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**ALLANA BUICK & BERS**

Making Buildings Perform Better

December 15, 2016

**Denis F. Shanagher**

Duane Morris LLP  
Spear Tower  
One Market Plaza, Suite 2200  
San Francisco, CA 94105-1127

**Re: The Millennium Tower – Residential Unit 31B, Odor Transfer Investigation  
Progress Report - DRAFT**

Denis,

In accordance with your request, Allana Buick & Bers, Inc. (ABBAE) is in the process of conducting a field investigation and analysis of residential unit 31B at The Millennium Tower in San Francisco, CA. We are pleased to present Duane Morris (DM) with a progress report of our investigation and preliminary findings.

**Background**

The Millennium Tower site consists of a 58 story multi residential hi-rise and a 9 story mid-rise building, built during 2008 and 2009. The resident of Unit 31B has been reporting infiltration of assorted odors into her condominium unit for the last 4 years. The focus of the investigation will be to test the existing conditions of the residence, the integrity of the unit surrounding walls, ceilings & floors and to provide analysis and repair recommendations based on our findings.

- The Millennium Tower, Unit 31B has a typical 2 bedroom 2.5 bathroom floor plan.
- The two bathrooms, the toilet room and the kitchen hood are served by a common exhaust duct which discharges into a vertical exhaust shaft routed up to a rooftop exhaust fan.
- A separate exhaust riser serves the clothes dryer exhaust.
- The unit heating and cooling is provided by two water source heat pumps. One heat pump [HP-C] supplies the master bedroom and part of the living room/dining room and the other heat pump [HP-B] supplies the small bedroom and part of the living room.
- As reported to us by the resident of 31B; the detection of undesirable indoor odors occurred at seemingly random periods of the day. The locations within the residence, where the smells were noticed, also varied without any consistency. And finally the types of odors were varied, from different food sources to smoke smells.
- The Building Engineers, we interviewed, stated that very few odor transfer issues have been reported by other units in the Millennium. There were some odor complaints, in the past, that were resolved by adjusting and balancing the building common exhaust and supply air systems.



## Site Investigation

An initial non-destructive site survey at the Millennium Tower Unit 31B was conducted by ABBAE staff on October 7, 2016. It included a general walk through of the residence and an interview with the unit resident and the building engineers.

On December 8, 2016; ABBAE staff conducted a series of onsite **smoke tests**. The object of the test was to determine if a path of air transfer existed between the subject residence in Unit 31B and the residence directly below, Unit 30B.

The smoke tests were performed utilizing “smoke emitters” by Regin HVAC Products [Model S104, 3 minute cartridges] which emit white colored and scented smoke.

### Unit 31B/30B SmokeTest Description

Six test locations were selected within the residence (as indicated in the attached unit floor plan):

ST1 – Wall cavity behind Heat Pump [HP-C]

\*Note that access to this location required a 24”x24” wall opening to be cut in the master bedroom of Units 30B and 31B.

ST2 – Area below living room window, adjacent to heat pump closet.

ST3 – Area below living room window, to the right of ST2.

ST4 – Area below kitchen exhaust hood

ST5 – Heat Pump [HP-B] closet

ST6 – Master bathroom.

### **Test 1**

- 11:00 AM (1) smoke emitter cartridge was setoff in Unit 30B at ST2
- Odor detected in Unit 31B kitchen area near heat pump HP-C closet.
  - Faint smoke haze in same area.

### **Test 2**

- 11:40 AM (1) smoke emitter cartridge was setoff in Unit 30B at ST1
- Significant amount of smoke streaming out of gaps in exterior wall (curtain wall) within the cavity behind the heat pump.

### **Test 3**

- 12:00 PM (2) smoke emitter cartridges was setoff in Unit 30B at ST1
- Significant amount of smoke streaming out of gaps in exterior wall (curtain wall) within the cavity behind the heat pump.
  - Similar to Test 2 but resulting in more intense smoke transfer.



#### Test 4

12:30 PM

- (1) smoke emitter cartridge was setoff in Unit 30B at ST6
  - Slight odor detected in Unit 31B entry hallway near laundry room
  - No smoke detected.

#### Test 5

1:00 PM

- (1) smoke emitter cartridge was setoff in Unit 30B at ST5
  - Significant amount of smoke streaming out of hydronic piping floor penetrations in heat pump closet.
  - Similar to Test 2 but resulting in more intense smoke transfer.

#### Test 6

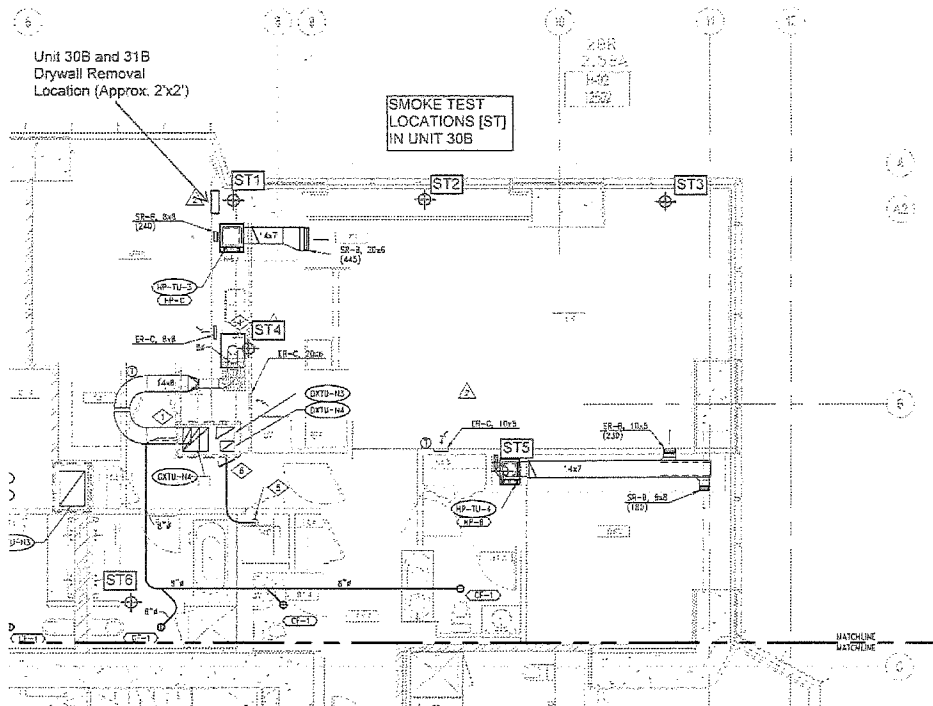
1:25 PM

- (2) smoke emitter cartridges was setoff in Unit 30B at ST5
  - Significant amount of smoke streaming out of hydronic-piping floor penetrations in heat pump closet.
  - Similar to Test 5 but resulting in more intense smoke transfer.

#### Test 7

1:45 PM

- (1) smoke emitter cartridge was setoff in Unit 30B at ST4
  - Odor detected in Unit 31B kitchen area.
  - Faint smoke haze in same area.



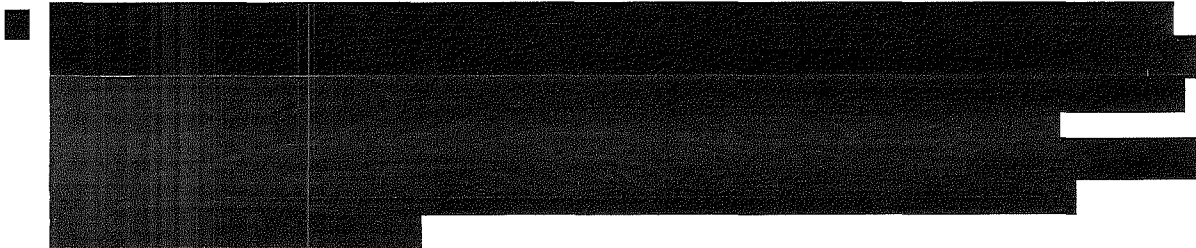


## Investigation Findings

The smoke test results clearly verified the existence of air transfer pathways between Unit 30B and Unit 31B. Suspended particles in the air can communicate between these neighboring residences through the same air transfer pathways, resulting in odors from one unit detected in the adjoining unit.

Two significant air leakage locations have been identified:

1. At site ST1;  
Large gaps on the interior surface of the exterior wall (curtain wall) within the cavity behind the heat pump [HP-C]. This condition exists on both floors 30B and 31B. The location of air leak is directly across from the intake of the forced air heat pump unit. The odor transfer is enhanced and further distributed into the residence with the operation of the heat pump fan.
2. At site ST5;  
Gaps around the hydronic-piping floor penetrations in the closet of heat pump [HP-B]. Here too the location of air leaks are close to the intake of the forced air heat pump unit. The odor transfer again is enhanced and further distributed into the residence with the operation of the heat pump fan.



## Repair Recommendations

The recommended repair consists of providing an air tight seal of the identified air gaps causing leaks between Units 30B and 31B.

1. At site ST1;  
Seal the air gaps on the interior surface of the exterior wall (curtain wall) within the cavity behind the heat pump [HP-C]. This condition exists on both floors 30B and 31B:
  - Provide sufficient access opening in bedroom wall to perform work in subject area.
  - Prep, patch and seal exterior wall gaps in curtain wall, air tight.
  - Patch, seal and finish access opening.
2. At site ST5;



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Seal the gaps around the hydronic-piping floor penetrations in the closet of heat pump [HP-B]:

- Provide sufficient access opening in hallway wall to perform work in subject area.
- Remove any existing fire stopping sealant at riser pipes.
- Apply new fire-stopping sealant to the full circumference of each riser pipe penetrating the floor of the heat pump closet of unit 31B and each riser pipe penetrating the ceiling of the heat pump closet of unit 30B
- Patch, seal and finish access opening.

Seal the gaps around the hydronic-piping floor penetrations in the closet of heat pump [HP-C]:

- Provide sufficient access opening in kitchen wall to perform work in subject area.
- Remove any existing fire stopping sealant at riser pipes.
- Apply new fire-stopping sealant to the full circumference of each riser pipe penetrating the floor of the heat pump closet of unit 31B and each riser pipe penetrating the ceiling of the heat pump closet of unit 30B
- Patch, seal and finish access opening.

Sincerely,

Allana Buick & Bers, Inc.

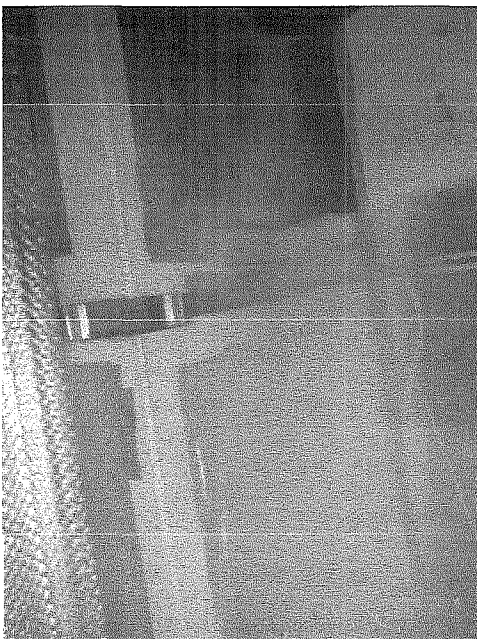
Eli Margalit, P.E., LEED AP  
Forensic Mechanical Engineer



**Photo Section**

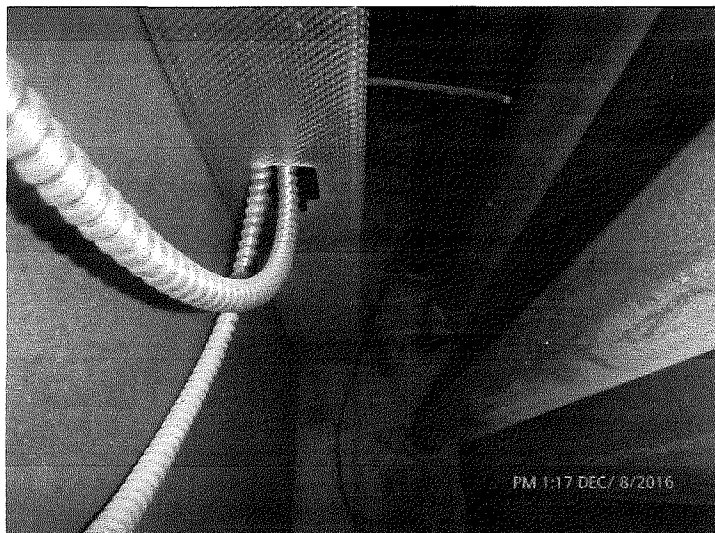


Test access opening in bedroom wall at site ST1 in unit 31B

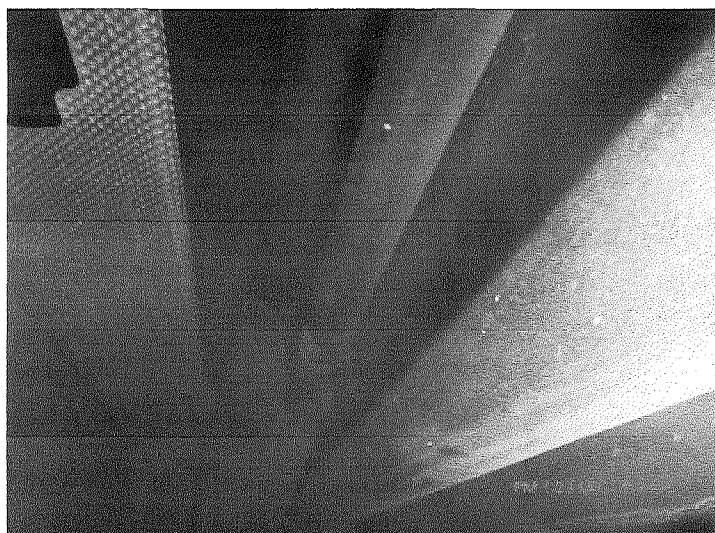


**AIR GAP IN CURTAIN  
WALL**

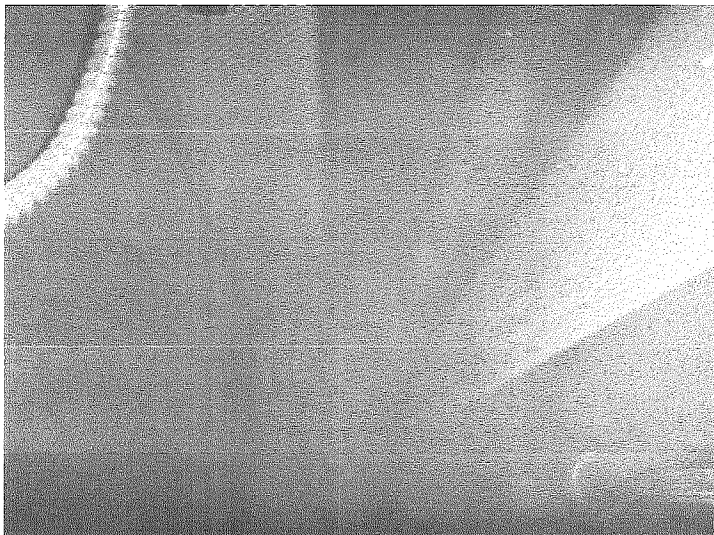
Smoke test site ST1 in unit 31B



Pre-Test Conditions:  
Test site ST5 in unit 31B heat pump closet.  
Note pipe risers routed through closet floor



During Smoke Test Conditions – 1/2 minute from start:  
Test site ST5 in unit 31B heat pump closet.  
Note white test smoke at pipe risers routed through closet floor



During Smoke Test Conditions- 1 minute from start:  
Test site ST5 in unit 31B heat pump closet.  
Note white test smoke completely filling closet



Test site ST5 in unit 31B heat pump closet.  
Note test smoke flowing up through heat pump closet door opening