

INDOOR ENVIRONMENTAL QUALITY EVALUATION

**MARTINEZ RESIDENCE
452 PRECIOUS, VILLAS AT FORTUNA
SAN ANTONIO, TEXAS**

Prepared for

**SAN ANTONIO HOUSING AUTHORITY
SAN ANTONIO, TEXAS**

by

ETC INFORMATION SERVICES, LLC

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Project No. 7A-020
May 17, 2007

Mr. Timothy Alcott
San Antonio Housing Authority
1315 N. Elmendorf
San Antonio, Texas 78207

**Re: Indoor Environmental Quality Evaluation
Martinez Residence, 452 Precious, San Antonio, Texas**

Dear Mr. Alcott:

A copy of the report for the investigation of the referenced property is being forwarded to you for your information and necessary action. This report is part of a more comprehensive report on ten properties in the Villas at Fortuna, Blueridge, and Sunflower subdivisions. The comprehensive report should be used for a full introduction, discussion of field operations, and discussion.

We will be happy to answer any questions concerning this report. It has been a pleasure working with you on this important assignment. We look forward to being of continuing service to you.

Sincerely,

ETC INFORMATION SERVICES, LLC

Donald J. Schaezler, Ph.D., P.E., CIH
President

1.0 INTRODUCTION AND BACKGROUND

1.1 Purpose of the Evaluation

The subject residence was evaluated for indoor environmental quality conditions April 17, 2007. The purposes of the evaluation were as follows:

- To interview residents about their complaints with respect to water damage, mold, health symptoms, and other indoor environmental issues
- To collect indoor air samples for identification and enumeration of airborne fungal spores and culturable fungi
- To collect indoor air samples for enumeration of fiber glass and other mineral fibers, pollen, skin cell fragments, and other particles
- To measure indoor air quality with respect to common chemical and physical parameters
- To evaluate apparent sources of water damage and visible mold in the residence
- To document areas with excess moisture content in building materials
- To assess, in a preliminary manner, the condition and performance of the HVAC system
- If necessary, to recommend remediation, including preparation of a Mold Remediation Protocol

The investigations were performed at a screening level and were designed to obtain information on the overall condition of the residence. They were not intended to be in-depth investigations of all potential conditions that affect the indoor environment.

The investigations were conducted by Donald J. Schaezler, Ph.D., P.E., CIH, with assistance from other ETC staff. Dr. Schaezler is a licensed Mold Assessment Consultant (MAC), a licensed professional engineer (P.E.), and a Certified Industrial Hygienist (CIH).

1.2 Subject Residence

The subject residence was in the Villas at Fortuna subdivision. The residence was apparently built by KB Homes in about 2000. It has been leased to the Martinez family, but it is owned by SAHA. Over the past several years, the residents in similar homes had complained to SAHA and KB about a variety of structural and indoor environmental issues. These complaints have triggered investigations by several consultants, including this report.

2.0 FIELD OPERATIONS

2.1 Description of Residence

The subject residence is approximately seven years old and is a single-family dwelling located in west San Antonio, between West Commerce and Culebra Road, near St. Mary's University. It appears to have a reinforced concrete foundation, Hardiplank® siding external wall finish, conventional wood framing, and a complex hip and gable roof with composition shingles. It is a one-story structure with three bedrooms, two bathrooms, Kitchen, Breakfast Room, Living Room, Utility Room, and an attached one-car Garage. The layout of the subject residence is shown schematically in Figure 1.

The residence had carpeting in the bedrooms, the Living Room, and the hallways. It had vinyl flooring in the Entry, Kitchen, bathrooms, and the Utility Room. Interior finishes were typically textured and painted gypsum board.

There is a single, central HVAC system of split design. The condenser unit (CU) is outside on a concrete pad. The air handler unit (AHU) is in a hallway closet near the living room. Return air is routed through a grille in the lower closet door and up through a supporting platform to the AHU. The AHU has a return air filter, evaporator coil, blower, and electric heating unit. Supply air is routed up to the Attic through a ductboard plenum. Flexible runouts are attached to that plenum. The return air plenum is shared by a low profile hot water heater. The ceiling penetration in the HVAC Closet is sealed with aluminum foil duct tape. There were small openings to a chase behind the AHU and, probably, to the attic behind the supply air plenum.

The Utility Room included connections for a washer and a dryer.

For simplicity of discussion in this report, Precious is assumed to run north-south. The subject residence is on the east side of the street, and the house is assumed to face west. Directional references, such as front, right, rear, and left will refer to an observer facing the front of the house from the street.

2.2 Observations

1. The resident was initially not present, and much of the investigation was performed before she arrived.
2. Cigarette smoke odor was detected in the house.
3. There was minor water staining at the window sill in the Master Bedroom.
4. There were stains on the cabinet shelf under the Kitchen sink that could have been from normal drips from containers or drips from the drain system.

5. There was water damage and mold growth in a small areas at the head of the tub in Bathroom 2
6. There were minor stains on the drain piping in the base cabinet in Bathroom 2. There could have been previous drips from the drain system.
7. The carpeting was dingy but appeared to be clean.
8. According to the resident, sewer backups occurred in 2001 because of balls of paint that had collected there. Overflows into the house occurred, but the water was clear. Some damage occurred at the base trim in the Master Bathroom. She said the sewer still performs poorly.
9. The home had a minor amount of dust in the return air plenum, including at the entrance to the air handler unit (AHU), and on the evaporator coils.
10. The home had excess dust collected at the exhaust air grille in the Master Bathroom and excess dust behind the washer/dryer. These indicate that the indoor environment has excessive dust levels.
11. The home was using two low efficiency return air filters, one on top of the other. The resident reported that her permanent electrostatic type filter would not fit after the AHU had been worked on most recently.
12. There was grass growing into Bedroom 2 from the outside. Sod had been placed above the bottom edge of the siding, thus encouraging its intrusion into the house. The bottom plank of siding had been replaced at the rear of the house.

2.3 Field Measurements

2.3.1 Moisture Content

Moisture measurements were made for wood, sheetrock, and concrete surfaces in areas with visible or potential water damage with Delmhorst and Tramex moisture instruments. Measurements were also taken in background areas for comparison. There were no areas where significant excess moisture was found.

2.3.2 Air Quality

During the survey, the indoor area was investigated by measuring general indoor air quality parameters to determine the potential for chemical and physical problems. Temperature, relative humidity, carbon dioxide, and carbon monoxide were measured using a Vulcain Safety Palm field instrument. Results are summarized in Table 3. Key points are discussed below. The house was occupied at the time of the survey.

1. The indoor relative humidity was high.
2. Carbon dioxide values were satisfactory, but there was nobody home when the measurements were taken.

3. Carbon monoxide values were one ppmv. These trace readings probably reflected the presence of smokers in the house, even though nobody was home when the measurements were made.

2.3.3 Thermal performance of Heating, Ventilation, and Air-Conditioning System (HVAC)

During the survey, the thermal performance of the HVAC system was evaluated by measuring the temperature of supply air and return air in the system, using a laser-focused infrared thermometer. The Martinez Residence had marginal thermal performance. The results are summarized in Table 4.

2.4 Sampling

The emphasis of the sampling program was to evaluate indoor air quality. The blower in the AHU was turned on before sampling. Samples were collected from two locations, at the return air grille and in the Master Bedroom near the Master Bathroom.

2.5 Photographs

Photographs of the subject residence are available for review.

3.0 RESULTS AND DISCUSSION

All sample results are included in the comprehensive report. The results are summarized in the tables and are discussed in this section for comparison purposes.

3.1 Fungi in Air

Three sets of indoor air samples and one outdoor air sample were collected for the house. One set of indoor air samples was collected from near the return air grille, one set was collected from the Master Bedroom near the Master Bathroom, and a third was collected from the third bedroom. Indoor air samples were collected for indirect evidence of water damage and mold amplification and to evaluate potential exposures to occupants of the house.

Outdoor air samples from the Martinez front yard were used for comparison.

Samples were collected for total bioaerosols, using Allergenco D cassettes, which are slit impaction samplers. Sampling was at 15 liters per minute for five minutes. The slides in the cassettes were interpreted microscopically by Aerotech and were analyzed for total bioaerosols. Results of analyses are summarized in Table 5.

Samples were also collected for culturable fungi, using a single stage Anderson-type impactor with potato dextrose agar plates. Sampling was at 28.3 liters per minute for three minutes. The plates were then reassembled, sealed with tape, and shipped to Aerotech for incubation and interpretation. Results of analyses are summarized in Table 6.

1. Outdoor air had typical levels of total fungal spores, dominated by Ascospores and with significant proportions of Basidiospores.
2. Indoor air had low to very low levels of total fungal spores. Basidiospores were the predominant spore type. *Aspergillus/Penicillium*-like spores were present at low levels in the Master Bedroom.
3. Outdoor air had moderate levels of culturable fungi, dominated by yeast and with a low level of *Cladosporium* species.
4. Indoor air had low levels of culturable fungi, in comparison to outdoor air, also dominated by yeast. There were trace levels of culturable *Aspergillus* and *Penicillium*.
5. These results indicate that there are not likely to be significant sources of mold growth in the Martinez residence.

3.2 Fibers and Other Particles in Air Samples

The Allergenco D slides were evaluated by Aerotech for the presence of fibers and particles of potential interest other than fungal spores and mycelial fragments. The fibers found were compared specifically to attic insulation. The results are summarized in Table 5. Compared to samples collected from other houses, there were low concentrations of fibers in the two samples. There were high levels of skin cell fragments in the two indoor air samples.

The fibers reported were found not to be from the attic insulation. The fibers were also not fiberglass.

3.3 Sources of Water Damage

Based on field observations and measurements, apparent sources of water causing damages at the subject residence include the following:

1. Condensation at windows
2. Overspray from showers onto nearby walls and floors, including the upper wall for the Master shower
3. Grass above the siding may cause some water to absorb into the slab at the floor level.

4.0 CONCLUSIONS

1. The Martinez Residence had marginal thermal performance of the air-conditioning system.
2. The residence had high relative humidity during the preliminary investigation, but the dew point was satisfactory.
3. The house had inadequate filtration within the air handler unit (AHU). This condition will contribute to accumulation of debris on the evaporator coils and contribute to problems with excess dust in the house.
4. The residence appeared to have excess dust accumulated within the interior environment.
5. The residence had some water staining at the window sill in the Master Bedroom. This damage is consistent with condensation that would occur during cold weather.
6. There was water damage and mold growth in a small area at the head of the tub in Bathroom 2. The damage is consistent with overspray from the shower.
7. The cleanliness of the AHU system was satisfactory. The thermal performance of the air-conditioning system was marginal. Two layers of return air filters were being used. This may impede the flow of air in the system.
8. There were normal levels of total fungal spores and culturable fungi in the indoor air.
9. There were low concentrations of fibers in the two samples. There were high levels of skin cell fragments in the two indoor air samples.

5.0 RECOMMENDATIONS

1. A technically competent HVAC contractor should evaluate the Martinez Residence for the size of the HVAC equipment, the capacity of the blower, the size of the plenums, the size and orientation of the ductwork, the size of the registers, the connections of all supply air components, the sealing of the HVAC Closet and return air plenum, the cleanliness of the system and the need for cleaning, the thermal performance of the system, the balance of the supply air system, the operation of the thermostat, the level of refrigerant in the system, and other aspects of the design and operation of the system. All deficiencies should be corrected, including cleaning of the evaporator coils outside of the house.
2. The Martinez Residence should use high performance pleated return air filters, rated as MERV 8 or better.
3. Deficiencies in installation of doors and windows should be corrected as necessary. This appears to be minor in nature at this house.
4. During the evaluation of the HVAC system and investigation of door and window installations, the Mold Assessment Consultant should evaluate the condition of the system with respect to mold contamination.
5. All penetrations of the ceilings (such as peripheral edges of supply air ducts and vents and exhaust fans) and chases (such as at the HVAC closet) should be sealed.
6. Improperly finished sheetrock/shower-surround junctions should be properly repaired.
7. The work recommended above is not considered to be mold remediation and will not be required to follow the Texas Mold Assessment and Remediation Rules (TMARR). A Mold Remediation Protocol is not being prepared for the work recommended above. If during the work it is determined that the TMARR must be followed, work should cease, and work should then be completed in full compliance with the TMARR.
8. Following the work recommended above, the residence should be thoroughly cleaned. HEPA-vacuums of all surfaces and HEPA-vacuums plus hot water extraction of upholstery and carpeting by a professional cleaning company may be very useful to reduce the inventory of dust in the houses. Badly soiled carpet should be discarded, especially carpet that was ever impacted by the sewer backups. Together with use of high performance return air filters, this should help to correct the dust problems.
9. The sod should be removed from the level of the siding, the ground recontoured, and then sod replaced well below the siding.

TABLE 1 – SUMMARY OF RESIDENCE CHARACTERISTICS

No.	Street	Resident	Owner	Yr. Built	SF	Stories	Garage	Floor Plan	Subdivision	Date Investigated
452	Precious	Martinez	SAHA	2000	1283	1	1-car	I	Villas at Fortuna	17-Apr

TABLE 2 – SUMMARY OF MOLD GROWTH, WATER DAMAGE AND MOISTURE CONTENT

No.	Street	Resident	Visible Mold Growth	Visible Water Damage	High Moisture Content
452	Precious	Martinez	Master Bathroom near head of the tub	Master Bathroom near head of the tub Master Bedroom window sill (slight) Bathroom 2 sink cabinet (slight) Kitchen sink cabinet (slight)	None

Yellow-highlighted boxes indicate conditions that may be significant in evaluation of indoor environmental issues.

**Table 3
Summary of Air Quality Measurements**

Location	Temp °F	RH %	CO ₂ Ppmv	CO Ppmv	Dew Point °F
April 17, 2007					
Outside Air	65.1	94	459	0	62.5
Inside Air					
452 Precious (Martinez) MBR	69.5	66	913	1	57
452 Precious (Martinez)RA	69.3	66	911	1	56.5

Yellow-highlighted boxes indicate conditions that may be significant in evaluation of indoor environmental issues.

TABLE 4 – SUMMARY OF HVAC SYSTEM OPERATION AND SPECIAL CONDITONS

No.	Street	Resident	AC Operation	AHU Cleanliness	Dew Point	IAQ CO ₂ /CO	No. Occupants	Pets	Comments
452	Precious	Martinez	Marginal ΔT= 13-14°	Satisfactory	57	913/1	2	0	Sod above bottom of siding History of sewer backups Cigarette smoker in house Carpets dingy

Yellow-highlighted boxes indicate conditions that may be significant in evaluation of indoor environmental issues.

TABLE 5 – SUMMARY OF AIRBORNE AND AHU PARTICLES

No.	Street	Resident	Sample Location	Total Fungal Spores	Unusual Spore Counts	Mycelial Fragments	Fiber Count	Skin Cell Fragments	Fiber-glass	Pollen	AHU
April 17, 2007											
Outdoor Air Samples – Villas at Fortuna											
452	Precious	Martinez	OA-front	2,160	Asc>Bas	<13	133	573	<13	67	
Indoor Air Samples – Villas at Fortuna											
452	Precious	Martinez	MBR	200	Bas>As/Pn	53	493	6,667	13	40	
452	Precious	Martinez	Return Air	27	Bas	53	600	4,760	<13	40	

Yellow-highlighted boxes indicate conditions that may be significant in evaluation of indoor environmental issues.

Alt denotes *Alternaria*. As/Pn denotes *Aspergillus/Penicillium*-like spores. Asc denotes Ascospores. Bas denotes Basidiospores. Bi denotes *Bipolaris/Drechslera*. Cl denotes *Cladosporium*. Sm denotes Smuts/Myxomycetes/*Periconia*. A>B, C denotes that type A is more numerous than type B, which in turn has the same numbers as type C.

TABLE 6 – SUMMARY OF AIRBORNE CULTURABLE FUNGI AND AHU SAMPLES

No.	Street	Resident	Sample Location	Total Fungi	Unusual Counts	Return Air Filter	Supply Air Plenum
April 17, 2007							
Outdoor Air Sample – Villas at Fortuna							
452	Precious	Martinez	OA-front	753	Y>Cl>StH		
Indoor Air Samples – Villas at Fortuna							
452	Precious	Martinez	MBR	82	Y		
452	Precious	Martinez	Return Air	82	Y		

Yellow-highlighted boxes indicate conditions that may be significant in evaluation of indoor environmental issues.

As denotes *Aspergillus*, Aur denotes *Aureobasidium*, Bi denotes *Bipolaris*, Cl denotes *Cladosporium*, Pn denotes *Penicillium*, Spo denotes *Sporotrichum*, Y denotes yeast, and StH denotes sterile Hyphae.

