trees too close to the building

Infected trees

Grading services walks / driveways Pitch / crack / Settled / Unleveled

Spalling concrete

Pitched in to the foundation

Unsealed asphalt Driveways

Wet patios settled

Grading and Drainage with negative drain pitch to foundation

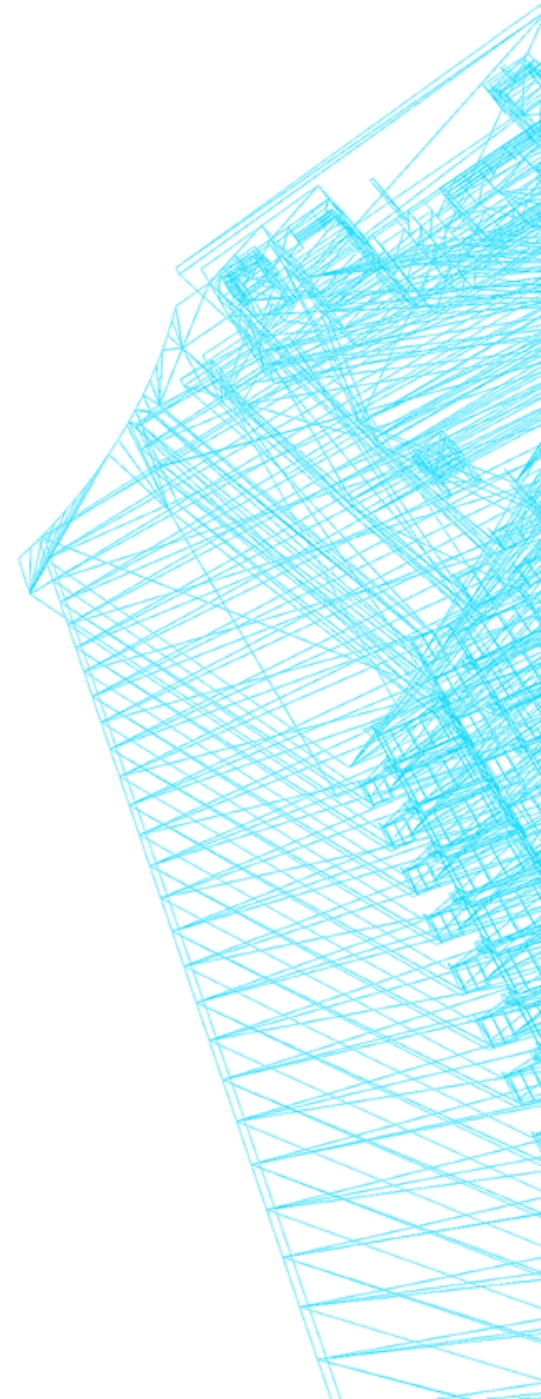
Retaining walls (excessive pressure behind them)

Presence of high trees planted at nearby the building foundation

3 steps stairway without railing

Lack of railing in porch above 30"

Excessive gap between balustrades (safety issues )



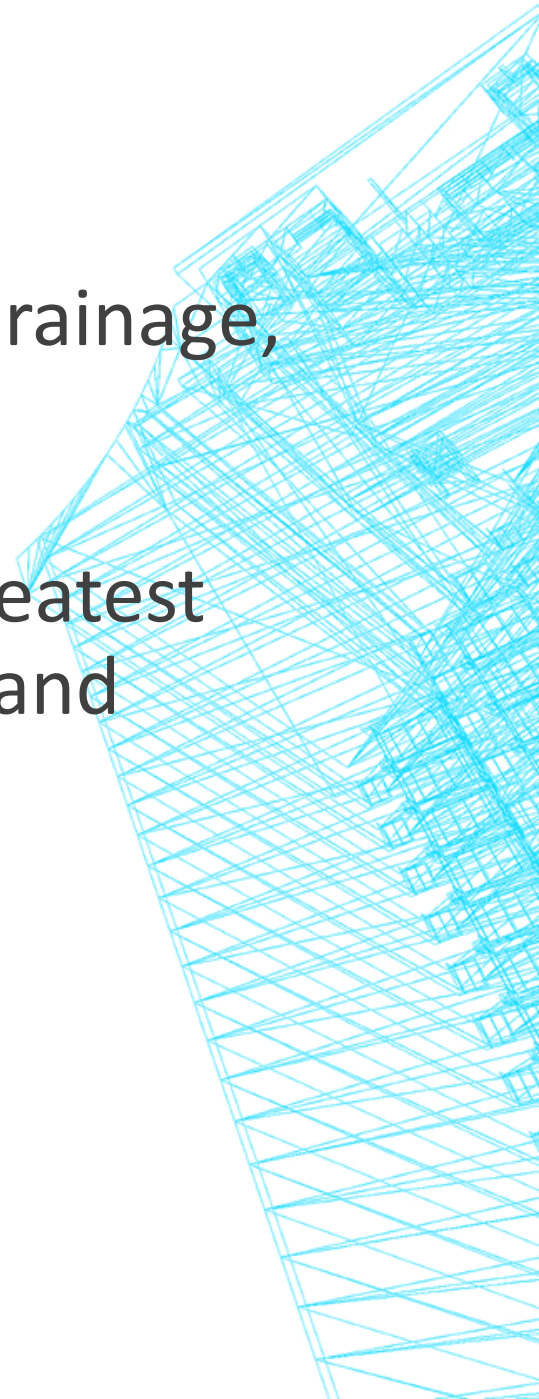
# SOIL CONDITION

## Geotechnical issues:

Is the condition of the soil itself: compacting, slopes, drainage, tunneling and retaining walls and patios.

Settlement (Structures built on unconsolidated material) Differential Settlement -Tends to produces greatest damage to structure improvement due to organic soil and ground water.

Geotechnical problems: Natural & Man made.





# SOIL CONDITIONS

## Geotechnical problems:

### Natural

Expansive soils

Subsidence of unstable soils

Slope creep and Slope instability

### Man Made

Construction on un-supported soil

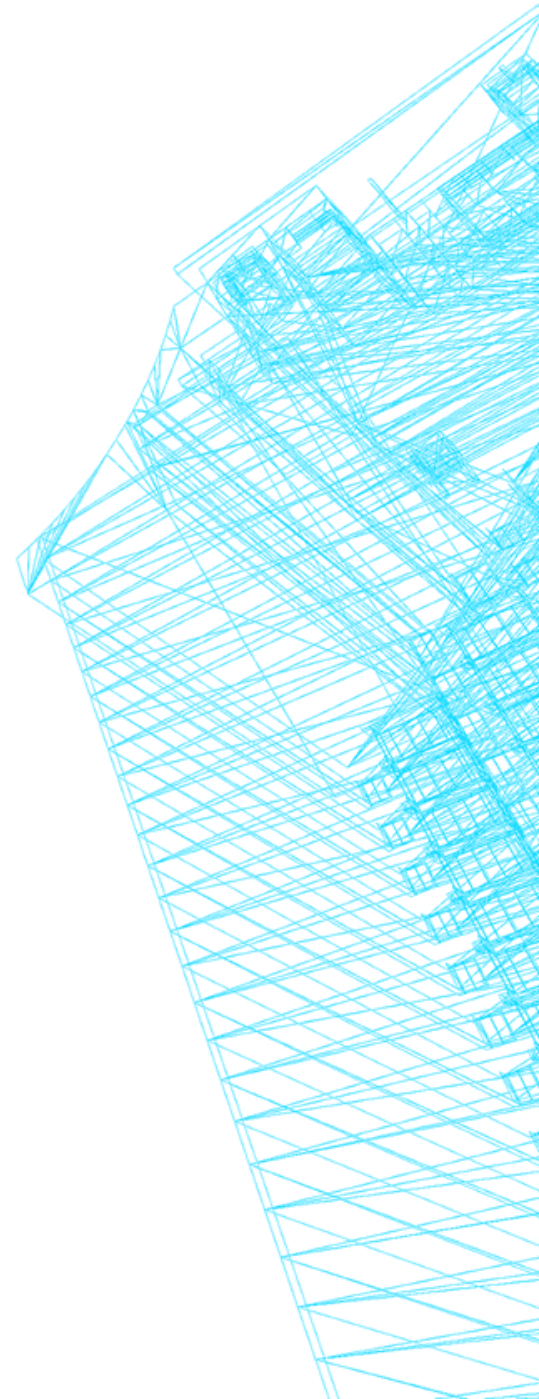
Un-compacted soils

Improper construction

Leaking pipes under the foundation

Inadequate drainage

Retaining walls when site require it



# SOIL CONDITION

MOST COMMON DETRIMENTAL FACTORS:

EROSION

EXPANSIVE SOIL

SULFATES CORROSIVES

SLOPE MOVEMENT

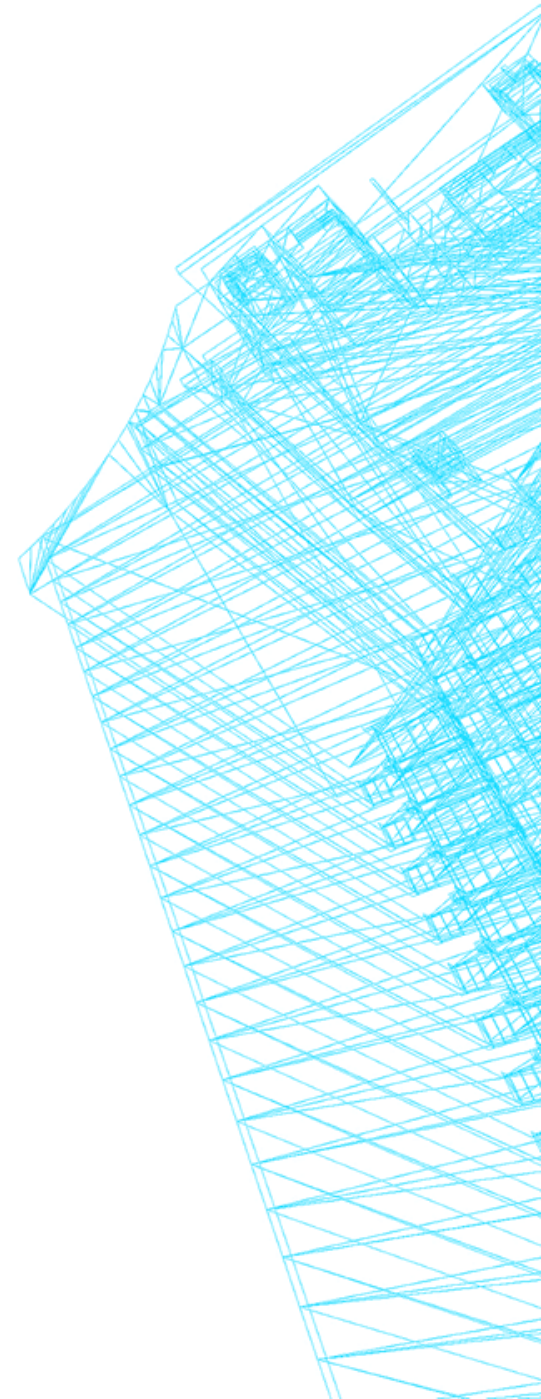
LANDSLIDES

SLOPE FAILURE

SUBSIDENCE

CREEP

STEEP SLOPE



# STRUCTURE DEFECTS DUE TO SOIL CONDITION

Most common defects due to soil condition are:

Structure defects due to soil

Cracks in walls

Doors and windows going out of point

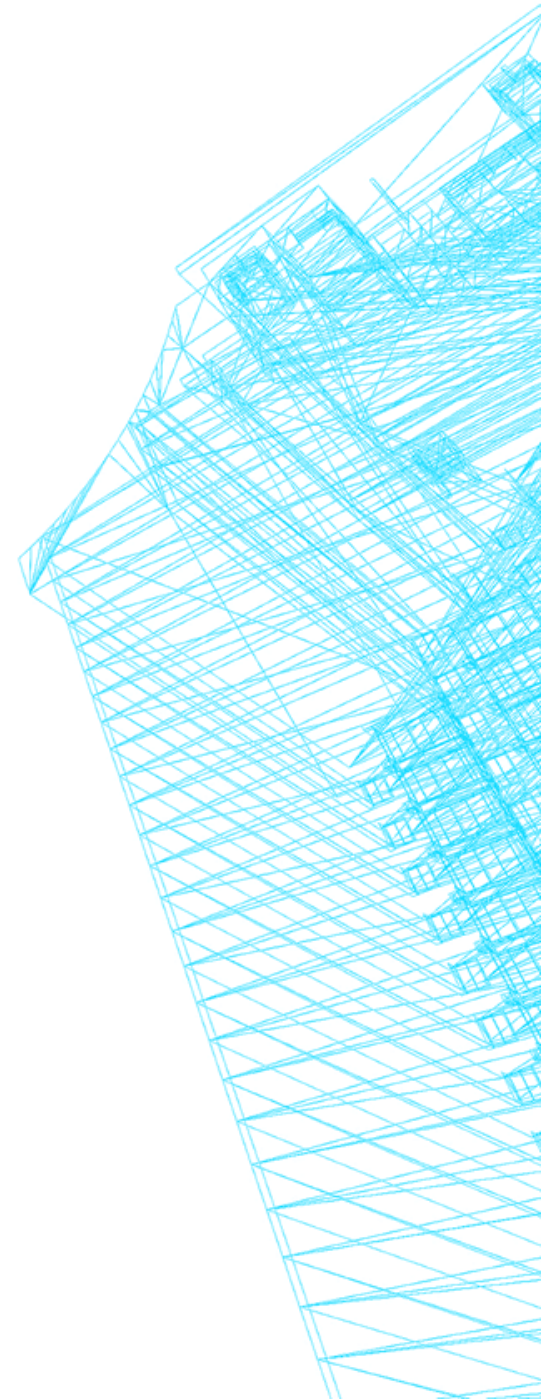
Cracks in foundation

Cracks in driveways, porch or garage

Sinking foundation

Differential settled displacement

Erosion, ground water, creep, slope failure, etc.



# ROOF INSPECTION- EXTERIOR

## ROOF INSPECTION:

After a deep visual inspection of the outside part of the building is it recommended that the next step is to continue to the roof. The several component which must take into consideration are: additional load placed on the roof, roof framing and type, roof material (concrete) skylights, drainages, vent pipe, treatment, apparent condition, life expectancy, pitch, and workmanship and quality control of the process.

The roof is one of the most important parts of a building, during the inspection process it is required that the surface be carefully inspected to detect: cracks, unlevelled, concavity, lack of drainage, none compliance pitch, roof remaining life, actual or newest roof protection applied.





# ROOF INSPECTION- EXTERIOR

THE MOST COMMON DEFECTS:

Improper Pitch or no pitch

Lack of drainage

Poor location of drainage

Unleveled surface

Cold joint that allow water penetration from outside to interior.

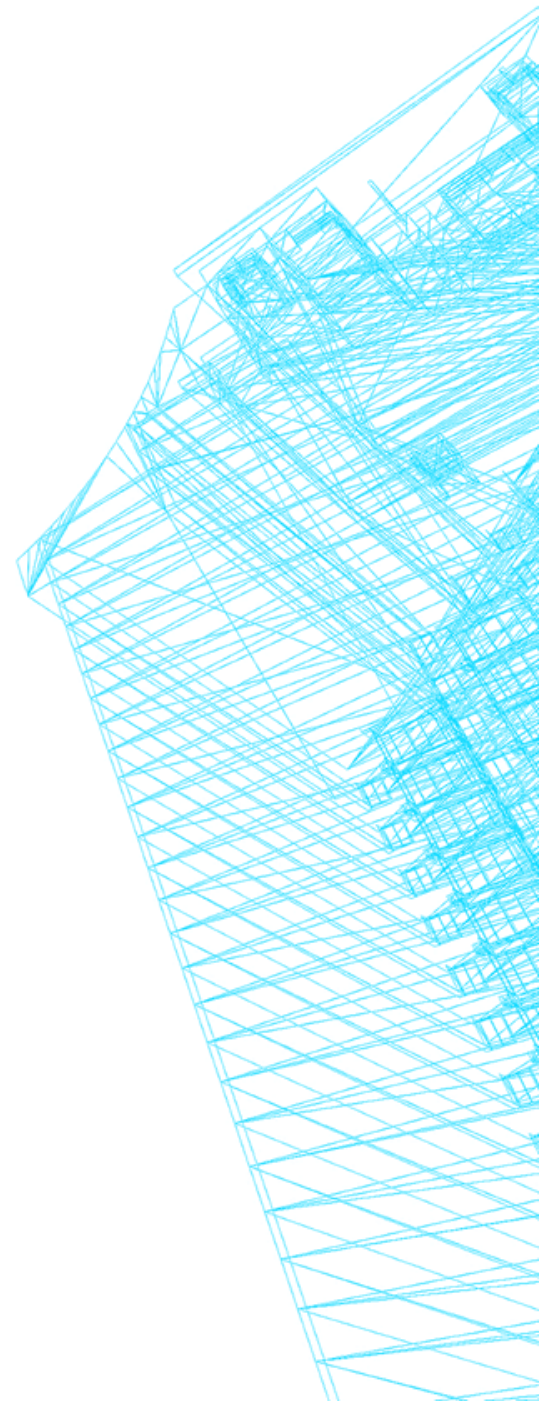
Alligatoring syndrome surface that allow water accumulated bellow the deteriorate material,

Concavity and convexity

Cracks that water filtration into the structure

Obstruction

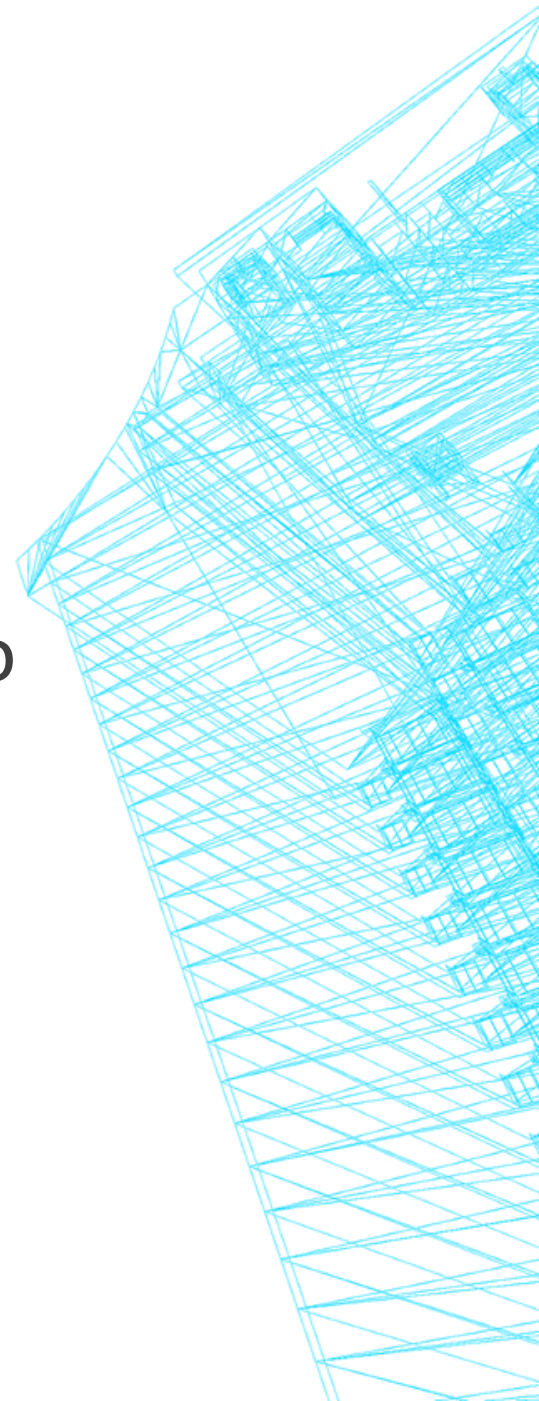
Type of support elements, sometime they provide a good place for other supported element



# GUTTER AND DOWNSPOUTS

The gutters and downspouts for home and building are the element utilized for water drainage to keep water discharged out away from the structure. It is recommended that the downspouts be out fitted with good long extension buried lines so water discharged out and around to the area of the building, but not to go inside of the foundation.

Obstruction in gutter and downspouts can be contributing with rapid accumulation of rain water on the roof.

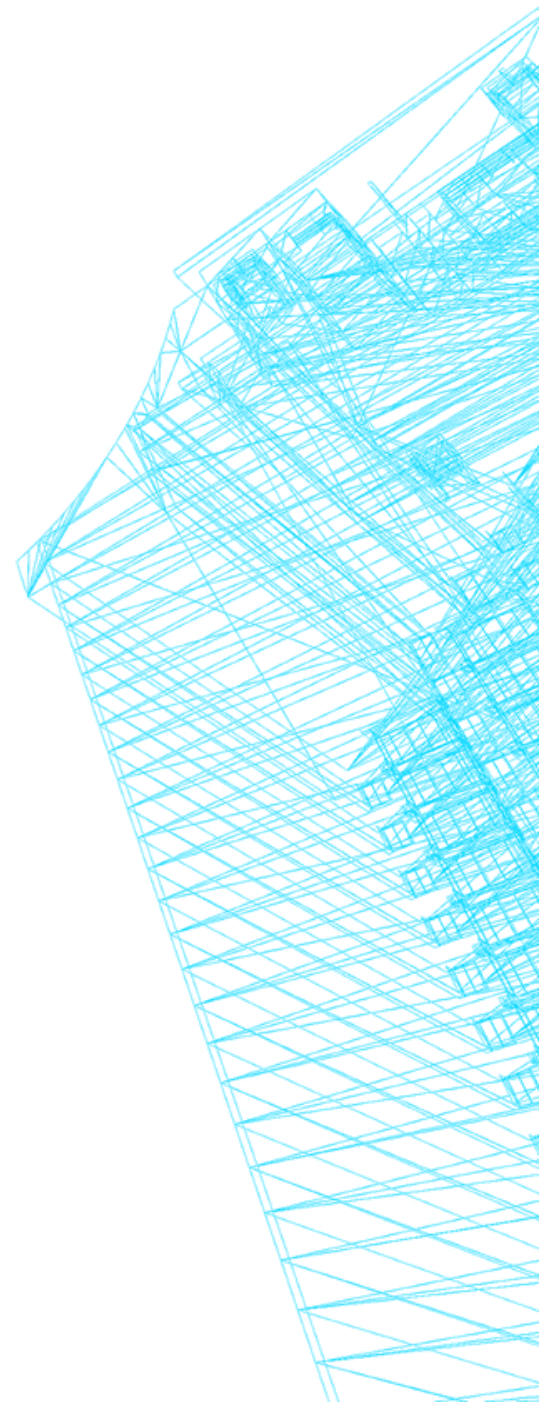


# PLUMBING AND SEWER SYSTEM

Plumbing and sewer system:

## Plumbing & Sewer System

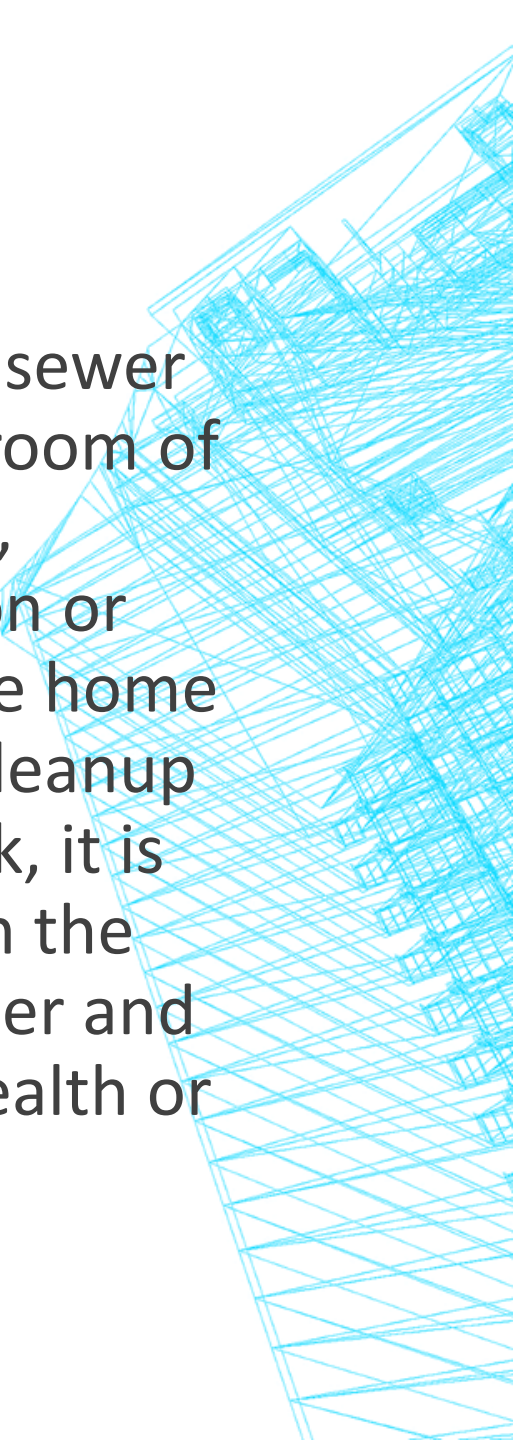
The sewage in a building or home is normally connected to the community public systems in urban area, but in most of the suburban areas there is a lack of public system. Due to this fact it is required the provision of septic tank. This component must be considered as part of the soil and the plumbing system like walls and other structural components.



# PLUMBING AND SEWER SYSTEM

Plumbing and sewer system::

The main components of a sewer and septic tank area: tank and sewer pipe in the ground and the sanitary components within the bathroom of the building or the home, such as: bathtub, lavatories, sink, tub, connected directly to discharge in the sewage piping with a siphon or intermediate component which avoid odor and insect get into the home or the building. In some place within the site there must exist a cleanup cap and venting pipe at each bathroom. In the case of septic tank, it is important to identify its exact location from the site limit and from the house foundation, also must be identified the numbers of chamber and required the owner (seller) to provide copy of permit from the health or sanitary authority.





# PLUMBING AND SEWER SYSTEM

## SEPTIC TANK

Capacity by Code ( plumbing code )

Number of chamber ( Health requirement )

Location ( FHA & Local requirement ) 5' from site limit & 10' from foundation minimum

Certification from health authority

The most Common defects in this system are:

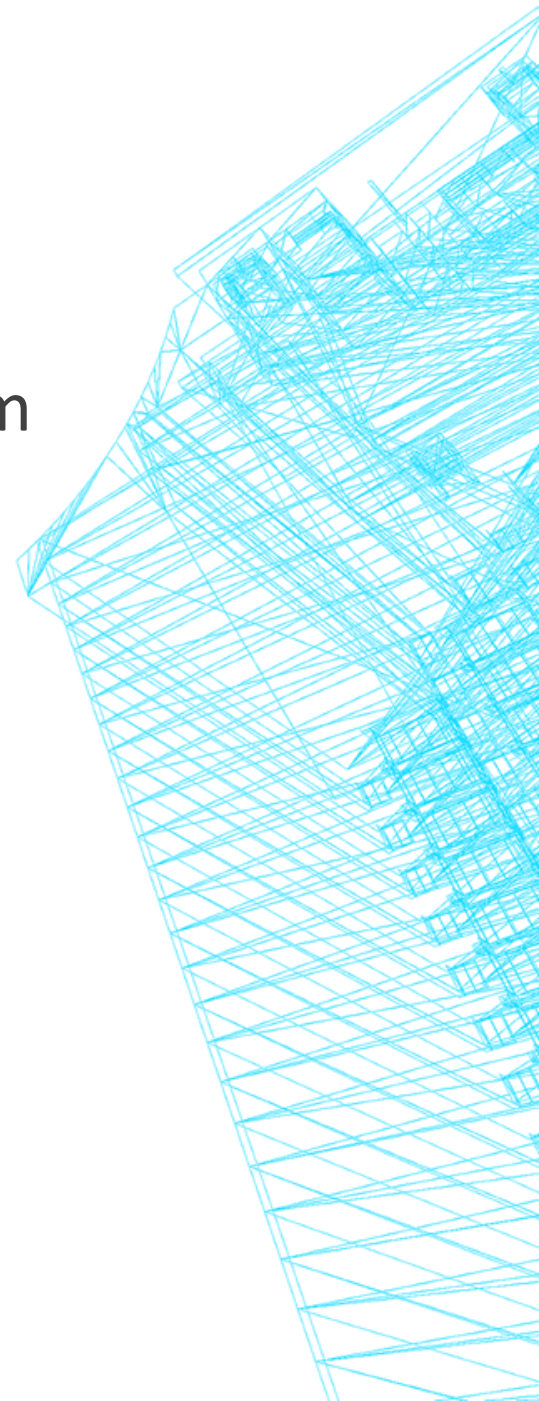
Under capacity tank

Septic tank with only one chamber for solid and liquid

Collapse of main pipe due to trees root obstruction.

Venting obstruction

Slow drainage from bath tub / stub



# PLUMBING AND SEWER SYSTEM

## Inspection of Plumbing System

Identify water linear material: Galvanized, cooper polypropylene, PVC

Identify water meter location and actual reading and Inspect for code accomplishment.

Water meter, Water pipes

Shut off valves location

Piping material

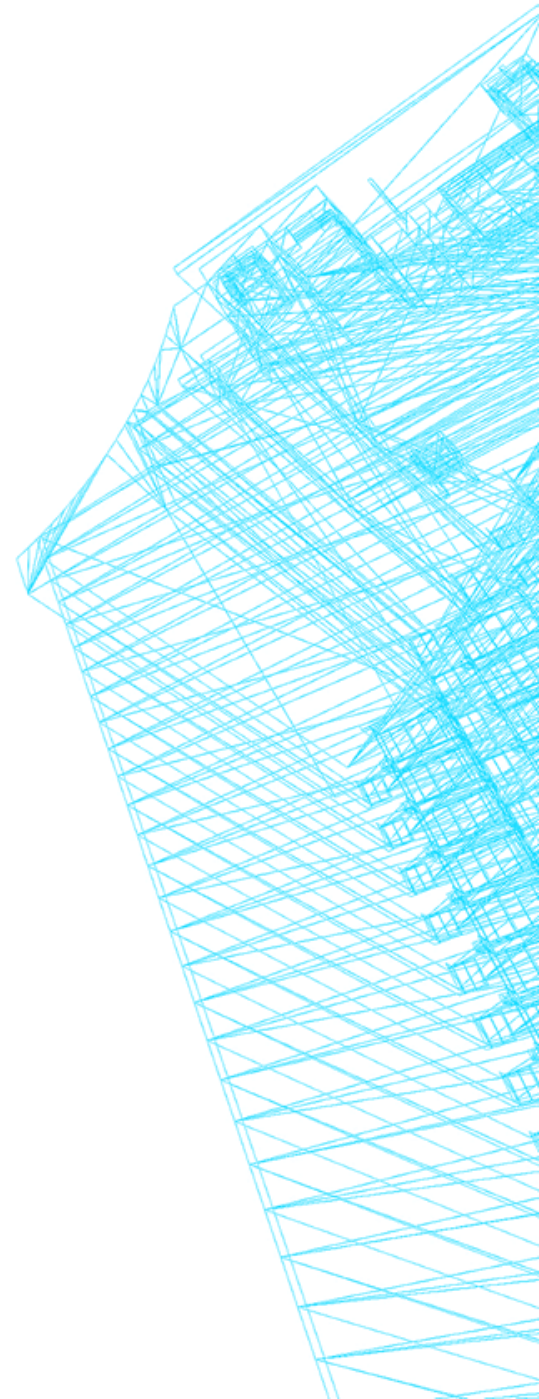
Electrical water heater & solar

Drain, wastes & vent pipe

Hose bibs

Water treatment unit : water softener

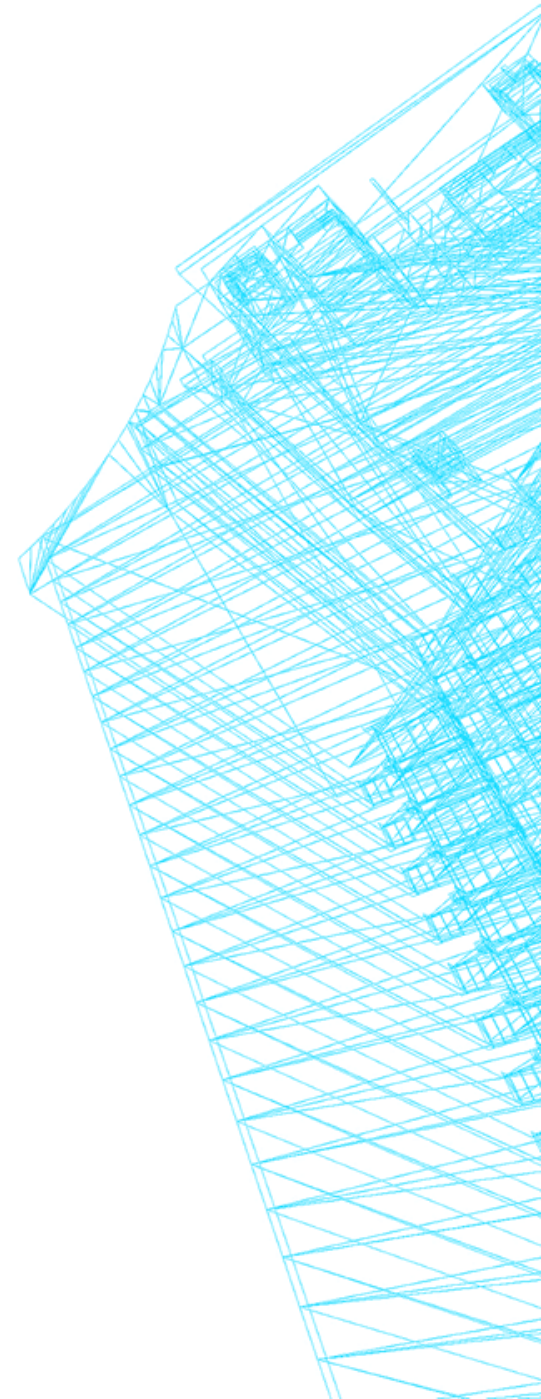
Water cistern (tank) capacity



# PLUMBING AND SEWER SYSTEM

## Common defects:

- Undersize capacity of septic tank
- One chamber for solid & liquid
- Failure to accomplish the minimum requirement
- Fail to provide Certification
- Unknown location
- Located at settled area
- Affected by trees root
- Under flood level a flooding area
- Additional enclosed area built on the top of the septic tank
- Poor construction and material
- Poor discharging pitch
- Cracks in galvanized water vent pipes
- Improper turn offs
- Inadequate cross connections
- Low water pressure at plumbing line
- Lack of relief valve and does exist,
- Rusty burner corner
- Water entry piping not visible
- Pipes leaking
- Valve broken / missing



# INSPECTION PROCESS: INTERIOR

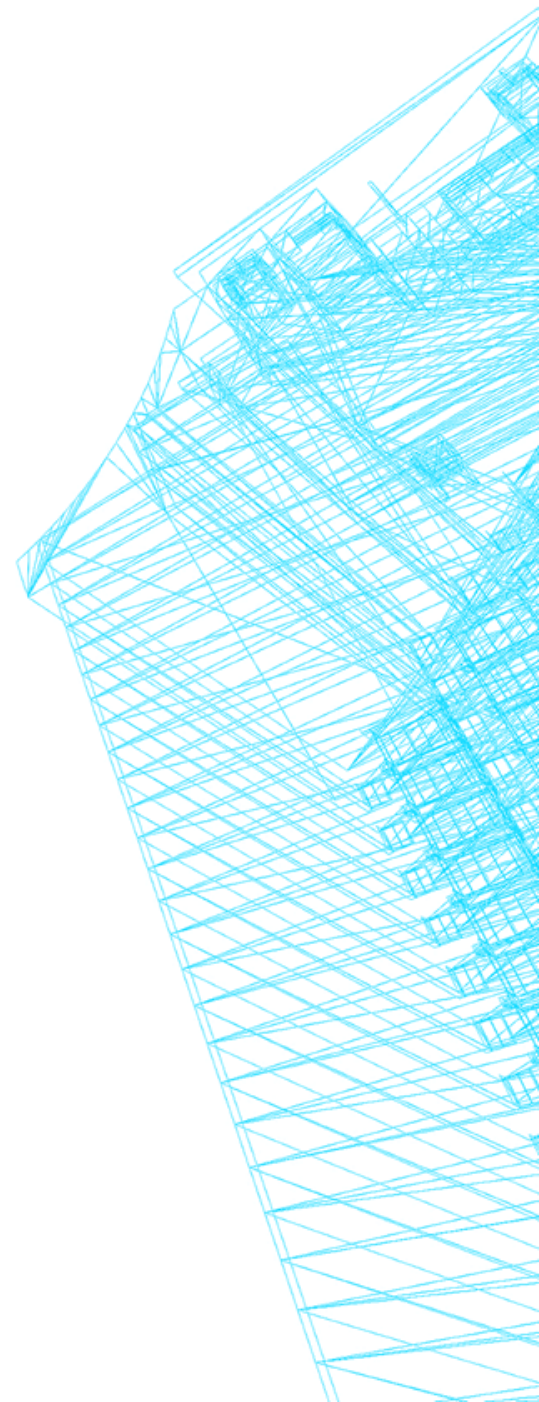
## INTERIOR INSPECTION PRECEDURES:

Start walking around

Prepare a non-scale sketch

Identified all defects and put reference point in the sketch.

Layer or multiple sketches are recommended when areas must be compare with other or must utilized to compare with a refernces area







# NON SCALE SKETCH

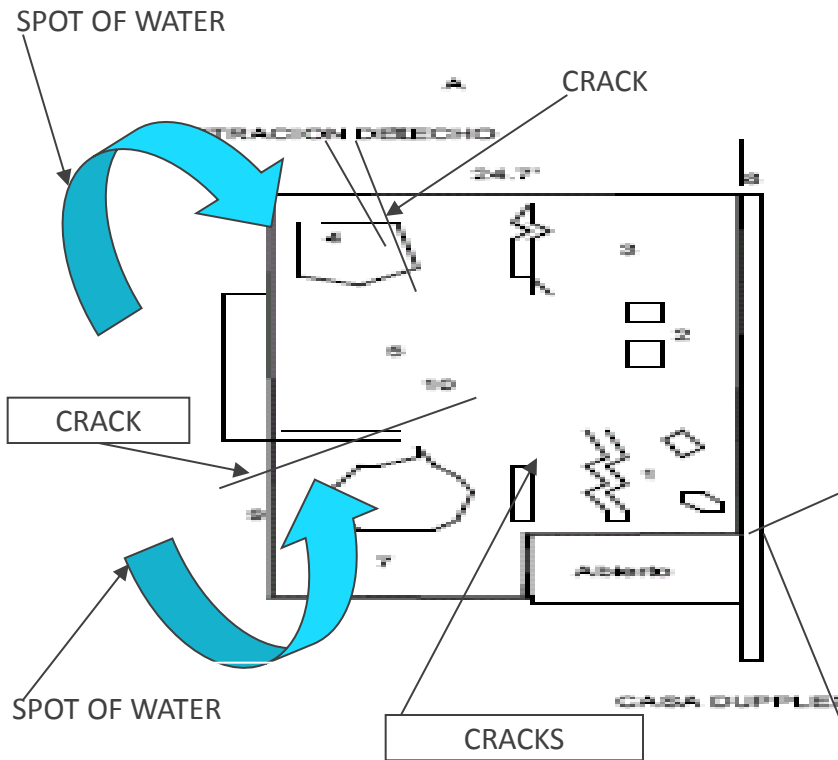
IT IS VERY IMPORTANT TO PREPARE AS MANY SKETCH AS NECCESARY IN ORDER TO MATCH :

DEFECT/ CONDITION EXACT LOCATION AND PHOTO IN ORDER TO HELP THE READER TO UNDERSTANT THE REPORT

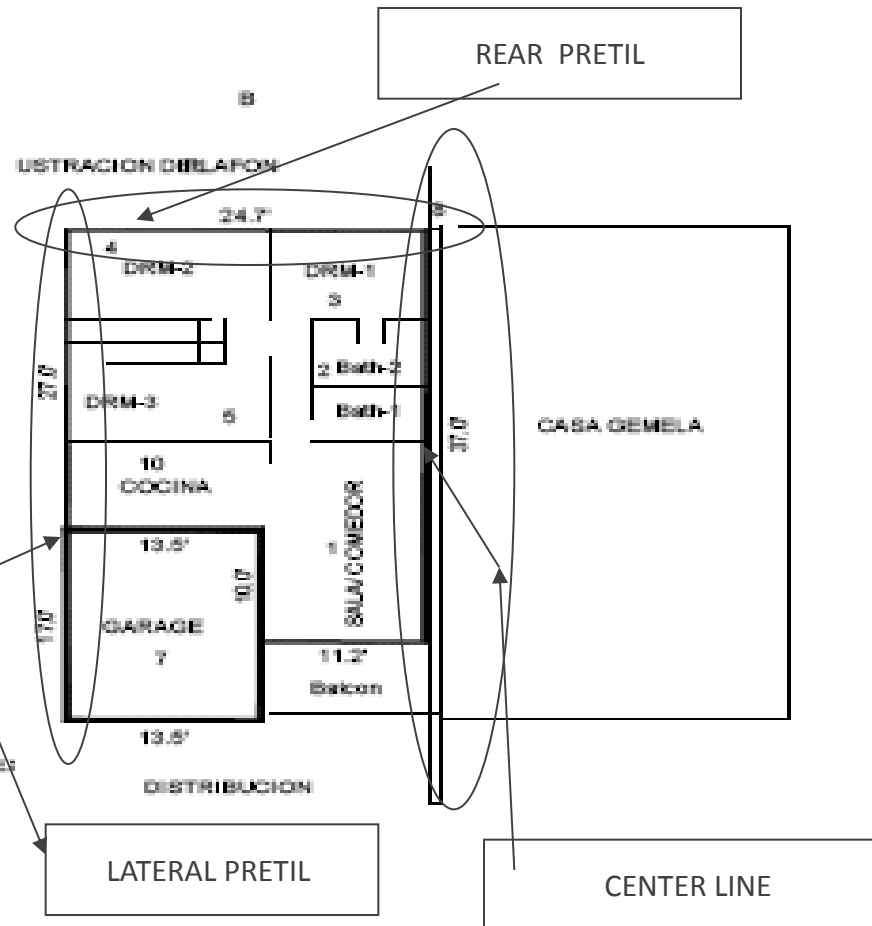


# ROOF AND CEILING

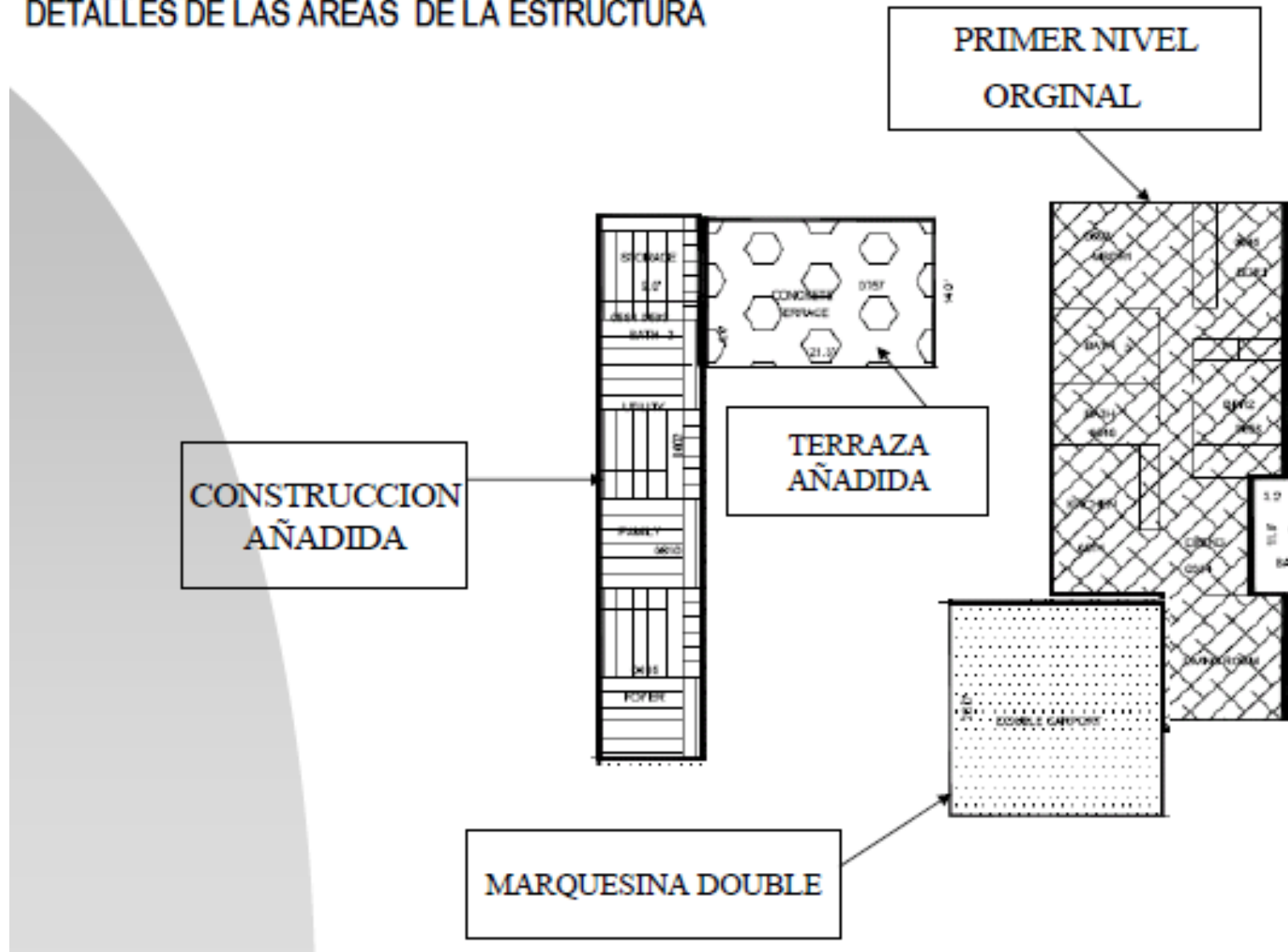
LEFT ( ROOF ). FROM EXTERIOR



RIGHT CEILING. FROM INSIDE



# APENDICE A-4 DETALLES DE LAS AREAS DE LA ESTRUCTURA





## KITCHEN AREA

Run water while testing electrical- CFGI

Check for wires under the sink

Burned marks and chips on countertops

Misadjusted drawers and cabinet doors

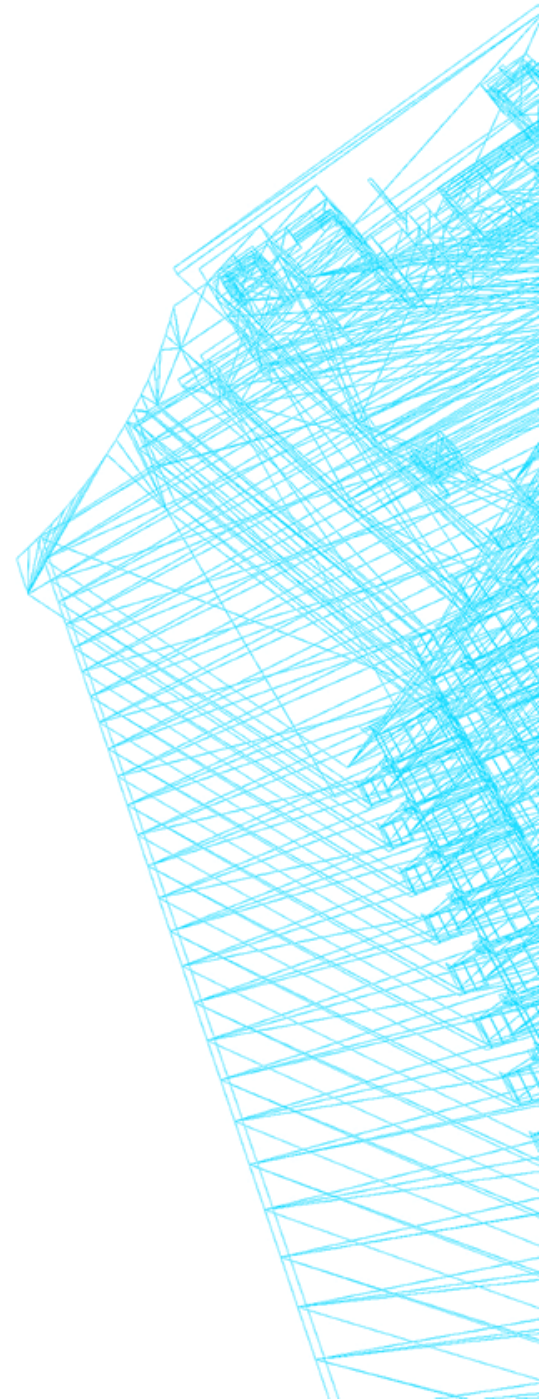
Ceiling & wall, counter top Floor cabinet

Wall cabinet

Plumbing system: pipe, fixtures and faucets

Electrical system, Ventilation system and

Sink and P-trap for leaking





## KITCHEN AREA

MOST COMMON DEFECTS:

Others defect are:

Water penetration around the countertop

Leakage from faucets

Slow sink drainage due to pipe obstruction

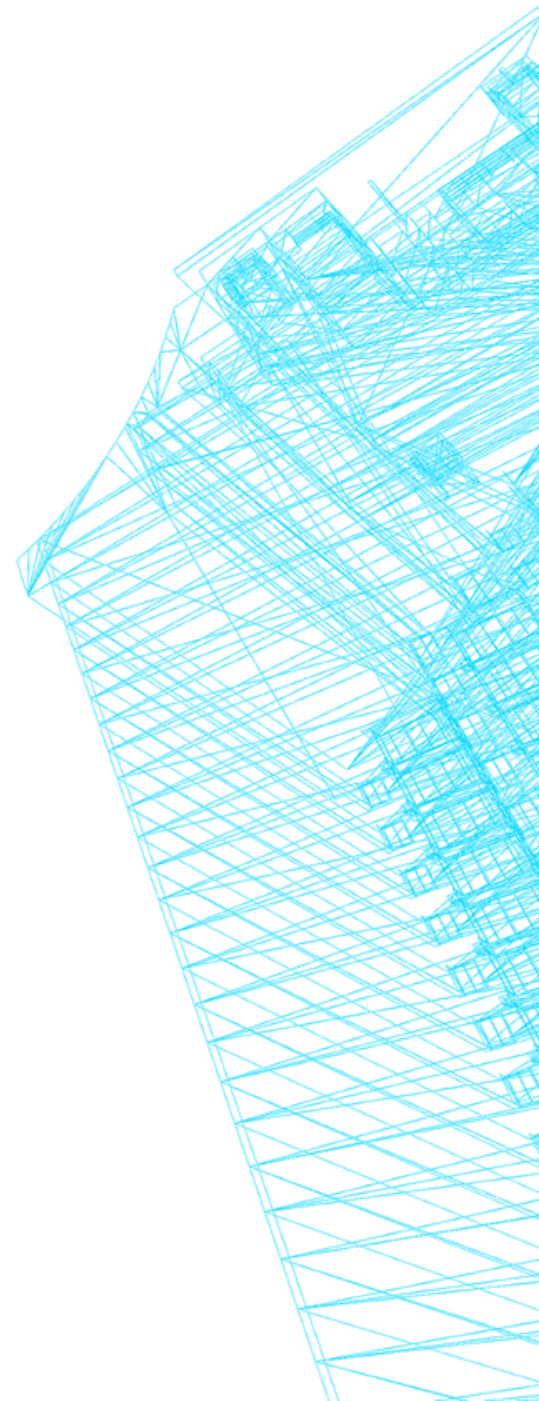
Interchange of house material for hot and cold water w

Extractor malfunctioning

Low pressure in water line

Broken sink and leaking

P- trap obstruction /or leaking



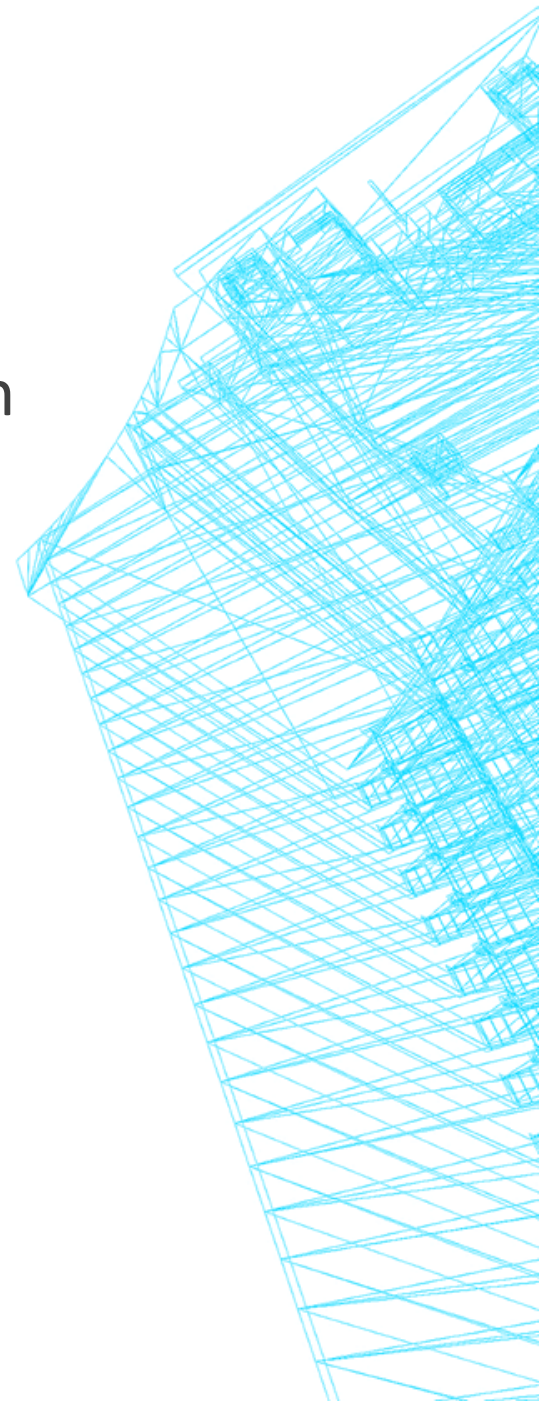
# EXTERIOR OF DWELLING OR BUILDING

## EXTERIOR OF DWELLING OR BUILDING

The exterior of the building generally is concrete block, reinforced concrete, masonry, and some rarely wood and metal sidings. The exterior mostly is built to protect the entire structure from rain water, moisture and air infiltration on any condition that could negatively affect the livability or the utilization of such building.

### Common defects:

- Crack in the walls
- De-lamination
- Painting deterioration
- Lack of painting or poor painting
- Unvented bathroom
- Accumulation of humidity at the floor perimeter
- Lack of plastering
- Doors projection and trim installation
- Fences, Gates and operator defectives and
- Plastering and cracks, and painting pilling down



# GARAGE/ CARPORT

## GARAGE/ CARPORT

Exterior wall

Type of construction

Materials

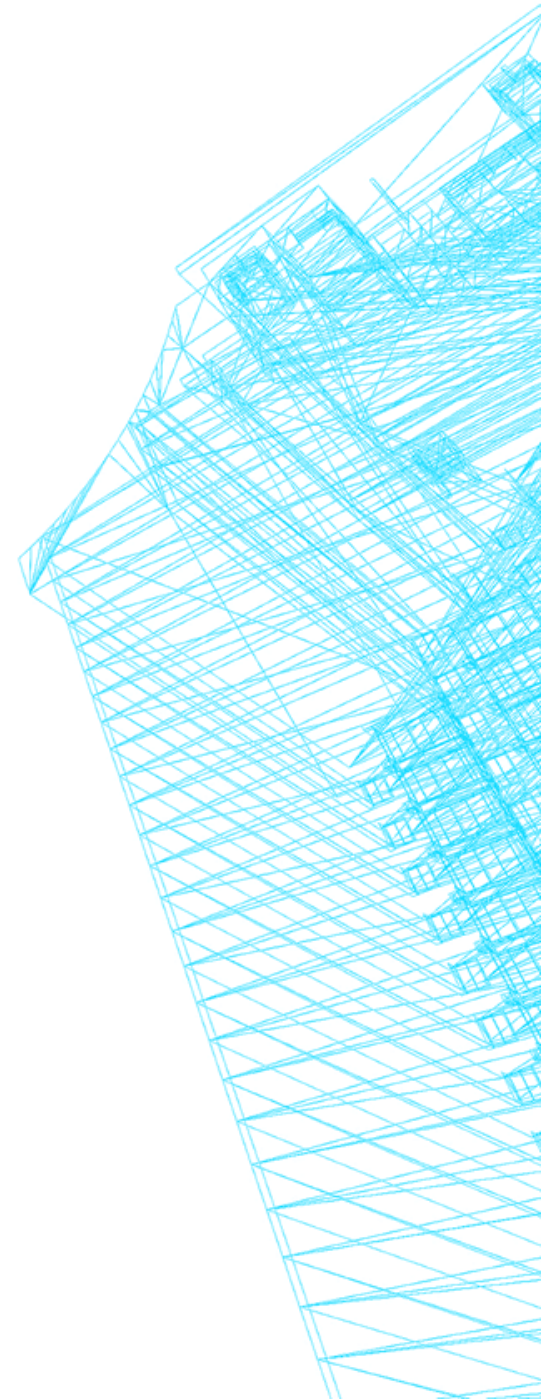
Ventilation

Construction

Floor

Walls

Doors, operator and gate



# INTERIOR INSPECTION

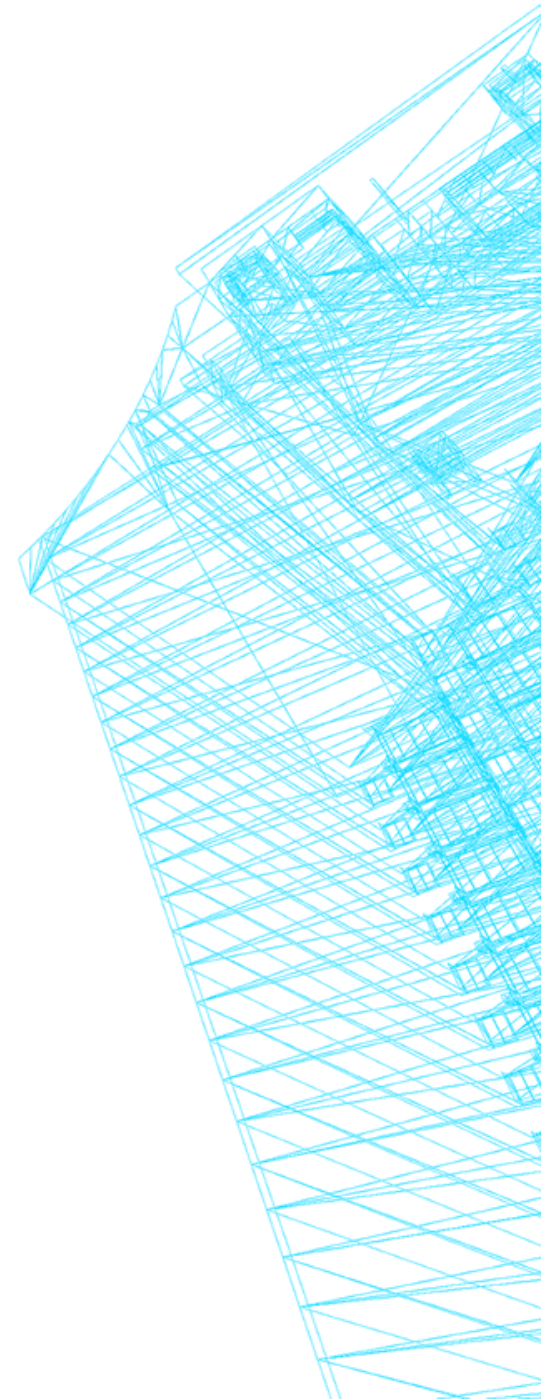
## INTERIOR

When the interior of the building is accessed in order to perform an inspection, the first step is to start looking the ceiling in order to make any connection with the findings at the roof and the ground

### SOME BASIC TOOLS:

It is required that a flashlight, caliper, magnifier, meter, and telescoping mirror are utilized in order to proceed with a systematic inspection process made to the complex system in the interior of a building.

Typical interior inspection required that the inspector verify:

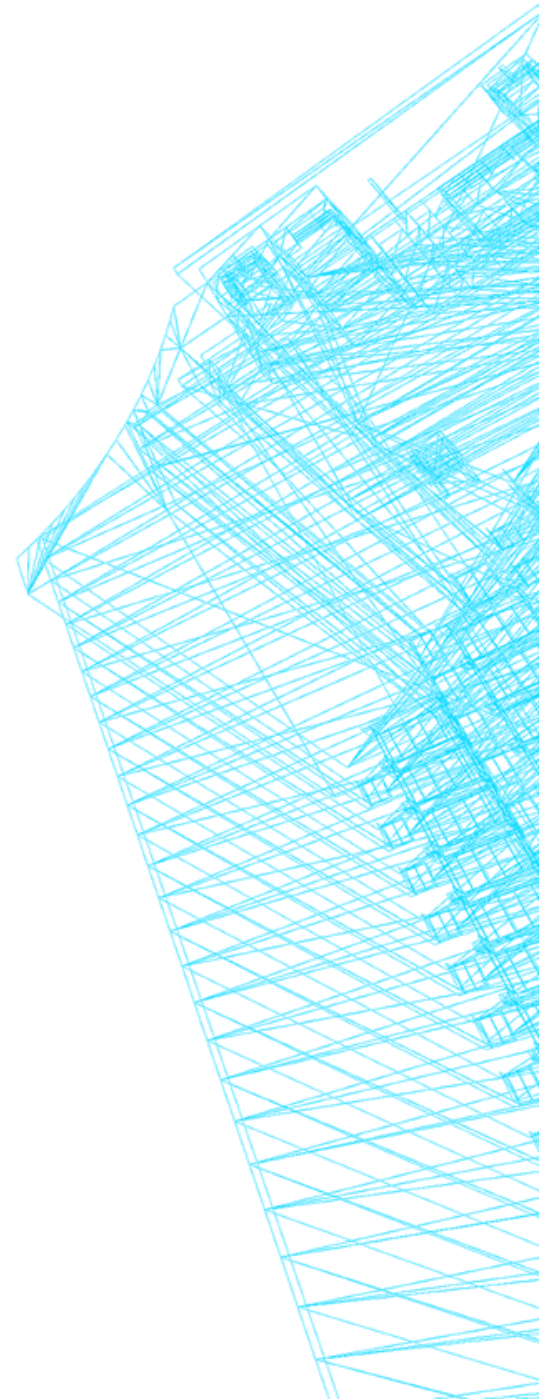




# INTERIOR INSPECTION

## INTERIOR

Ceilings, walls and floor covered  
Building elements: beam, column  
Partition, Closets,  
Stairways, steps, and railings  
Kitchen components  
Doors and windows



# INTERIOR INSPECTION

## CEILING

Ceiling and walls must be describe, indicating type of material, existing damages, and general condition. The following are the most common defects:

De- lamination

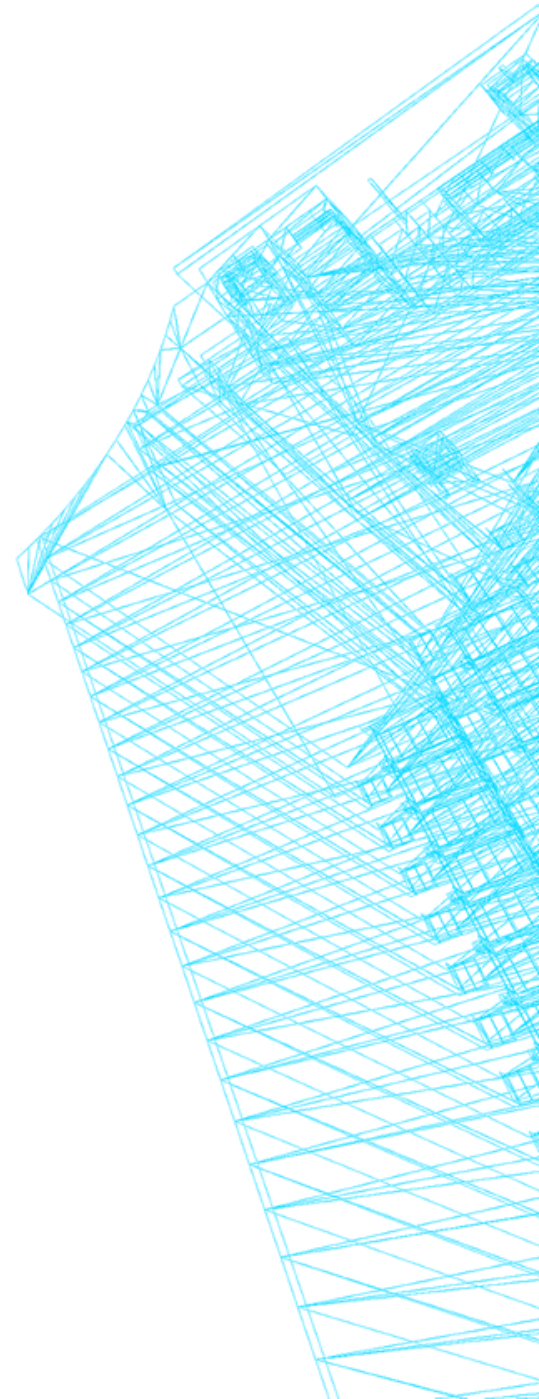
Cracks

Filtration, humidity and mold

Exposed bars

Painting pilling down

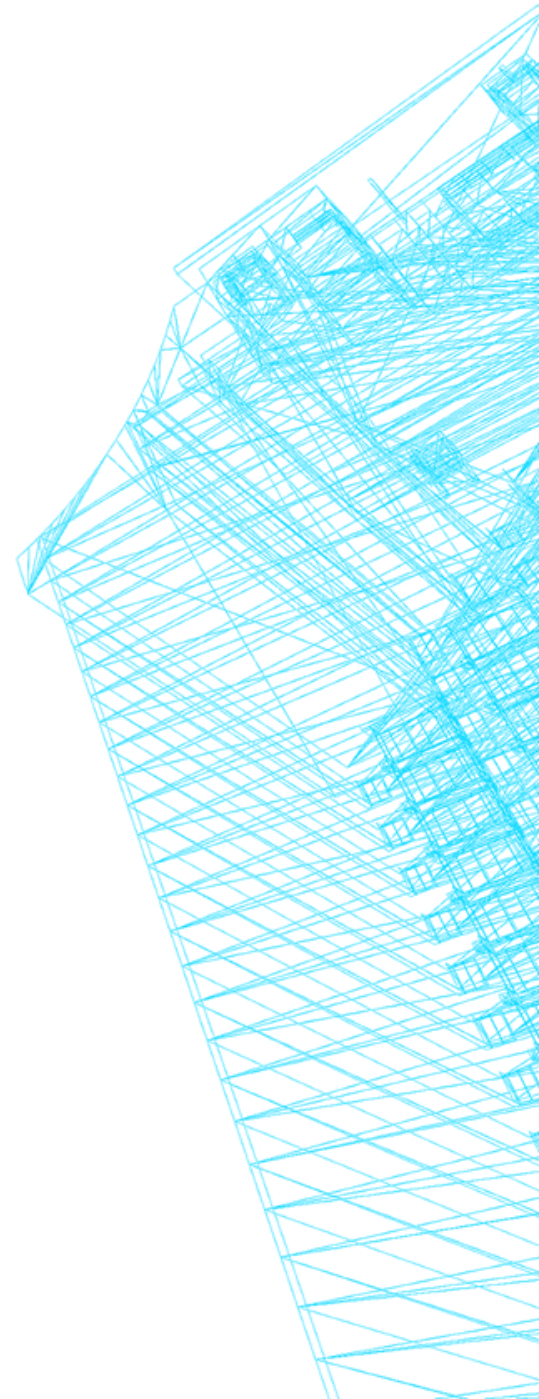
Plastering pilling down, concrete de-lamination



# INTERIOR INSPECTION

## WINDOWS AND DOORS

Complete description of doors and windows from and interior doors, windows, its types according to type of material and design and style, sizes, quantities, qualities, operational conditions and apparent condition must be reported.

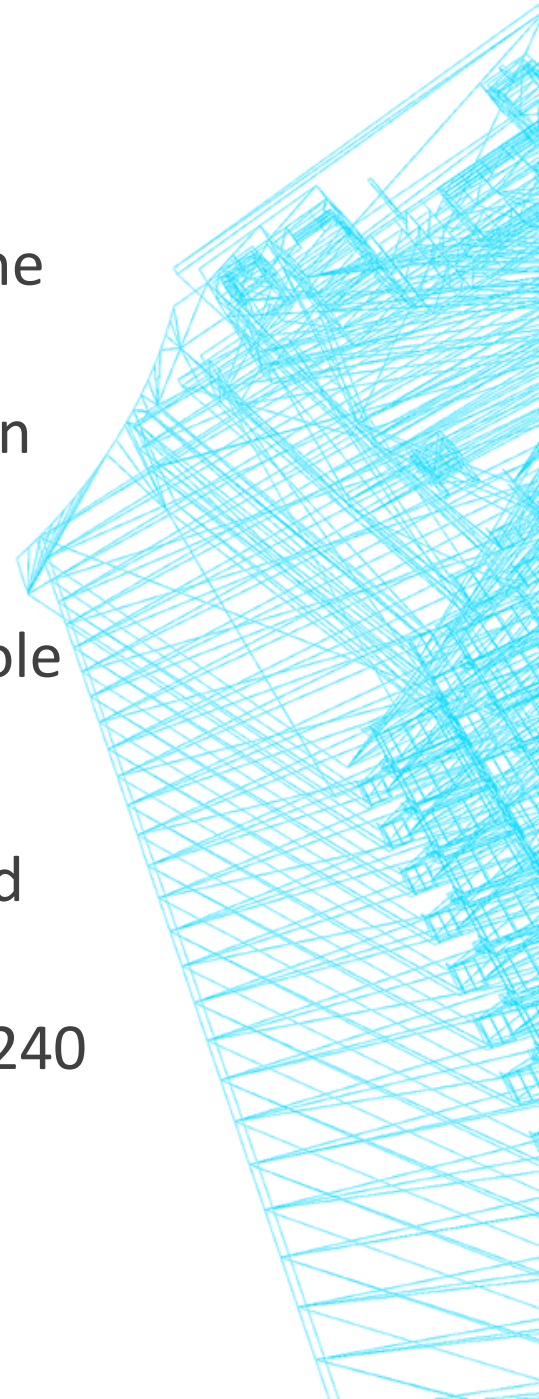


# INTERIOR INSPECTION: ELECTRICAL SYSTEM

The electrical system is the energy supply and energy transformed of the house or the building. Electrical current is the flow of electrons along a conductor such as a copper wire. The electrons are produced by a generator or battery that forces electrons to follow the conductors to an appliance such as a microwave, TV, computer, light-bulb, radio, AC unit, etc.

This flow occurs in a circuit that is composed of service line to a utility pole transformer, service drop (overhead or underground), service mast, service entrance, meter, raceway, disconnectors, grounding, service equipment, then to panel board circuit, circuit breaker, ground fault breaker, wire, switches, interrupters, junction boxes and outlets, ground fault circuit interrupter GFCI

The normal main breaker for a typical house is controlled by 200 amp, 240 volt.





# ELECTRICAL APPLIANCES & COMPONENTS

RANGE

REFRIGERATOR

LIGHTING

OUTLETS

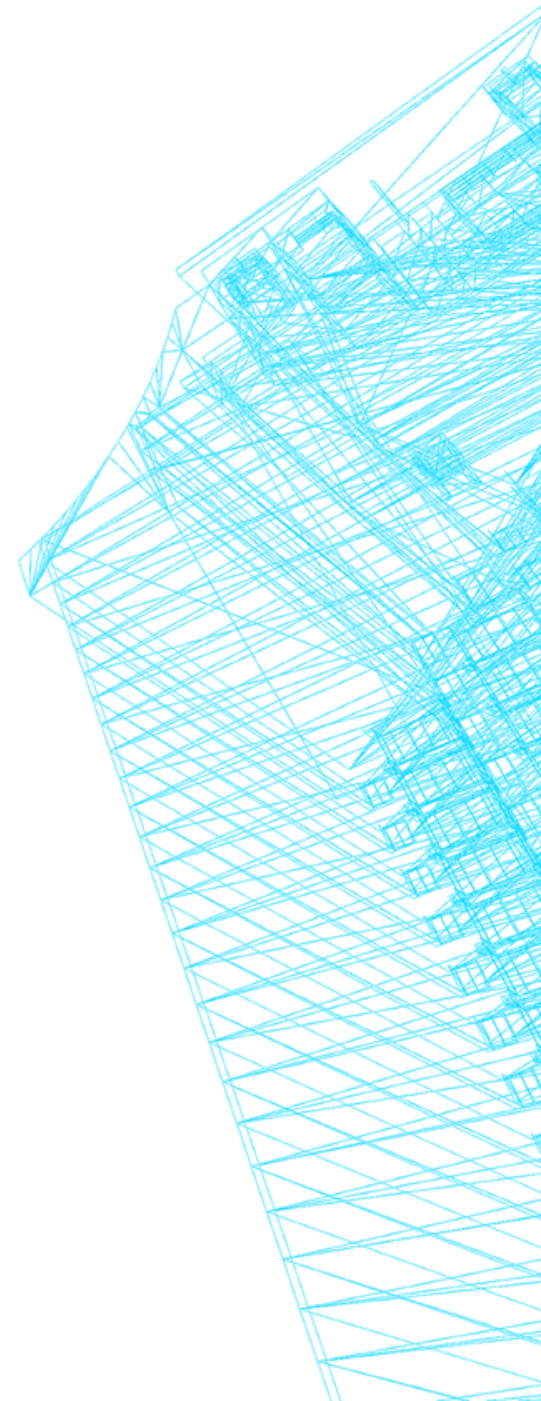
MICROWAVE

LAUNDRY AND BATHROOM

HVAC

GARAGE DOOR OPERATOR

OTHERS



# ELECTRICAL SYSTEMS

## ELECTRICAL SYSTEM COMPONENTS:

Important facts on the electrical system are:

Component manufacturer, brand name, type, serial number, and class.

Number of circuit

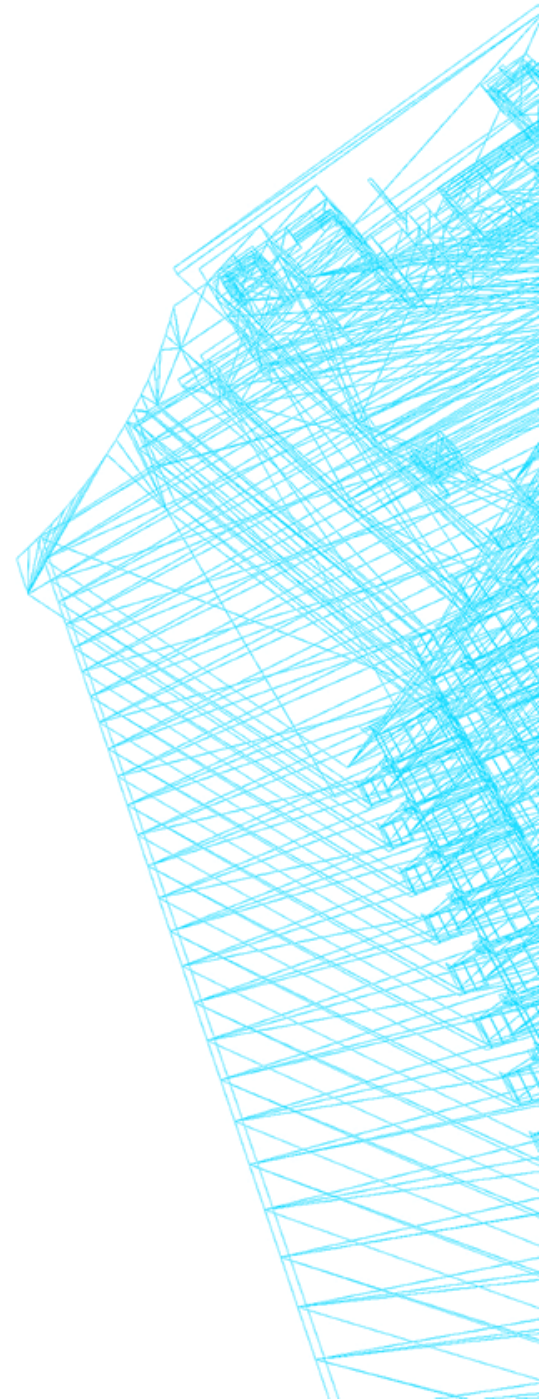
Breaker Breakdown

CFGI circuits for: Kitchen, Bathroom, Laundry must be check for CFGI receptacles.

Receptacle distribution and installation must be in compliance with code and standard.

Wiring size according amperage must be property installed.

Wiring to garage door operator must be property done



# ELECTRICAL SYSTEMS

Most Common defects of the electrical system:

Open function box

Broken wire, exposure wire, open receptacle

Unprotected function

Loses or lack of ground

Two 20 amp circuit at 240 volts

Lack GFCI circuit in the following areas: Kitchen, whirlpool, bathroom walls, and laundry area, nonmetallic shielded wiring along near foundation wall and failures switches

Installation of Improper wire sizes and ground

Switches, receptacles, outlets and receptacle fixtures operate all G.F.C.I test devices and outlets by water failure on missing

Over size fuser / breaker for wire size

Uncover boxes

Exposes wired

Main panel not grounded

Reverse polarity / open grounder by water failed

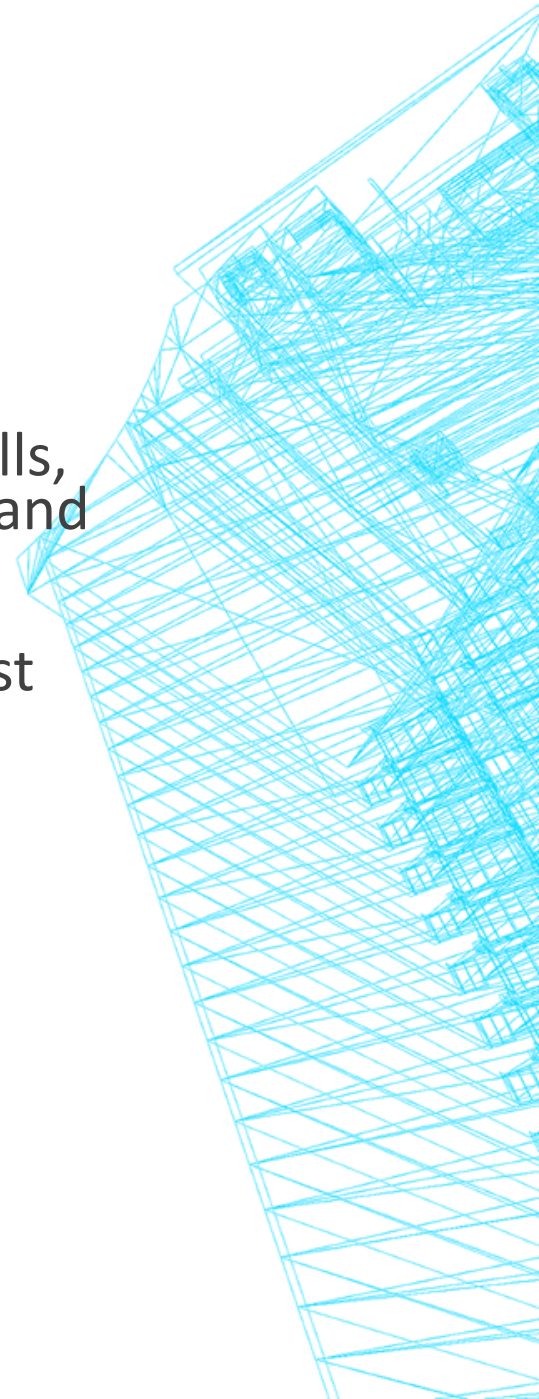
Extension cord wiring

Wiring place into concrete without conduit

Ungrounded panel

Panel located under drains

Panel with no turns offs system.



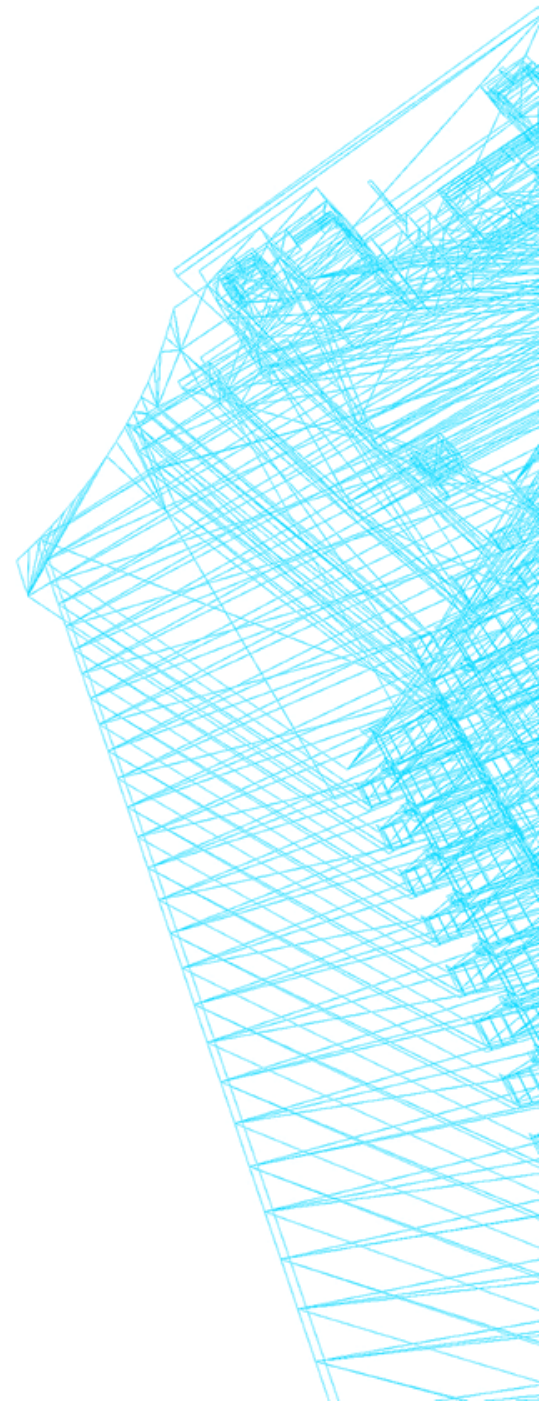
# INSPECTION REPORT

**NARRATIVE IS WRITTEN IN PARAGRAPH FORM AND REFLECTS THE INSPECTOR OBSERVATION AND OPINION OF THE CONDITION OF A SUBJECT BUILDING.**

**NARRATIVE REPORT WITH CHECKLIST OR RATING SYSTEM AND NARRATIVE REPORT COMBINED WITH A CHECKLIST OR RATING SYSTEM REPORT THAT MORE FULLY EXPLAINS THE INSPECTOR'S OBSERVATION OF THE BUILDING.**

**CHECKLIST REPORT, A SYSTEMATIC ITEMIZATION OF THE VARIOUS COMPONENTS OF A PROPERTY THAT IS ORGANIZE INTO SECTION THAT ALLOY THE INSPECTOR TO CHECK OF INSPECTED PROPERLY COMPONENTS AND COMMENT FOR AN SPECIFIC PROBLEM.**

**Any one the above described report forms must begin with the scope of work and they follow any systematic method choice by the inspector. However we have been using this procedure successfully for the past 8 years.**





# SUMMARY OF REPORT CONTENT

SITE/ SOIL

FOUNDATION

BUILDING ENVELOPES

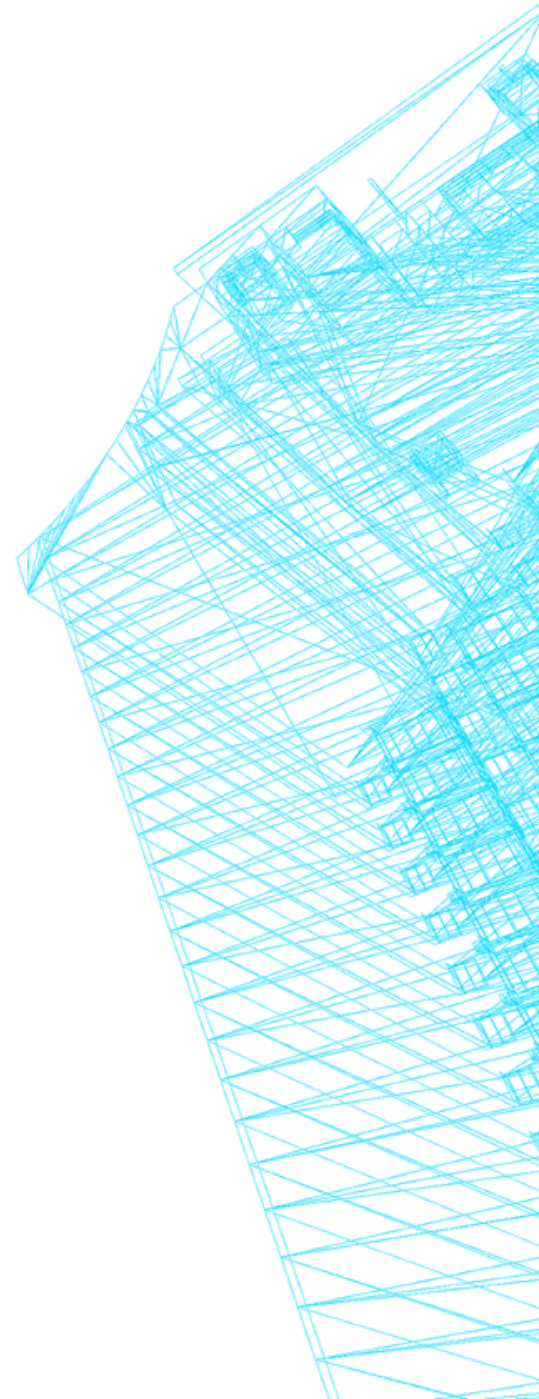
ROOF SYSTEM AND CONTENT

EXTERIOR COMPONENTS

INTERIOR COMPONENTS: KITCHEN, BATHROOM, OTHER  
ROOMS

PLUMBING AND SEWER SYSTEMS

ELECTRICAL SYSTEM



# SUMMARY OF REPORT CONTENT

APPLIANCES

SUMMARY OF FINDINGS

COSMETIC DEFECTS ITEMS

REPLACEABLE ITEMS

REPAIRABLE ITEMS

NON REPAIRABLE ITEMS

SAFETY AND HEALTH ITEMS

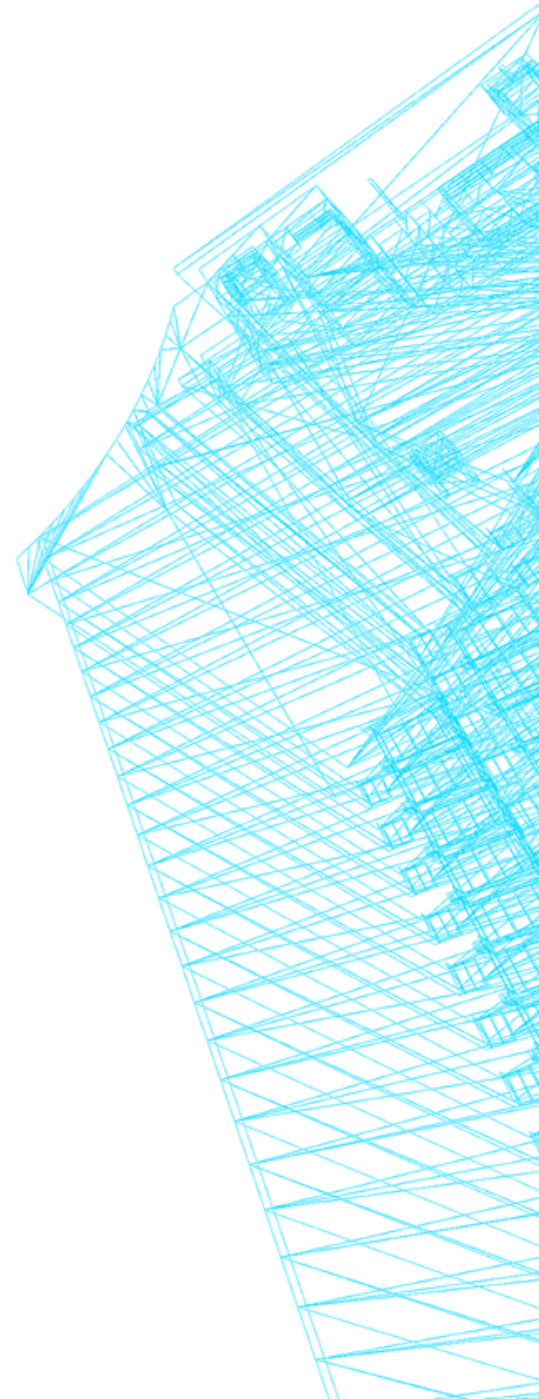
DEFERRED MAINTENANCE ITEMS

STRUCTURAL ITEMS

OBSOLETE ITEMS

TOTAL COST OF: REPLACE AND REPLACED

ITEMS FOR FURTHER ANALYSIS.





# THIS IS TIME TO ASK QUESTIONS AND MAKE COMMENTS

THANKS FOR YOUR PATIENT AN LETTING ME TO TALK TO YOU

DR. JUAN F. CHARLES, PE, CBIE, PPL, F-NAFE

ANY COMMENTS: [Charless@Caribe.net](mailto:Charless@Caribe.net)