24

Kansas City, Missouri
Airport Traffic Control Tower
(MCI ATCT)

Post Mold Remediation
Clearance Report

Performed: October 3 - November 2, 2007

Report Prepared by: Barbara Hebert, NISC CIH

Tables:

Attachments:

Introduction

On October 2, 2007, B&R Insulation, Incorporated, initiated remediation of water-stained and mold-contaminated gypsum board, shaft liner, insulation, and pipe insulation in the Kansas City Airport Traffic Control Tower (MCI ATCT), in accordance with Specification FAA-ACE 472-169 and the guidelines established by the New York City Department of Health for the Assessment and Remediation of Fungi in Indoor Environments. Rooms were considered "clean" when: 1) a visual inspection of the work area was performed and passed; 2) air monitoring results were acceptable (only performed when remediation exceeded 100 square feet); and 3) there was no evidence of contamination. The work area and data discrepancies were evaluated by professionals and advice/direction was given to address the issues.

After Rooms 10TS5, 11TS5, SJ1, and 3TS5 passed a visual inspection, clearance air sampling was performed as specified in the **MCI ATCT Mold Remediation Project Clearance Protocol (MCI ATCT MRPCP)**, based on the size of the area impacted by mold contamination, that exceeded 100 square feet.

Air sampling was conducted using a Zefon Mini-Pump and Air-O-Cell® cassettes. The Zefon pump provides a continuous 15 liters per minute flow rate and is designed for exclusive use with Air-O-Cell® cassettes. The Zefon pump was calibrated before and after each sampling period with a Zefon Air-O-Cell calibrator. Analysis of all samples was completed by Aerotech Laboratories, Incorporated, a laboratory accredited by the American Industrial Hygiene Association's Environmental Microbiology Laboratory Accreditation Program (EMLAP).

Air-O-Cell® cassettes are designed for rapid collection and analysis of a wide range of airborne particulates, such as mold spores, pollen, skin cell fragments, and inorganic particulates. The design of the airflow pathway creates a deposition of particles onto the glass slide contained in the cassette housing. After sampling, the glass slides are removed and analyzed by direct microscopic analysis at 600X magnification. This method does not differentiate between viable and non-viable spores, therefore, a total count is reported.

Sampling intervals varied between five and ten minutes for the outside samples and between one and five minutes for the non-complaint area and containment samples. The sampling intervals were varied, dependent upon environmental conditions, in order to reduce the collection of non-microbial particulates that can mask the presence of mold spores and bias the numbers reported. Included with the cassette, on the laboratory Chain of Custody form, was the volume of air sampled, based on the flowrate and duration of sampling. Counts per cubic meter of air were then determined, thus allowing for a direct comparison of all samples collected (outside, non-complaint area, and containment).

In Rooms 10TS5, 11TS5, SJ1, and 3TS5, three samples were collected from the outside air (o), three samples were collected from a non-complaint area (n), and five

samples were collected from the containment (c). A respective mean concentration was determined for the "o, n, and c".

Air monitoring results were within acceptable ranges when the average airborne total mold spore concentration measured inside the containment area was not statistically higher than the average airborne concentration measured outside the containment area, **and** the **genus level** constituents similar for all samples taken inside the containment, inside the building (but outside of the containment) and outside of the building. Discrepancies were reviewed and addressed on a case-by-case basis.

Statistical significance may be determined in the following manner:

A. All containment sample airborne total concentration levels are lower than those taken from outside the containment, or

B. The Z-test score is less than or equal to 1.65 Standard Deviations from the Mean, indicating a 90% confidence interval. The Z-test is carried out by calculating:

$$Z = \frac{Y_I - Y_O}{0.8\,(1/n_I + 1/n_O)^{1/2}}$$

where Y_I is the average of the natural logarithms of the inside samples, Y_O is the average of the natural logarithms of the outside samples, n_I is the number of inside samples and n_O is the number of outside samples.

The **genus level** constituents were evaluated using the Spearman Rank Order Correlation (SROC), which is a statistical technique used to test the direction and strength of the relationship between two variables. It uses the statistic "Rs", which falls between –1 and +1. If the "Rs" value is –1, there is a perfect negative correlation; between –1 and –0.5, there is a strong negative correlation; between –0.5 and 0, there is a weak negative correlation; if 0, there is no correlation; between 0 and 0.5, there is a weak positive correlation; between 0.5 and 1, there is a strong positive correlation; and if 1, there is a perfect positive correlation. Use of the Spearman Rank Order Correlation test is described in Chapter 13, Data Analysis, of "Bioaerosols: Assessment and Control" (BAC), published by the American Conference of Governmental Industrial Hygienists (ACGIH) in 1999. Calculated "Rs" values can also be compared to the Critical Values (CV) listed in Table 13.7 of BAC, which are drawn from a standard statistical table. Comparing the "Rs" to the CV permits a methodical acceptance, or rejection, of this portion of the project completion criteria. This is commonly done at the $p = 0.1$ or $p = 0.05$ confidence level. If the "Rs" value exceeds the 0.1 confidence level, the populations appear to be related or appear similar. If the "Rs" value is below the 0.1 confidence level, the populations do not appear to be related or appear different.

The rank-order test indicates the confidence with which one can say that two samples differ or are similar, however, the results do not assess the importance of any differences that may be statistically significant such as variations at the species level that

may produce different health effects, rank differences that may be judged significant based on very low concentrations, and other examples as well.

In Rooms 10TS5, 11TS5, SJ1, and 3TS5, respective "Rs" values were determined when comparing the outside samples versus the containment samples, as well as the non-complaint area samples versus the containment samples. The "Rs" values were then compared to the CV to permit a methodical acceptance or rejection.

Although some areas passed via visual inspection and/or air monitoring, a decision was reached to re-inspect or re-clean an area. This was based on a professional opinion that circumstances warranted further consideration based on knowledge and experience from similar mold remediation projects.

The overall results, as determined by air monitoring and/or visual examination, are summarized in the following section of this report.

Results

Room 10TS5 - Cleared and released for restoration on 10/5/07. The mean containment concentration (195 counts per cubic meter) was significantly below the mean outside concentration (2273 counts per cubic meter) and below the mean non-complaint area concentration (427 counts per cubic meter). By SROC, there was a weak positive correlation when comparing the outside samples versus containment samples (Rs = 0.30) and non-complaint area samples versus containment samples (Rs = 0.23). Both Rs values were below the 0.1 confidence level (0.3260 and 0.4182), therefore, the populations appear different. The mean containment concentration was, however, very low, and the samples contained only six types of mold. The non-complaint area samples contained nine types of mold, while the outside samples contained 17 types of mold. As indicated by the BAC, rank differences based on very low concentrations may be due to chance variation, therefore, in this example, were not judged to be significant.

Both the containment area location and the non-complaint area location are non-occupied areas.

Room 11TS5 - Cleared and released for restoration on 10/10/07. The mean containment concentration (438 counts per cubic meter) was below the mean outside concentration (2827 counts per cubic meter) but above the mean non-complaint area concentration (31 counts per cubic meter). By SROC, there was a weak positive correlation when comparing the outside samples versus containment samples (Rs = 0.46) and a strong positive correlation when comparing the non-complaint area samples versus containment samples (Rs = 0.69). Both Rs values were above the 0.1 confidence level (0.3791 and 0.4182), therefore, the populations appear similar.

The final containment mean concentration was higher than expected and above the non-complaint area mean concentration, therefore, the area was re-inspected. Although visually clean, a small breach/gap was discovered in the southwest corner of

the room, near the floor, where a beam and the shaft liner meet. This gap was caused by the removal of the concealed layer of gypsum board that occurred during the remediation process. It was apparent that air from an outside source was being drawn into the containment by the negative air machine.

The gap was sealed with firestop caulk. As a precaution, the room was thoroughly re-cleaned, and the air was scrubbed for an additional three hours, prior to release for restoration.

Both the containment area location and the non-complaint area location are non-occupied areas.

Room SJ1 - Cleared and released for restoration on 10/11/07. The mean containment concentration (33 counts per cubic meter) was significantly below the mean outside concentration (5487 counts per cubic meter) and below the mean non-complaint area concentration (44 counts per cubic meter). By SROC, there was a strong positive correlation when comparing the outside samples versus containment samples (Rs = 0.74) and non-complaint area samples versus containment samples (Rs = 0.98). Both Rs values were above the 0.1 confidence level (0.3382 and 0.7000), therefore, the populations appear similar.

Room SJ1 failed to meet the initial clearance requirements on 10/9/07. Excessively high background debris concentrations in the containment samples rendered the data questionable. SJ1 was re-cleaned and re-tested and passed favorably on 10/11/07.

Both the containment area location and the non-complaint area location are occupied areas. Room SJ1 houses ASDE/AMASS equipment, TDWR DFU equipment, and Multiple PCS and Radio Receiver equipment.

Room 3TS5 - Cleared and released for restoration on 10/24/07. The mean containment concentration (1563 counts per cubic meter) was below the mean outside concentration (7614 counts per cubic meter) but above the mean non-complaint area concentration (35 counts per cubic meter). The calculated Z-test score (-2.84) met the criteria specified in the MCI ATCT MRPCP. By SROC, there was a strong positive correlation when comparing the outside samples versus containment samples (Rs = 0.85) and a weak positive correlation when comparing the non-complaint area samples versus containment samples (Rs = 0.22). The Rs value for the outside samples versus containment samples was above the 0.1 confidence level (0.3626), therefore, the populations appear similar. The Rs value for the non-complaint area samples versus containment samples was below the 0.1 confidence level (0.3791), therefore, the populations appear different.

The containment clearance testing results obtained on 10/19/07 were higher than expected, therefore, the room was re-evaluated and a number of findings were noted.

Room 3TS5 contains fire suppression equipment and is unique in many ways. In order to moisturize the seals on the centrifigal water pumps, which are used to pressurize the sprinkler system in time of a fire, a trickle of water is continuously fed to the pumps, which empties into a reservoir. Once the depth in the reservoir reaches a certain level, the water will then drain out. Since standing water is normally present, it may potentially serve as an amplification site for mold. An additional section of shaft liner was removed and the reservoir basins were covered.

The west, north, and a portion of the east wall have block foam insulation panels located between the precast wall and unfinished gypsum board. During the remediation process, the gypsum board had been removed at the four foot level, exposing the foam blocks beneath. During the re-inspection process, after removing and evaluating the blocks, water was observed running down the wall directly below a humidity sensor panel. Closer inspection determined that outside air was entering the room from a gap where the sensor was attached to the wall. The problem was reported and the gap was re-caulked. Had it not have been raining on that particular day, water would not have been seen, and the gap would not have been noticed.

The entire Room 3TS5 was re-cleaned and re-tested. While the mean containment concentration still had not significantly changed, it was below the mean outside concentration, and the calculated Z-test score met the criteria specified in the MCI ATCT MRPCP. A strong positive correlation value was obtained by SROC, when comparing outside air constituents to the containment constituents, indicating their similarities. The containment was released for restoration on 10/24/07.

At a later time during that day, while performing a visual assessment of the entire elevator shaft, a gap was observed where the additional section of shaft liner had been removed and replaced. It was apparent that additional outside air was being drawn into Room 3TS5, from the elevator shaft, by the negative air machine, that had been running during the time of re-testing. This finding was supported by the strong positive correlation value obtained by SROC, as described above.

Both the containment area location and the non-complaint area location are non-occupied areas.

The mean clearance concentrations, confidence level critical values, and SROC values are summarized in Tables 1, 2, and 3, respectively.

The Spearman Rank Order Correlation calculations are presented in Attachment 3.

Numerous other rooms were solely cleared by visual examination. The clearance dates were as follows:

Room 10TS4 - Approximately 33 square feet was removed. The room was cleared and released for restoration on 10/03/07.

Room 11TS6 - Approximately 18 square feet was removed. The room was cleared and released for restoration on 10/05/07.

Cab Level Stairs - Approximately 20 square feet was removed. The area was cleared and released for restoration on 10/07/07.

Cab Level Walkway Door - Approximately four square feet was removed. The area was cleared and released for restoration on 10/07/07.

Room SJ1 north and east walls - Three access panels were cut and framed on the north and east walls of this room to serve as a means of evaluating the concealed shaft liner behind the walls. These areas were evaluated on 10/08/07 and no mold was found.

Room G4 - Approximately 14 square feet was removed. The room was cleared and released for restoration on 10/09/07.

Room 2TS5 - Approximately 13 square feet was removed. The room was cleared and released for restoration on 10/10/07.

11th Floor Outer Ring - All gypsum board scraps, debris, and fire safing insulation was removed. The area was cleared and released for restoration on 10/11/07.

Room 8TS1 - Approximately 39 square feet was removed above the ceiling in the southwest corner of the room. This area was cleared and released for restoration on 10/17/07. See additional discussion concerning this room in the **Room 8TS5** paragraph below.

Room 8TS6 - Approximately 40 square feet was removed. The room was cleared and released for restoration on 10/17/07.

Room SJ1 east wall (modification added to current contract on 10/2/07) - Approximately 8 square feet was removed. The area was cleared and released for restoration on 10/17/07.

Room 8TS5 - Based upon a decision made by the Project Engineer, an opening was made on the south wall of this room, centered approximately 13'6" above floor finish, to coincide with the location of the mold found on the outside of the elevator shaft liner panel during the initial inspection of the facility. The source of this mold was due to a blocked humidifier floor drain that was additionally the source of the problems found in other areas of the facility. The purpose for creating this opening was to be able to evaluate the concealed face of the shaft liner panel and the concealed layer of 5/8" gypsum board on the opposite side of the wall. This wall is a fire rated partition, therefore, in order to access and determine the amount of contaminated material on the elevator shaft liner, it was necessary to first remove two layers of 5/8" gypsum board. While minimal contamination was found on the middle layer of gypsum board,

approximately 37 square feet of contaminated shaft liner was found and removed on the south and east walls of Room 8TS5. An additional 20 square feet of contaminated shaft liner was found and removed on the north wall of the adjacent Room 8TS1. Room 8TS5 and the north wall of Room 8TS1 were cleared and released for restoration on 10/18/07.

Room 4TS3 - Approximately 11 square feet was removed. The room was cleared and released for restoration on 10/18/07.

Room 3TS3 - Approximately 77 square feet was removed. The room was cleared and released for restoration on 10/18/07.

Room 9TS5 - This room was similarly evaluated as was Room 8TS5, in order to determine any possible contamination on the concealed face of the elevator shaft liner. While minimal contamination was found on the middle layer of gypsum board, approximately 22 square feet of contaminated shaft liner was found and removed on the south wall. The room was cleared and released for restoration on 10/19/07.

Room 7TS5 - This room was similarly evaluated on 10/19/07, as was Room 8TS5, in order to determine any possible contamination on the concealed face of the elevator shaft liner. No mold was found.

Room J10 (modification added to current contract on 10/2/07) - Approximately 7 square feet was removed. The area was cleared and released for restoration on 10/22/07.

10th Floor Stairwell - An access panel was cut and framed on the south wall of the stairwell to serve as a means of evaluating the concealed spaces behind the stairwell. The area was evaluated on 10/29/07 and no mold was found.

7th Floor Stairwell - An access panel was cut and framed on the south wall of the stairwell to serve as a means of evaluating the concealed spaces behind the stairwell. The area was evaluated on 10/29/07 and no mold was found.

9th Floor Stairwell - An access panel was cut and framed on the south wall of the stairwell to serve as a means of evaluating the concealed spaces behind the stairwell. Suspect black spots were found all along the stairway wall that appeared to penetrate the gypsum board. A bulk sample was collected and analyzed on 10/30/07 and it did not contain mold.

6th Floor Stairwell - An access panel was cut and framed on the south wall of the stairwell to serve as a means of evaluating the concealed spaces behind the stairwell. The area was evaluated on 10/30/07 and no mold was found.

5th Floor Stairwell - An access panel was cut and framed on the south wall of the stairwell to serve as a means of evaluating the concealed spaces behind the stairwell. The area was evaluated on 10/30/07 and no mold was found.

4th Floor Stairwell - An access panel was cut and framed on the south wall of the stairwell to serve as a means of evaluating the concealed spaces behind the stairwell. The area was evaluated on 10/30/07 and no mold was found.

3rd Floor Stairwell - An access panel was cut and framed on the south wall of the stairwell to serve as a means of evaluating the concealed spaces behind the stairwell. The area was evaluated on 10/30/07 and no mold was found.

2nd Floor Stairwell - An access panel was cut and framed on the south wall of the stairwell to serve as a means of evaluating the concealed spaces behind the stairwell. A black and white substance, approximately 2" by 3" in size, was found on the middle panel of gypsum board. Two tape samples were collected and analyzed on 10/30/07 and mold was found. The spot and surrounding area were cleaned with detergent solution on 10/30/07 and re-cleaned on 11/1/07.

Ground Floor Stairwell - An access panel was cut and framed on the south wall of the stairwell to serve as a means of evaluating the concealed spaces behind the stairwell. Although minimal mold was found, approximately 228 square feet of multiple layers of 5/8" gypsum board and shaft liner were removed from the east stairway wall. The area was cleared and released for restoration on 11/1/07.

8th Floor Stairwell - An access panel was cut and framed on the south wall of the stairwell to serve as a means of evaluating the concealed spaces behind the stairwell. Although minimal mold was found, approximately 150 square feet of gypsum board and shaft liner were removed from the northeast corner (floor level), northwest corner (floor level), and northwest corner (at ceiling level). The area was cleared and released for restoration on 11/2/07.

11th Floor Corridor - An access panel was cut and framed in the ceiling of corridor 11TS1 to serve as a means of evaluating the concealed spaces above the ceiling. A water stained area was observed on the unfinished gypsum board near the elevator door on 11/2/07 and a 2" core was drilled in order to examine the concealed face behind this stain. No water stains or mold were found.

10th Floor Corridor - An access panel was cut and framed in the ceiling of corridor 10TS1 to serve as a means of evaluating the concealed spaces above the ceiling. A faintly water stained area was observed on the unfinished gypsum board near the elevator door on 11/2/07, in the same location as corridor 11TS1. A core was not drilled in this location because the staining appeared to be only on the surface.

5th Floor Corridor - An access panel was cut and framed in the ceiling of corridor 5TS1 to serve as a means of evaluating the concealed spaces above the ceiling. The area was evaluated on 11/2/07 and no water stains or mold were found.

Table 1: Summary of Mean Clearance Concentrations

Location	Clearance Date	Outside Mean Concentration (Counts/M^3)	Non-Complaint Area Mean Concentration (Counts/M^3)	Containment Mean Concentration (Counts/M^3)
10TS5	10/5/07	2273	427	195
11TS5	10/10/07	2827	31	438
SJ1	10/11/07	5487	44	33
3TS5	10/24/07	7614	35	1563

Table 2: Summary of Confidence Level Critical Values *

Number of Isolates	P = 0.10	P = 0.05
5	0.7000	0.8000
11	0.4182	0.5273
13	0.3791	0.4780
14	0.3626	0.4593
16	0.3382	0.4265
17	0.3260	0.4118

* From Table 13.7 of "Bioaerosols: Assessment and Control".

Table 3: Summary of Spearman Rank Order Correlation Values and Confidence Level Critical Values

Location	Outside Vs. Containment (Rs)	P = 0.10 Confidence Level	Non-Complaint Area Vs. Containment (Rs)	P = 0.10 Confidence Level
10TS5	0.30	0.3260	0.23	0.4182
11TS5	0.46	0.3791	0.69	0.4182
SJ1	0.74	0.3382	0.98	0.7000
3TS5	0.85	0.3626	0.22	0.3791

Attachment 1

Aerotech Laboratories Total Fungal Spore Air Analysis Reports

Attachment 2

Aerotech Laboratories Total Fungal Spore Bulk and Tape Analysis Report

Attachment 3

Spearman Rank Order Correlation Calculations

Spearman Rank Order Correlation

Step 1: Rank both sets from highest to lowest.

Step 2: Subtract two sets of ranks to get the difference d.

Step 3: Square the values of d.

Step 4: Add the squared values of d to get Sigma d^2.

Step 5: Use the formula Rs = 1 - (6 Sigma d^2/n^3 - n), where n = the number of ranks.

Room 10TS5

Analyte	Outside Mean Conc.	Rank	Containment Mean Conc.	Rank
Cladosporium	1369	1	8	3
Basidiospores	362	2	5	6
Smuts	144	3	ND	12
Alternaria	126	4	ND	12
Aspergillus	104	5	160	1
Ascospores	99	6	7	4.5
Other Colorless	24	7	ND	12
Rusts	13	8	ND	12
Pithomyces	9	9	ND	12
Curvularia	5	10	ND	12
Nigrospora	4	11	ND	12
Oidium	2	14	ND	12
Other Brown	2	14	7	4.5
Epicoccum	2	14	ND	12
Chaetomium	2	14	ND	12
Torula	2	14	ND	12
Ulocladium	ND	17	9	2

Difference in Ranks	Square Ranks	
2	4	Rs = 1 - (6)(569.5) / 4896
4	16	
9	81	Rs = 1 - 0.70
8	64	
4	16	Rs = 0.30
1.5	2.25	
5	25	
4	16	
3	9	
2	4	
1	1	
2	4	
9.5	90.25	
2	4	
2	4	
2	4	
15	225	
Total =	569.5	

Room 10TS5

Analyte	Non-Complaint Area Mean Conc.	Rank	Containment Mean Conc.	Rank
Cladosporium	120	1	8	3
Aspergillus	98	2	160	1
Basidiospores	67	3	5	6
Smuts	58	4	ND	9
Alternaria	40	5	ND	9
Ascospores	22	6	7	4.5
Pithomyces	9	7.5	ND	9
Chaetomium	9	7.5	ND	9
Stachybotrys	4	9	ND	9
Ulocladium	ND	10.5	9	2
Other Brown	ND	10.5	7	4.5

Difference in Ranks	Square Ranks	
2	4	Rs = 1 - (6)(170) / 1194
1	1	
3	9	Rs = 1 - 0.85
5	25	
4	16	Rs = 0.15
1.5	2.25	
1.5	2.25	
1.5	2.25	
0	0	
8.5	72.25	
6	36	
Total =	170	

Room 11TS5

Analyte	Outside Mean Conc.	Rank	Containment Mean Conc.	Rank
Basidiospores	1693	1	23	3
Ascospores	996	2	13	5
Cladosporium	868	3	57	2
Aspergillus	191	4	284	1
Alternaria	33	5	5	10
Rusts	16	6	ND	12.5
Smuts	11	7	12	6
Nigrospora	7	8.5	ND	12.5
Other Colorless	7	8.5	7	8.5
Other Brown	2	10.5	9	7
Epicoccum	2	10.5	7	8.5
Stachybotrys	ND	12.5	19	4
Chaetomium	ND	12.5	3	11

Difference in Ranks	Square Ranks	
2	4	Rs = 1 - (6)(198) / 2184
3	9	
1	1	Rs = 1 - 0.54
3	9	
5	25	Rs = 0.46
6.5	45.25	
1	1	
4	16	
0	0	
3.5	12.25	
2	4	
8.5	72.25	
1.5	2.25	
Total =	198	

Room 11TS5

Analyte	Non-Complaint Area Mean Conc.	Rank	Containment Mean Conc.	Rank
Aspergillus	18	1	284	1
Basidiospores	13	2	23	3
Ascospores	ND	7	13	5
Cladosporium	ND	7	57	2
Alternaria	ND	7	5	10
Smuts	ND	7	12	6
Other Colorless	ND	7	7	8.5
Other Brown	ND	7	9	7
Epicoccum	ND	7	7	8.5
Stachybotrys	ND	7	19	4
Chaetomium	ND	7	3	11

Difference in Ranks	Square Ranks	
0	0	Rs = 1 - (6)(69.5) / 1320
1	1	
2	4	Rs = 1 - 0.31
5	25	
3	9	Rs = 0.69
1	1	
1.5	2.25	
0	0	
1.5	2.25	
3	9	
4	16	
Total =	69.5	

Room SJ1

Analyte	Outside Mean Conc.	Rank	Containment Mean Conc.	Rank
Cladosporium	3280	1	20	1
Basidiospores	1155	2	7	2.5
Smuts	249	3	7	2.5
Aspergillus	235	4	ND	9.5
Alternaria	231	5	ND	9.5
Cercospora	111	6	ND	9.5
Ascospores	109	7	ND	9.5
Epicoccum	49	8	ND	9.5
Rusts	31	9	ND	9.5
Arthrinium	9	10.5	ND	9.5
Pithomyces	9	10.5	ND	9.5
Nigrospora	7	12	ND	9.5
Torula	5	13	ND	9.5
Chaetomium	2	15	ND	9.5
Oidium	2	15	ND	9.5
Bipolaris	2	15	ND	9.5

Difference in Ranks	Square Ranks	
0	0	Rs = 1 - (6)(183.25) / 4080
0.5	0.25	
0.5	0.25	Rs = 1 - 0.26
5.5	30.25	
4.5	20.25	Rs = 0.74
3.5	12.25	
2.5	6.25	
1.5	2.25	
0.5	0.25	
1	1	
1	1	
2.5	6.25	
3.5	12.25	
5.5	30.25	
5.5	30.25	
5.5	30.25	
Total =	183.25	

Room SJ1

Analyte	Non-Complaint Area Mean Conc.	Rank	Containment Mean Conc.	Rank
Cladosporium	13	1	20	1
Alternaria	11	2.5	ND	2.5
Aspergillus	11	2.5	ND	2.5
Smuts	9	4	7	4.5
Basidiospores	ND	5	7	4.5

Difference in Ranks		Square Ranks	
0		0	Rs = 1 - (6)(0.5) / 120
0		0	
0		0	Rs = 1 - 0.025
0.5		0.25	
0.5		0.25	Rs = 0.975
	Total =	0.5	

Room 3TS5

Analyte	Outside Mean Conc.	Rank	Containment Mean Conc.	Rank
Cladosporium	4146	1	897	1
Basidiospores	2480	2	283	2
Ascospores	453	3	119	4
Smuts	193	4	59	5
Alternaria	149	5	18	7
Aspergillus	91	6	148	3
Epicoccum	42	7	23	6
Other Brown	18	8	3	10.5
Nigrospora	16	9	3	10.5
Curvularia	9	10	ND	13
Rusts	5	11	5	9
Botrys	4	12.5	ND	13
Pithomyces	4	12.5	ND	13
Bipolaris	2	14	7	8

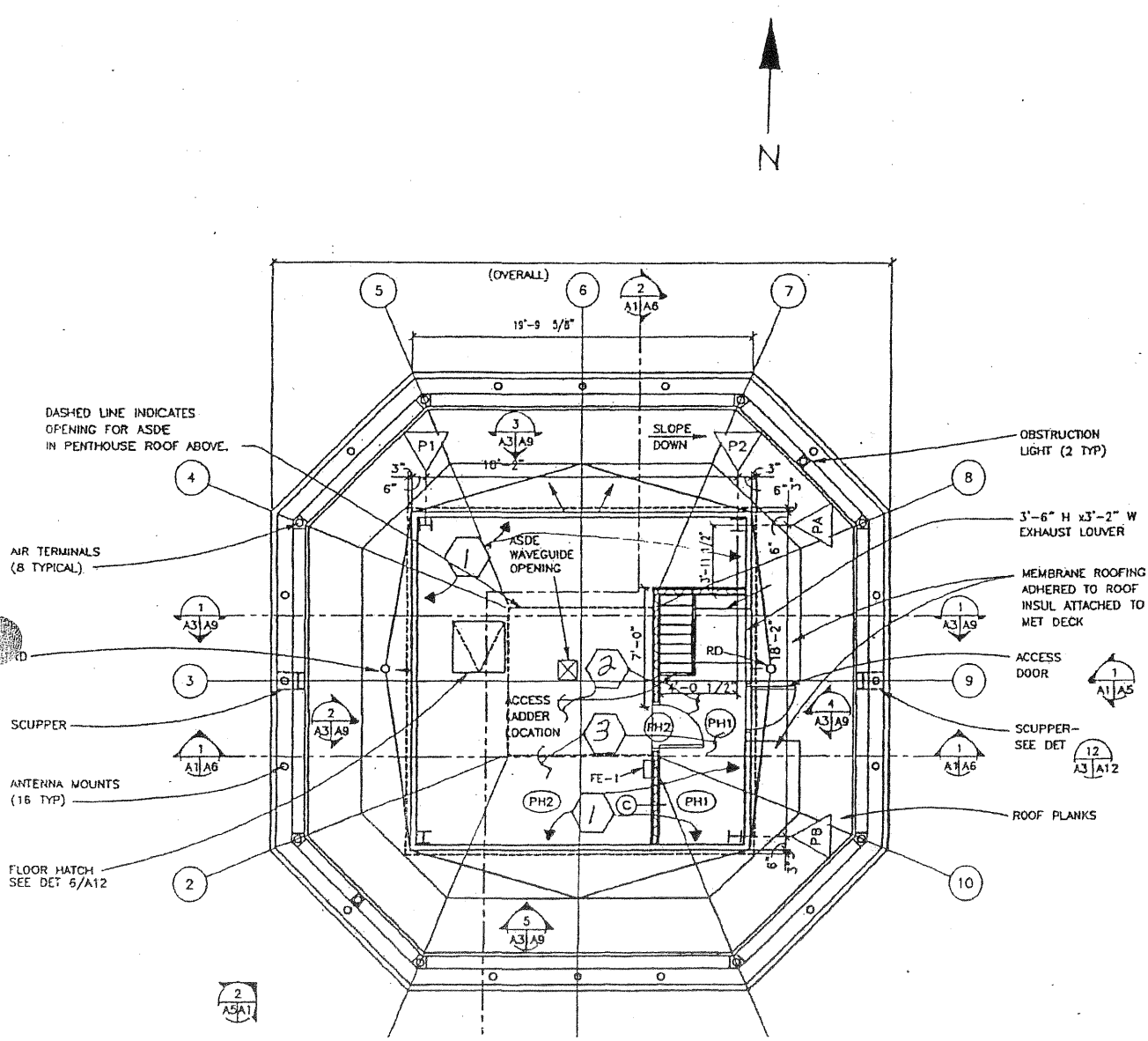
Difference in Ranks	Square Ranks	
0	0	Rs = 1 - (6)(70) / 2730
0	0	
1	1	Rs = 1 - 0.15
1	1	
2	4	Rs = 0.85
3	9	
1	1	
1.5	2.25	
1.5	2.25	
3	9	
2	4	
0.5	0.25	
0.5	0.25	
6	36	
Total =	70	

Room 3TS5

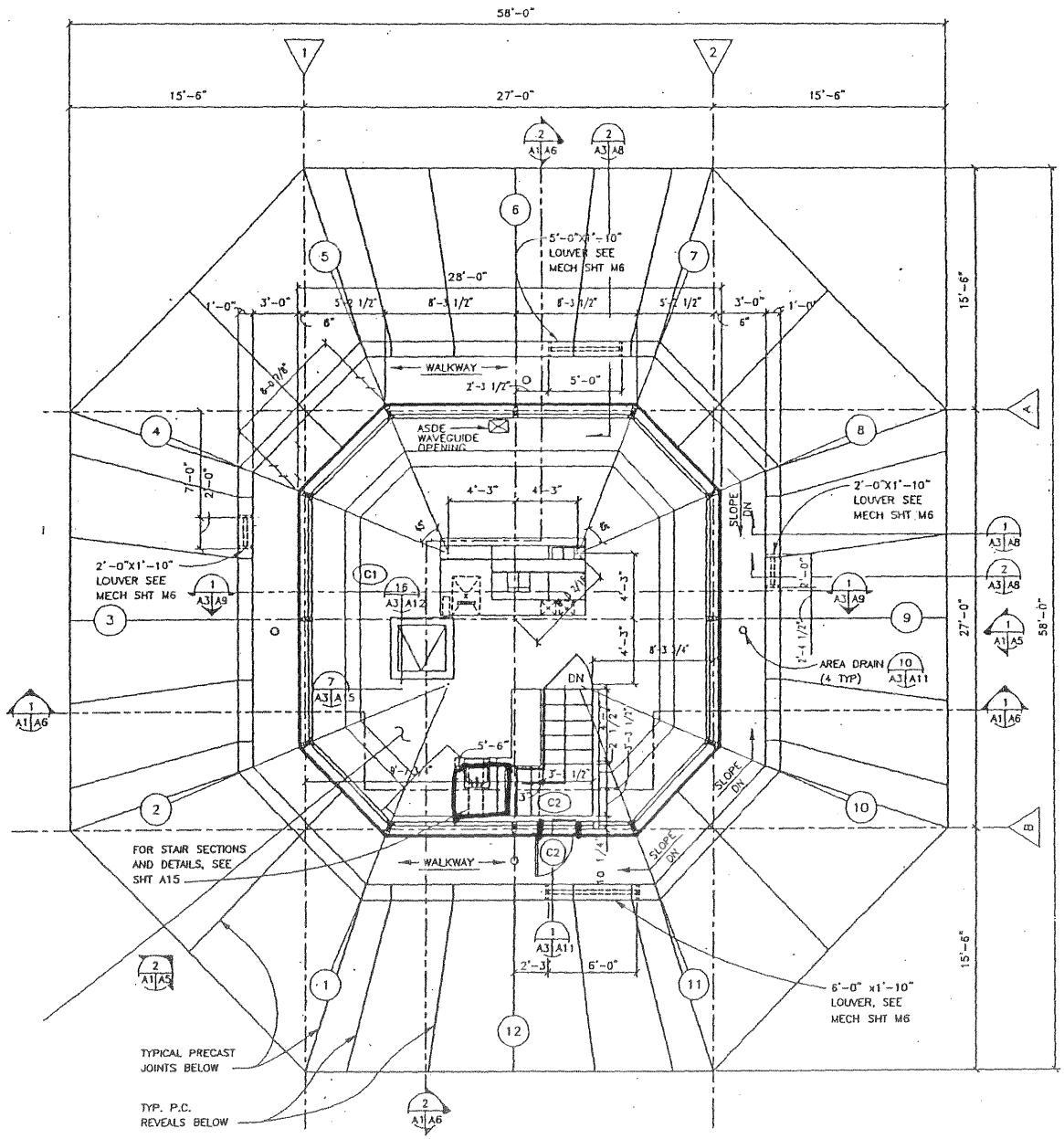
Analyte	Non-Complaint Area Mean Conc.	Rank	Containment Mean Conc.	Rank
Basidiospores	13	1.5	283	2
Aspergillus	13	1.5	148	3
Cercospora	4	3.5	ND	12.5
Chaetomium	4	3.5	ND	12.5
Cladosporium	ND	9	897	1
Ascospores	ND	9	119	4
Smuts	ND	9	59	5
Alternaria	ND	9	18	7
Epicoccum	ND	9	23	6
Other Brown	ND	9	3	10.5
Nigrospora	ND	9	3	10.5
Rusts	ND	9	5	9
Bipolaris	ND	9	7	8

Difference in Ranks	Square Ranks	
0.5	0.25	Rs = 1 - (6)(284) / 2184
1.5	2.25	
9	81	Rs = 1 - 0.78
9	81	
8	64	Rs = 0.22
5	25	
4	16	
2	4	
3	9	
0.5	0.25	
0.5	0.25	
0	0	
1	1	
Total =	284	

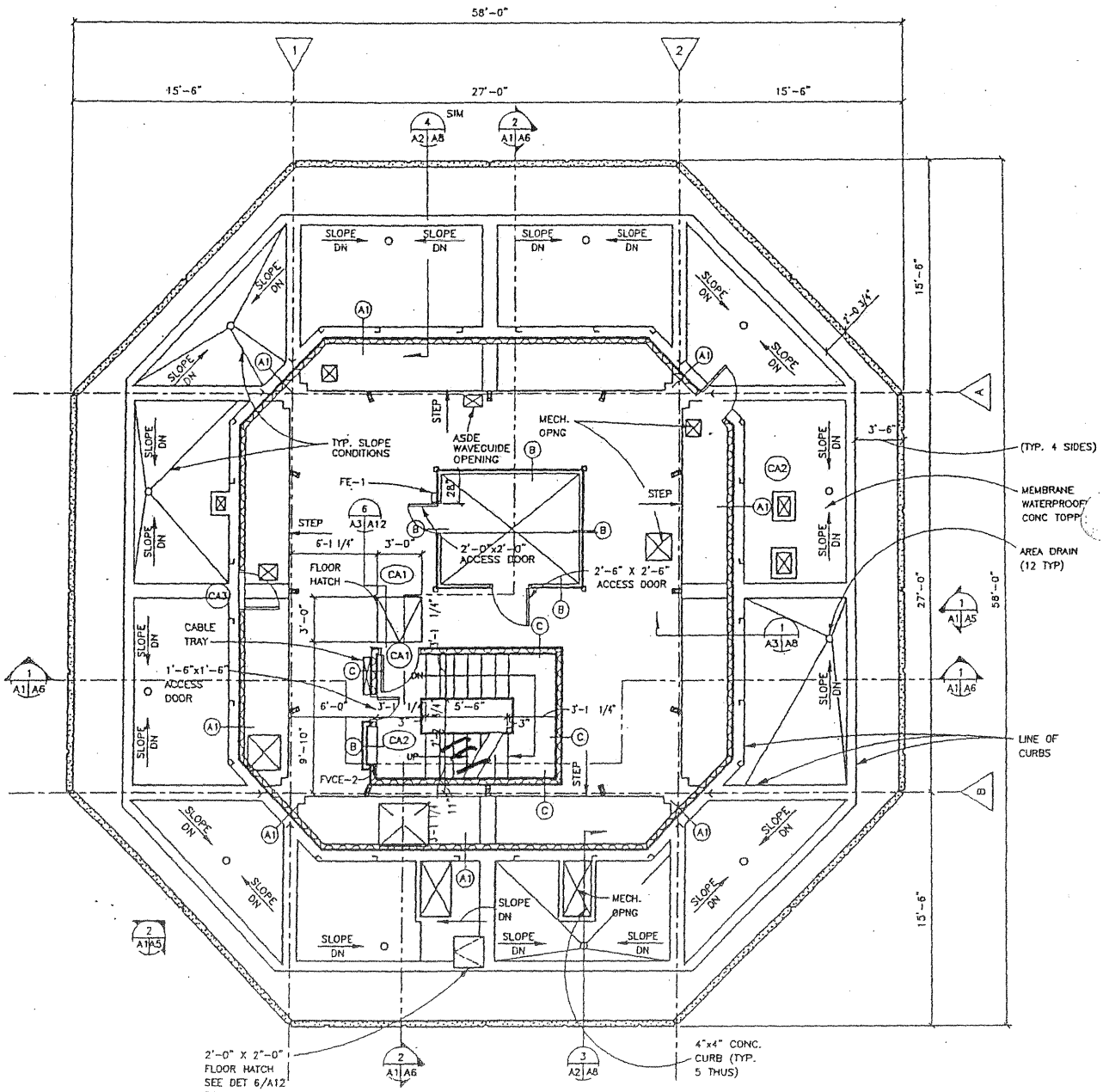
ASDE PENTHOUSE LEVEL



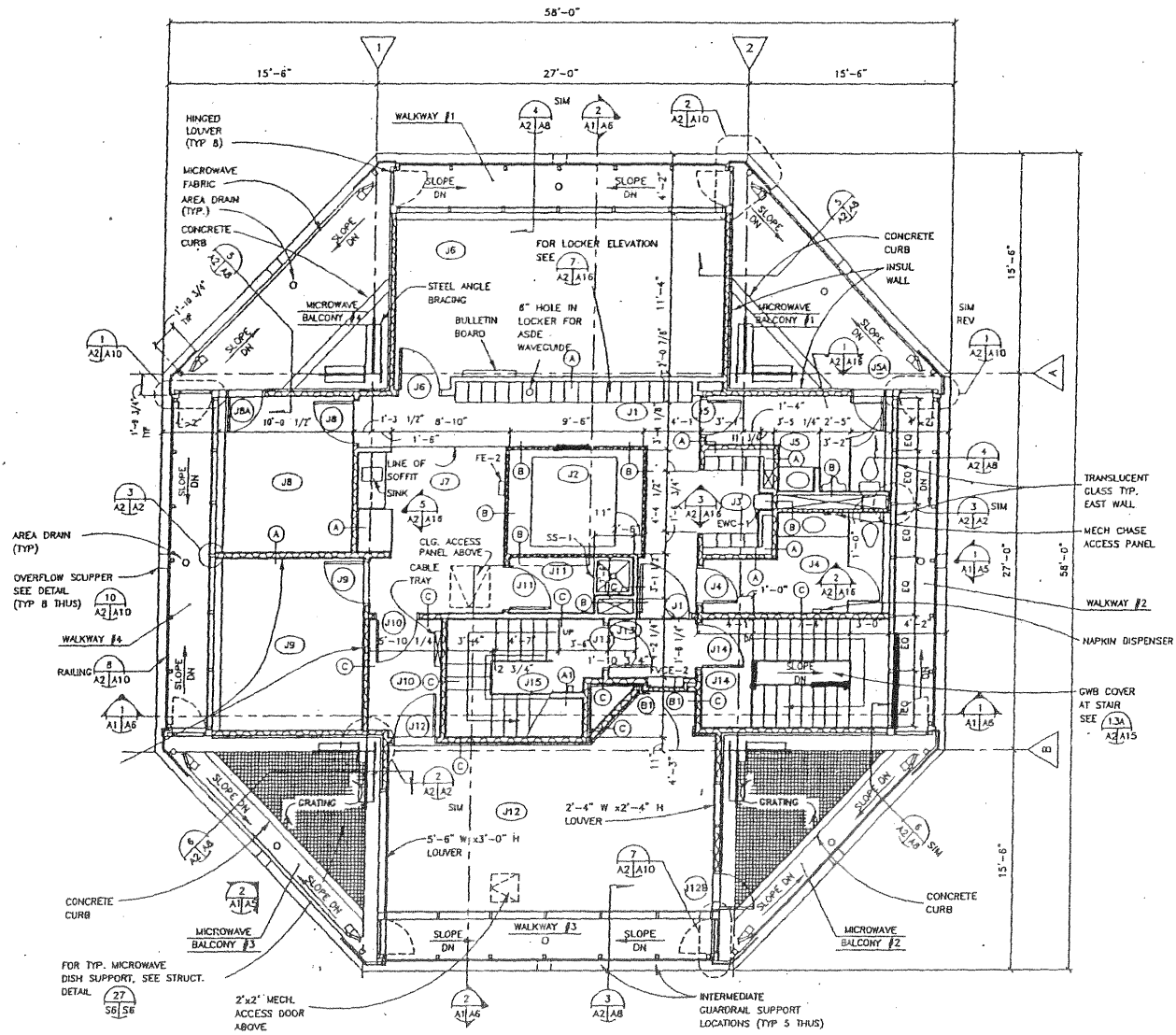
CAB LEVEL


58'-0"
15'-6"
27'-0"
15'-6"
28'-0"
WALKWAY
ASDE WAVEGUIDE OPENING
5'-0"X1'-10" LOUVER SEE MECH SHT M6
2'-0"X1'-10" LOUVER SEE MECH SHT M6
AREA DRAIN (4 TYP)
SLOPE DN
DN
FOR STAIR SECTIONS AND DETAILS, SEE SHT A15
6'-0" x1'-10" LOUVER, SEE MECH SHT M6
TYPICAL PRECAST JOINTS BELOW
TYP. P.C. REVEALS BELOW

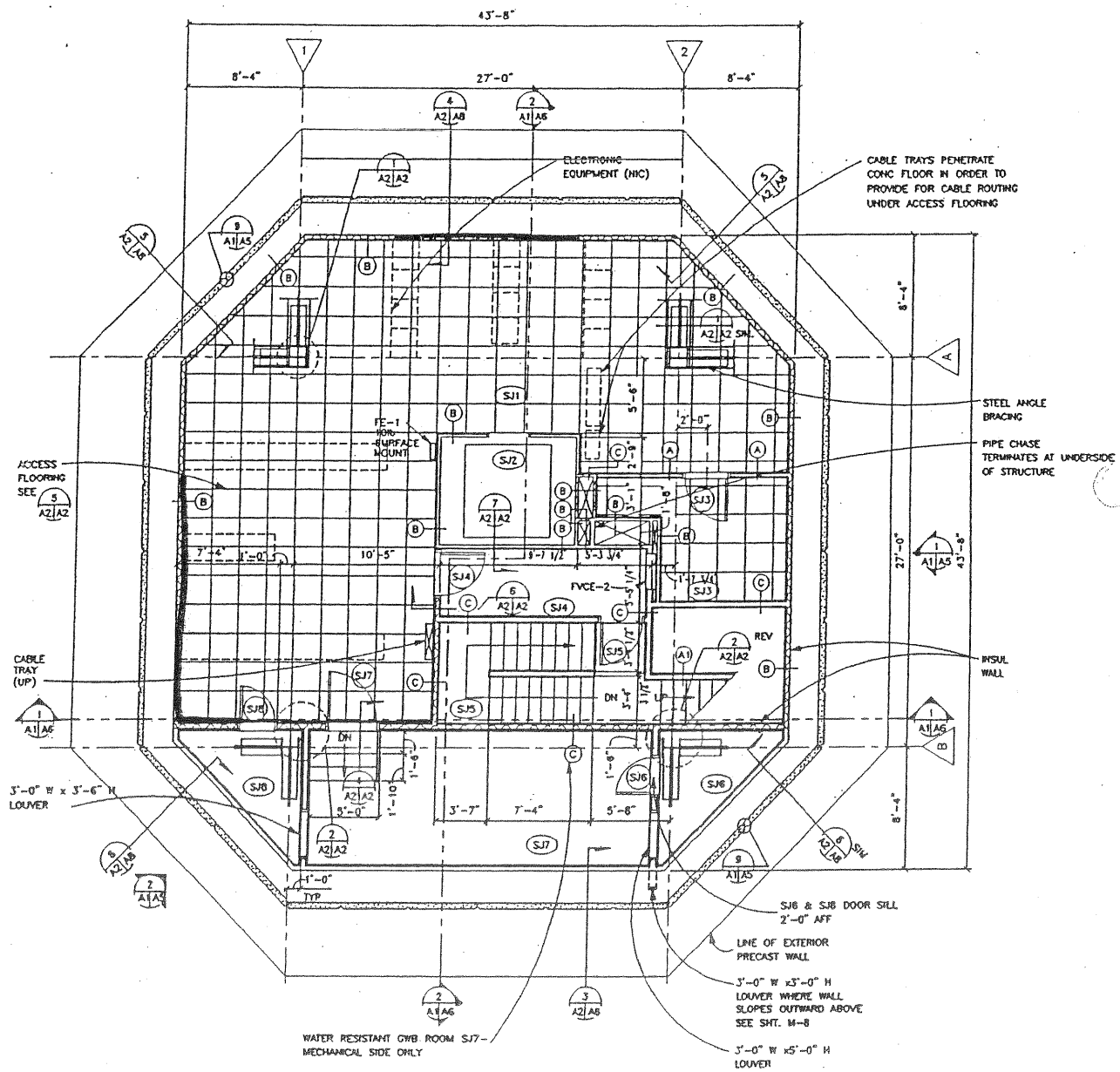
CABLE ACCESS LEVEL



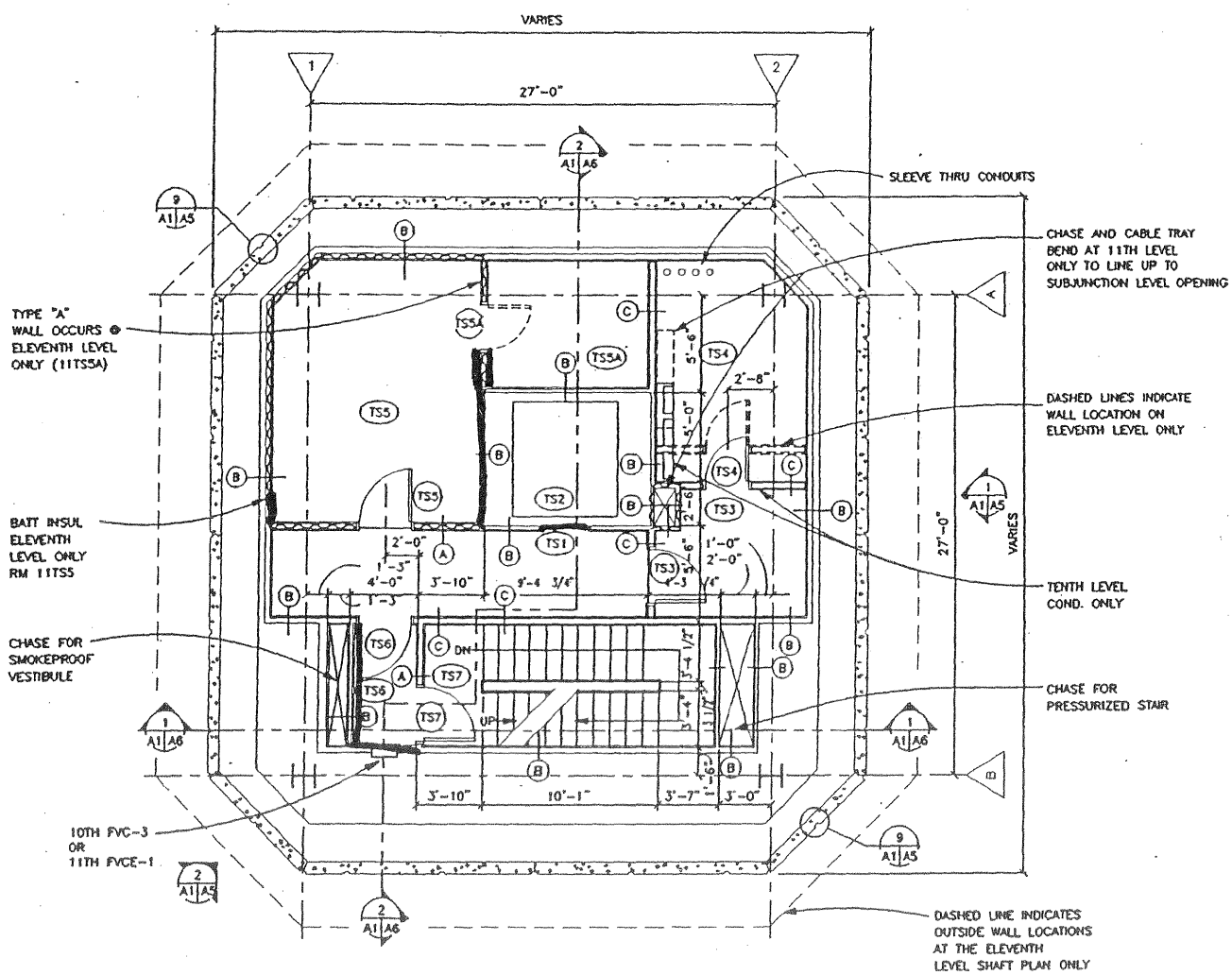
JUNCTION LEVEL



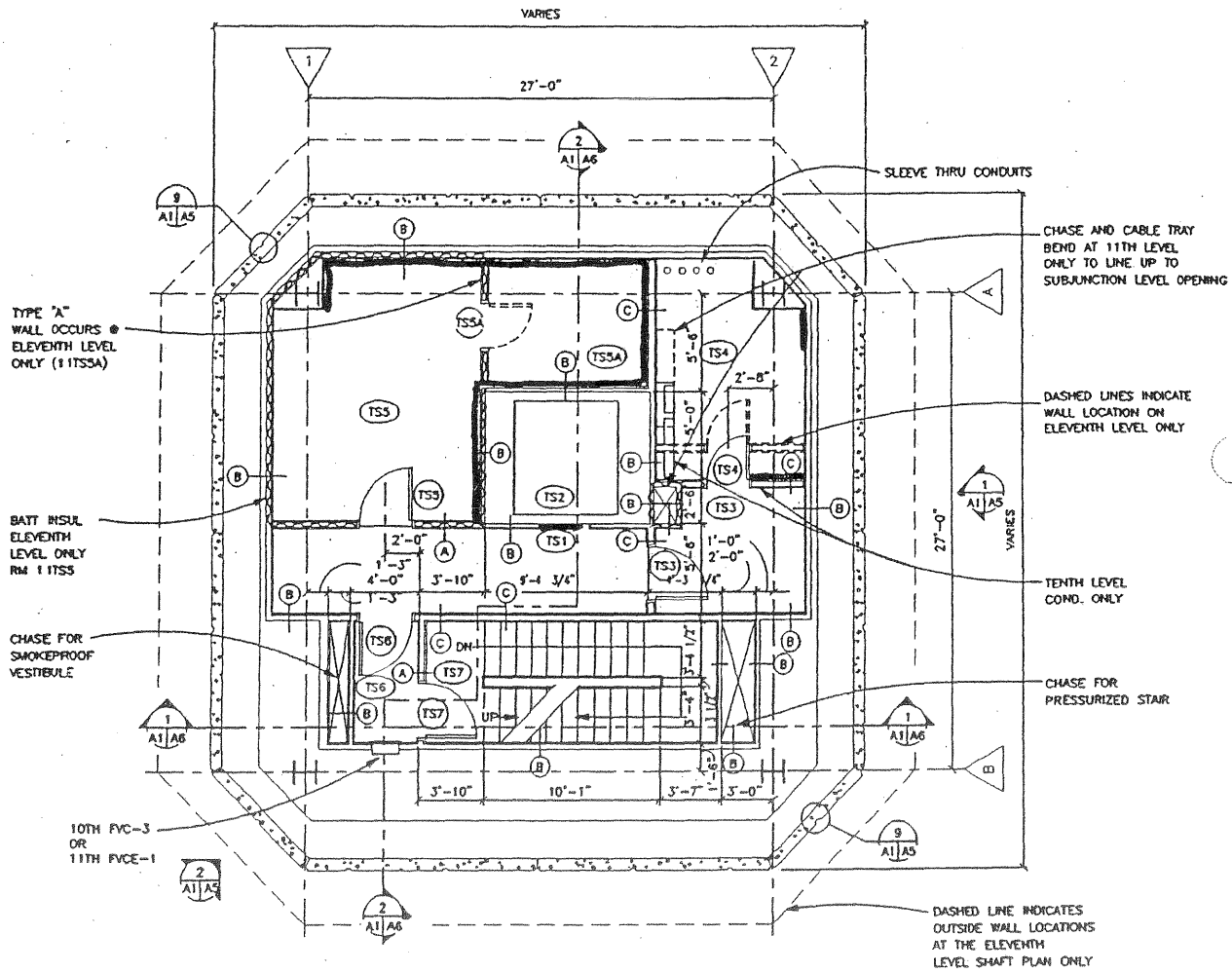
SUBJUNCTION LEVEL



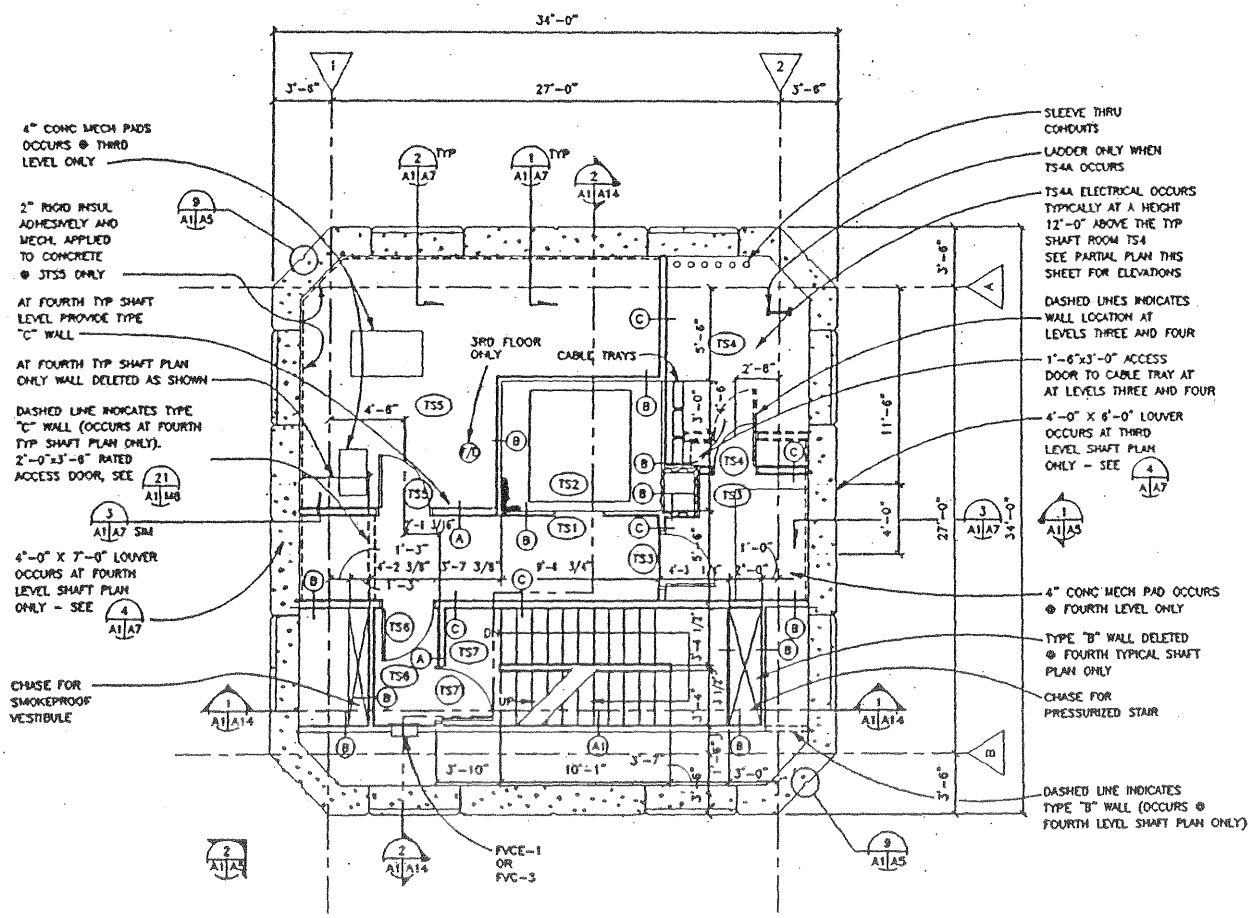
11TH FLOOR


VARIES
27'-0"
SLEEVE THRU CONDUITS
CHASE AND CABLE TRAY BEND AT 11TH LEVEL ONLY TO LINE UP TO SUBJUNCTION LEVEL OPENING
TYPE "A" WALL OCCURS @ ELEVENTH LEVEL ONLY (11TS5A)
DASHED LINES INDICATE WALL LOCATION ON ELEVENTH LEVEL ONLY
BATT INSUL ELEVENTH LEVEL ONLY RM 11TS5
TENTH LEVEL COND. ONLY
CHASE FOR SMOKEPROOF VESTIBULE
CHASE FOR PRESSURIZED STAIR
10TH FVC-3 OR 11TH FVCE-1
DASHED LINE INDICATES OUTSIDE WALL LOCATIONS AT THE ELEVENTH LEVEL SHAFT PLAN ONLY
TS1
TS2
TS3
TS4
TS5
TS5A
TS6
TS7
UP
DN
27'-0"
VARIES
3'-10"
10'-1"
3'-7"
3'-0"

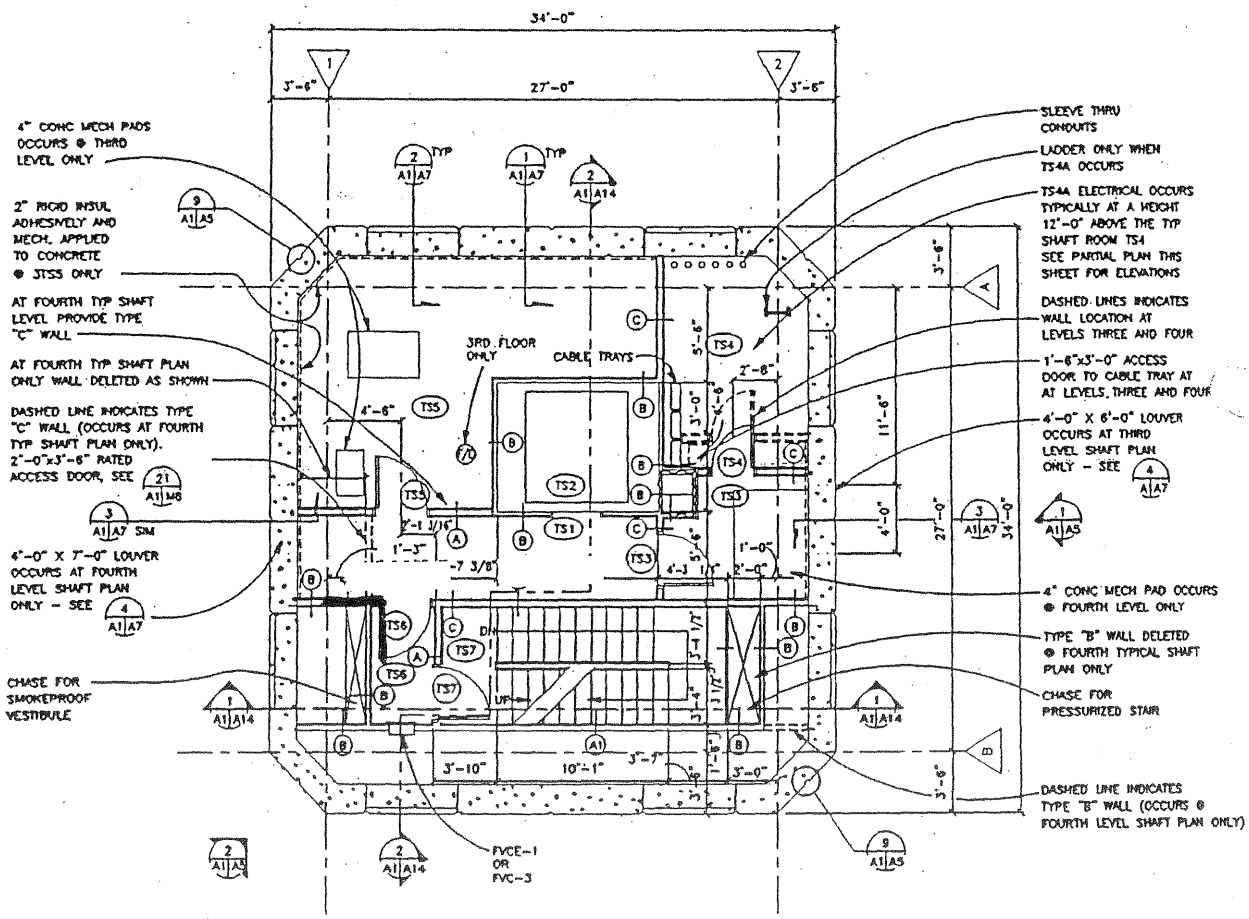
10TH FLOOR


VARIES
27'-0"
SLEEVE THRU CONDUITS
CHASE AND CABLE TRAY BEND AT 11TH LEVEL ONLY TO LINE UP TO SUBJUNCTION LEVEL OPENING
TYPE "A" WALL OCCURS @ ELEVENTH LEVEL ONLY (1 1TS5A)
DASHED LINES INDICATE WALL LOCATION ON ELEVENTH LEVEL ONLY
BATT INSUL ELEVENTH LEVEL ONLY RM 1 1TS5
TENTH LEVEL COND. ONLY
CHASE FOR SMOKEPROOF VESTIBULE
CHASE FOR PRESSURIZED STAIR
10TH FVC-3 OR 11TH FVCE-1
DASHED LINE INDICATES OUTSIDE WALL LOCATIONS AT THE ELEVENTH LEVEL SHAFT PLAN ONLY
TS1
TS2
TS3
TS4
TS5
TS5A
TS6
TS7
DN
UP
27'-0"
VARIES
3'-10"
10'-1"
5'-7"
3'-0"

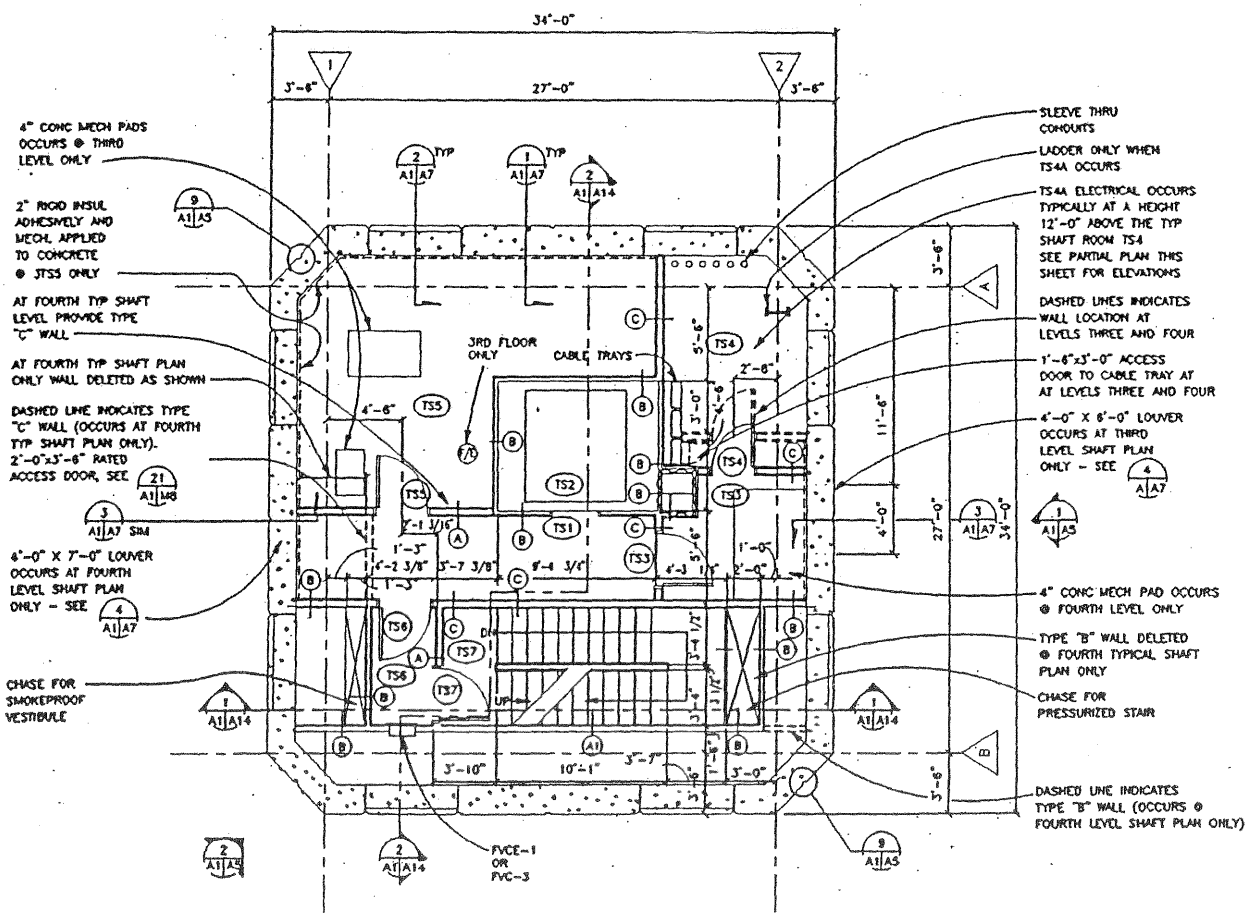
9TH FLOOR


34'-0"
27'-0"
3'-6"
3'-6"
4" CONC MECH PADS OCCURS @ THIRD LEVEL ONLY
2" RIGID INSUL ADHESIVELY AND MECH. APPLIED TO CONCRETE @ TS5 ONLY
AT FOURTH TYP SHAFT LEVEL PROVIDE TYPE "C" WALL
AT FOURTH TYP SHAFT PLAN ONLY WALL DELETED AS SHOWN
DASHED LINE INDICATES TYPE "C" WALL (OCCURS AT FOURTH TYP SHAFT PLAN ONLY).
2'-0"x3'-8" RATED ACCESS DOOR, SEE
4'-0" X 7'-0" LOUVER OCCURS AT FOURTH LEVEL SHAFT PLAN ONLY - SEE
CHASE FOR SMOKEPROOF VESTIBULE
SLEEVE THRU CONDUITS
LADDER ONLY WHEN TS4A OCCURS
TS4A ELECTRICAL OCCURS TYPICALLY AT A HEIGHT 12'-0" ABOVE THE TYP SHAFT ROOM TS4 SEE PARTIAL PLAN THIS SHEET FOR ELEVATIONS
DASHED LINES INDICATES WALL LOCATION AT LEVELS THREE AND FOUR
1'-6"x3'-0" ACCESS DOOR TO CABLE TRAY AT AT LEVELS THREE AND FOUR
4'-0" X 6'-0" LOUVER OCCURS AT THIRD LEVEL SHAFT PLAN ONLY - SEE
4" CONC MECH PAD OCCURS @ FOURTH LEVEL ONLY
TYPE "B" WALL DELETED @ FOURTH TYPICAL SHAFT PLAN ONLY
CHASE FOR PRESSURIZED STAIR
DASHED LINE INDICATES TYPE "B" WALL (OCCURS @ FOURTH LEVEL SHAFT PLAN ONLY)
3RD FLOOR ONLY
CABLE TRAYS
TS1
TS2
TS3
TS4
TS5
TS6
TS7
FVCE-1 OR FVC-3
UP
DN

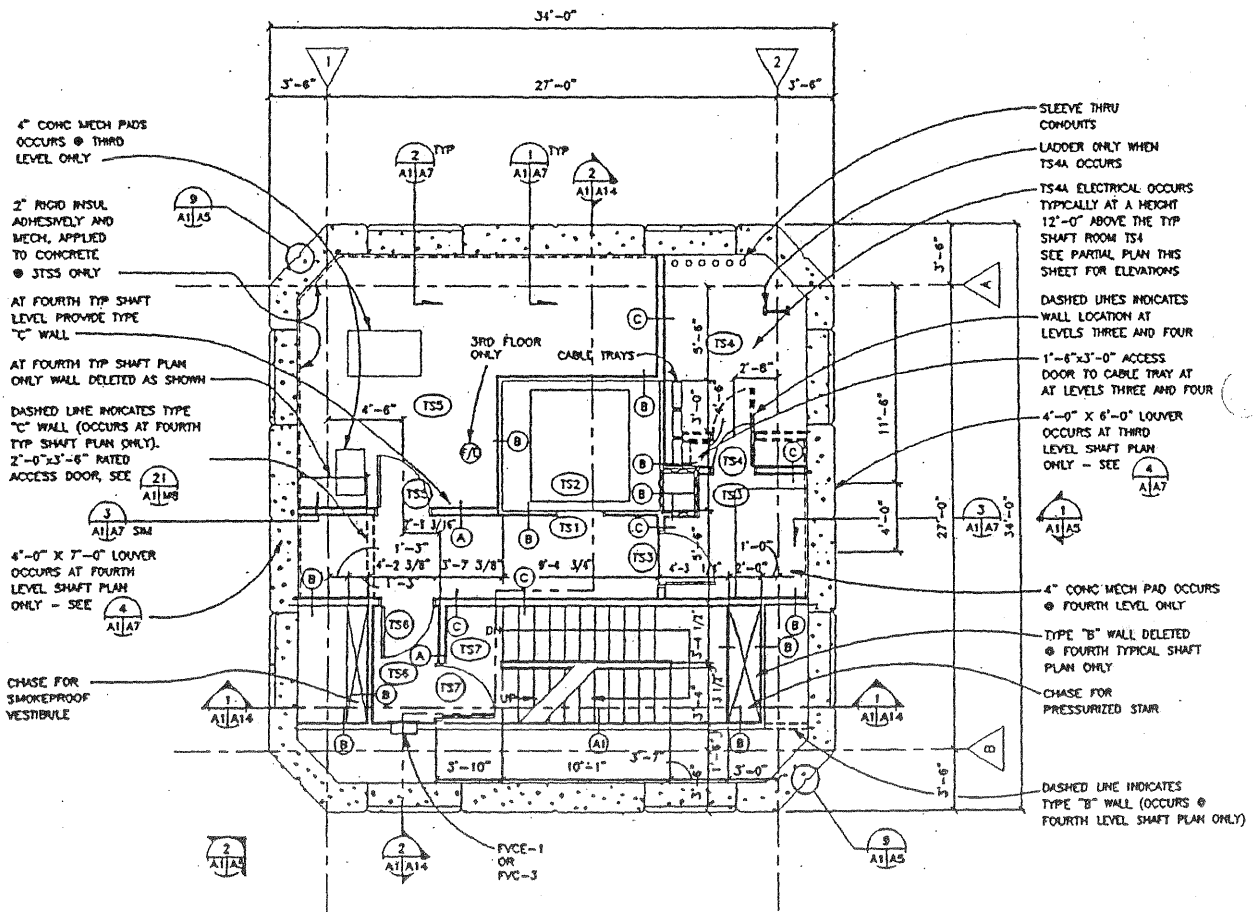
8TH FLOOR


34'-0"
27'-0"
3'-6"
3'-6"
4" CONC MECH PADS OCCURS @ THIRD LEVEL ONLY
2" RIGID INSUL ADHESIVELY AND MECH. APPLIED TO CONCRETE @ JTSS ONLY
AT FOURTH TYP SHAFT LEVEL PROVIDE TYPE "C" WALL
AT FOURTH TYP SHAFT PLAN ONLY WALL DELETED AS SHOWN
DASHED LINE INDICATES TYPE "C" WALL (OCCURS AT FOURTH TYP SHAFT PLAN ONLY). 2'-0"x3'-6" RATED ACCESS DOOR, SEE
4'-0" X 7'-0" LOUVER OCCURS AT FOURTH LEVEL SHAFT PLAN ONLY - SEE
CHASE FOR SMOKEPROOF VESTIBULE
SLEEVE THRU CONDUITS
LADDER ONLY WHEN TS4A OCCURS
TS4A ELECTRICAL OCCURS TYPICALLY AT A HEIGHT 12'-0" ABOVE THE TYP SHAFT ROOM TS4 SEE PARTIAL PLAN THIS SHEET FOR ELEVATIONS
DASHED LINES INDICATES WALL LOCATION AT LEVELS THREE AND FOUR
1'-6"x3'-0" ACCESS DOOR TO CABLE TRAY AT AT LEVELS, THREE AND FOUR
4'-0" X 6'-0" LOUVER OCCURS AT THIRD LEVEL SHAFT PLAN ONLY - SEE
4" CONC MECH PAD OCCURS @ FOURTH LEVEL ONLY
TYPE "B" WALL DELETED @ FOURTH TYPICAL SHAFT PLAN ONLY
CHASE FOR PRESSURIZED STAIR
DASHED LINE INDICATES TYPE "B" WALL (OCCURS @ FOURTH LEVEL SHAFT PLAN ONLY)
3RD. FLOOR ONLY
CABLE TRAYS
TS1
TS2
TS3
TS4
TS5
TS6
TS7
FVCE-1 OR FVC-3
UP
DN

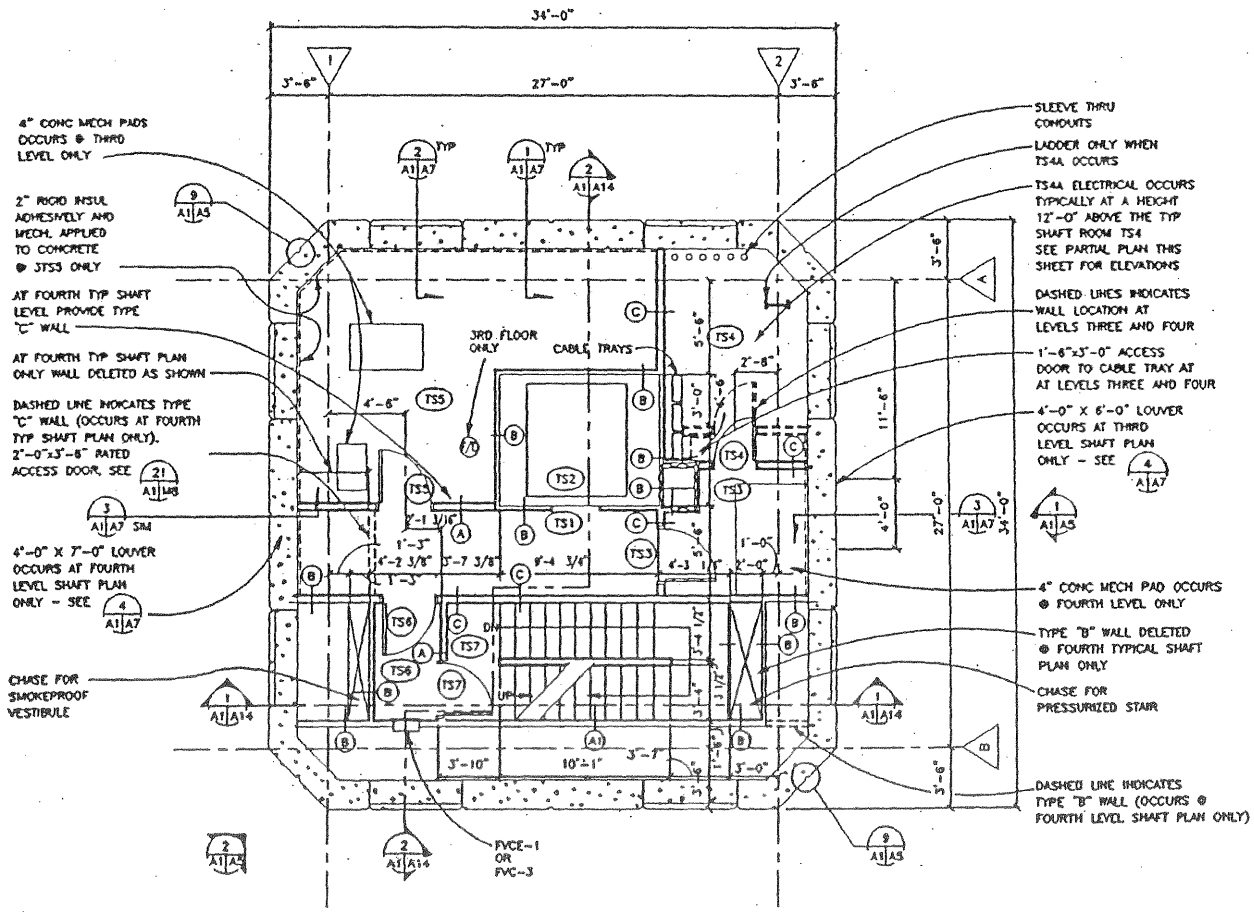
7TH FLOOR


34'-0"
27'-0"
3'-6"
3'-6"
4" CONC MECH PADS OCCURS @ THIRD LEVEL ONLY
2" RIGID INSUL ADHESIVELY AND MECH. APPLIED TO CONCRETE @ TS5 ONLY
AT FOURTH TYP SHAFT LEVEL PROVIDE TYPE "C" WALL
AT FOURTH TYP SHAFT PLAN ONLY WALL DELETED AS SHOWN
DASHED LINE INDICATES TYPE "C" WALL (OCCURS AT FOURTH TYP SHAFT PLAN ONLY). 2'-0"x3'-6" RATED ACCESS DOOR, SEE
6'-0" X 7'-0" LOUVER OCCURS AT FOURTH LEVEL SHAFT PLAN ONLY - SEE
CHASE FOR SMOKEPROOF VESTIBULE
3RD FLOOR ONLY
CABLE TRAYS
TS1
TS2
TS3
TS4
TS5
TS6
TS7
SLEEVE THRU CONDUITS
LADDER ONLY WHEN TS4A OCCURS
TS4A ELECTRICAL OCCURS TYPICALLY AT A HEIGHT 12'-0" ABOVE THE TYP SHAFT ROOM TS4 SEE PARTIAL PLAN THIS SHEET FOR ELEVATIONS
DASHED LINES INDICATES WALL LOCATION AT LEVELS THREE AND FOUR
1'-6"x3'-0" ACCESS DOOR TO CABLE TRAY AT AT LEVELS THREE AND FOUR
4'-0" X 6'-0" LOUVER OCCURS AT THIRD LEVEL SHAFT PLAN ONLY - SEE
4" CONC MECH PAD OCCURS @ FOURTH LEVEL ONLY
TYPE "B" WALL DELETED @ FOURTH TYPICAL SHAFT PLAN ONLY
CHASE FOR PRESSURIZED STAIR
DASHED LINE INDICATES TYPE "B" WALL (OCCURS @ FOURTH LEVEL SHAFT PLAN ONLY)
FVCE-1 OR FVC-3
UP
DN

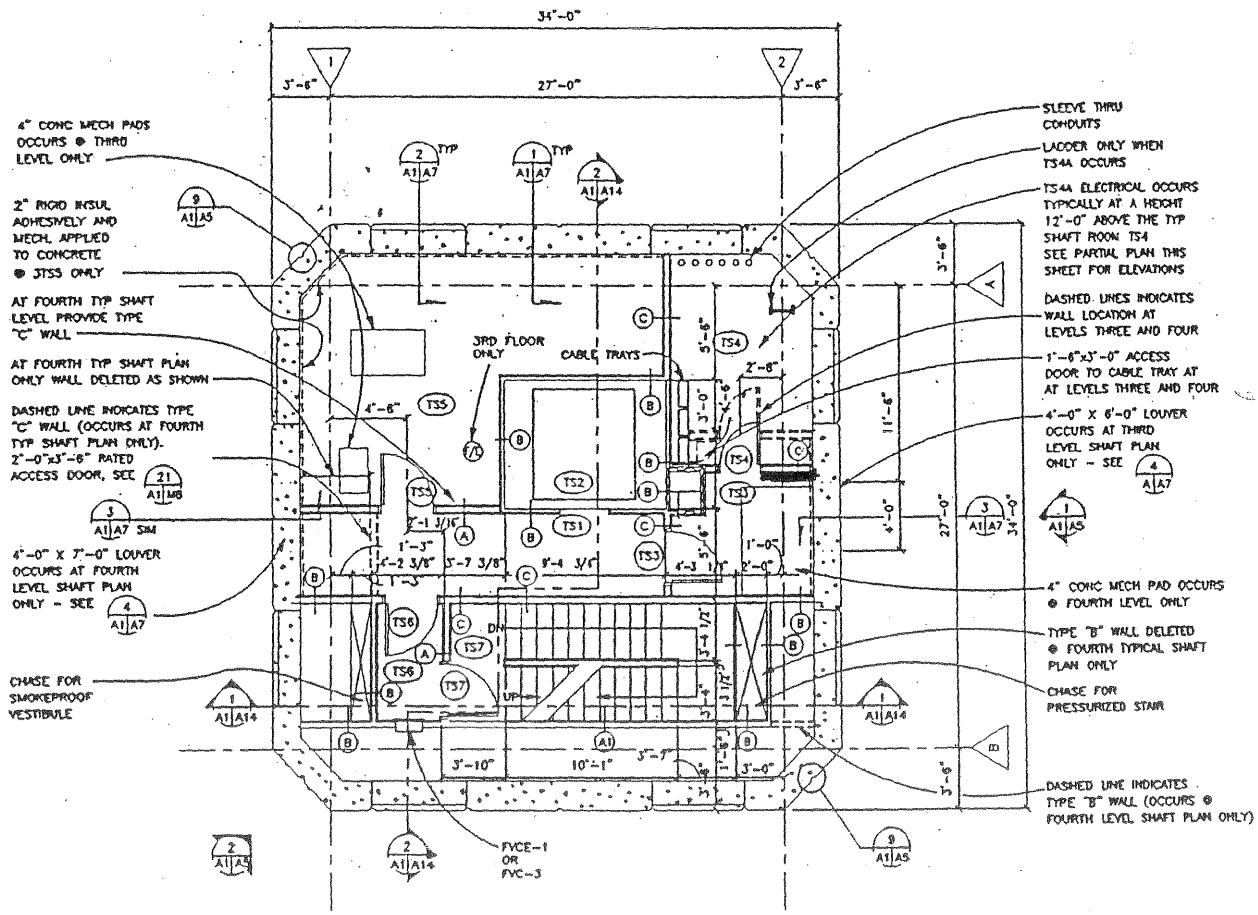
6TH FLOOR


4" CONC MECH PADS OCCURS @ THIRD LEVEL ONLY
2" RIGID INSUL ADHESIVELY AND MECH. APPLIED TO CONCRETE @ TS5 ONLY
AT FOURTH TYP SHAFT LEVEL PROVIDE TYPE "C" WALL
AT FOURTH TYP SHAFT PLAN ONLY WALL DELETED AS SHOWN
DASHED LINE INDICATES TYPE "C" WALL (OCCURS AT FOURTH TYP SHAFT PLAN ONLY). 2'-0"x3'-6" RATED ACCESS DOOR, SEE
4'-0" X 7'-0" LOUVER OCCURS AT FOURTH LEVEL SHAFT PLAN ONLY - SEE
CHASE FOR SMOKEPROOF VESTIBULE
SLEEVE THRU CONDUITS
LADDER ONLY WHEN TS4A OCCURS
TS4A ELECTRICAL OCCURS TYPICALLY AT A HEIGHT 12'-0" ABOVE THE TYP SHAFT ROOM TS4 SEE PARTIAL PLAN THIS SHEET FOR ELEVATIONS
DASHED LINES INDICATES WALL LOCATION AT LEVELS THREE AND FOUR
1'-6"x3'-0" ACCESS DOOR TO CABLE TRAY AT AT LEVELS THREE AND FOUR
4'-0" X 6'-0" LOUVER OCCURS AT THIRD LEVEL SHAFT PLAN ONLY - SEE
4" CONC MECH PAD OCCURS @ FOURTH LEVEL ONLY
TYPE "B" WALL DELETED @ FOURTH TYPICAL SHAFT PLAN ONLY
CHASE FOR PRESSURIZED STAIR
DASHED LINE INDICATES TYPE "B" WALL (OCCURS @ FOURTH LEVEL SHAFT PLAN ONLY)
3RD FLOOR ONLY
CABLE TRAYS
FVCE-1 OR FVC-3
34'-0"
27'-0"
3'-6"
TS1
TS2
TS3
TS4
TS4A
TS5
TS6
TS7

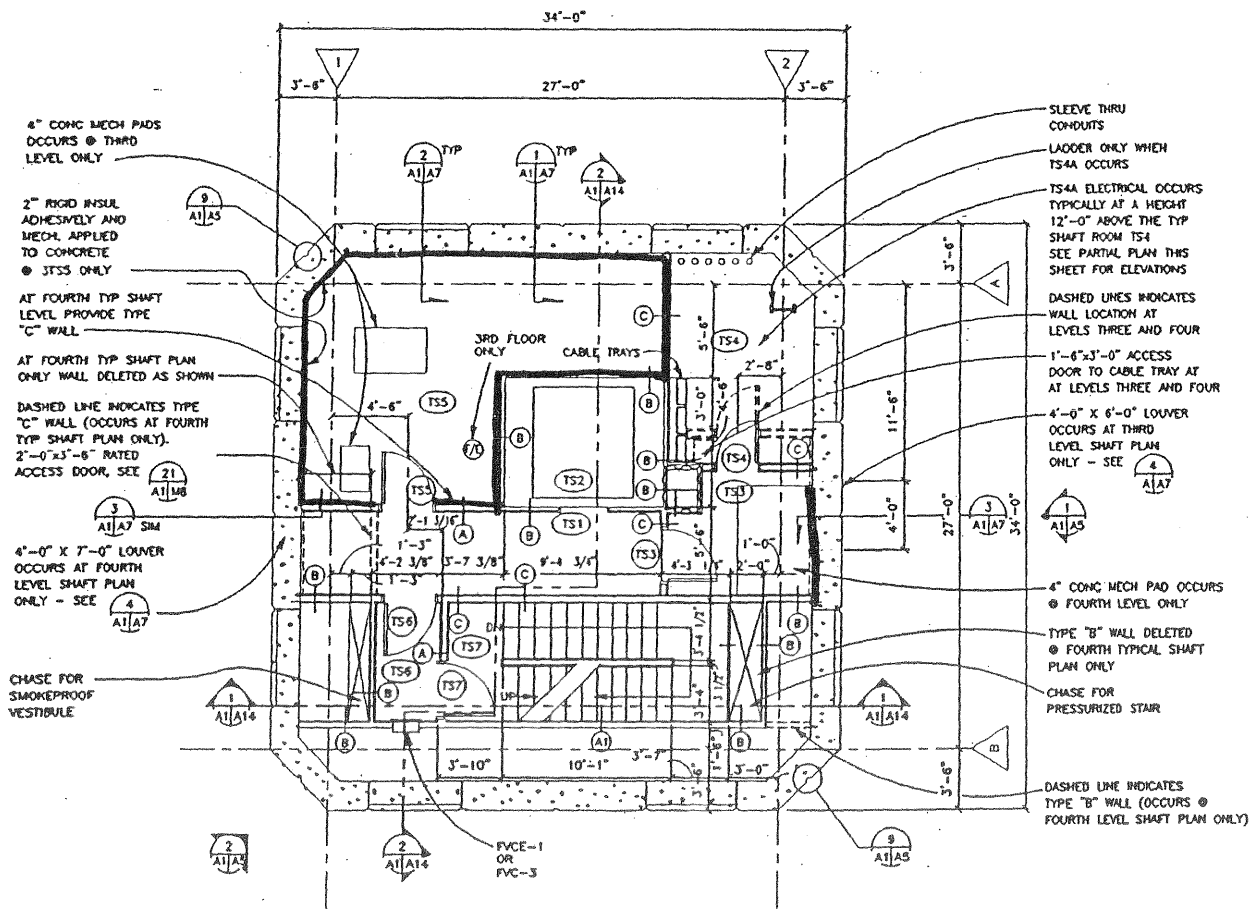
5TH FLOOR


34'-0"
3'-6"
27'-0"
3'-6"
4" CONC MECH PADS OCCURS @ THIRD LEVEL ONLY
2" RIGID INSUL ADHESIVELY AND MECH. APPLIED TO CONCRETE @ JTS3 ONLY
AT FOURTH TYP SHAFT LEVEL PROVIDE TYPE "C" WALL
AT FOURTH TYP SHAFT PLAN ONLY WALL DELETED AS SHOWN
DASHED LINE INDICATES TYPE "C" WALL (OCCURS AT FOURTH TYP SHAFT PLAN ONLY). 2'-0"x3'-8" RATED ACCESS DOOR, SEE
4'-0" X 7'-0" LOUVER OCCURS AT FOURTH LEVEL SHAFT PLAN ONLY - SEE
CHASE FOR SMOKEPROOF VESTIBULE
SLEEVE THRU CONDUITS
LADDER ONLY WHEN TS4A OCCURS
TS4A ELECTRICAL OCCURS TYPICALLY AT A HEIGHT 12'-0" ABOVE THE TYP SHAFT ROOM TS4 SEE PARTIAL PLAN THIS SHEET FOR ELEVATIONS
DASHED LINES INDICATES WALL LOCATION AT LEVELS THREE AND FOUR
1'-6"x3'-0" ACCESS DOOR TO CABLE TRAY AT AT LEVELS THREE AND FOUR
4'-0" X 6'-0" LOUVER OCCURS AT THIRD LEVEL SHAFT PLAN ONLY - SEE
4" CONC MECH PAD OCCURS @ FOURTH LEVEL ONLY
TYPE "B" WALL DELETED @ FOURTH TYPICAL SHAFT PLAN ONLY
CHASE FOR PRESSURIZED STAIR
DASHED LINE INDICATES TYPE "B" WALL (OCCURS @ FOURTH LEVEL SHAFT PLAN ONLY)
3RD FLOOR ONLY
CABLE TRAYS
FVCE-1 OR FVC-3
TS1
TS2
TS3
TS4
TS5
TS6
TS7
UP
DN

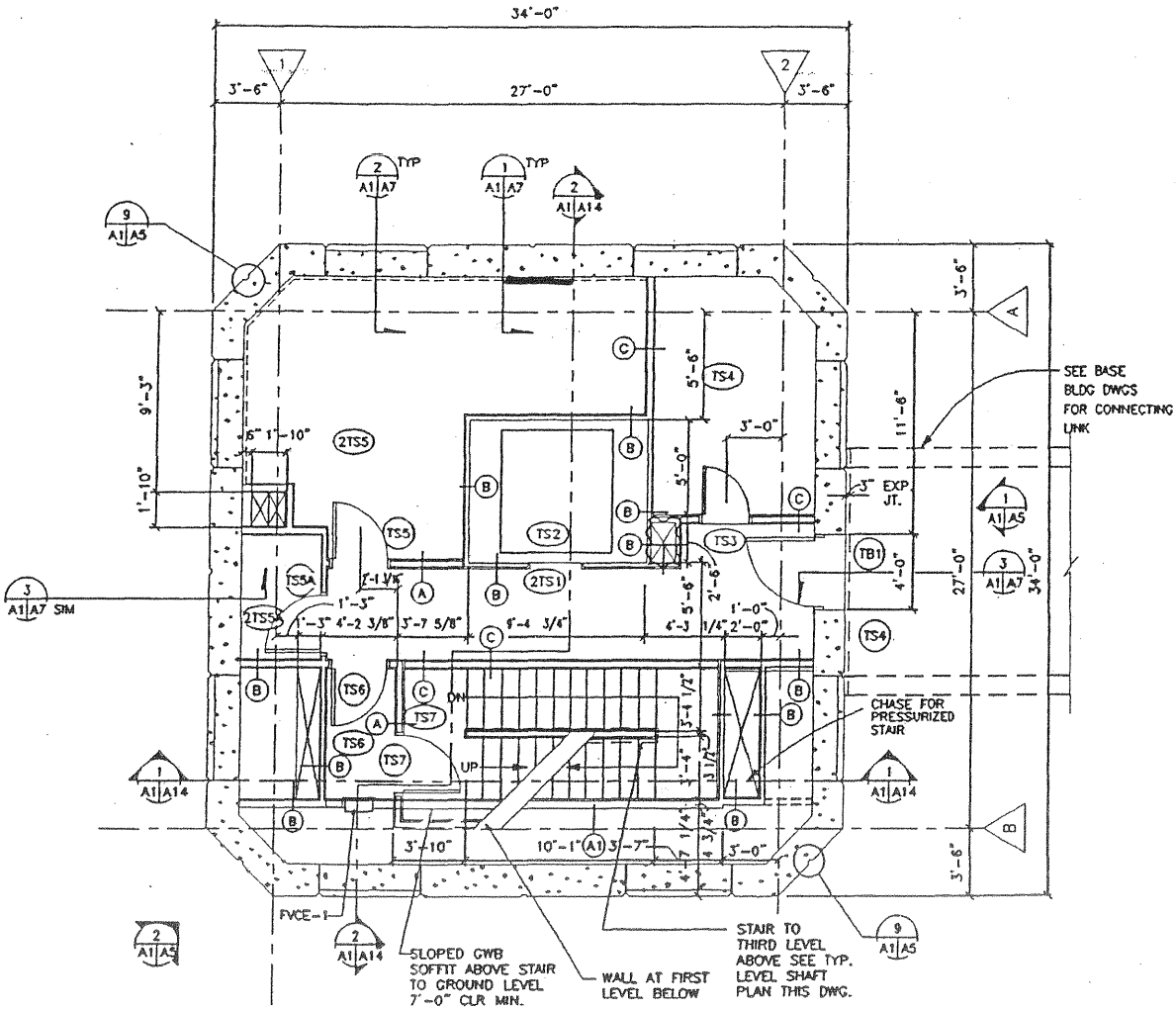
4TH FLOOR


34'-0"
27'-0"
3'-6"
3'-6"
4" CONC MECH PADS OCCURS @ THIRD LEVEL ONLY
2" RIGID INSUL ADHESIVELY AND MECH. APPLIED TO CONCRETE @ 3TSS ONLY
AT FOURTH TYP SHAFT LEVEL PROVIDE TYPE "C" WALL
AT FOURTH TYP SHAFT PLAN ONLY WALL DELETED AS SHOWN
DASHED LINE INDICATES TYPE "C" WALL (OCCURS AT FOURTH TYP SHAFT PLAN ONLY). 2'-0"x3'-6" RATED ACCESS DOOR, SEE
3 A1|A7 SIM
4'-0" X 7'-0" LOUVER OCCURS AT FOURTH LEVEL SHAFT PLAN ONLY - SEE
CHASE FOR SMOKEPROOF VESTIBULE
3RD FLOOR ONLY
CABLE TRAYS
TS1
TS2
TS3
TS4
TS4A
TS5
TS6
TS7
UP
DN
SLEEVE THRU CONDUITS
LADDER ONLY WHEN TS4A OCCURS
TS4A ELECTRICAL OCCURS TYPICALLY AT A HEIGHT 12'-0" ABOVE THE TYP SHAFT ROOM TS4 SEE PARTIAL PLAN THIS SHEET FOR ELEVATIONS
DASHED LINES INDICATES WALL LOCATION AT LEVELS THREE AND FOUR
1'-6"x3'-0" ACCESS DOOR TO CABLE TRAY AT AT LEVELS THREE AND FOUR
4'-0" X 6'-0" LOUVER OCCURS AT THIRD LEVEL SHAFT PLAN ONLY - SEE
4" CONC MECH PAD OCCURS @ FOURTH LEVEL ONLY
TYPE "B" WALL DELETED @ FOURTH TYPICAL SHAFT PLAN ONLY
CHASE FOR PRESSURIZED STAIR
DASHED LINE INDICATES TYPE "B" WALL (OCCURS @ FOURTH LEVEL SHAFT PLAN ONLY)
FVCE-1 OR FVC-3
3'-10"
10'-1"
3'-7"
3'-0"

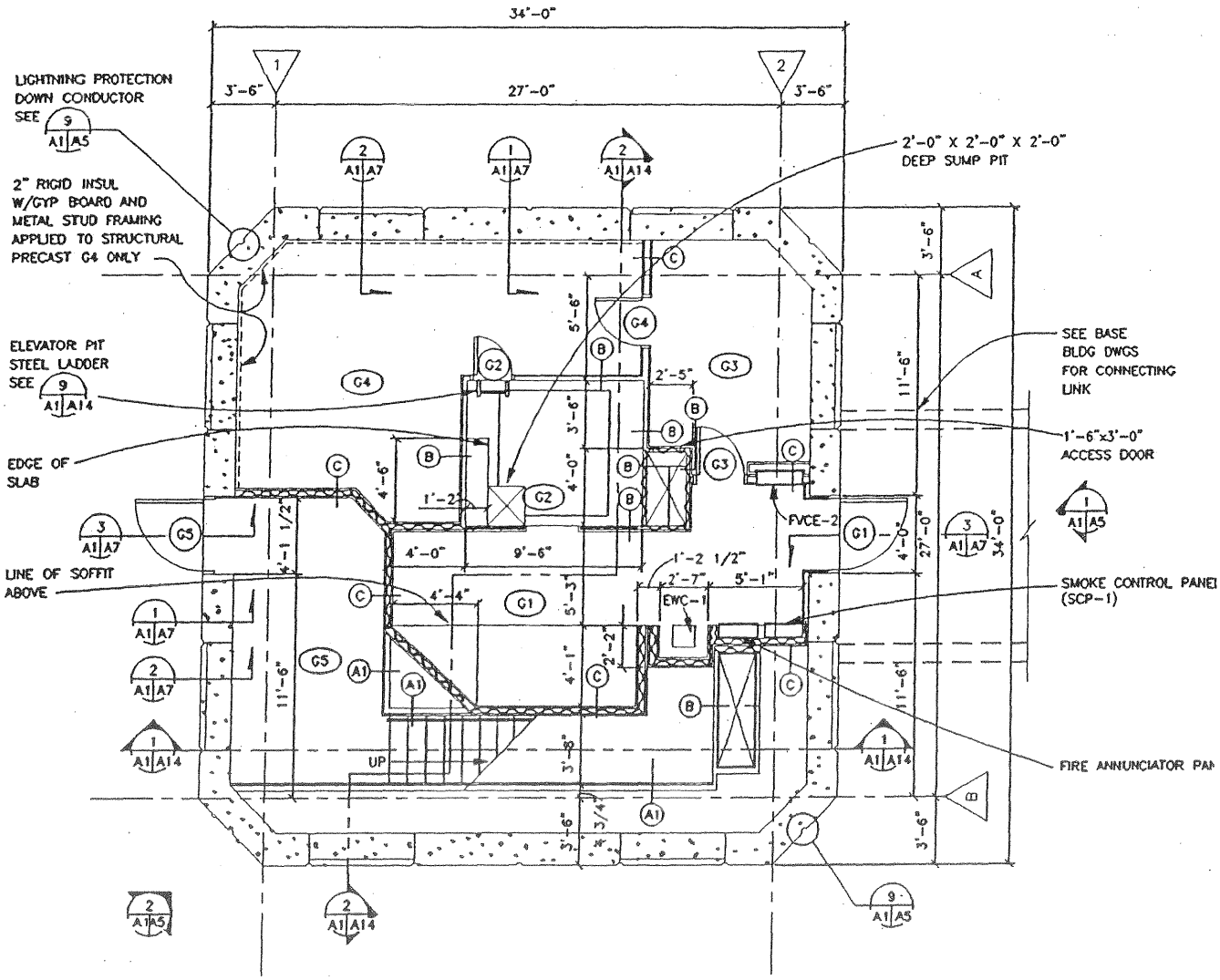
3RD FLOOR


34'-0"
27'-0"
3'-6"
3'-6"
4" CONC MECH PADS OCCURS @ THIRD LEVEL ONLY
2" RIGID INSUL ADHESIVELY AND MECH. APPLIED TO CONCRETE @ 3TS5 ONLY
AT FOURTH TYP SHAFT LEVEL PROVIDE TYPE "C" WALL
AT FOURTH TYP SHAFT PLAN ONLY WALL DELETED AS SHOWN
DASHED LINE INDICATES TYPE "C" WALL (OCCURS AT FOURTH TYP SHAFT PLAN ONLY). 2'-0"x3'-6" RATED ACCESS DOOR, SEE
4'-0" X 7'-0" LOUVER OCCURS AT FOURTH LEVEL SHAFT PLAN ONLY - SEE
CHASE FOR SMOKEPROOF VESTIBULE
3RD FLOOR ONLY
CABLE TRAYS
TS1
TS2
TS3
TS4
TS5
TS6
TS7
SLEEVE THRU CONDUITS
LADDER ONLY WHEN TS4A OCCURS
TS4A ELECTRICAL OCCURS TYPICALLY AT A HEIGHT 12'-0" ABOVE THE TYP SHAFT ROOM TS4 SEE PARTIAL PLAN THIS SHEET FOR ELEVATIONS
DASHED LINES INDICATES WALL LOCATION AT LEVELS THREE AND FOUR
1'-6"x3'-0" ACCESS DOOR TO CABLE TRAY AT AT LEVELS THREE AND FOUR
4'-0" X 6'-0" LOUVER OCCURS AT THIRD LEVEL SHAFT PLAN ONLY - SEE
4" CONC MECH PAD OCCURS @ FOURTH LEVEL ONLY
TYPE "B" WALL DELETED @ FOURTH TYPICAL SHAFT PLAN ONLY
CHASE FOR PRESSURIZED STAIR
DASHED LINE INDICATES TYPE "B" WALL (OCCURS @ FOURTH LEVEL SHAFT PLAN ONLY)
FVCE-1 OR FVC-3
UP
DN

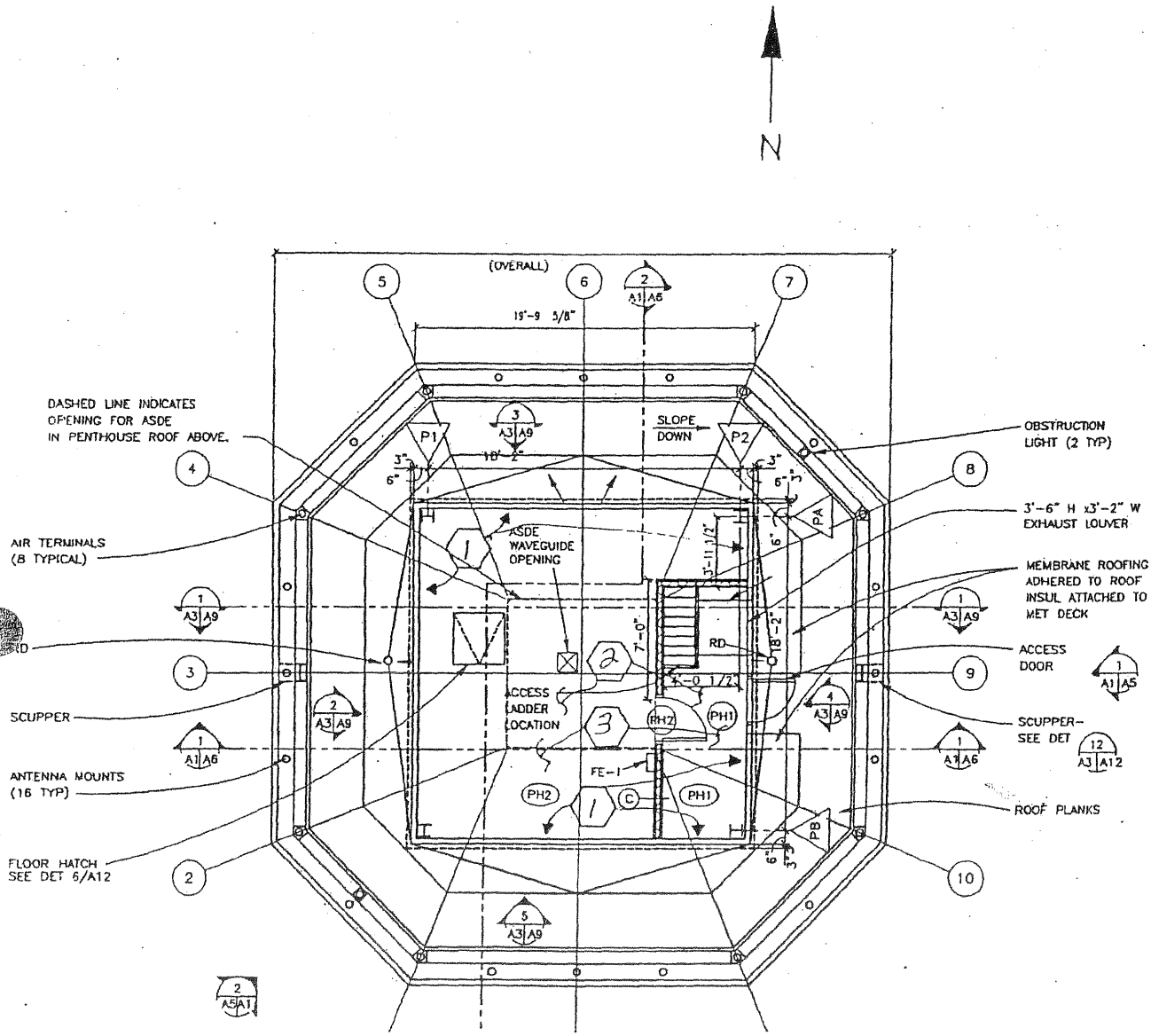
2ND FLOOR


34'-0"
27'-0"
3'-6"
3'-6"
SEE BASE BLDG DWGS FOR CONNECTING UNIK
3" EXP JT.
CHASE FOR PRESSURIZED STAIR
STAIR TO THIRD LEVEL ABOVE SEE TYP. LEVEL SHAFT PLAN THIS DWG.
SLOPED GWB SOFFIT ABOVE STAIR TO GROUND LEVEL 7'-0" CLR MIN.
WALL AT FIRST LEVEL BELOW
FVCE-1
TS1
TS2
TS3
TS4
TS5
TS6
TS7
2TS1
2TS5
TB1
UP
DN

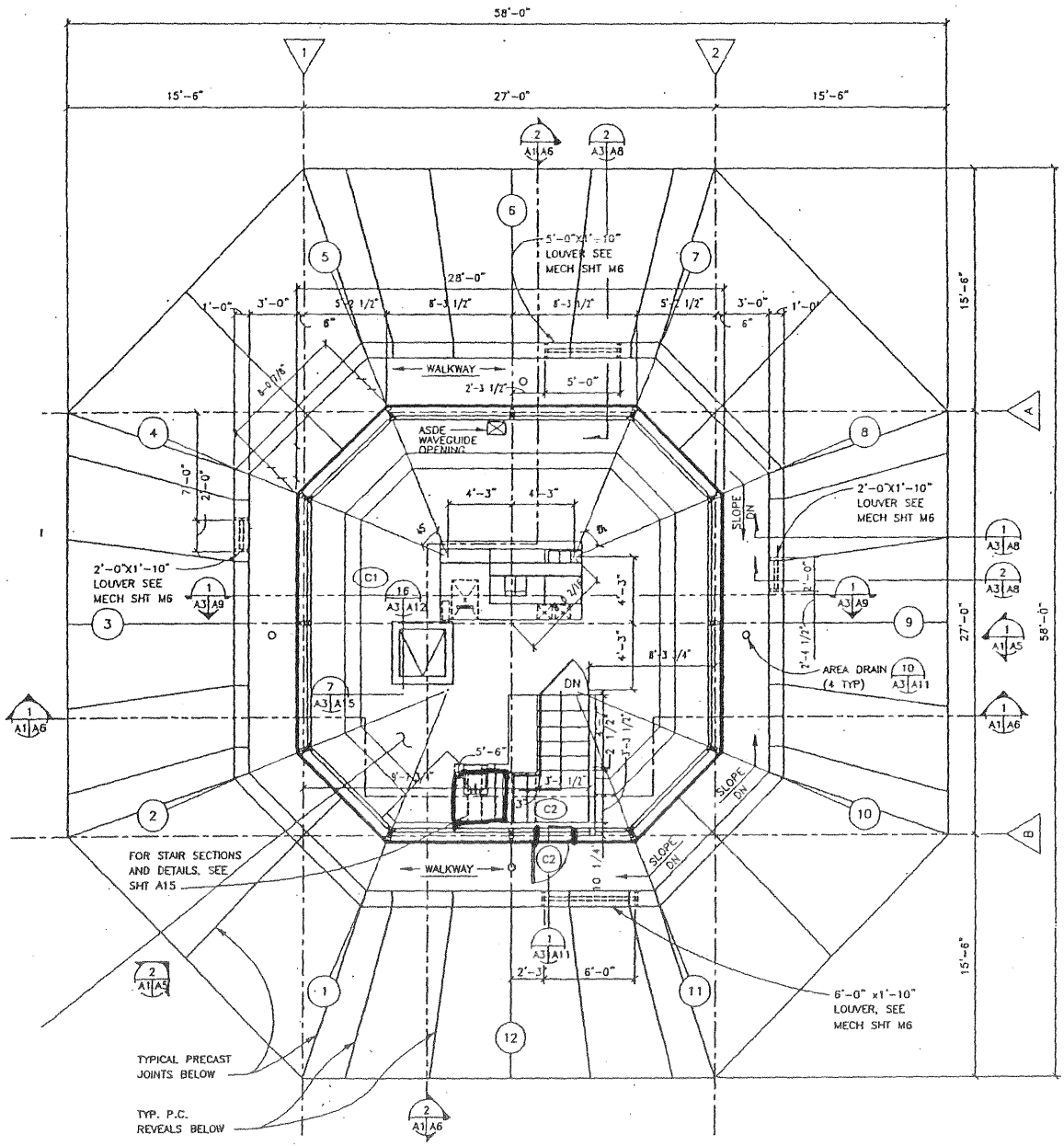
GROUND FLOOR



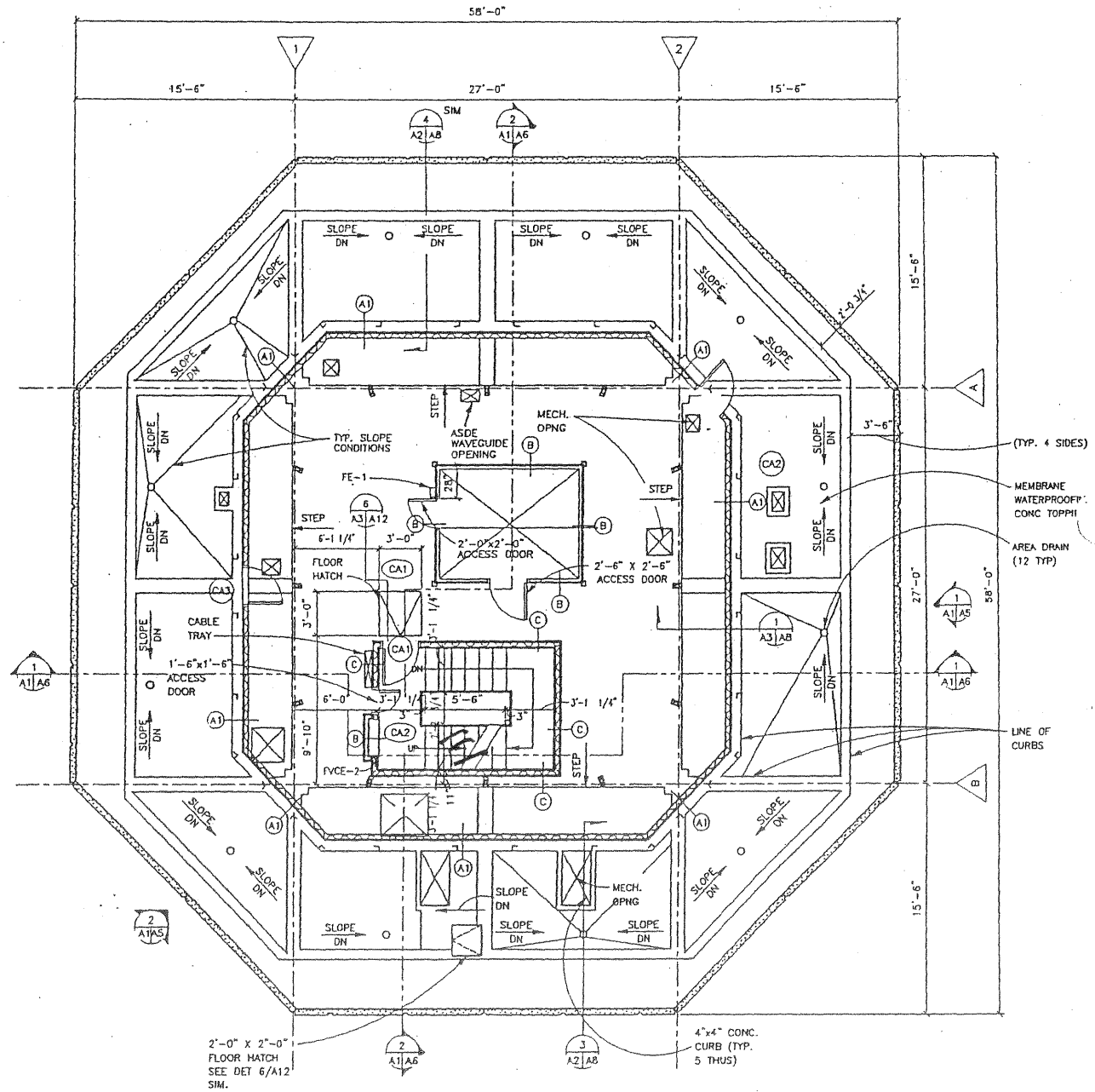
ASDE PENTHOUSE LEVEL



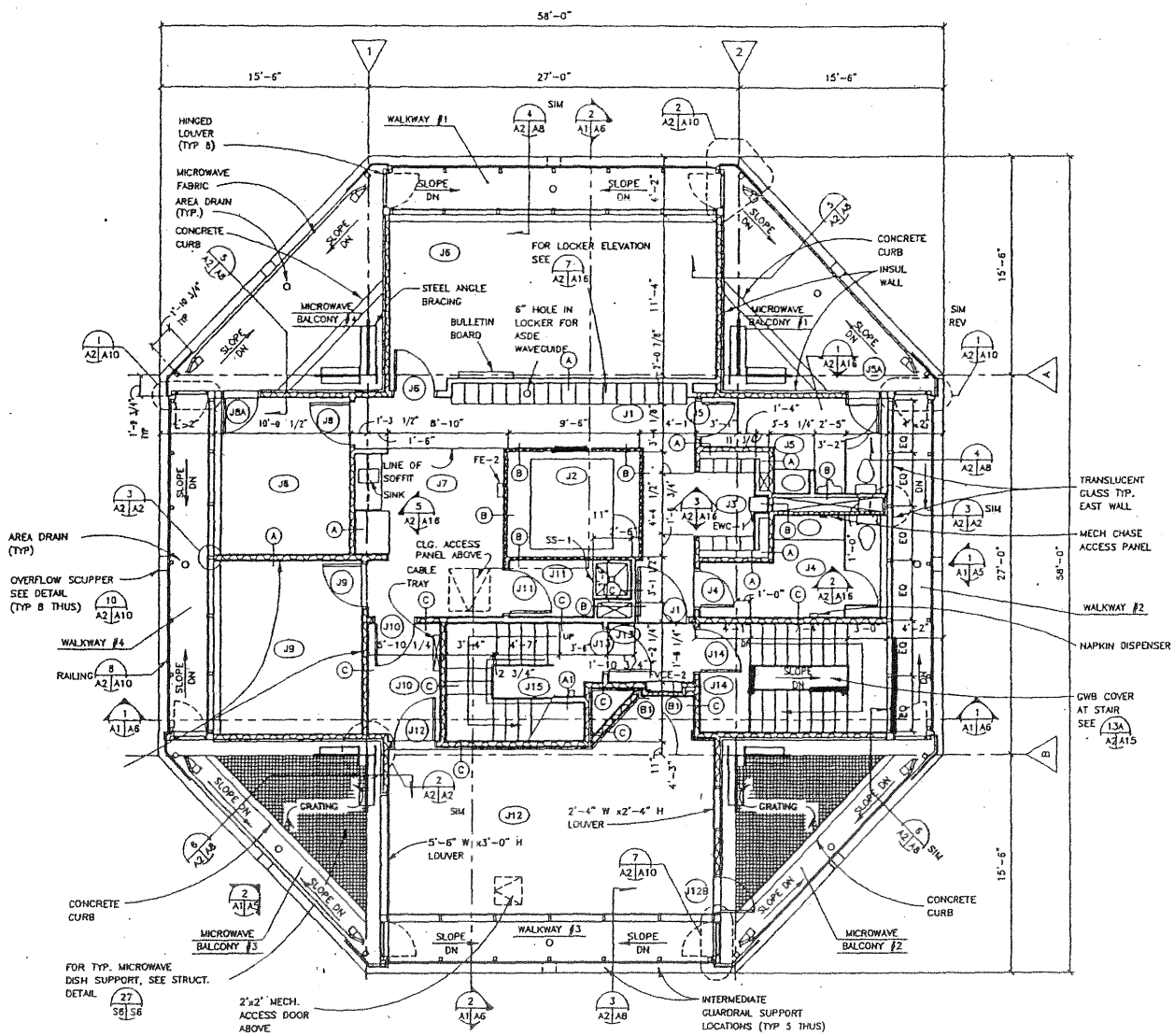
CAB LEVEL


58'-0"
15'-6"
27'-0"
15'-6"
28'-0"
WALKWAY
ASDE WAVEGUIDE OPENING
5'-0"X1'-10" LOUVER SEE MECH SHT M6
2'-0"X1'-10" LOUVER SEE MECH SHT M6
AREA DRAIN (4 TYP)
SLOPE DN
DN
FOR STAIR SECTIONS AND DETAILS, SEE SHT A15
6'-0" x1'-10" LOUVER, SEE MECH SHT M6
TYPICAL PRECAST JOINTS BELOW
TYP. P.C. REVEALS BELOW
15'-6"
27'-0"
58'-0"

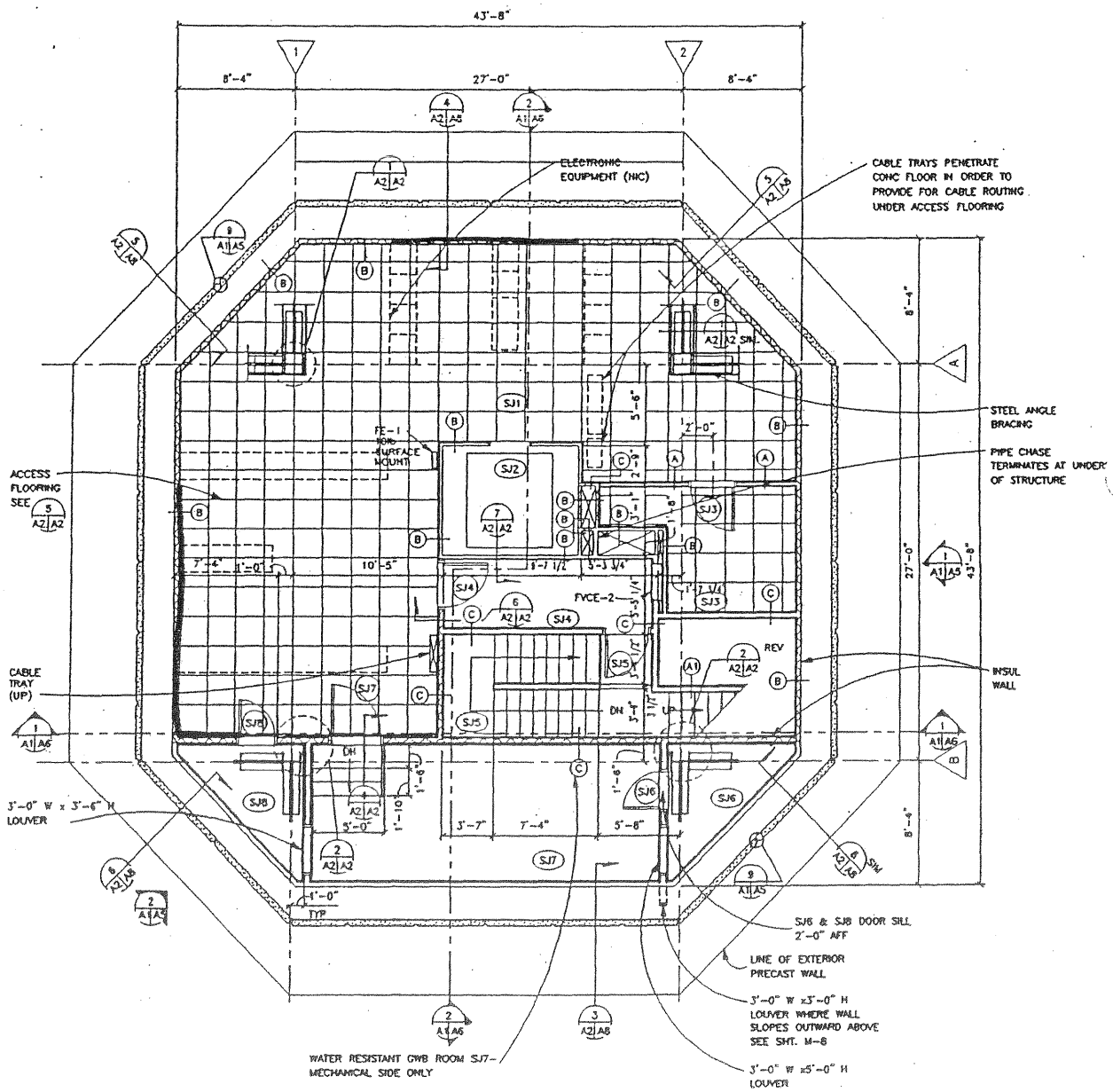
CABLE ACCESS LEVEL



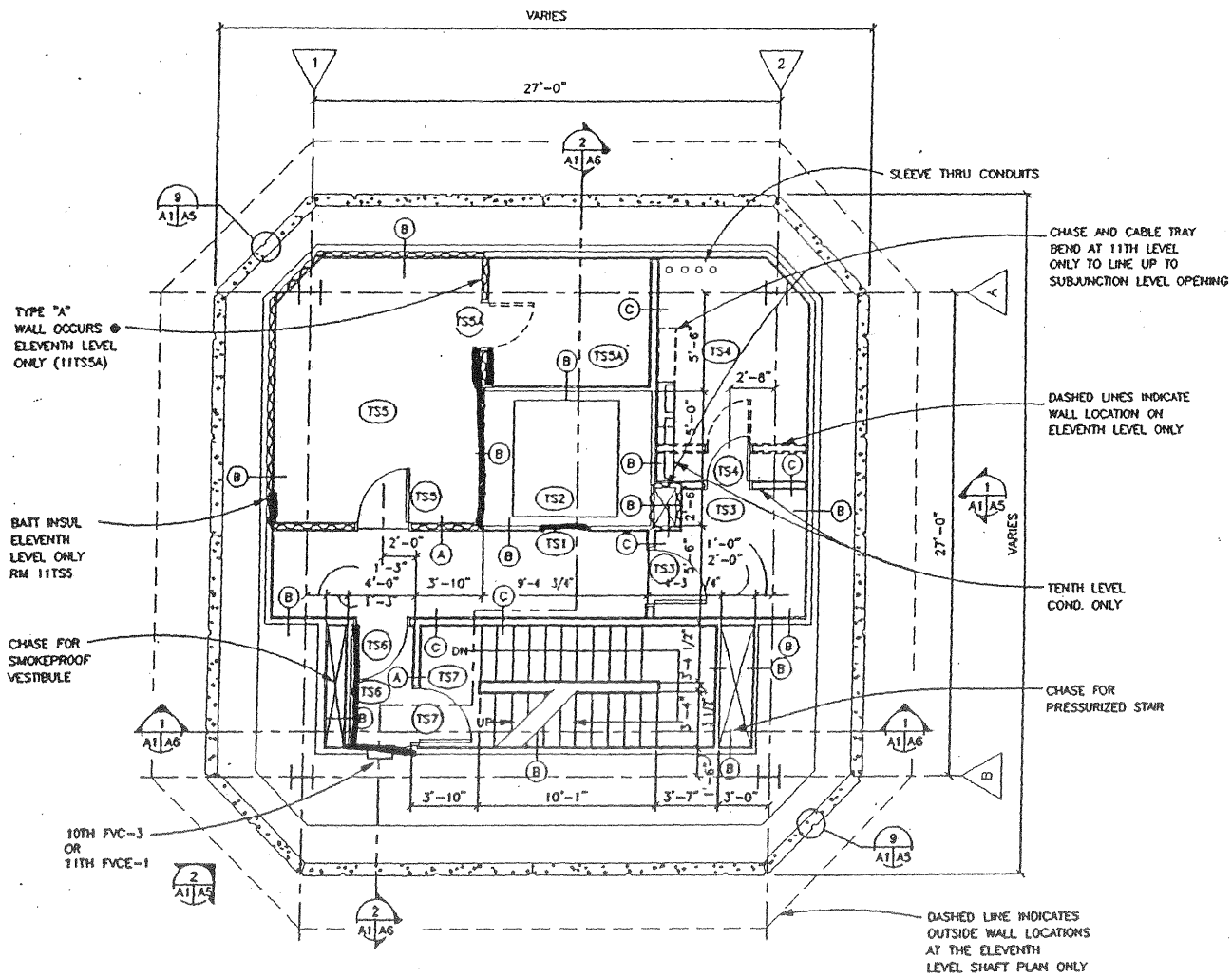
JUNCTION LEVEL



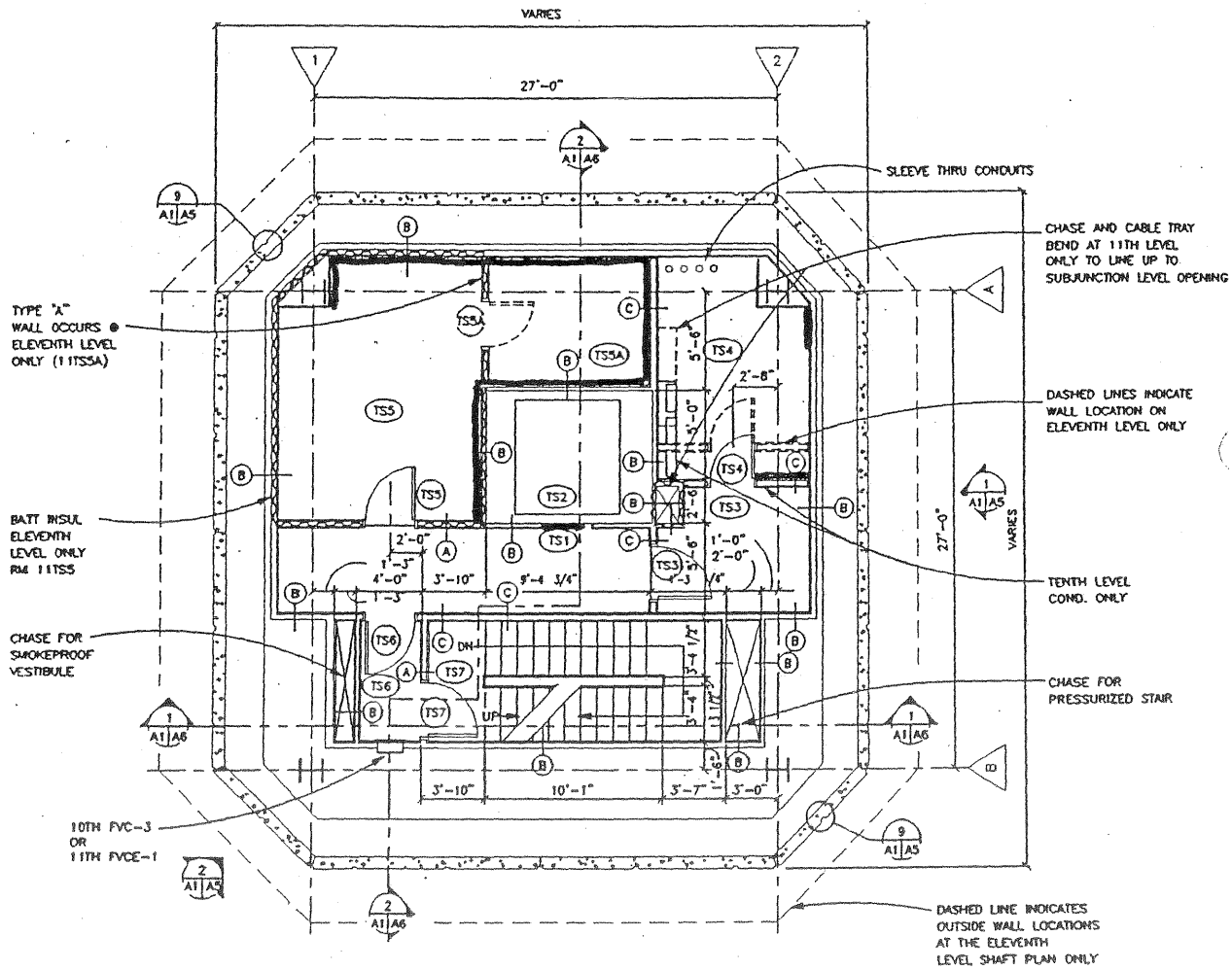
SUBJUNCTION LEVEL



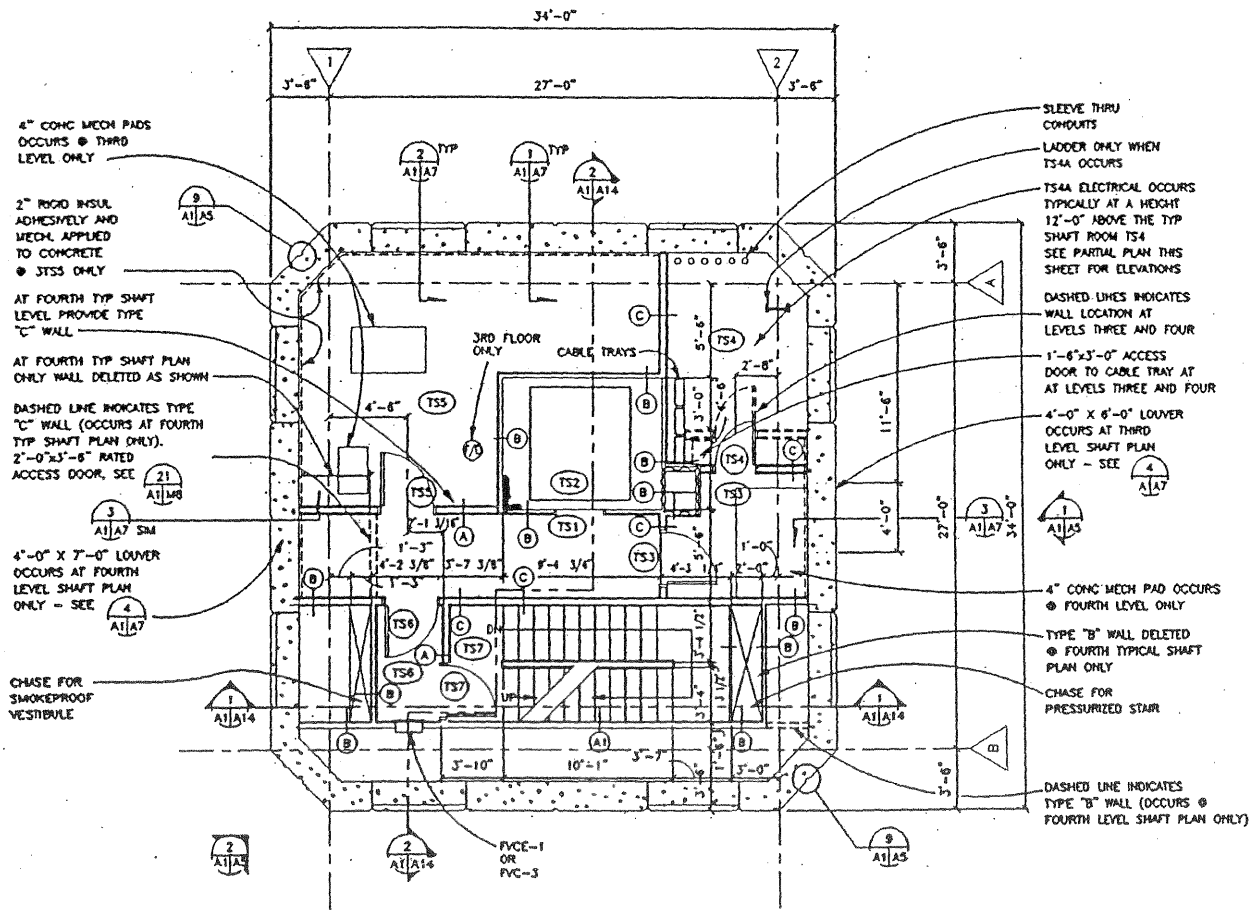
11TH FLOOR


VARIES
27'-0"
SLEEVE THRU CONDUITS
CHASE AND CABLE TRAY BEND AT 11TH LEVEL ONLY TO LINE UP TO SUBJUNCTION LEVEL OPENING
TYPE "A" WALL OCCURS @ ELEVENTH LEVEL ONLY (11TS5A)
DASHED LINES INDICATE WALL LOCATION ON ELEVENTH LEVEL ONLY
BATT INSUL ELEVENTH LEVEL ONLY RM 11TS5
TENTH LEVEL COND. ONLY
CHASE FOR SMOKEPROOF VESTIBULE
CHASE FOR PRESSURIZED STAIR
10TH FVC-3 OR 11TH FVCE-1
DASHED LINE INDICATES OUTSIDE WALL LOCATIONS AT THE ELEVENTH LEVEL SHAFT PLAN ONLY
TS1
TS2
TS3
TS4
TS5
TS5A
TS6
TS7
27'-0"
VARIES
3'-10"
10'-1"
3'-7"
3'-0"

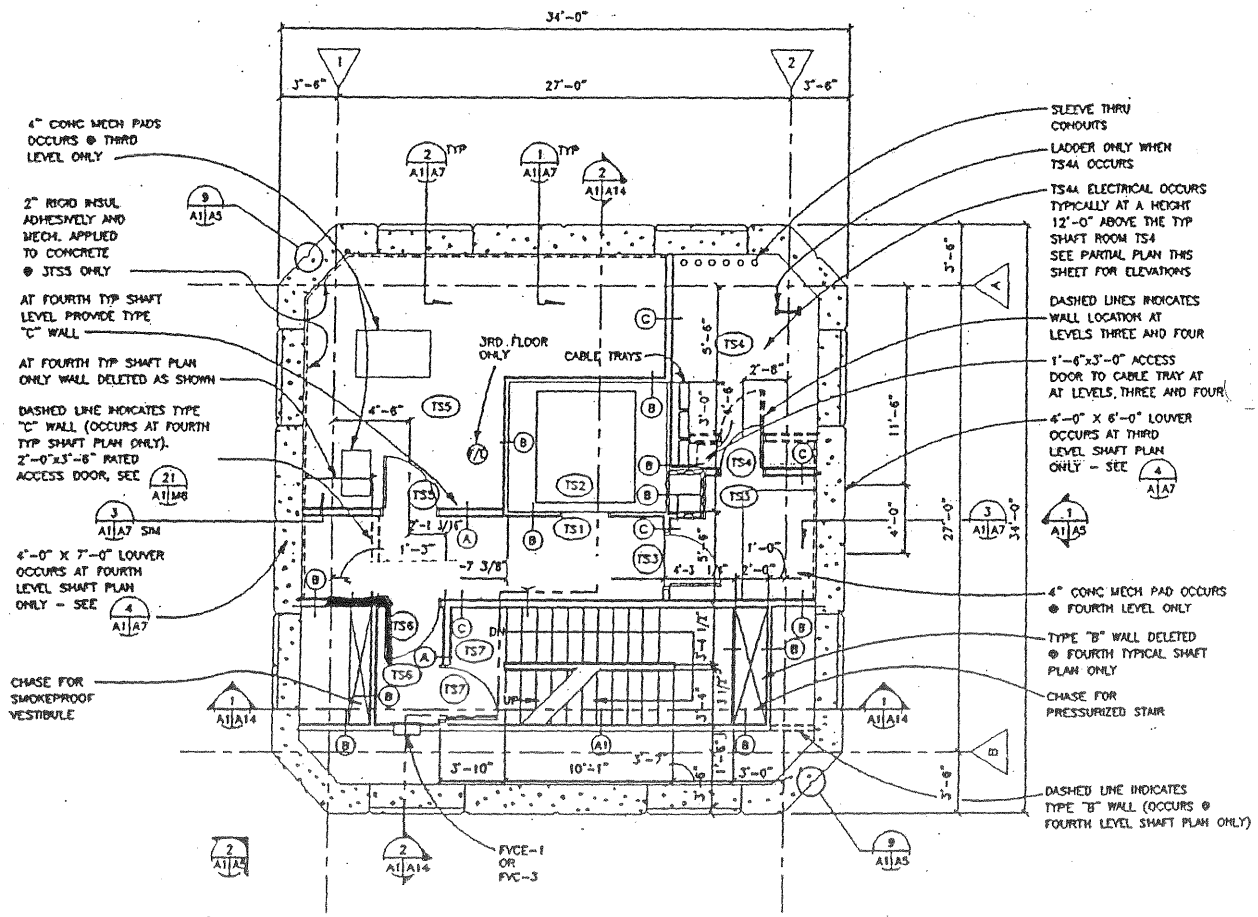
10TH FLOOR


VARIES
27'-0"
SLEEVE THRU CONDUITS
CHASE AND CABLE TRAY BEND AT 11TH LEVEL ONLY TO LINE UP TO SUBJUNCTION LEVEL OPENING
TYPE "A" WALL OCCURS @ ELEVENTH LEVEL ONLY (11TSSA)
DASHED LINES INDICATE WALL LOCATION ON ELEVENTH LEVEL ONLY
BATT INSUL ELEVENTH LEVEL ONLY RM 11TS5
TENTH LEVEL COND. ONLY
CHASE FOR SMOKEPROOF VESTIBULE
CHASE FOR PRESSURIZED STAIR
10TH FVC-3 OR 11TH FVCE-1
DASHED LINE INDICATES OUTSIDE WALL LOCATIONS AT THE ELEVENTH LEVEL SHAFT PLAN ONLY
TS5
TS5A
TS4
TS3
TS2
TS1
TS6
TS7
DN
UP
27'-0"
VARIES
3'-10"
10'-1"
3'-7"
3'-0"

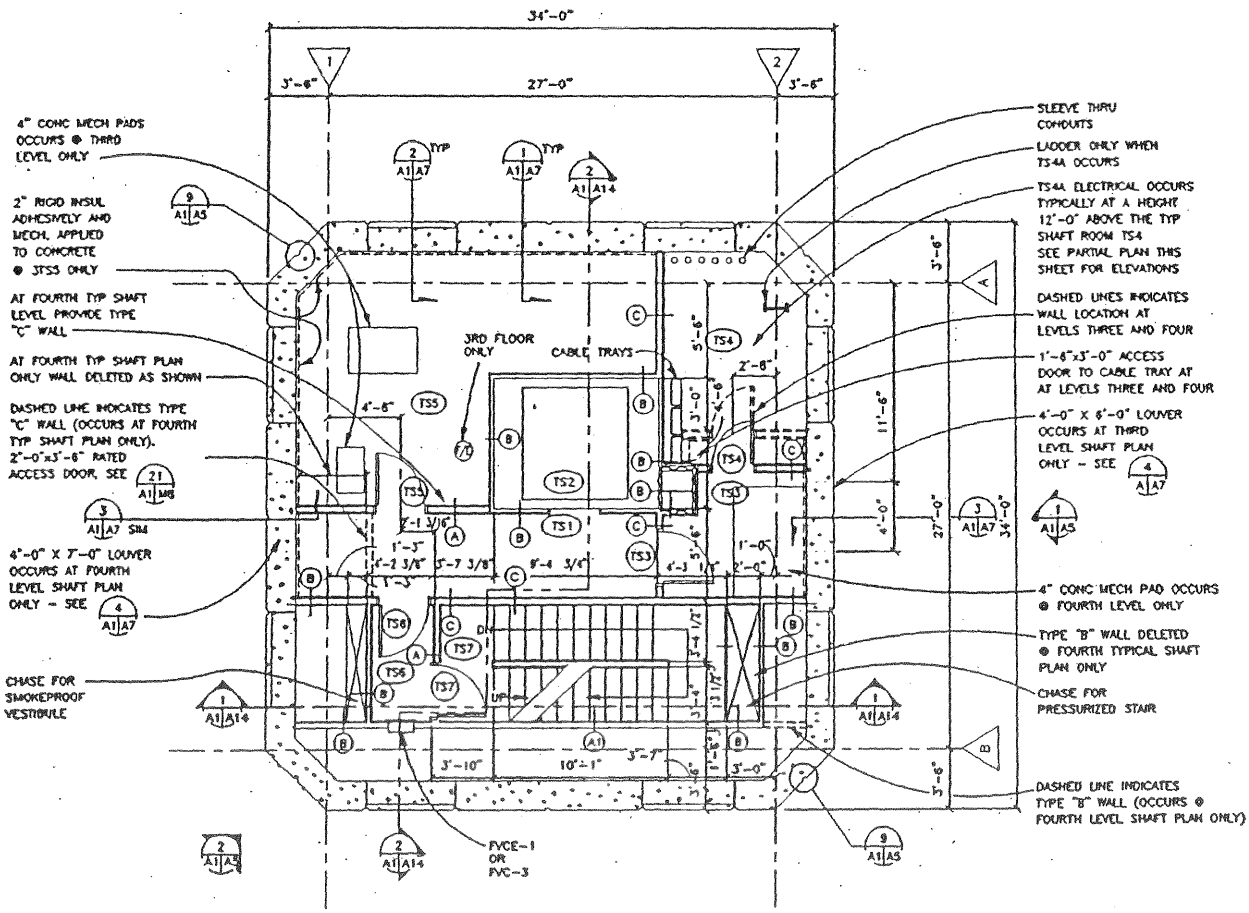
9TH FLOOR


34'-0"
3'-6"
27'-0"
3'-6"
4" CONC MECH PADS OCCURS @ THIRD LEVEL ONLY
2" RIGID INSUL ADHESIVELY AND MECH. APPLIED TO CONCRETE @ TS5S ONLY
AT FOURTH TYP SHAFT LEVEL PROVIDE TYPE "C" WALL
AT FOURTH TYP SHAFT PLAN ONLY WALL DELETED AS SHOWN
DASHED LINE INDICATES TYPE "C" WALL (OCCURS AT FOURTH TYP SHAFT PLAN ONLY). 2'-0"x3'-6" RATED ACCESS DOOR, SEE
4'-0" X 7'-0" LOUVER OCCURS AT FOURTH LEVEL SHAFT PLAN ONLY - SEE
CHASE FOR SMOKEPROOF VESTIBULE
3RD FLOOR ONLY
CABLE TRAYS
TS1
TS2
TS3
TS4
TS5
TS6
TS7
UP
DN
FVCE-1 OR FVC-3
SLEEVE THRU CONDUITS
LADDER ONLY WHEN TS4A OCCURS
TS4A ELECTRICAL OCCURS TYPICALLY AT A HEIGHT 12'-0" ABOVE THE TYP SHAFT ROOM TS4 SEE PARTIAL PLAN THIS SHEET FOR ELEVATIONS
DASHED LINES INDICATES WALL LOCATION AT LEVELS THREE AND FOUR
1'-6"x3'-0" ACCESS DOOR TO CABLE TRAY AT AT LEVELS THREE AND FOUR
4'-0" X 6'-0" LOUVER OCCURS AT THIRD LEVEL SHAFT PLAN ONLY - SEE
4" CONC MECH PAD OCCURS @ FOURTH LEVEL ONLY
TYPE "B" WALL DELETED @ FOURTH TYPICAL SHAFT PLAN ONLY
CHASE FOR PRESSURIZED STAIR
DASHED LINE INDICATES TYPE "B" WALL (OCCURS @ FOURTH LEVEL SHAFT PLAN ONLY)

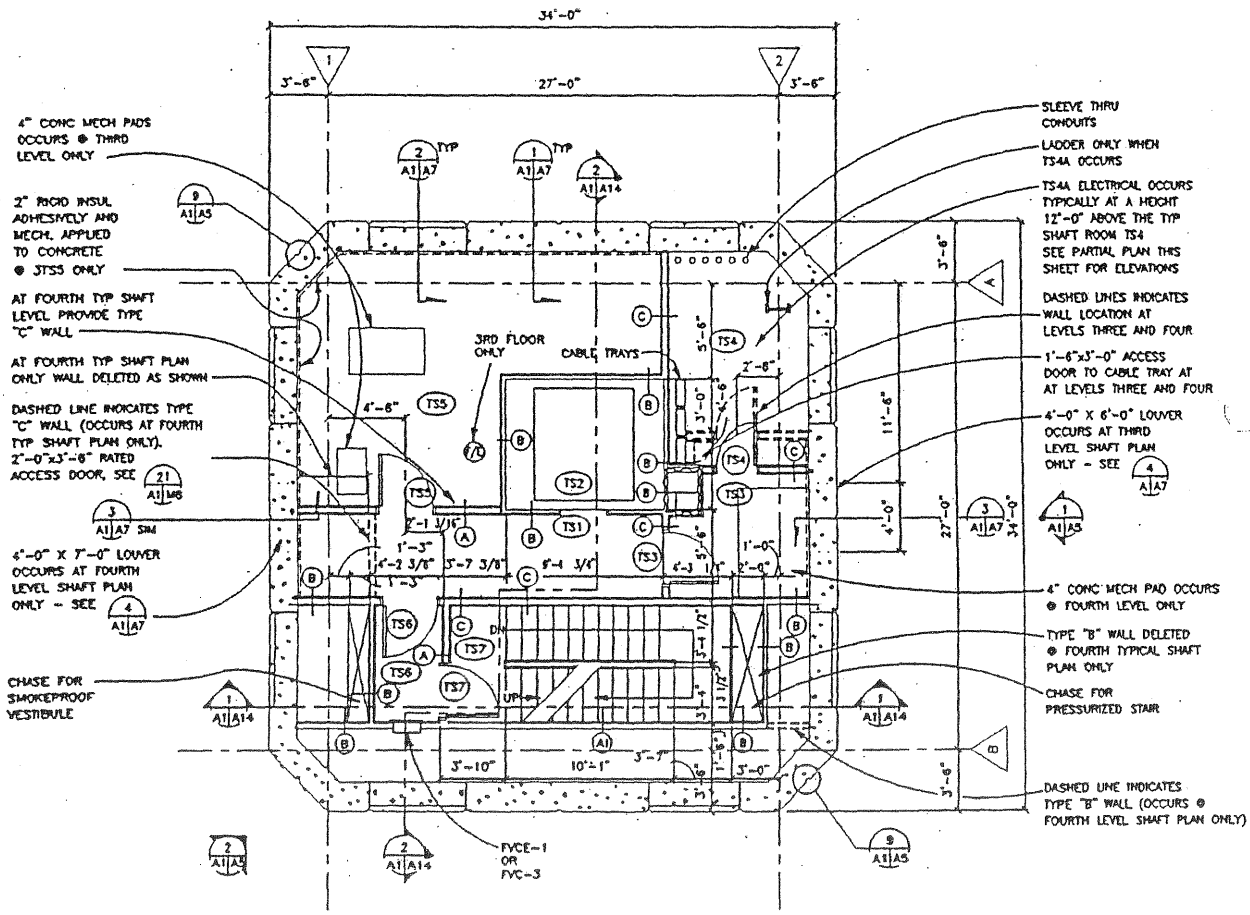
8TH FLOOR


34'-0"
27'-0"
3'-6"
3'-6"
4" CONC MECH PADS OCCURS @ THIRD LEVEL ONLY
2" RIGID INSUL ADHESIVELY AND MECH. APPLIED TO CONCRETE @ TS5 ONLY
AT FOURTH TYP SHAFT LEVEL PROVIDE TYPE "C" WALL
AT FOURTH TYP SHAFT PLAN ONLY WALL DELETED AS SHOWN
DASHED LINE INDICATES TYPE "C" WALL (OCCURS AT FOURTH TYP SHAFT PLAN ONLY). 2'-0"x3'-6" RATED ACCESS DOOR, SEE
4'-0" X 7'-0" LOUVER OCCURS AT FOURTH LEVEL SHAFT PLAN ONLY - SEE
CHASE FOR SMOKEPROOF VESTIBULE
SLEEVE THRU CONDUITS
LADDER ONLY WHEN TS4A OCCURS
TS4A ELECTRICAL OCCURS TYPICALLY AT A HEIGHT 12'-0" ABOVE THE TYP SHAFT ROOM TS4 SEE PARTIAL PLAN THIS SHEET FOR ELEVATIONS
DASHED LINES INDICATES WALL LOCATION AT LEVELS THREE AND FOUR
1'-6"x3'-0" ACCESS DOOR TO CABLE TRAY AT AT LEVELS, THREE AND FOUR
4'-0" X 6'-0" LOUVER OCCURS AT THIRD LEVEL SHAFT PLAN ONLY - SEE
4" CONC MECH PAD OCCURS @ FOURTH LEVEL ONLY
TYPE "B" WALL DELETED @ FOURTH TYPICAL SHAFT PLAN ONLY
CHASE FOR PRESSURIZED STAIR
DASHED LINE INDICATES TYPE "B" WALL (OCCURS @ FOURTH LEVEL SHAFT PLAN ONLY)
3RD. FLOOR ONLY
CABLE TRAYS
FVCE-1 OR FVC-3
TS1
TS2
TS3
TS4
TS5
TS6
TS7
UP
DN

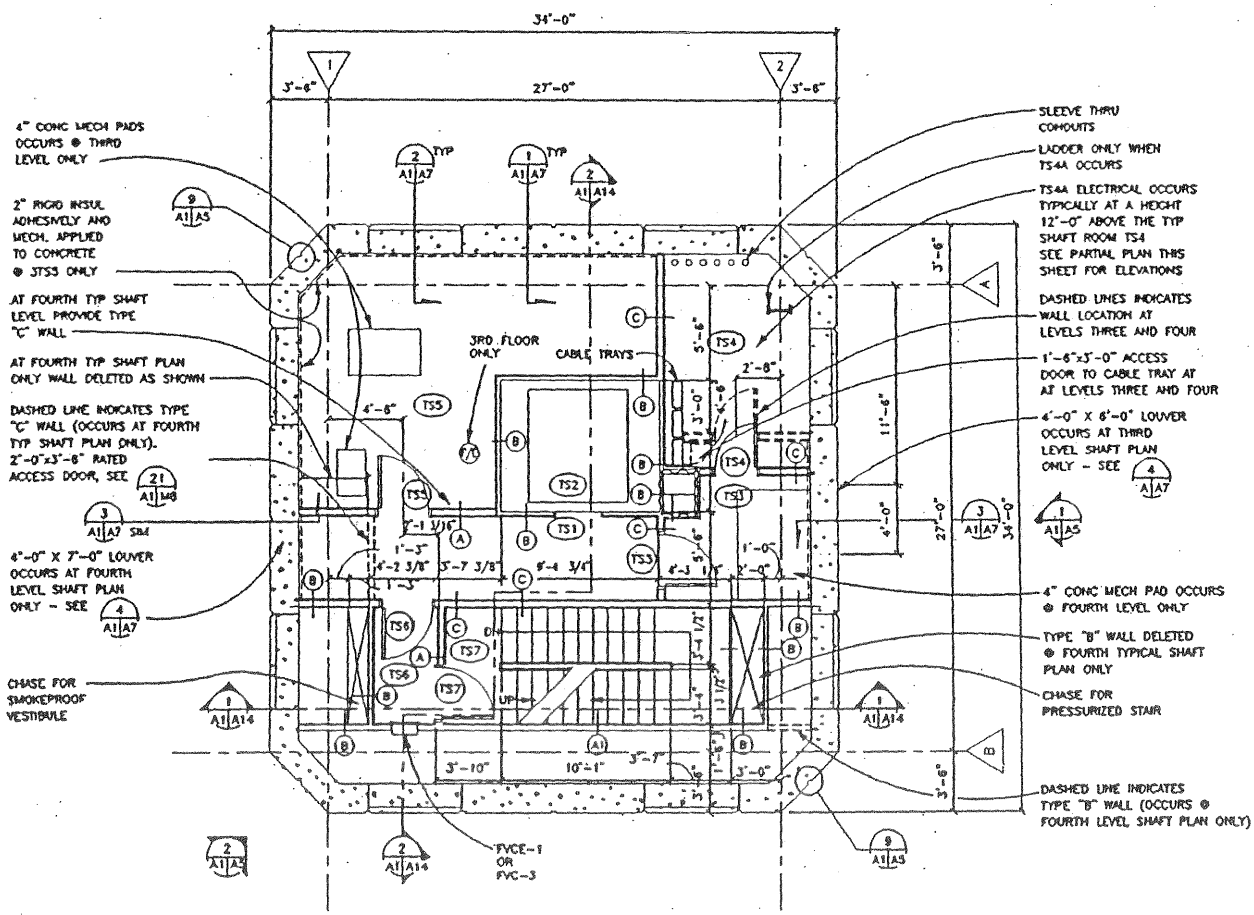
7TH FLOOR


34'-0"
27'-0"
3'-6"
3'-6"
4" CONC MECH PADS OCCURS @ THIRD LEVEL ONLY
2" RIGID INSUL ADHESIVELY AND MECH. APPLIED TO CONCRETE @ 3TSS ONLY
AT FOURTH TYP SHAFT LEVEL PROVIDE TYPE "C" WALL
AT FOURTH TYP SHAFT PLAN ONLY WALL DELETED AS SHOWN
DASHED LINE INDICATES TYPE "C" WALL (OCCURS AT FOURTH TYP SHAFT PLAN ONLY). 2'-0"x3'-6" RATED ACCESS DOOR, SEE
4'-0" X 7'-0" LOUVER OCCURS AT FOURTH LEVEL SHAFT PLAN ONLY - SEE
CHASE FOR SMOKEPROOF VESTIBULE
3RD FLOOR ONLY
CABLE TRAYS
TS1
TS2
TS3
TS4
TS5
TS6
TS7
TS8
SLEEVE THRU CONDUITS
LADDER ONLY WHEN TS4A OCCURS
TS4A ELECTRICAL OCCURS TYPICALLY AT A HEIGHT 12'-0" ABOVE THE TYP SHAFT ROOM TS4 SEE PARTIAL PLAN THIS SHEET FOR ELEVATIONS
DASHED LINES INDICATES WALL LOCATION AT LEVELS THREE AND FOUR
1'-6"x3'-0" ACCESS DOOR TO CABLE TRAY AT AT LEVELS THREE AND FOUR
4'-0" X 6'-0" LOUVER OCCURS AT THIRD LEVEL SHAFT PLAN ONLY - SEE
4" CONC MECH PAD OCCURS @ FOURTH LEVEL ONLY
TYPE "B" WALL DELETED @ FOURTH TYPICAL SHAFT PLAN ONLY
CHASE FOR PRESSURIZED STAIR
DASHED LINE INDICATES TYPE "B" WALL (OCCURS @ FOURTH LEVEL SHAFT PLAN ONLY)
FVCE-1 OR FVC-3
UP
DN

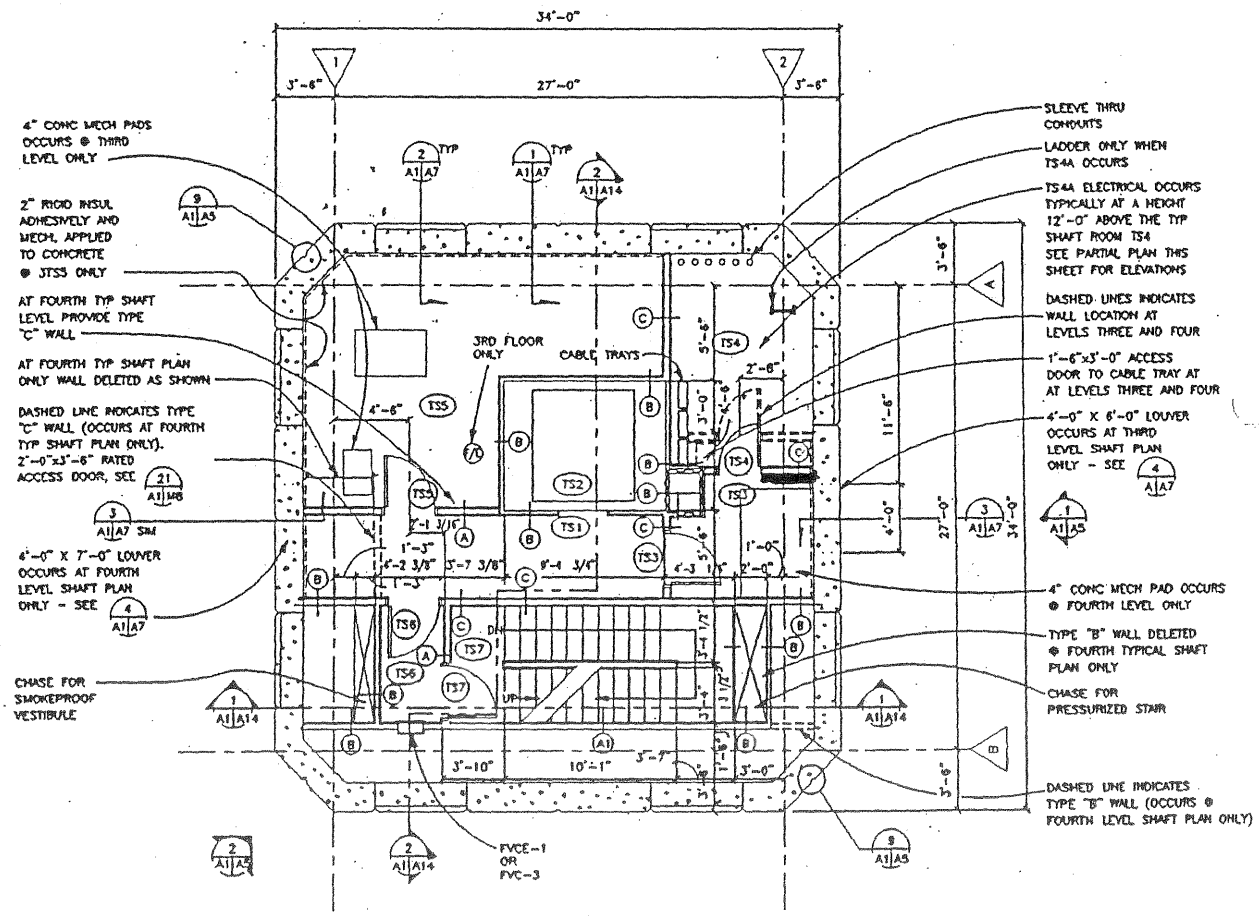
6TH FLOOR


4" CONC MECH PADS OCCURS @ THIRD LEVEL ONLY
2" RIGID INSUL ADHESIVELY AND MECH. APPLIED TO CONCRETE @ TS5 ONLY
AT FOURTH TYP SHAFT LEVEL PROVIDE TYPE "C" WALL
AT FOURTH TYP SHAFT PLAN ONLY WALL DELETED AS SHOWN
DASHED LINE INDICATES TYPE "C" WALL (OCCURS AT FOURTH TYP SHAFT PLAN ONLY). 2'-0"x3'-6" RATED ACCESS DOOR, SEE
4'-0" X 7'-0" LOUVER OCCURS AT FOURTH LEVEL SHAFT PLAN ONLY - SEE
CHASE FOR SMOKEPROOF VESTIBULE
SLEEVE THRU CONDUITS
LADDER ONLY WHEN TS4A OCCURS
TS4A ELECTRICAL OCCURS TYPICALLY AT A HEIGHT 12'-0" ABOVE THE TYP SHAFT ROOM TS4 SEE PARTIAL PLAN THIS SHEET FOR ELEVATIONS
DASHED LINES INDICATES WALL LOCATION AT LEVELS THREE AND FOUR
1'-6"x3'-0" ACCESS DOOR TO CABLE TRAY AT AT LEVELS THREE AND FOUR
4'-0" X 6'-0" LOUVER OCCURS AT THIRD LEVEL SHAFT PLAN ONLY - SEE
4" CONC MECH PAD OCCURS @ FOURTH LEVEL ONLY
TYPE "B" WALL DELETED @ FOURTH TYPICAL SHAFT PLAN ONLY
CHASE FOR PRESSURIZED STAIR
DASHED LINE INDICATES TYPE "B" WALL (OCCURS @ FOURTH LEVEL SHAFT PLAN ONLY)
FVCE-1 OR FVC-3
3RD FLOOR ONLY
CABLE TRAYS
34'-0"
27'-0"
3'-6"
TS1
TS2
TS3
TS4
TS5
TS6
TS7
UP
DN

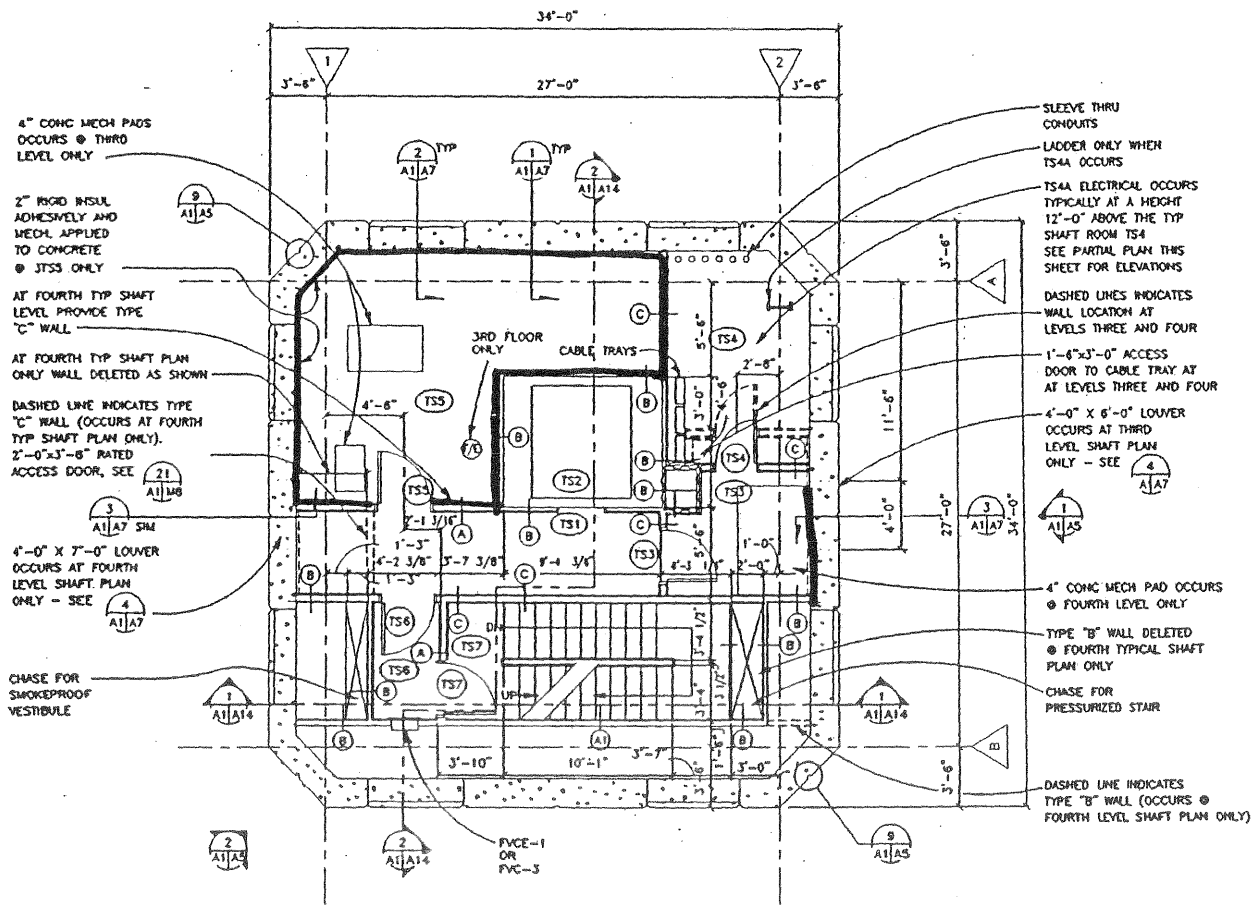
5TH FLOOR


34'-0"
27'-0"
3'-6"
3'-6"
4" CONC MECH PADS OCCURS @ THIRD LEVEL ONLY
2" RIGID INSUL ADHESIVELY AND MECH. APPLIED TO CONCRETE @ JTS3 ONLY
AT FOURTH TYP SHAFT LEVEL PROVIDE TYPE "C" WALL
AT FOURTH TYP SHAFT PLAN ONLY WALL DELETED AS SHOWN
DASHED LINE INDICATES TYPE "C" WALL (OCCURS AT FOURTH TYP SHAFT PLAN ONLY). 2'-0"x3'-6" RATED ACCESS DOOR, SEE
4'-0" X 7'-0" LOUVER OCCURS AT FOURTH LEVEL SHAFT PLAN ONLY - SEE
CHASE FOR SMOKEPROOF VESTIBULE
3RD FLOOR ONLY
CABLE TRAYS
TS1
TS2
TS3
TS4
TS5
TS6
TS7
TS8
UP
DN
FVCE-1 OR FVC-3
SLEEVE THRU CONDUITS
LADDER ONLY WHEN TS4A OCCURS
TS4A ELECTRICAL OCCURS TYPICALLY AT A HEIGHT 12'-0" ABOVE THE TYP SHAFT ROOM TS4 SEE PARTIAL PLAN THIS SHEET FOR ELEVATIONS
DASHED LINES INDICATES WALL LOCATION AT LEVELS THREE AND FOUR
1'-6"x3'-0" ACCESS DOOR TO CABLE TRAY AT AT LEVELS THREE AND FOUR
4'-0" X 8'-0" LOUVER OCCURS AT THIRD LEVEL SHAFT PLAN ONLY - SEE
4" CONC MECH PAD OCCURS @ FOURTH LEVEL ONLY
TYPE "B" WALL DELETED @ FOURTH TYPICAL SHAFT PLAN ONLY
CHASE FOR PRESSURIZED STAIR
DASHED LINE INDICATES TYPE "B" WALL (OCCURS @ FOURTH LEVEL SHAFT PLAN ONLY)

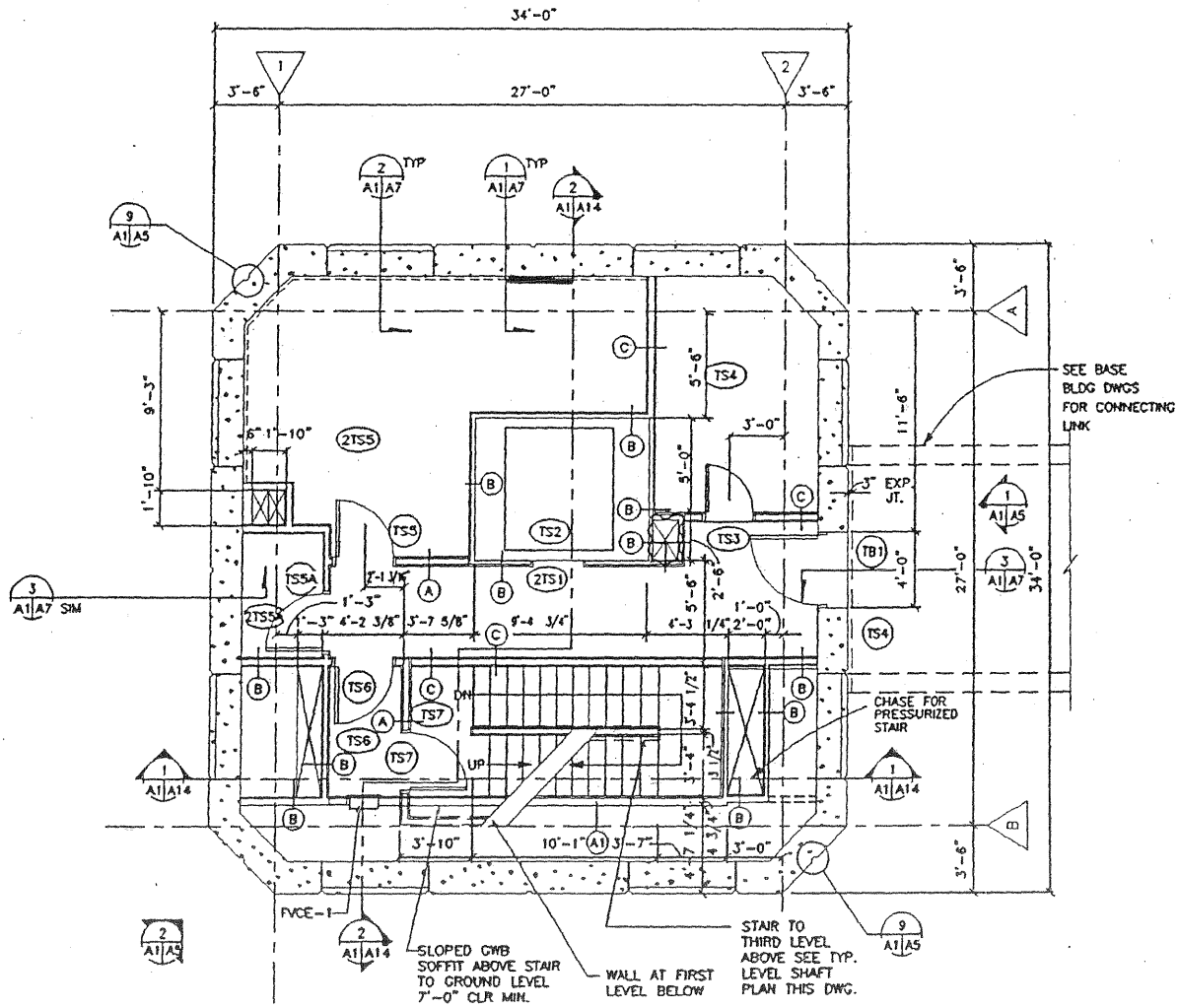
4TH FLOOR


34'-0"
27'-0"
3'-6"
3'-6"
4" CONC MECH PADS OCCURS @ THIRD LEVEL ONLY
2" RIGID INSUL ADHESIVELY AND MECH. APPLIED TO CONCRETE @ JTS5 ONLY
AT FOURTH TYP SHAFT LEVEL PROVIDE TYPE "C" WALL
AT FOURTH TYP SHAFT PLAN ONLY WALL DELETED AS SHOWN
DASHED LINE INDICATES TYPE "C" WALL (OCCURS AT FOURTH TYP SHAFT PLAN ONLY).
2'-0"x3'-6" RATED ACCESS DOOR, SEE
6'-0" X 7'-0" LOUVER OCCURS AT FOURTH LEVEL SHAFT PLAN ONLY - SEE
CHASE FOR SMOKEPROOF VESTIBULE
SLEEVE THRU CONDUITS
LADDER ONLY WHEN TS4A OCCURS
TS4A ELECTRICAL OCCURS TYPICALLY AT A HEIGHT 12'-0" ABOVE THE TYP SHAFT ROOM TS4 SEE PARTIAL PLAN THIS SHEET FOR ELEVATIONS
DASHED LINES INDICATES WALL LOCATION AT LEVELS THREE AND FOUR
1'-6"x3'-0" ACCESS DOOR TO CABLE TRAY AT AT LEVELS THREE AND FOUR
4'-0" X 6'-0" LOUVER OCCURS AT THIRD LEVEL SHAFT PLAN ONLY - SEE
4" CONC MECH PAD OCCURS @ FOURTH LEVEL ONLY
TYPE "B" WALL DELETED @ FOURTH TYPICAL SHAFT PLAN ONLY
CHASE FOR PRESSURIZED STAIR
DASHED LINE INDICATES TYPE "B" WALL (OCCURS @ FOURTH LEVEL SHAFT PLAN ONLY)
3RD FLOOR ONLY
CABLE TRAYS
TS1
TS2
TS3
TS4
TS5
TS6
TS7
FVCE-1 OR FVC-3
UP
DN

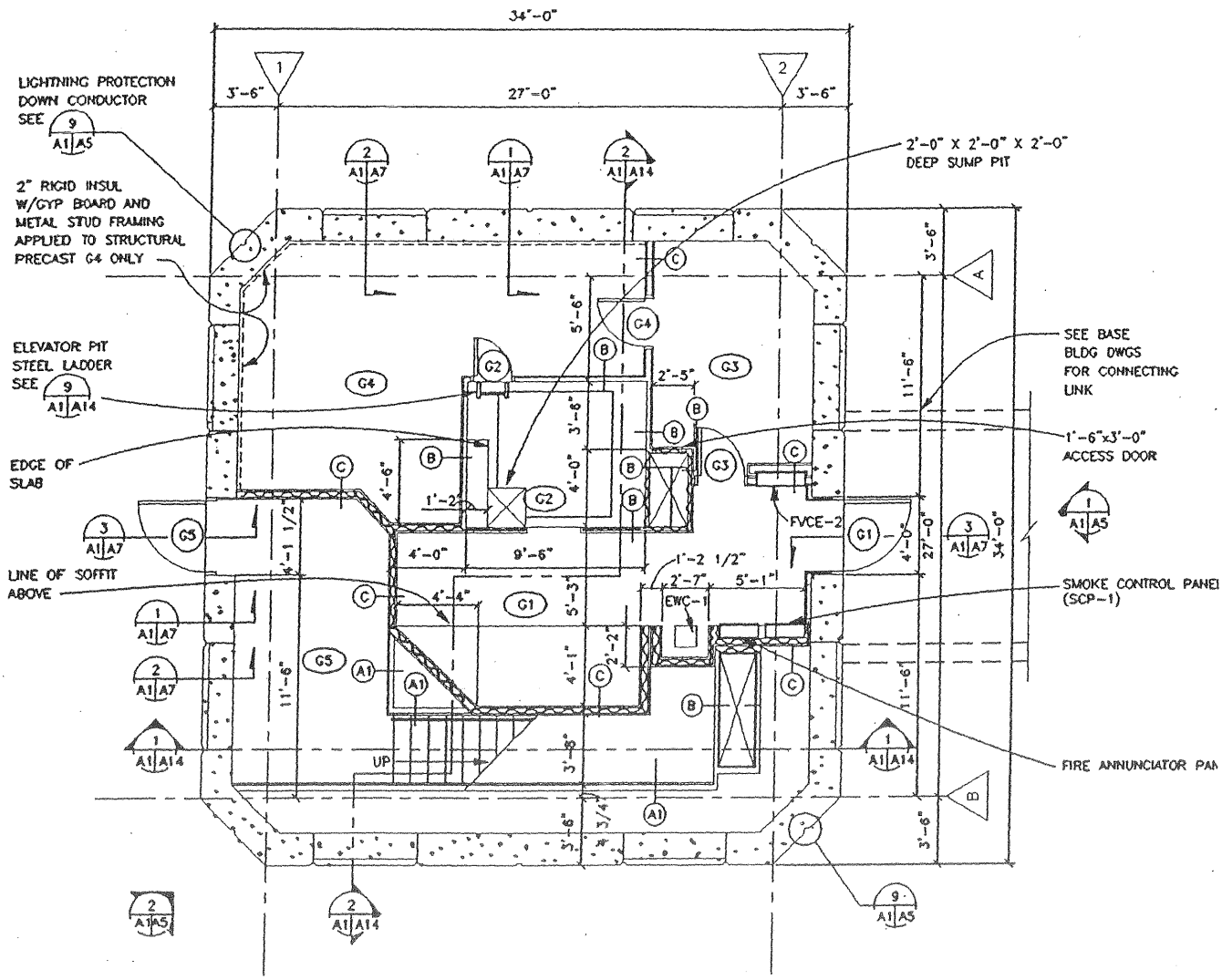
3RD FLOOR


4" CONC MECH PADS OCCURS @ THIRD LEVEL ONLY
2" RIGID INSUL ADHESIVELY AND MECH. APPLIED TO CONCRETE @ JTS3 ONLY
AT FOURTH TYP SHAFT LEVEL PROVIDE TYPE "C" WALL
AT FOURTH TYP SHAFT PLAN ONLY WALL DELETED AS SHOWN
DASHED LINE INDICATES TYPE "C" WALL (OCCURS AT FOURTH TYP SHAFT PLAN ONLY). 2'-0"x3'-6" RATED ACCESS DOOR, SEE
4'-0" X 7'-0" LOUVER OCCURS AT FOURTH LEVEL SHAFT PLAN ONLY - SEE
CHASE FOR SMOKEPROOF VESTIBULE
SLEEVE THRU CONDUITS
LADDER ONLY WHEN TS4A OCCURS
TS4A ELECTRICAL OCCURS TYPICALLY AT A HEIGHT 12'-0" ABOVE THE TYP SHAFT ROOM TS4 SEE PARTIAL PLAN THIS SHEET FOR ELEVATIONS
DASHED LINES INDICATES WALL LOCATION AT LEVELS THREE AND FOUR
1'-6"x3'-0" ACCESS DOOR TO CABLE TRAY AT AT LEVELS THREE AND FOUR
4'-0" X 6'-0" LOUVER OCCURS AT THIRD LEVEL SHAFT PLAN ONLY - SEE
4" CONC MECH PAD OCCURS @ FOURTH LEVEL ONLY
TYPE "B" WALL DELETED @ FOURTH TYPICAL SHAFT PLAN ONLY
CHASE FOR PRESSURIZED STAIR
DASHED LINE INDICATES TYPE "B" WALL (OCCURS @ FOURTH LEVEL SHAFT PLAN ONLY)
3RD FLOOR ONLY
CABLE TRAYS
FVCE-1 OR FVC-3
34'-0"
27'-0"
3'-6"
TS1
TS2
TS3
TS4
TS5
TS6
TS7
UP
DN

2ND FLOOR


34'-0"
27'-0"
3'-6"
3'-6"
SEE BASE BLDG DWGS FOR CONNECTING LINK
3" EXP. JT.
CHASE FOR PRESSURIZED STAIR
SLOPED GWB SOFFIT ABOVE STAIR TO GROUND LEVEL 7'-0" CLR MIN.
WALL AT FIRST LEVEL BELOW
STAIR TO THIRD LEVEL ABOVE SEE TYP. LEVEL SHAFT PLAN THIS DWG.
FVCE-1
TS1
TS2
TS3
TS4
TS5
TS5A
TS6
TS7
2TS1
2TS2
2TS5
TB1
UP
DN

GROUND FLOOR



24b

WONDER MAKERS

ENVIRONMENTAL

March 19, 2008

Howard Blankenship, Regional Vice President
NATCA Central Region
14630 South Kaw Drive
Olathe, KS 66062

RE: Post-Remediation Data from MCI ATCT, October 2007
WME project GC08-8027

Dear Howard:

Thank you for allowing Wonder Makers Environmental to review the correspondence and data attached to an e-mail you sent to Michael Pinto on March 4, 2008. This material included;

- A letter from Jennifer Kukac to you that was not dated
- EMLab P&K analysis reports of post-remediation spore trap testing conducted in the Kansas City, KS ATCT on October 3, 9, 10, and 23, 2007
- Data from bulk and tape samples collected on October 30, 2007
- A letter to Steve Baker and Howard Lyons dated October 23, 2007, from Kevin Peterson, MCI FacRep
- FAA Memorandum from Howard Lyons, Staff Manager, MCI ATCT, dated December 26, 2007, to Kevin E. Peterson

The focus of this review will be the content of Ms. Kukac's letter related to the EMLab P&K analysis reports of post-remediation testing and the post-remediation data itself. All comments are based on comparing the letter and data against the post-remediation criteria established in an article entitled "Mold Clean-up Projects; Post-remediation criteria are crucial to success" that was published in the November 2004 issue of *Professional Safety* magazine, a peer-reviewed journal. A copy of this article is enclosed.

Jennifer Kukac letter

Ms. Kukac states that there are several items of concern reflected in the data. Her first concern is that *Stachybotrys* was recovered in a sample collected on October 3, 2007 (sample #4) and in samples collected on October 9, 2007 (sample #7 & #10). Ms. Kukac is correct that *Stachybotrys* found in post remediation samples is cause for concern. *Stachybotrys*, along with *Fusarium, Chaetomium, Trichoderma,* and *Memnoniella,* are considered target organisms. These molds are rarely found out-of-doors as they require significant amounts of moisture in which to survive. As stated on page 49 of the aforementioned article, finding "these organisms in a cleaned work

area indicates ineffective remediation". Target fungal types can produce potent mycotoxins that can be harmful to humans.

Ms. Kukac was also concerned about the levels of *Penicillium/Aspergillus* and *Cladosporium* that appeared on several of the samples. We will address each of these individually.

Penicillium and *Aspergillus* are considered to be indicator organisms. Indicator organisms grow quickly on water-damaged materials. When higher levels of these organisms are found indoors than out-of-doors, it can be an indication that water-damaged finish building materials are present in the indoor environment. The post-remediation criteria that we are using for reference requires that *Penicillium/Aspergillus* levels be less than 200 counts per cubic meter of air (c/m^3). Using this criterion, the following post-remediation samples are cause for concern:

- 10/3 – Samples 6 & 7
- 10/9 – Samples 8–11
- 10/23 – Samples 7 & 8

Cladosporium is the most common mold found out-of-doors. Its primary purpose is to decay dead plant materials such as leaves and grass. It can be found in most places in the world, including deserts, rain forests, and prairies. As with all molds it is considered to be a human allergen in affected individuals, however, exposure to this type of mold is not generally considered to be hazardous to human health. The post-remediation criterion that applies to *Cladosporium* requires that the level of each fungal type recovered inside the work area be less than 100 c/m^3 above the level of the same fungal type in the comparison sample. As such, *Cladosporium* would not be a cause for concern on the post-remediation samples collected at the MCI ATCT.

The spore concentration on the tape sample collected on October 30, 2007, was less than 1%. The spore types recovered are common out-of-doors molds that are regularly found on indoor surfaces in these concentrations. As a result, we would consider the surface from which this sample was collected to represent a normal fungal ecology.

Post-remediation data

A number of the samples did not meet all of the post-remediation criteria published in *Professional Safety*. Wonder Makers cannot attest to whether or not the remediated areas meet criterion 1 since we did not conduct the post-remediation verification inspection of the work sites. This analysis is based strictly on the data we reviewed. Data from the out-of-doors samples was averaged before it was used in this evaluation.

The table below lists the six post-remediation criteria referenced above and summarizes the samples that did not meet the criteria.

Post-Remediation Criteria

1. **Visual Inspection** - By submission of samples client has indicated that specifications were followed, moisture source was identified and corrected, contents and debris were removed, all visible mold was removed, and work area is white-glove dust free.
2. **Total Spore Concentration** - Total spore concentration on work area sample is below 2,000 c/m³. If less than 800 c/m³, go to criterion 4.
3. **Comparison to Make-up Air Source** - Total spore concentration on work area sample is below comparison sample.
4. **Rank / Order Comparison** - The level of each fungal type and hyphae recovered on the work area sample is less than 100 c/m³ above the comparison sample levels.
5. **Indicator Organisms** - *Aspergillus/Penicillium*-like spores on the work area sample are below 200 c/m³.
6. **Target Organisms** - The work area sample recovered no target fungal types (*Stachybotrys*, *Fusarium*, *Trichoderma**, *Memnoniella*, *Chaetomium*).

Date	Sample #	Criteria Not Met
October 3, 2007	4	#6 – *Stachybotrys* present
	5	#6 – *Chaetomium* present
	6	#5 – *Penicillium/Aspergillus* greater than 200 c/m^3 #6 – *Chaetomium* present
	7	#5 – *Penicillium/Aspergillus* greater than 200 c/m^3
October 9, 2007	7	#6 – *Stachybotrys* present
	8	#5 – *Penicillium/Aspergillus* greater than 200 c/m^3 #6 – *Chaetomium* present
	9	#5 – *Penicillium/Aspergillus* greater than 200 c/m^3
	10	#5 – *Penicillium/Aspergillus* greater than 200 c/m^3 #6 – *Stachybotrys* present
	11	#5 – *Penicillium/Aspergillus* greater than 200 c/m^3
October 23, 2007	4	#6 – *Chaetomium* present
	7	#2 – Total spore concentration greater than 2,000 c/m^3 #5 – *Penicillium/Aspergillus* greater than 200 c/m^3
	8	#5 – *Penicillium/Aspergillus* greater than 200 c/m^3
	10	#2 – Total spore concentration greater than 2,000 c/m^3

Another piece of information that can be gleaned from the data submitted for October 2, 2007, is the presence of *Ulocladium* on samples 9 and 10. This spore type is a slow colonizer that, like the target spores mentioned above, requires very wet conditions in which to grow. Other characteristics similar to target spores are that *Ulocladium* is not commonly found in out-of-doors air samples, and that it produces potent mycotoxins.

Although it is true that the criteria used by Wonder Makers for determining whether a mold remediation project was completed successfully is quite stringent, it is successfully employed by

consultants and contractors across the U.S. and Canada. Such stringent criteria help to assure that the work was done professionally and that the work area is clean before the remediated area is returned for building use or further renovation. It is obvious by the review of the data that the level of cleanliness required to satisfy the criteria was not met in a number of areas. All of the above information calls into question the effectiveness of the remediation efforts that were undertaken in those areas. This is especially disturbing given that the Kansas City ACTC is a critical use facility, that occupants have reported long term health effects that can be caused by mold exposure, and that the FAA has had a dismal track record of dealing properly with mold at other locations, which should have resulted in the Agency learning from past mistakes.

Please let us know if we can provide any additional information in regards to this situation.

Sincerely,

Troy T. Wilkinson, CMP
Senior Environmental Specialist

Reviewed by,

Michael A. Pinto, CSP, CMP
CEO

Enclosure: "Mold Clean-up Projects: Post-remediation criteria are crucial to success", *Professional Safety*: November 2004; pp.42–50.

25

Report on Mold and Moisture Inspection
Kansas City International Airport
Airport Traffic Control Tower

Purpose, background + inspection process
Photos included
June - August 2006

PURPOSE

This inspection was conducted as the preliminary step in developing the Independent Solution for OPS Requirement 0682MH572. This requirement addresses the need for mold remediation and restoration in the ATCT. This report addresses only the ATCT. There is a separate OPS Requirement (0682MK545) pending solution development that addresses mold remediation and restoration in the base building. OPS Requirement 0682MH573 is pending solution development and it addresses condensation issues in unconditioned spaces within the ATCT.

BACKGROUND

Visible mold growth was discovered on gypsum board walls in the 5th, 6th, and 7th floors of the ATCT in 2003. The initial analysis and inspection showed that the source of water contributing to the mold growth was water infiltration through building caulk joints. This water could be observed during or after periods of rain trickling in through the concrete walls where sections of precast and or cast in place concrete butted together. During this inspection, discolored gypsum board was found on the 10th floor and added to the scope of work. At this time, the SSC also indicated that some walls in Room G4 of the tower had become wet during fire sprinkler testing and maintenance and had visible mold growth. Personnel involved in fire life safety projects at the ATCT were consulted and indicated that no visible mold was seen in the elevator shaft during their inspection. Engineering designs were completed to address the water infiltration and mold remediation and restoration. The building joint sealant project included recaulking all of the joints on the exterior of the ATCT and the project was completed in the Fall of 2004. Mold remediation and restoration began immediately after completion of the caulking project. During the performance of the remediation work some smaller areas of additional mold were discovered on the 7th, 8th, and 11th floors and significant amounts of mold were discovered on the 10th floor once removal of the discolored gypsum board began. All areas of visible mold were addressed on the project and the work was completed in December 2004.

In January 2005, a large water puddle was found on the floor in the middle of room 10TS5. Since it had been there long enough for some of the water to evaporate, it was not possible to tell if it had originated from behind the north or west walls of the room. Prior to this occurrence, the building had been monitored by personnel in the environmental unit and no building leaks were found. The building was also inspected during heavier rains later in 2005 by personnel in the environmental unit and ACE-472 and no building leaks were found. Frosting or condensation on the interior face of the concrete walls of the tower was considered as a possible source of moisture. Personnel working on fire life safety upgrades at the tower had previously reported instances where there was moisture or frost on the interior face of the concrete walls and they were unable to install firestop caulk on these surfaces. In order to further investigate the condensation and frost potential, ACE-470 purchased GE Protimeters, Model 4100. This device records ambient temperature and humidity as well as two surface temperatures. The data can be downloaded and analyzed through the GE software that will calculate the dew point temperature.

Whenever the surface temperature is at or below the dew point, condensation will occur and frosting will occur when the temperature is at or below freezing. Data collection began for the winter months in October 2005. In December 2005, an access panel was added on the west side of the 10th floor to allow visual observations and monitoring of temperature and humidity in the concealed space behind the gypsum board walls. Water was found dripping off of the steel beam above the new opening and a puddle of water was found on the floor in room 10TS5. Shortly thereafter, further investigations were conducted to locate the source of the leak and much more water was found. Significant amounts of water were found running down the exterior face of the elevator shaft in room 10TS5 and the fireproofing on the metal decking above was wet. The conditions on the 11th floor were similar and water was found puddled in the 11th floor corridor adjacent to the elevator door. Large quantities of standing water were found on the concrete floor slab under the raised access floor in the subjunction level equipment room, SJ1. Visible mold was found on the gypsum board walls under the raised floor. The source of water was found to be a clogged floor drain under the raised floor where water is discharged from a humidifier serving the equipment room. It appears that the drain had been clogged for some time and backed up during periods when the humidifier was frequently being used. ESU personnel cleared the drain and set out fans to help dry the building materials that had become wet. This drain line and trap are uninsulated and are routed through unconditioned spaces on the 11th floor. It is possible that the trap or drain line could freeze during cold periods and cause the backup of water under the raised floor in the Subjunction level Equipment Room. This occurrence and the unresolved issues with condensation and unconditioned spaces within the tower lead to the development of the requirements identified above.

INSPECTION PROCESS

The inspection was performed by Ed Winkler, Civil Engineer, ACE-472 and Barbara Hebert, Certified Industrial Hygienist, ACE-471. Tom Orr, Mechanical Engineer, ACE-472 has also been involved in review and analysis of the mold and moisture issues and will be developing the independent solution for the problem of condensation in unconditioned spaces in the ATCT, OPS Requirement 0682MH573. The inspection was conducted between June and August 2006. Additional periodic inspections were conducted as necessary to monitor conditions in the ATCT.

It was known that the mold and moisture inspection needed to be very thorough to identify to the maximum extent possible any water sources that might contribute to mold growth within the facility as well as to fully address the quantity of affected building materials that must be addressed in the remediation and restoration project. Moisture is always a precursor to a mold problem. If the sources of water are not identified and corrected, mold growth will continue. Any remediation effort undertaken without first solving the cause of the moisture problem will be futile and costly. Lessons learned from the previous mold remediation project showed that the inspection process needed to be more thorough and invasive than a visual inspection of the surface of walls. The quantity of mold was typically more on the concealed layers of gypsum board in a fire rated wall assembly since they remained wet for longer periods of time then the visible surface layer. The majority of walls in the ATCT are fire rated partitions and consist of up to 4 layers of gypsum board.

Prior to beginning the on site inspection, a thorough review of the facility drawings (series 7893) was conducted to identify potential problem areas that might contribute to the moisture problems within the facility. This review looked at all potential problem areas such as roofs, walkways, storm drains, flashing details, window systems, building openings such as at louvers, floor drains, wall construction details, etc. A copy of the "Report on Exterior Building Envelope and HVAC Conditions, Detroit Metropolitan Wayne County Airport, Airport Traffic Control Tower (Prepared by the engineering firm DMJMH&N, dated April 24, 2005) was read and analyzed since that tower is of similar construction and has mold related problems. Any potential problem areas identified in the report that were not considered in the facility drawing review were noted as items requiring inspection. The facility drawing review and that of the DTW ATCT report lead to the creation of a checklist that was used during the inspection to track all items requiring observation during the physical walk through of the tower from top to bottom.

Past experience proved that the inspection would need to be more thorough than that performed originally in 2004. As a result, the inspection included pulling back vinyl cove base on gypsum board walls at any area that could have been wet at some time. This included locations such as walls that Tee into exterior walls, walls adjacent to floor drains, near any pipes showing signs of leaks, or at any location that showed signs of water stains or prior leaks from any source. Checking behind the cove base is typically a good location to identify problems since any water leaks will accumulate at the floor level and the wall will likely remain wet for longer periods of time and allow mold growth to occur on the paper surfaces of the gypsum board. Core samples of gypsum board were taken at suspect areas to detect visible mold on concealed layers of gypsum board and utilized to help define the remediation limits. Bulk samples and tape samples were taken and sent to an outside lab at all locations of suspect mold growth where it was not visually obvious that mold was present. Photographs documenting problems found are included in appendix 1. The location and approximate quantity of all mold found through the visual inspection or lab analysis were documented. The lab results are included in appendix 2 and the quantities of materials requiring mold remediation are included in appendix 3. Additional work required is identified in appendix 4. This includes any items to correct potential moisture or water related problems, work to minimize or prevent the future recurrence of mold growth, testing (and repair if necessary) and reinsulation of drain lines with water stained insulation, adding access panels to allow visual inspection of concealed locations, etc. Appendix 5 identifies additional inspections, testing, and engineering analysis that must be completed to fully address mold and moisture related problems or issues.

It should be noted that some mold might be present in the facility that hasn't been detected. The majority of the mold growth is on gypsum board concealed behind the visible layer. Some of the mold is located in areas of the tower that have no access for inspection. Core samples of walls were approximately 2" in diameter and taken at locations that showed signs of being wet at some time so it is possible that some areas may have been missed where there were no visible signs of water damage. Larger access holes were cut through walls to expose concealed areas where it seemed likely that water leaks could occur or may have occurred in the past. The quantities of materials requiring remediation were based on good engineering judgment and the intent is to error somewhat on the high side without needlessly driving up the project cost. When the contaminated materials are removed during remediation, it will be possible to view the concealed layers of gypsum board during the inspection process and verify the completeness of the

remediation at these locations. If additional work is found to be required, the contract will need to be modified to address it. The size, complexity of the construction, and the inability to view or access all areas of the tower make it extremely difficult to track the origin and path of all sources of water within the facility. Water sources include building envelope leaks (roofs, drains, walls, openings, etc.), condensation, pipe leaks, problems with drains, etc. Assumptions and best judgment are often required to analyze and assess the existing building structure and its moisture related problems.

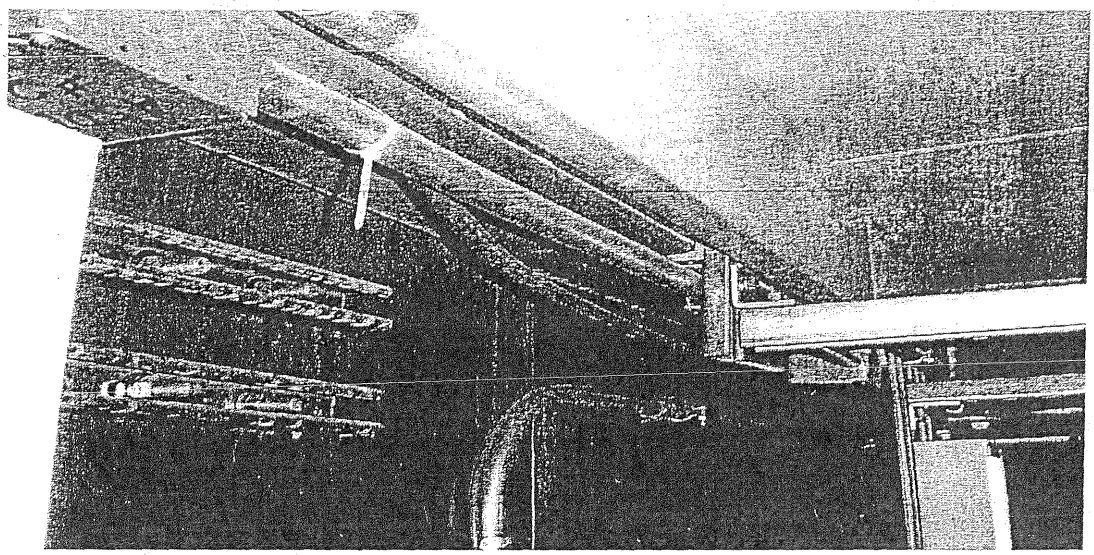


Photo 1: ASDE Penthouse, North Wall at Roof Beam.
There is no insulation on the bottom and backside of the beam or the ¼" steel roof deck adjacent to the insulated panel wall. The gap between the beam and the wall allows warm air to contact the cold steel surfaces. The uninsulated steel is the likely point where condensation is occurring as shown by the heavy white residue visible on the wall near the bottom of the beam in the ASDE Penthouse.

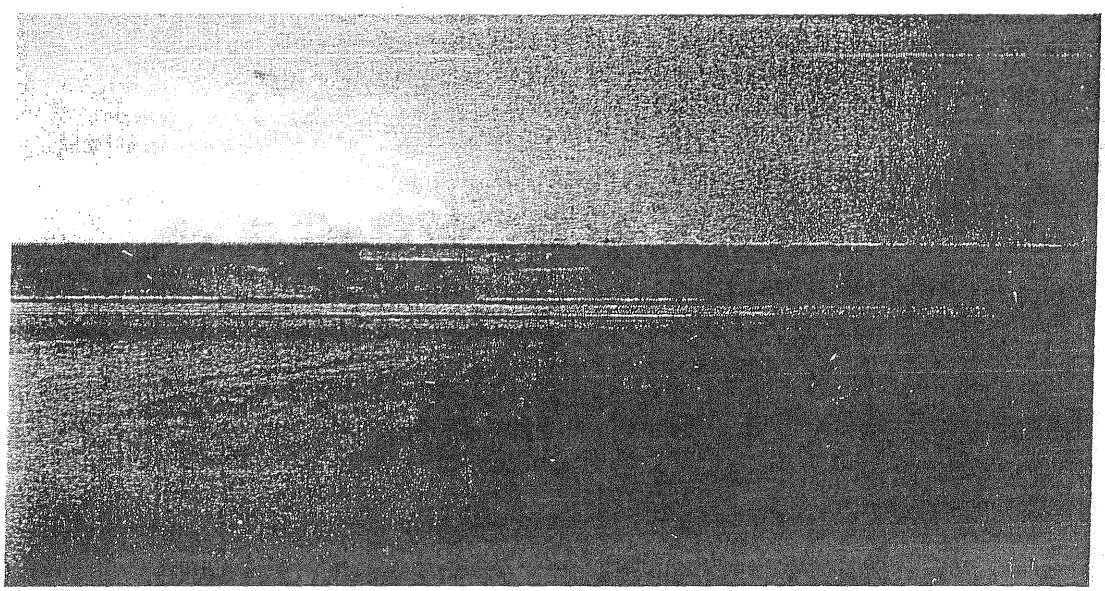


Photo 2: ASDE Penthouse, South Wall Between Beam and IMP.
This view is looking up at the ¼" uninsulated steel roof deck between the insulated metal panel and steel beam. Rust, water stains, and white residue are visible on all surfaces from condensation and frosting.

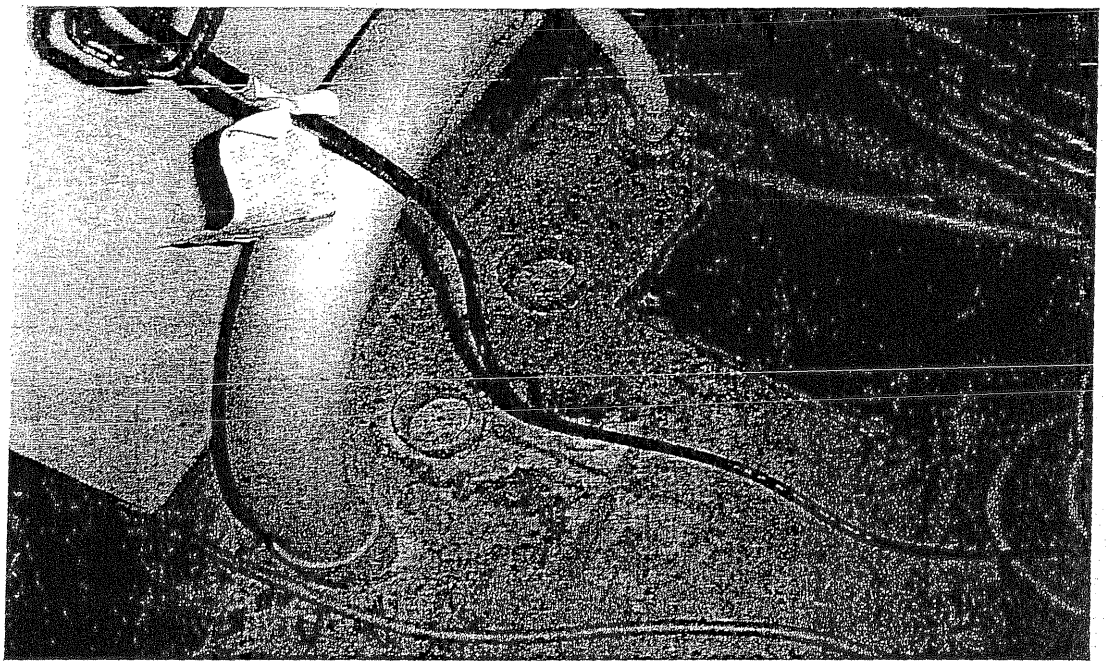


Photo 3: ASDE Penthouse, East Wall, South of Door.
The white residue shown on the floor of the ASDE Penthouse appears to be caused by condensation on the insulated metal panel and uninsulated steel beam and sections of roof deck.

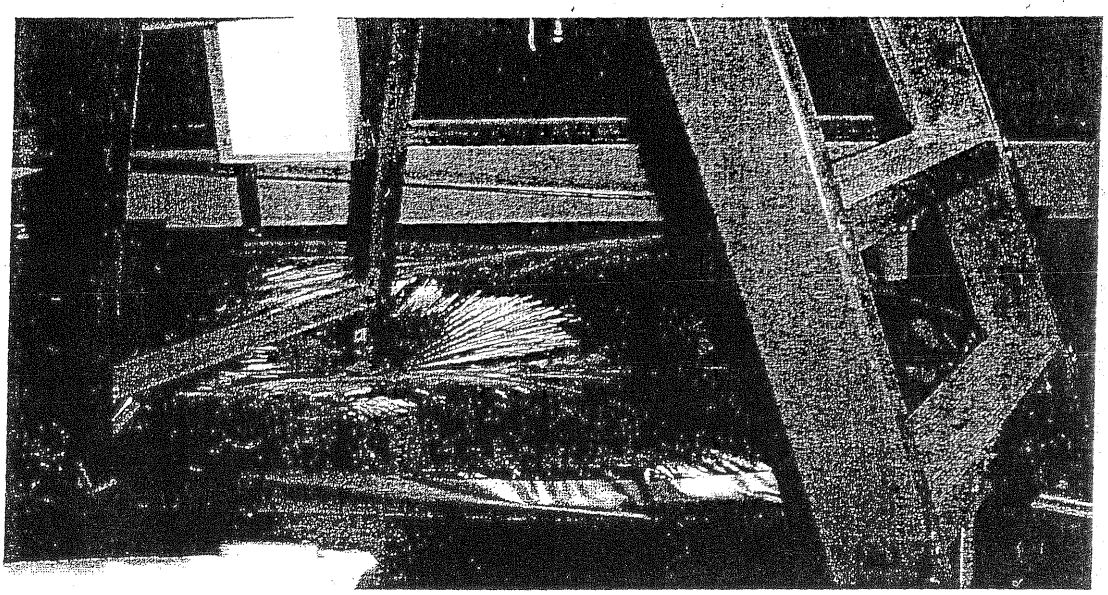


Photo 4: ASDE Penthouse, Floor Hatch.
The plastic covering the steel equipment floor hatch shows air infiltration from the Cab. In the winter months, this likely provides a source of warm humid air, which increases the potential for condensation on cold surfaces in the Penthouse.

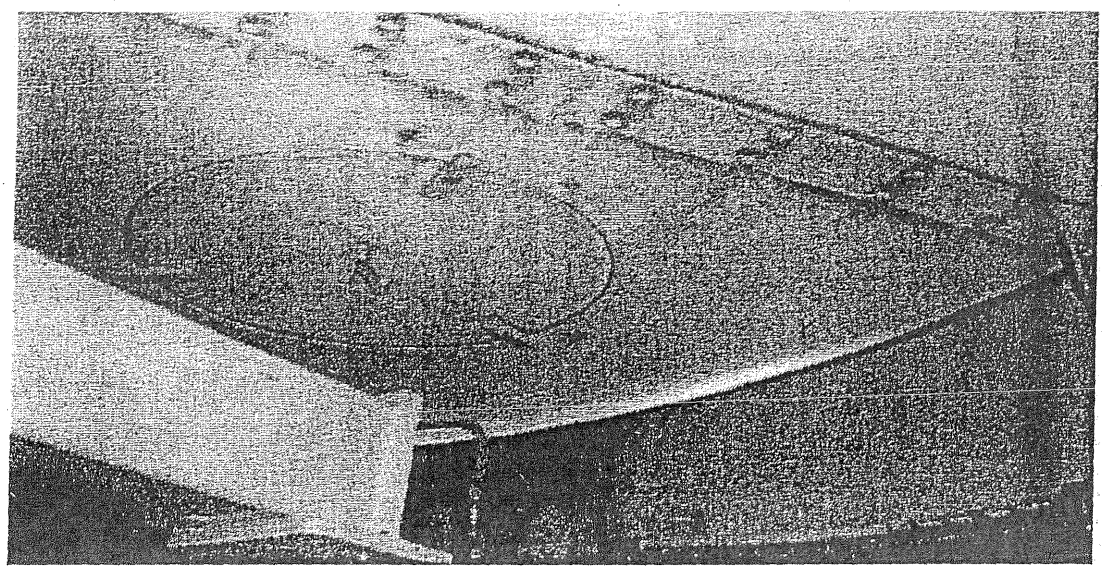


Photo 5: ASDE Penthouse, Antenna Opening.
The antenna opening is shown in the ceiling of the room. Rust and water stains are visible on the surrounding walls from condensation or frosting.

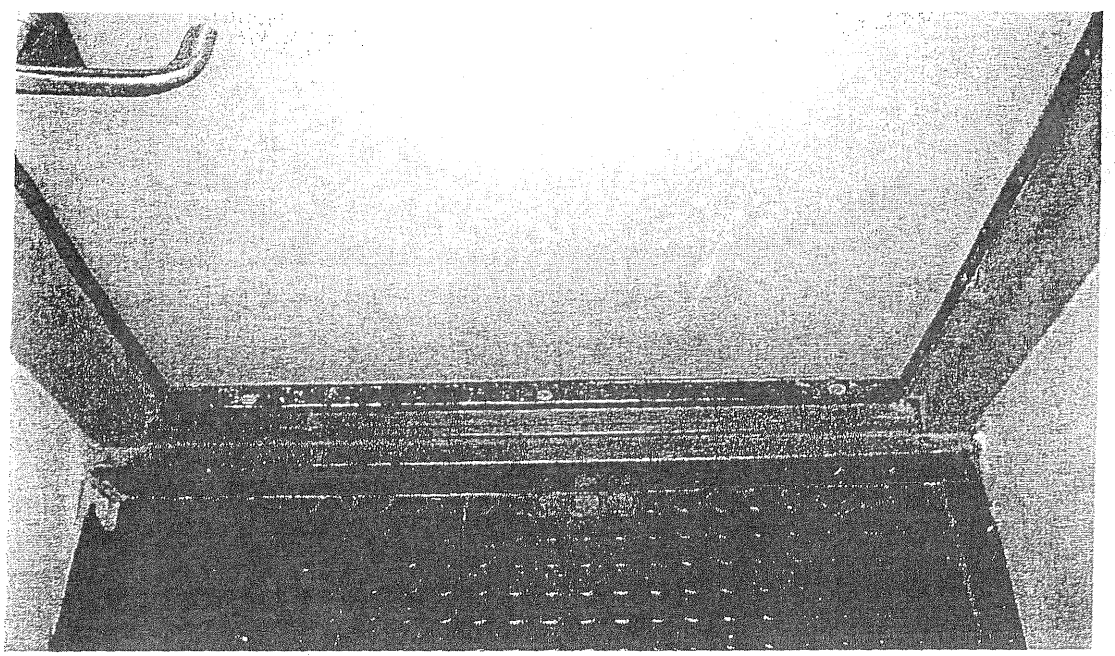


Photo 6: Cab Level, Interior of Door to Outside Walkway.
A gap in the doorframe weather-stripping and flashing that improperly slopes towards the door, have allowed water to enter the stairway near the door. The water has wicked up adjacent gypsum board causing it to deteriorate and has also resulted in mold growth behind the vinyl base.

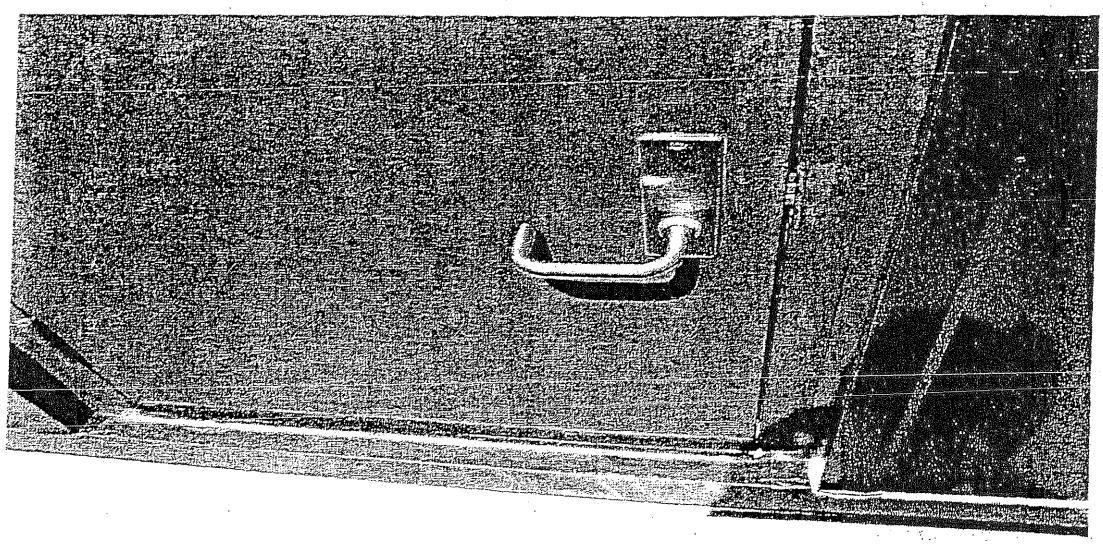


Photo 7: Cab Level, Exterior of Door by Outside Walkway.
An excessive gap is shown on the latch side of the door that allows water to enter the building. The metal flashing also has a slight slope towards the door and threshold instead of towards the exterior.

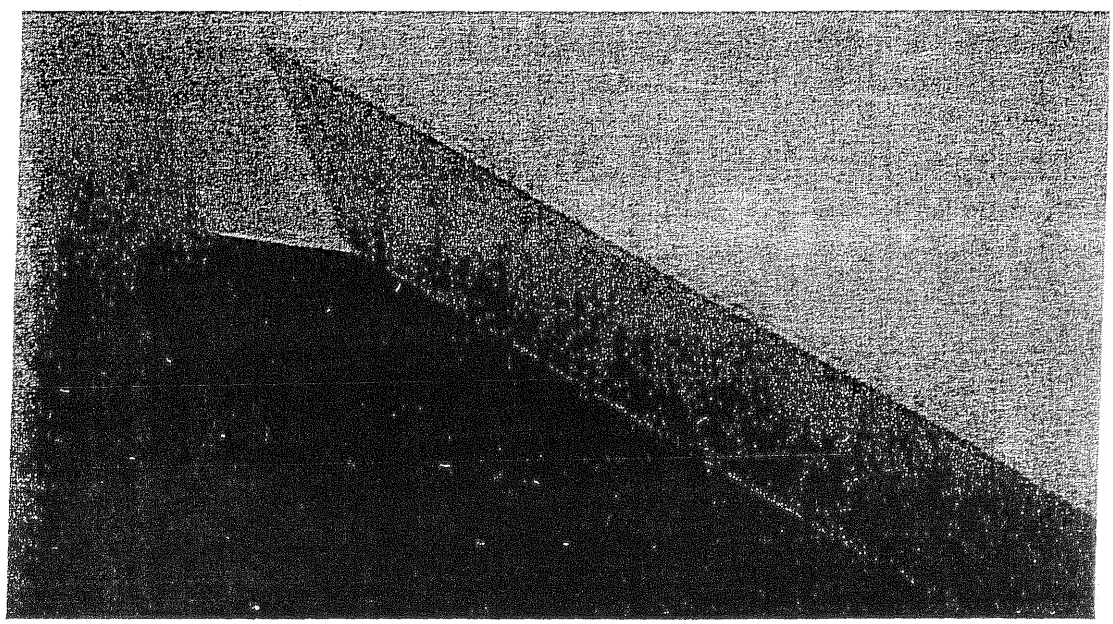


Photo 8: Below Cab Level, West Side of West Stair Wall.
Alternaria (31 counts/cm^2), *Ascospores* (46 counts/cm^2), *Pithomyces* (15 counts/cm^2), and *Smuts* (15 counts/cm^2) were detected on the west side and middle of the west stair wall. A small-scale test showed that removing the dust and cleaning the underlying surface with a detergent was not completely effective in removing the mold, therefore, more stringent biocide cleaning measures will be needed.

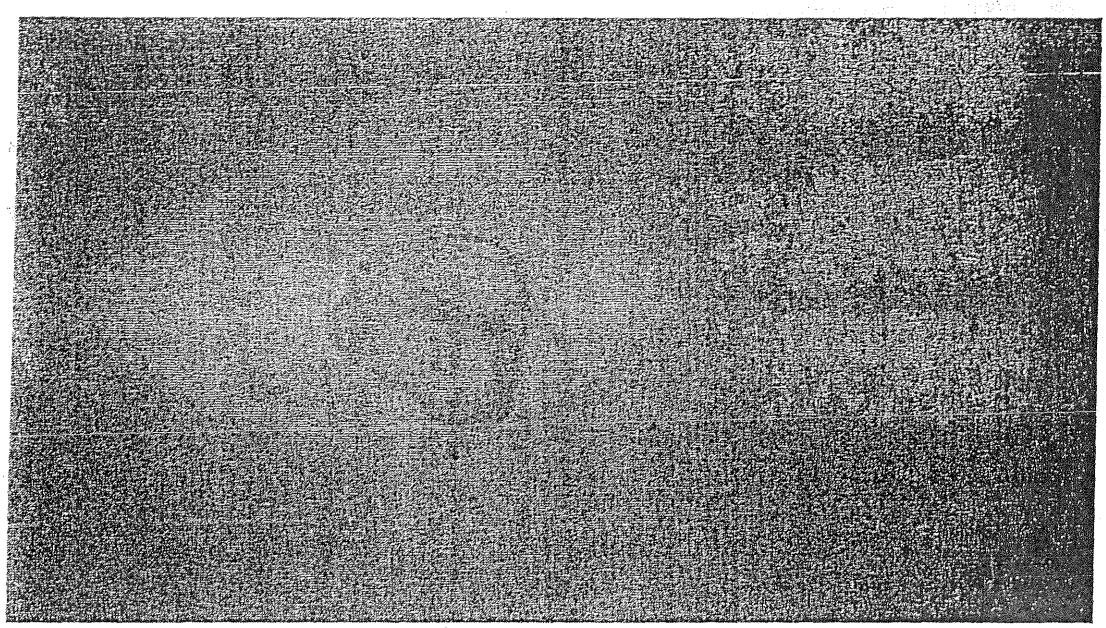


Photo 9: Cab Level Stairs, Water Stain on Sloped Ceiling.
Water stains are shown on the sloped ceiling under the Cab Level sink due to past water line or drain line leaks. Cleaning out a clogged drain line appears to be a major source of the water damage.

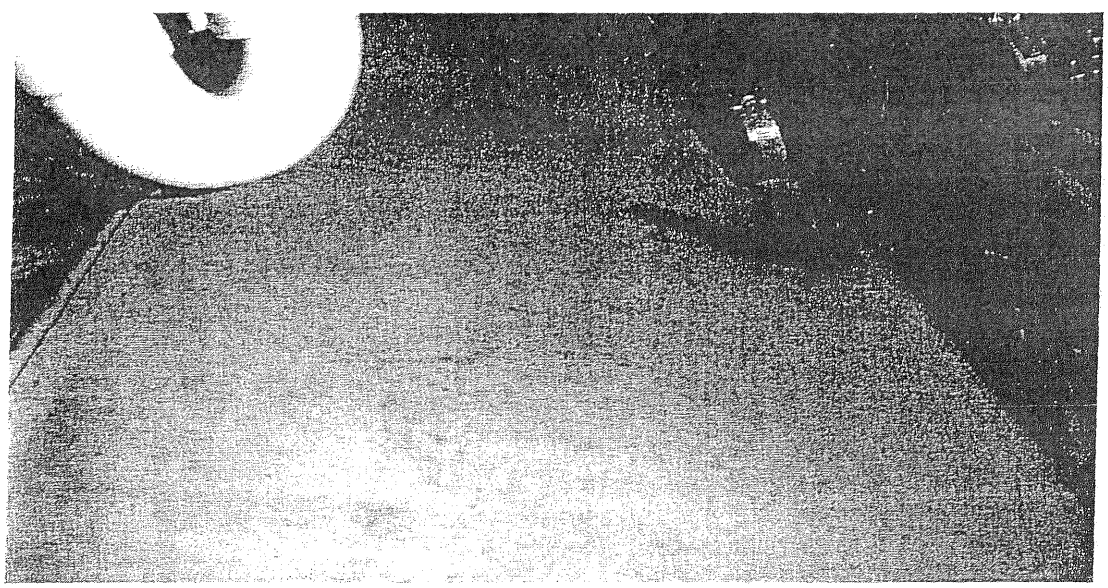


Photo 10: Cab Level, Back Side of Gypsum Board under Sink.
Mold is visible on the gypsum board under the sink due to past drain line leaks and possibly past water line leaks. Removal of the cap to clean out a clogged drain line also appears to have been the major source for water leaks/stains here and below in the Cab stairs.

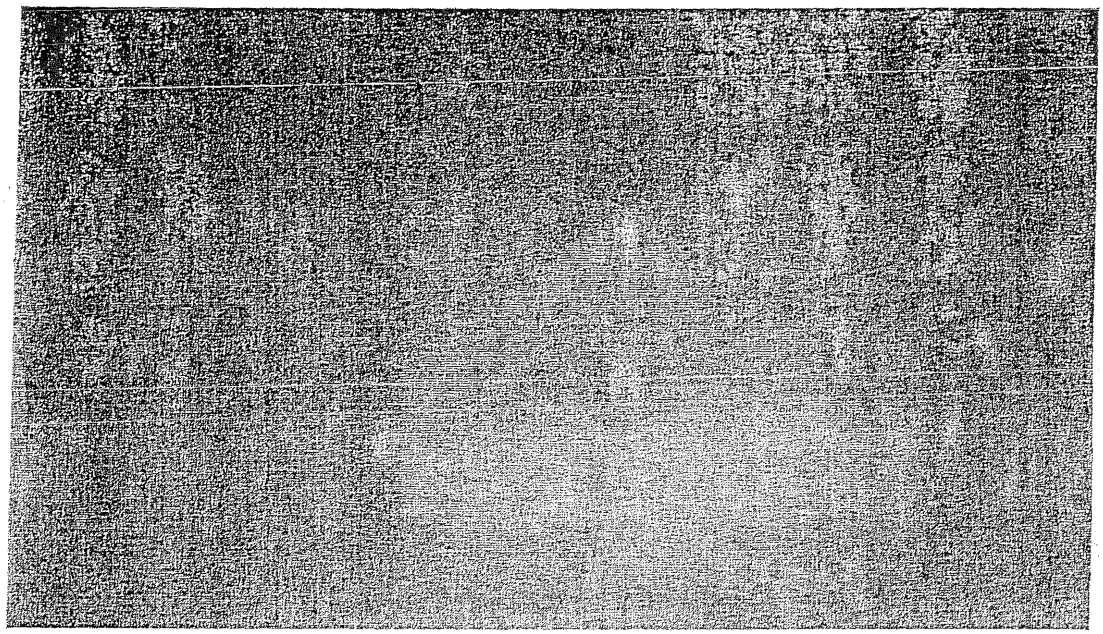


Photo 11: CA2 Landing, South Wall, Bottom of Soffit.
The water stain shown was likely caused by drain line leaks from the sink in the Cab Level.

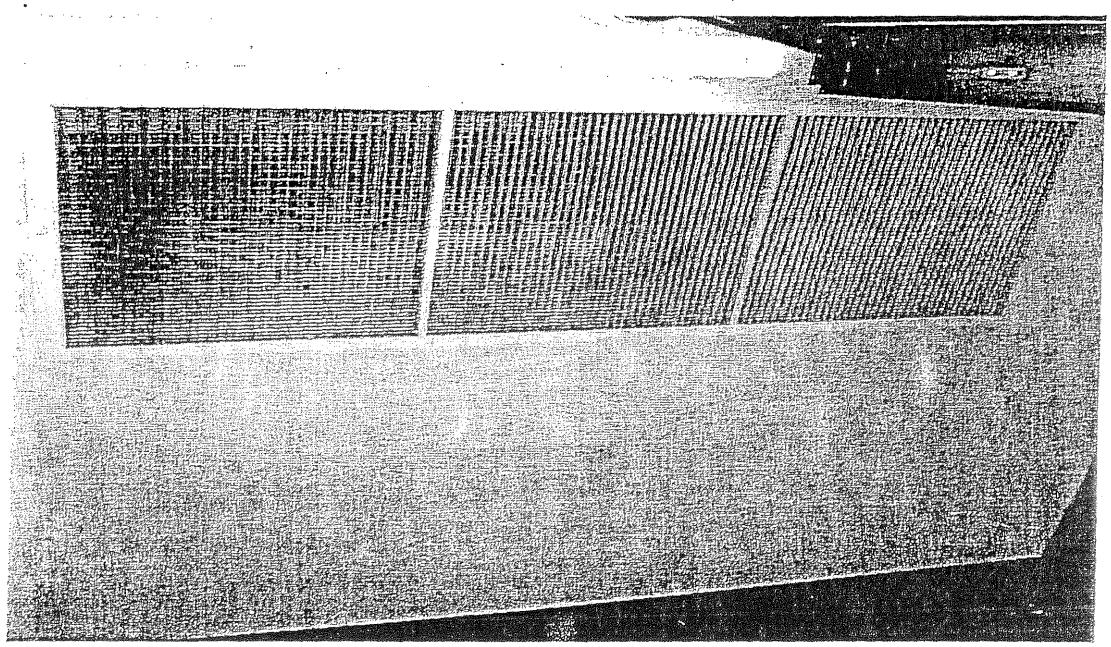


Photo 12: Below Cable Access Level, Return Air Grill.
Debris from this return air grill has contaminated adjacent walls as shown in Photo 8. Dust provides a food source, which sustains the growth of mold.

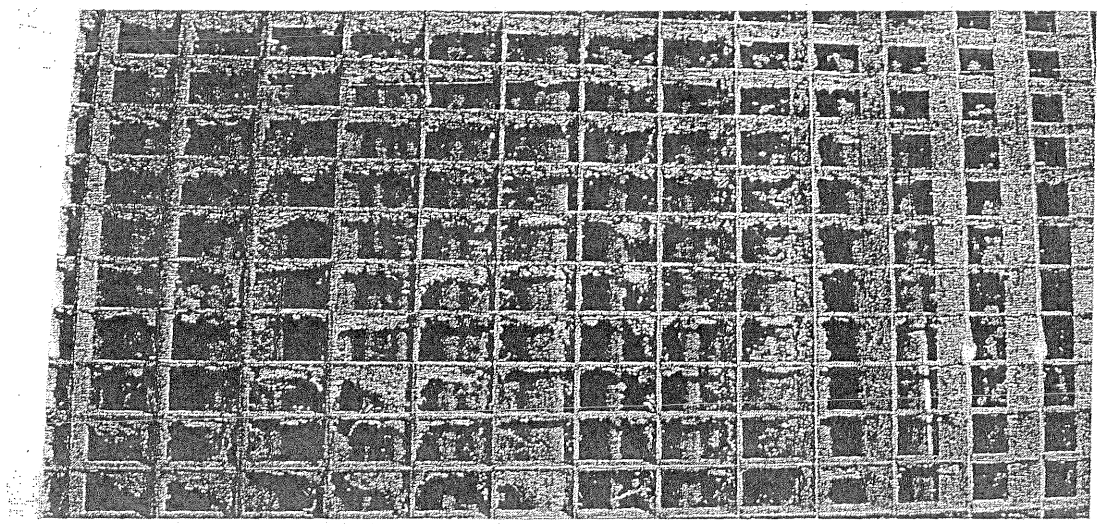


Photo 13: Below Cable Access Level, Dirty Return Air Grill.
A close up of the return air grill from Photo 12 above shows a thick lading of dust, indicating the need for an increased frequency of housekeeping measures.

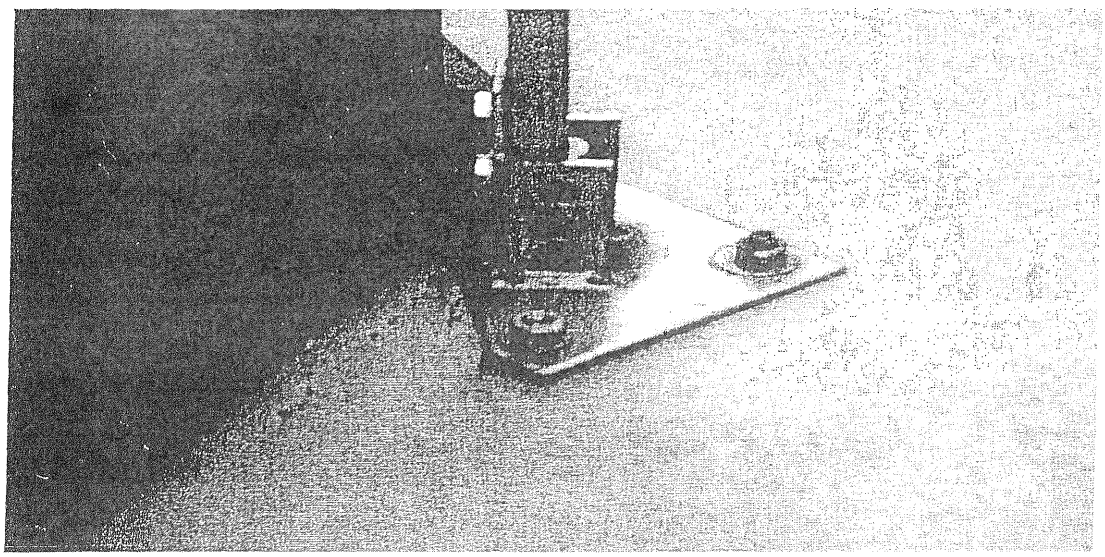


Photo 14: Cab Level Walkway, Penetrations in Floor.
The roof system on the walkway consists of a waterproof membrane on top of the structural concrete deck. The membrane is covered with a concrete topping slab that is coated with a waterproof deck coating. The membrane is installed utilizing typical roofing details and is the primary waterproofing component. The membrane terminates at the drains and is clamped in place at the drain bodies as shown above. In this type of system, the drain bodies have seepage holes to allow any water that gets through the waterproof deck coating and concrete topping slab, to follow the membrane and drain from the roof through the seepage holes into the storm drain piping. If the membrane is not fully compressed under the clamping collar into the drain body, a leak can occur.

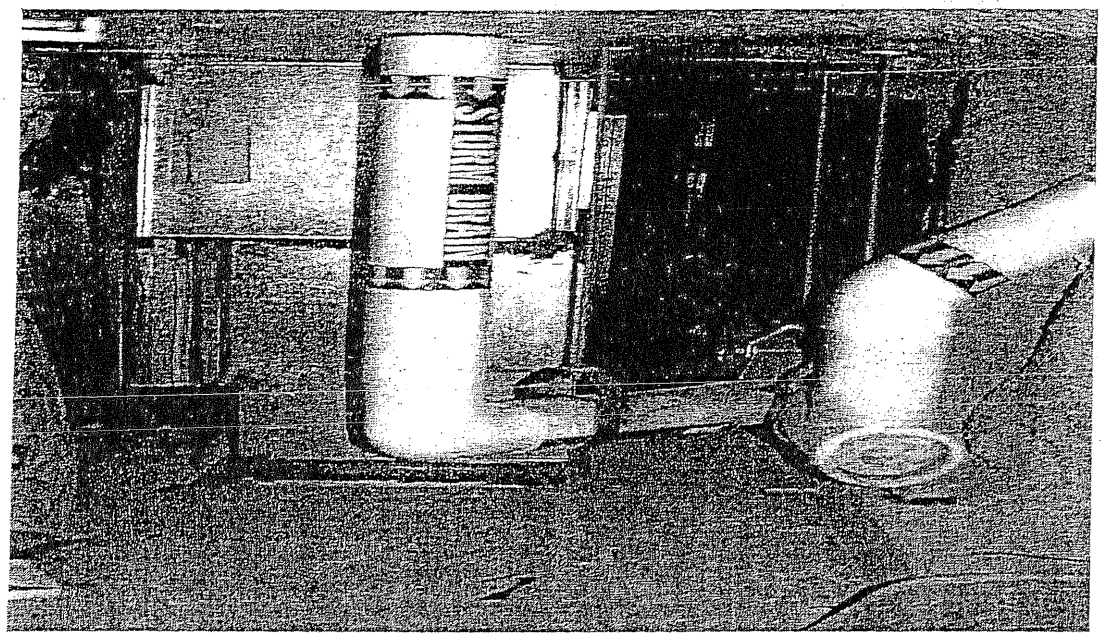


Photo 15: Cable Access Room (CA1).
One of the storm drain pipes in Room CA1, directly beneath the drain body, had water stained insulation as shown above. The stained insulation could be caused by a leak getting under the membrane and following the structural concrete slab to the opening around the drain body, a leak at the connection between the drain body and drain pipe, or possibly from condensation due to a damaged vapor barrier jacket on the insulation.

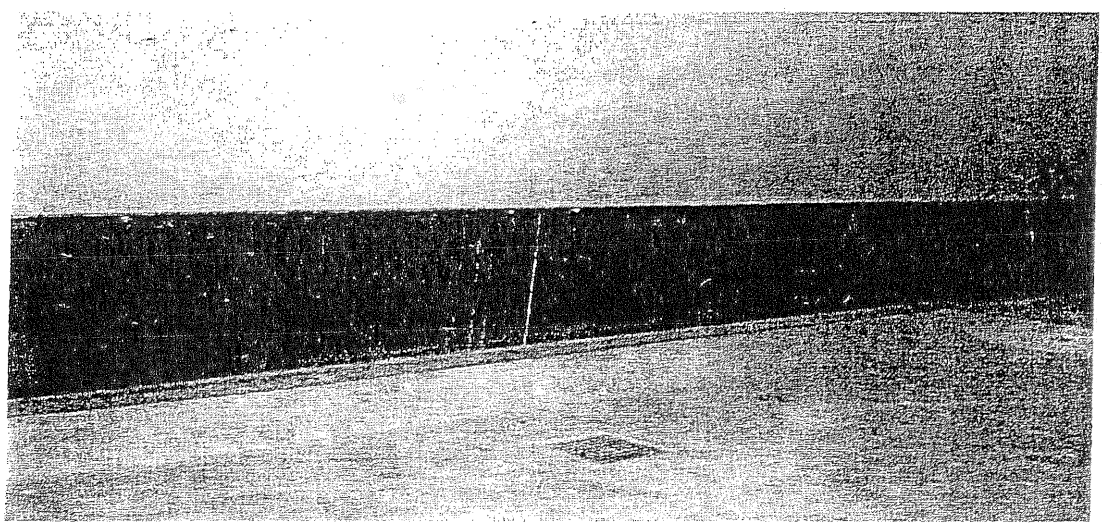


Photo 16: Cable Access Level, Northeast Wall.
Water stains are shown on the metal panel on the northeast wall, similar to that found on the IMP walls in the ASDE Penthouse. The potential sources of this water are condensation or building leaks.

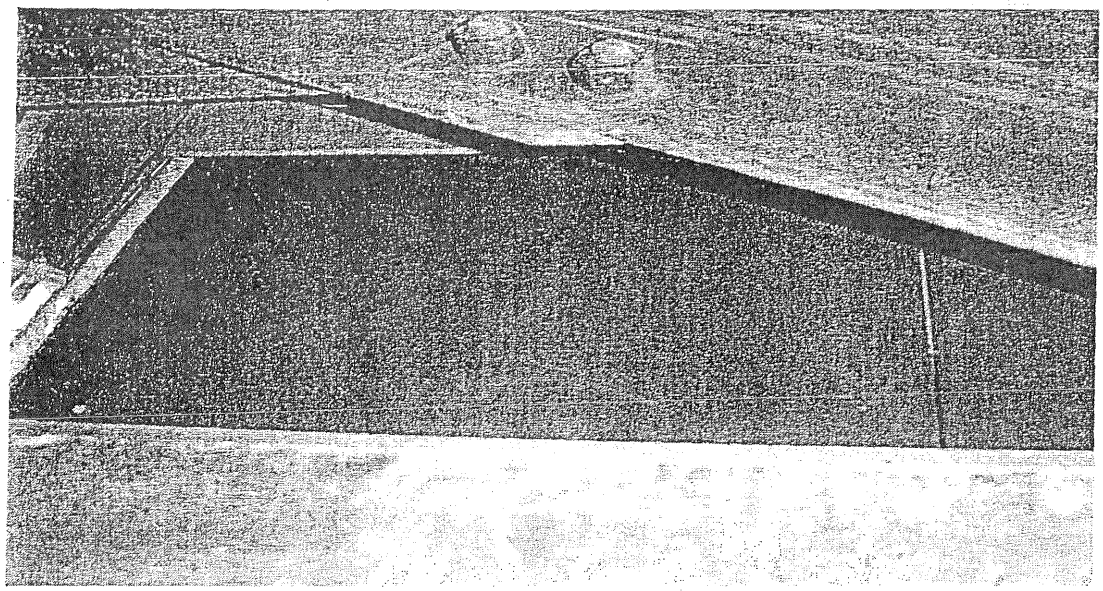


Photo 17: Cable Access Level, Outer Portion, Northeast Wall, Interior Face of IMP Siding.

Water stains are shown on the metal panel, similar to that found on the IMP walls in the ASDE Penthouse. The potential sources of this water are condensation or building leaks.

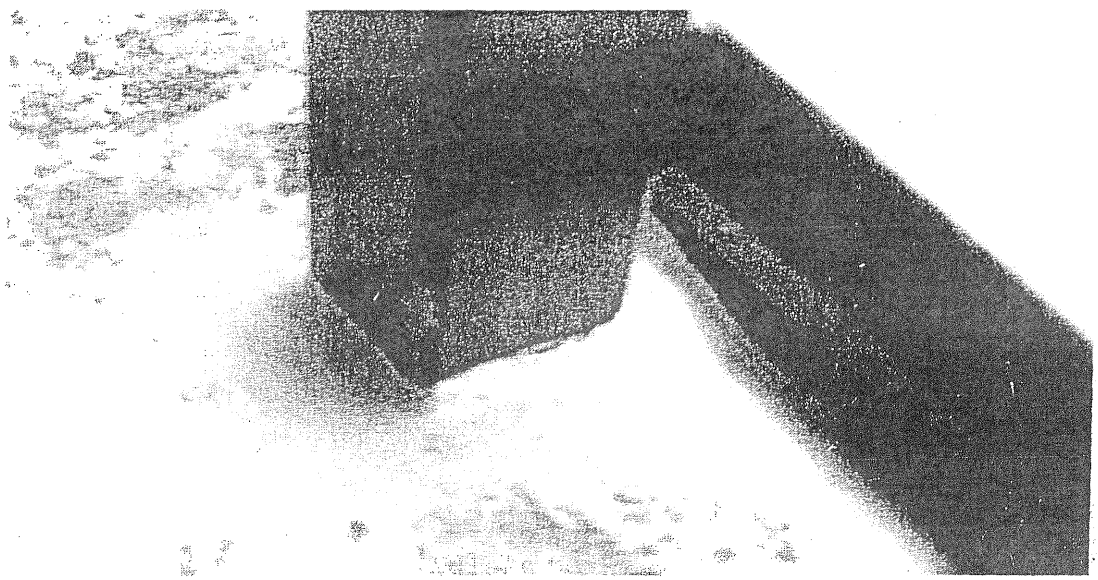


Photo 18: Junction Level, Bottom of Handrail Post.

The waterproofing on the Junction Level walkway is identical to the roofing system on the Cab Level walkway. There is some delamination of the waterproof coating on top of the concrete topping layer and some peeling at the handrail posts as shown above. No membrane flashing is evident around the handrail post and there appears to be a pliable caulk-like material under the waterproof coating around the post. This could be a source of leaks.

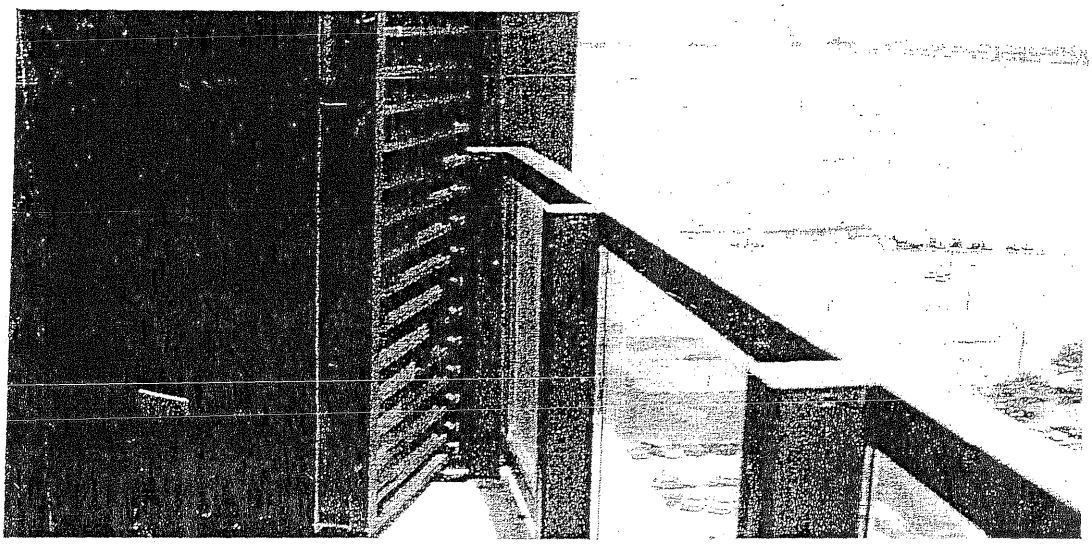


Photo 19: Junction Level, Holes in Hand Rail Post.
Each of the railing posts on the walkways has a hole in the side near the top that could allow rather small quantities of water into the tube and down into the building as shown above. The holes appear to be vent holes from when the posts were hot dip galvanized during fabrication. The holes may allow water to enter the building behind the walls of the SubJunction Level.

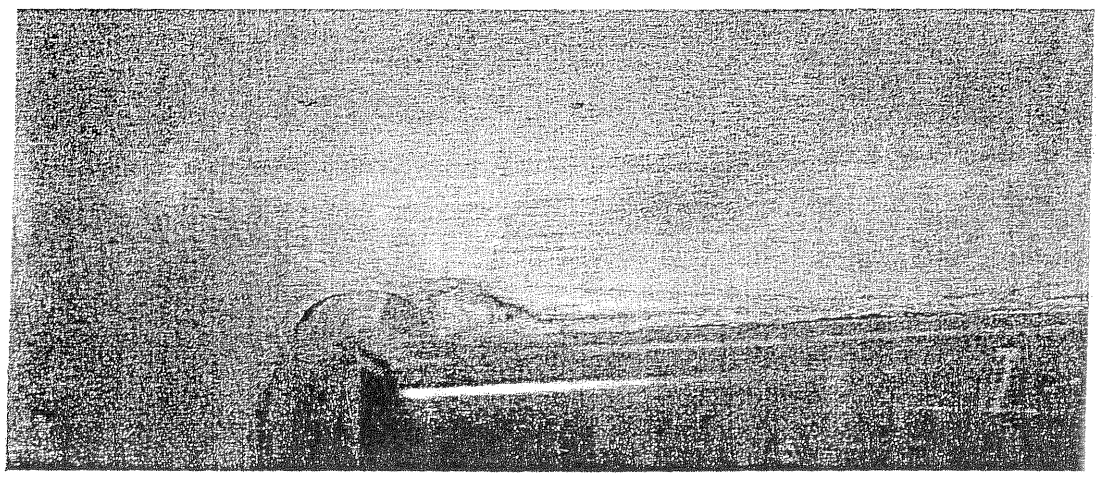


Photo 20: Junction Level, Mold-Containing Dust on Wall of Elevator Door.
Alternaria (31 counts/cm^2), *Ascospores* (15 counts/cm^2), *Aspergillus* (662 counts/cm^2), *Basidiospores* (31 counts/cm^2), *Cladosporium* (92 counts/cm^2), *Epicoccum* (15 counts/cm^2), *Pithomyces* (15 counts/cm^2), and *Smuts* (31 counts/cm^2) were detected above the elevator door. Biocide cleaning measures will be required in the area represented by this sample location. Potted plants are a known contributor of *Aspergillus* spores to the overall ambient concentration. The plants located in this area may be partially responsible for the elevated count reported.

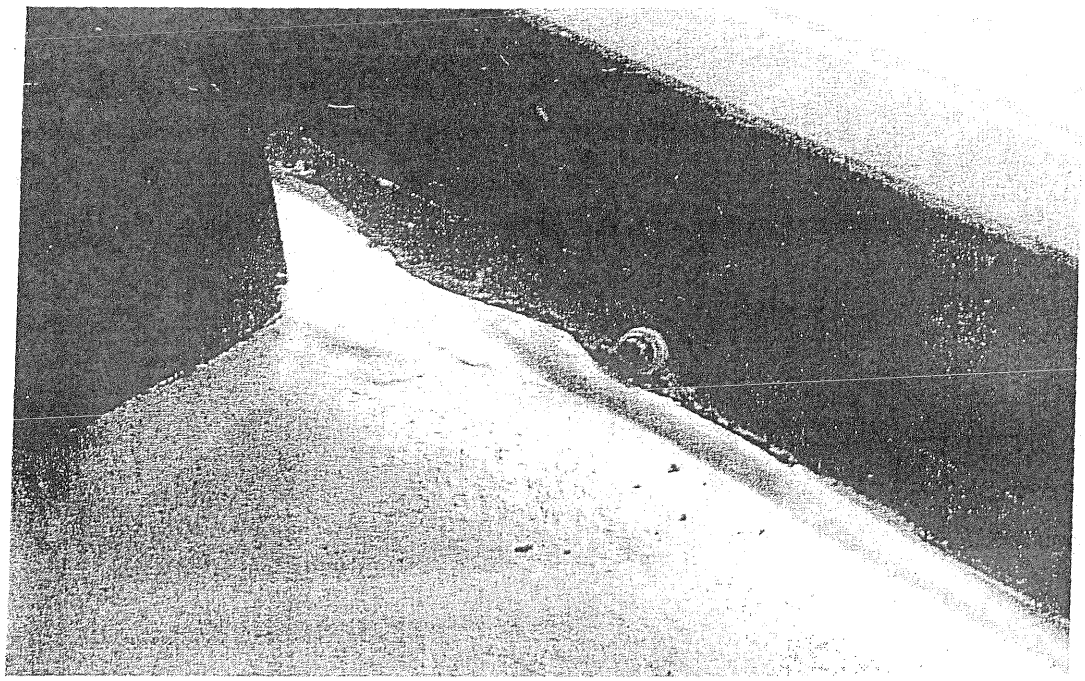


Photo 21: Junction Level, Northwest Corner of Walkway.
A rusty flashing is shown in the northwest corner of the walkway, indicating improper drainage of water in the area.

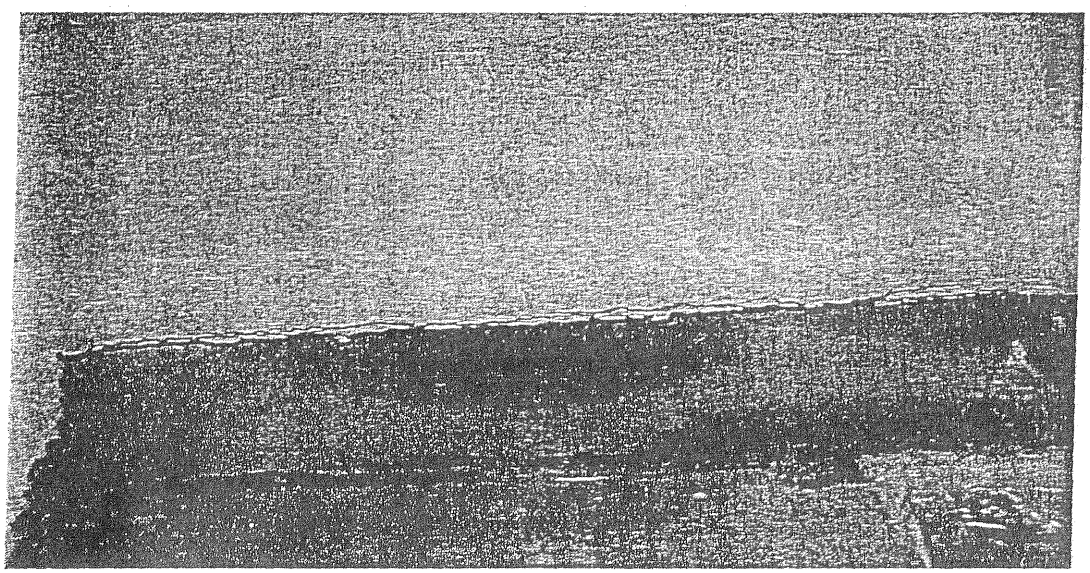


Photo 22: Junction Level, Water Stain on North Walkway.
A water stain is shown on the north walkway, indicating improper drainage of water in the area.

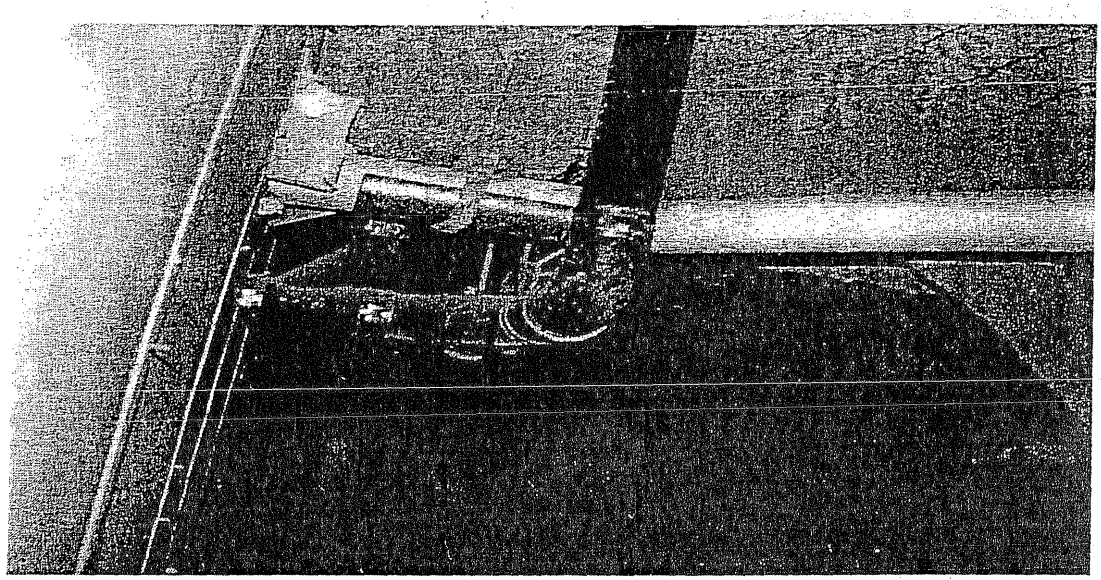


Photo 23: Sub Junction Level, Concealed Space between East 2-hour Shaft Wall of Room SJ1, looking North.

This area was evaluated in order to verify the storm drains were not leaking as well as determine the presence of mold.

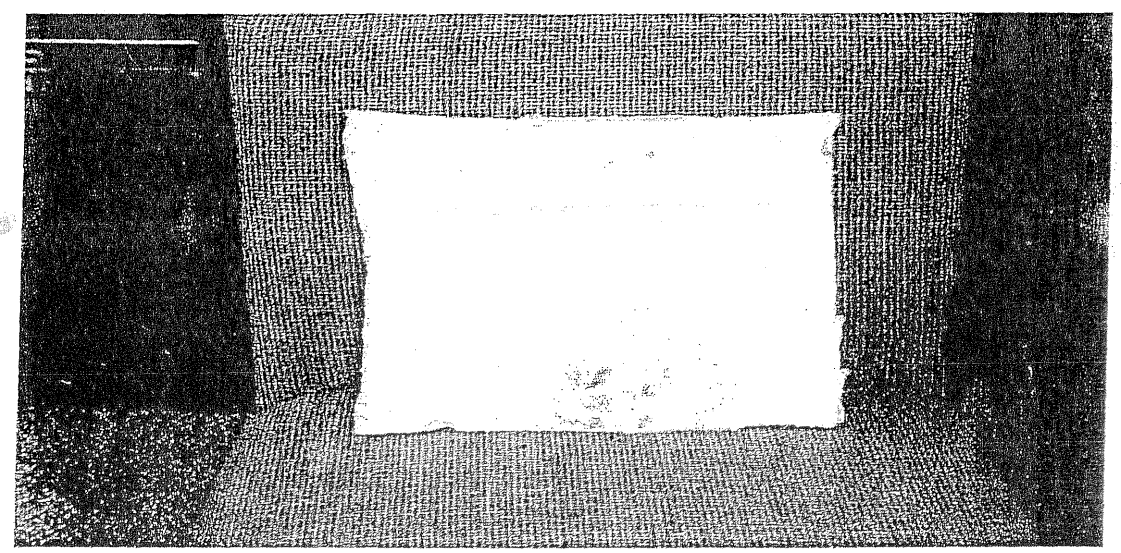


Photo 24: Sub Junction Level, Mold on Room SJ1 side of 1" GWB cut from the West Wall, South end.

Four openings approximately 12" square were cut through the perimeter 2-hour rated shaft wall above the suspended ceiling on the east, north, and west walls to inspect the concealed spaces located underneath the Junction Level walkways and between the sloped architectural precast concrete panels and the perimeter gypsum board walls. A mold-contaminated section of the shaft liner shown above was cut from the west wall, south end.

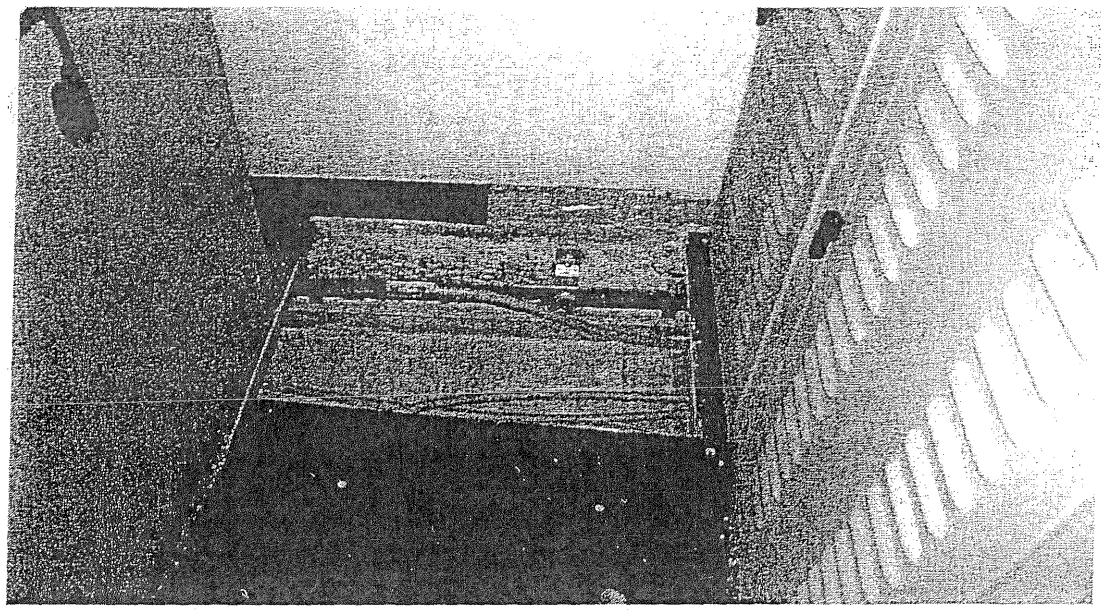


Photo 25: Sub Junction Level, Room SJ1, West Wall.
Inspection of the gypsum board walls below the raised access floor in the Equipment Room SJ1 revealed heavy concentrations of black mold as shown above. It can be attributed to the water from the humidifier and plugged floor drain in the southwest corner of this room.

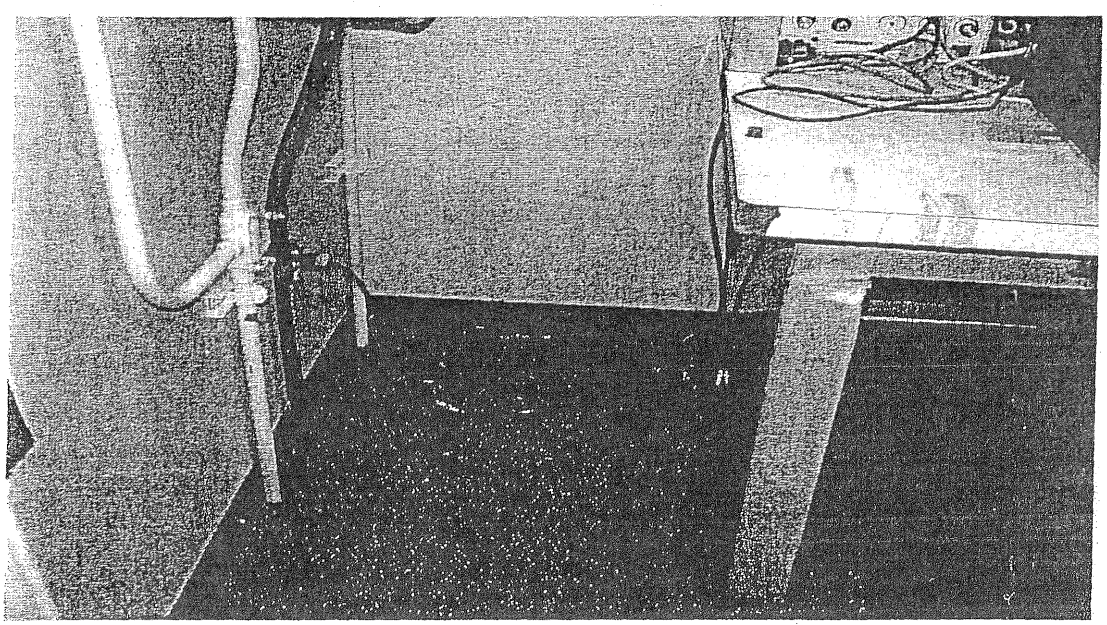


Photo 26: Sub Junction Level, Room SJ1, Southwest Corner.
Areas of yellow discoloration in the painted finish as shown above and visible mold were found up to thee feet above the raised access floor.

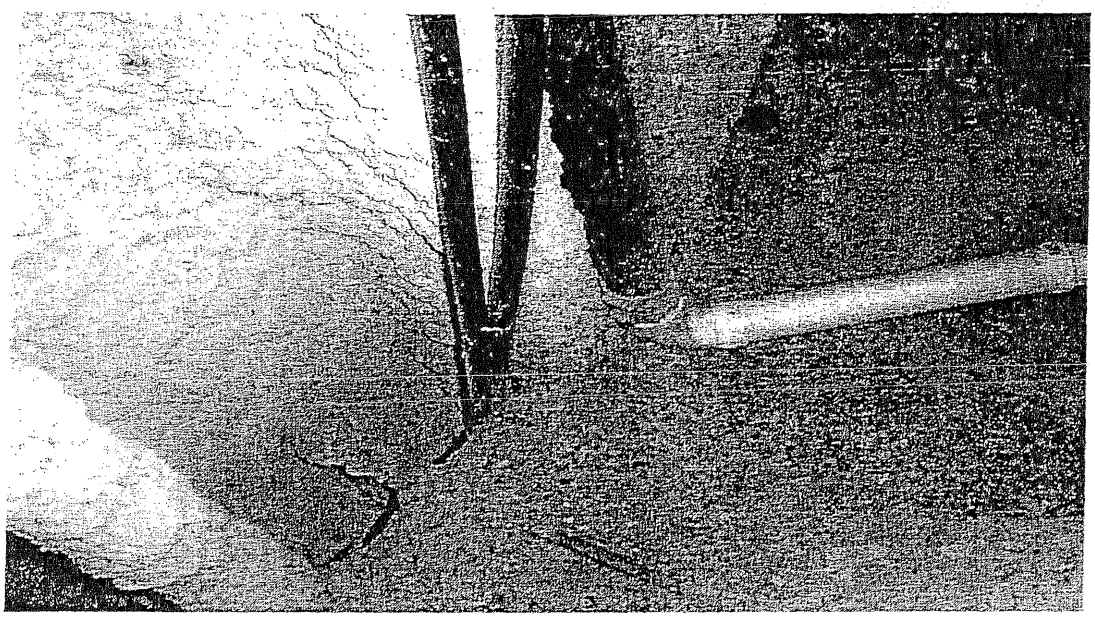


Photo 27: Sub Junction Level, Room SJ6.
Air shaft SJ6 has an area floor drain pipe, serving the concrete slab adjacent to the microwave fabric on the Junction Level, which discharges over the top of each floor drain as shown above.

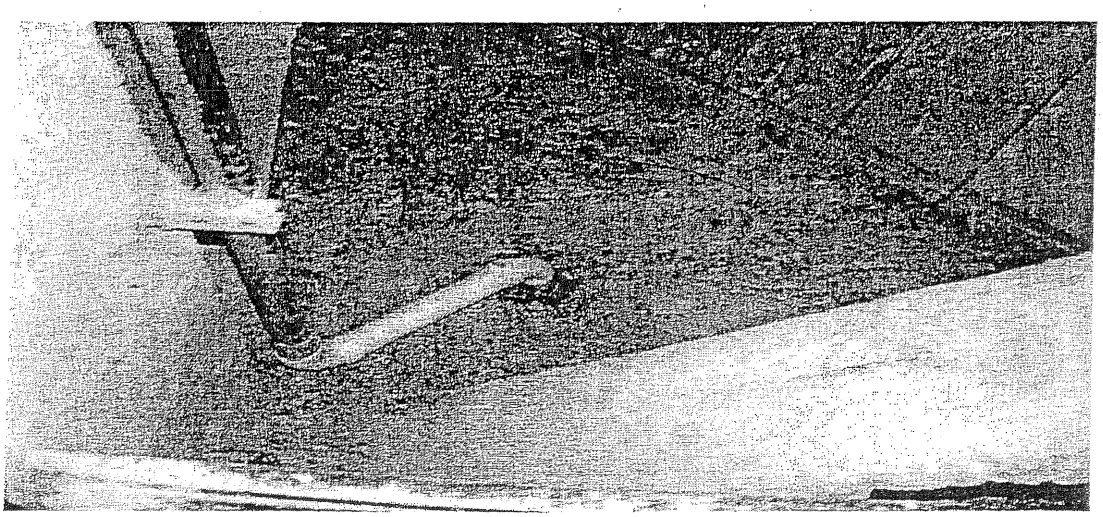


Photo 28: Sub Junction Level, Room SJ8.
Air shaft SJ8 is the outside air intake for the air-handling unit in the SubJunction Level Mechanical Room. The fireproofing debris present may block the drain line. Pigeon staining and droppings were also observed in the bottom of the shaft. The mold *Aspergillis* grows in damp bird debris, as well as possibly harboring other infectious agents such as *Chlamydophilia psittaci*, *Cryptococcus neoformans*, and *Histoplama capsulatum*. No pathogenic compounds were detected from the sample collected from this location.

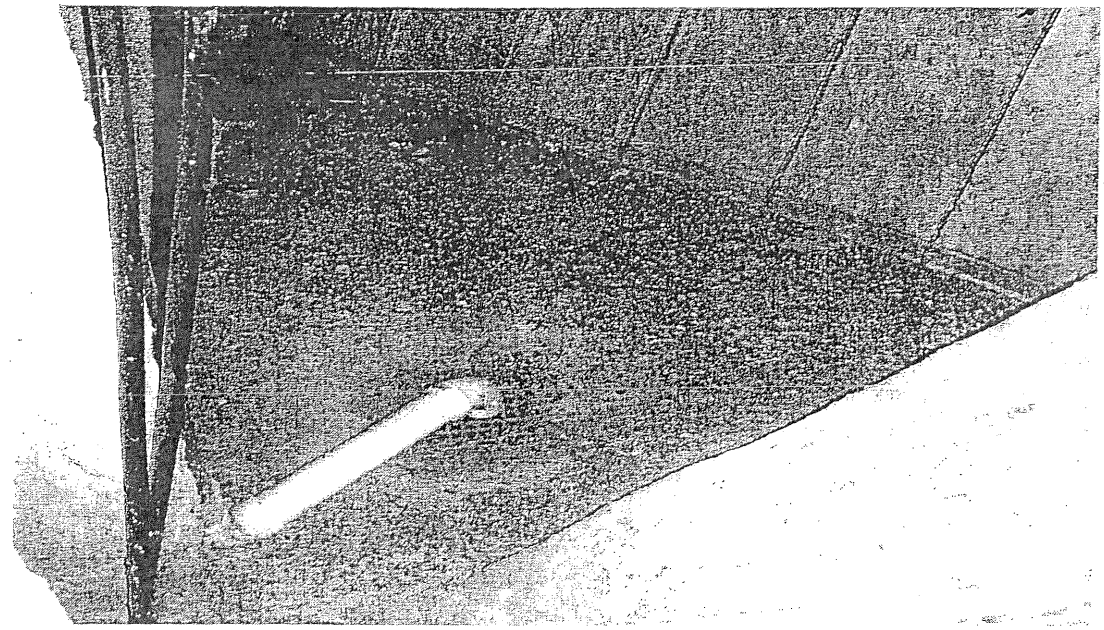


Photo 29: Sub Junction Level, Room SJ6.
Fireproofing debris and pigeon staining and droppings were observed in the bottom of air shaft SJ6. No pathogenic compounds were detected from the sample collected from this location.

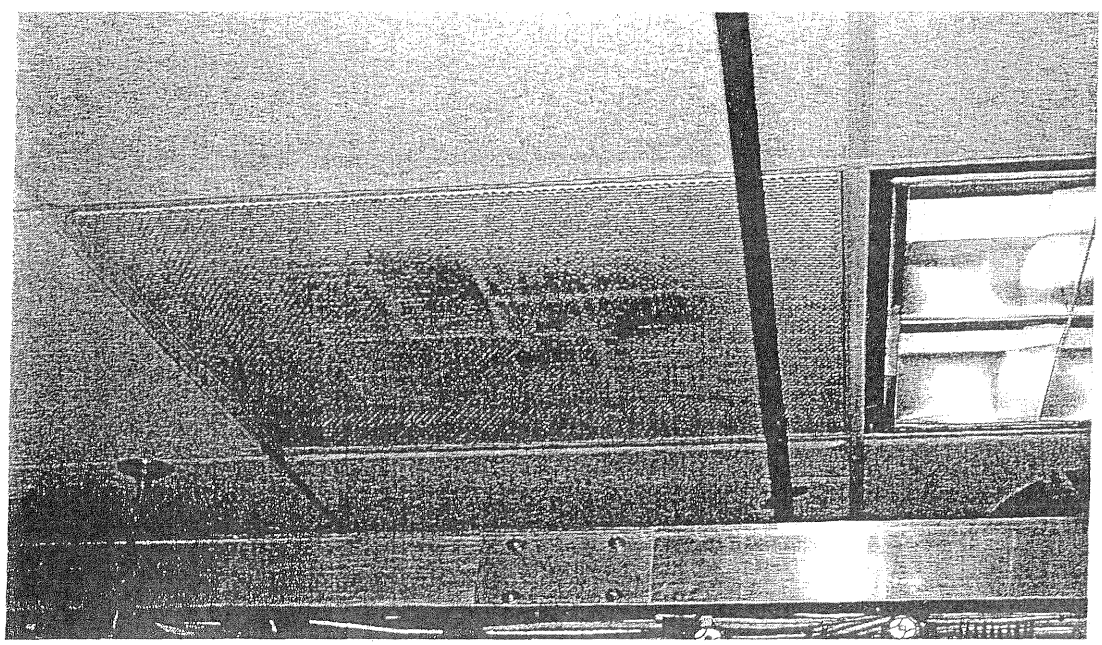


Photo 30: Sub Junction Level, Room SJ1, Dirty Diffuser.
A dirty diffuser is shown in Room SJ1. Diffusers and grilles must be cleaned as the dust provides a food source for mold.

Photo 31: Debris found in 11th Floor Outer Ring.
A large quantity of scrap gypsum board was found in the void between the edge of the floor slab, precast exterior walls, and perimeter fire rated gypsum board walls as shown above.

Photo 32: Construction Debris found in 11th Floor Outer Ring, Back of the West wall of 11TS5.
This debris was found in the same location as the material shown in Photo 31. Much of this material appears to be left from the building's initial construction.

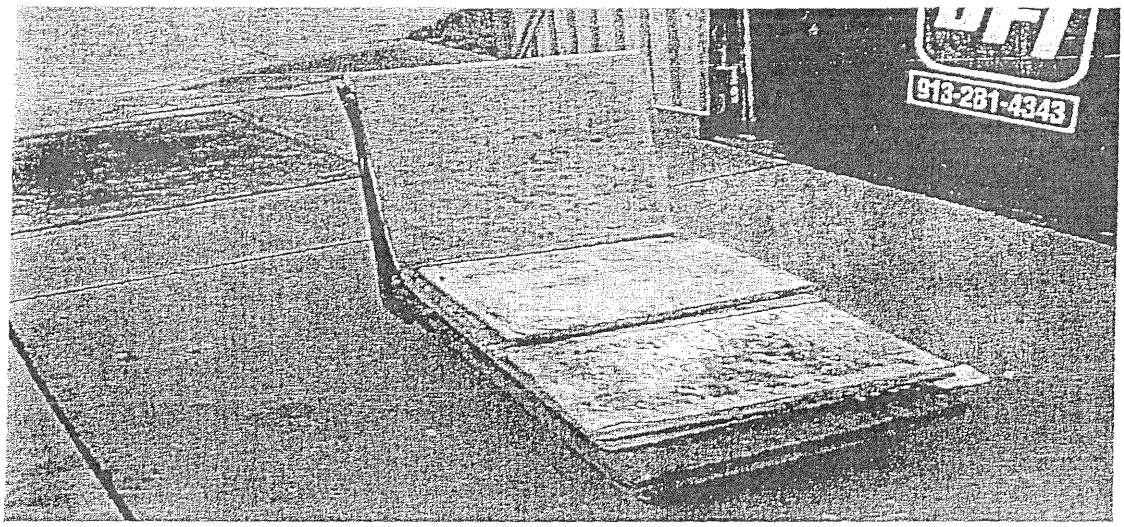


Photo 33: Moldy Construction Debris found in 11th Floor Outer Ring, Back of the West wall of 11TS5.
This construction debris was found in the same location as the material shown in Photos 31 and 32. Much of the scrap had large quantities of mold.

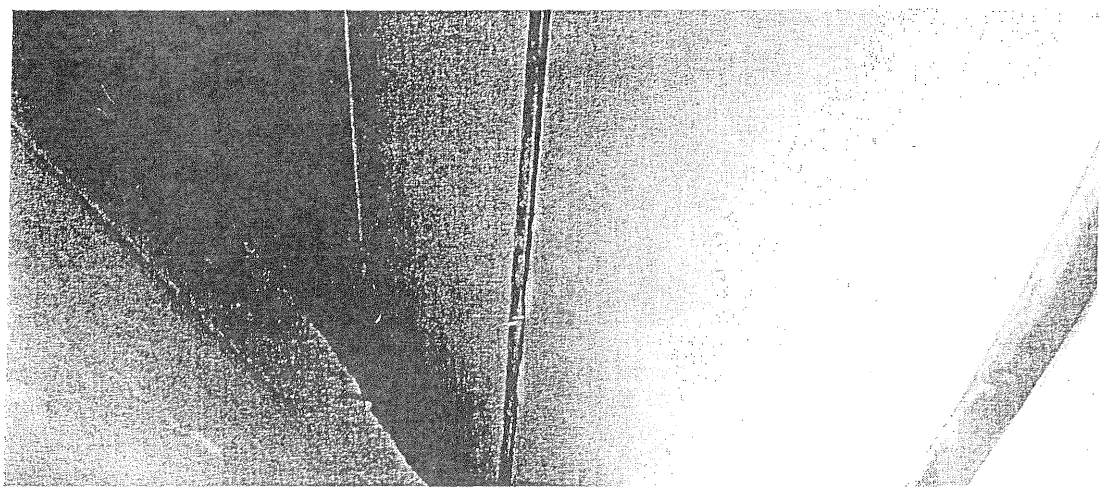


Photo 34: 11th Floor Outer Ring, Back of the West wall of 11TS5.
The debris shown in Photos 31, 32, and 33 were pulled from this location. Moisture from building and humidifier leaks lead to the growth of mold on the debris, which contaminated this area. *Ulocladium* (154 counts/cm^2) was detected on the 5th panel from the South, in an area that had been biocide treated prior to sampling. After subsequent re-cleaning, *Pithomyces* (31 counts/cm^2) was detected in the same area. After a 3rd biocide cleaning, however, all mold spore concentrations were below the limit of detection.

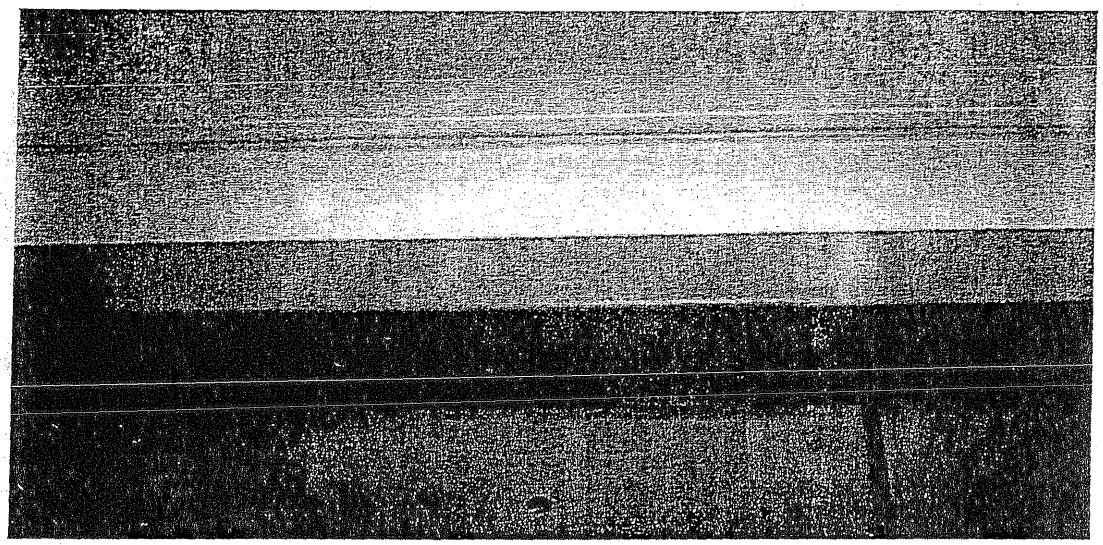


Photo 35: 11TS1, Mold-Containing Dust on Wall of Elevator Door.
Alternaria (77 counts/cm^2), *Ascospores* (15 counts/cm^2), *Cladosporium* (31 counts/cm^2), *Epicoccum* (15 counts/cm^2), *Pithomyces* (31 counts/cm^2), and *Smuts* (31 counts/cm^2) were detected above the elevator door. Biocide cleaning measures will be required in the area represented by this sample location.

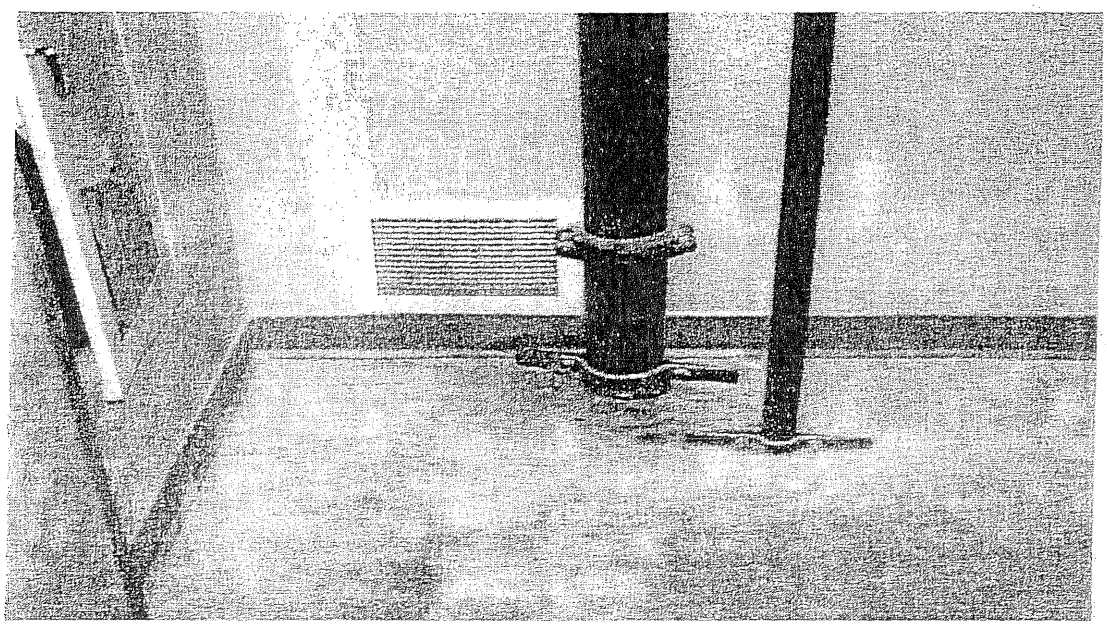


Photo 36: 11TS6, Southwest corner.
Water stains and discoloration were found on the concrete floor and gypsum board wall of stair vestibule 11TS6. A union and short section of pipe in the fire sprinkler line was unpainted and had been replaced after the tower was constructed. It was confirmed that this pipe had leaked and as repaired. Peeling back the vinyl base revealed visible mold.

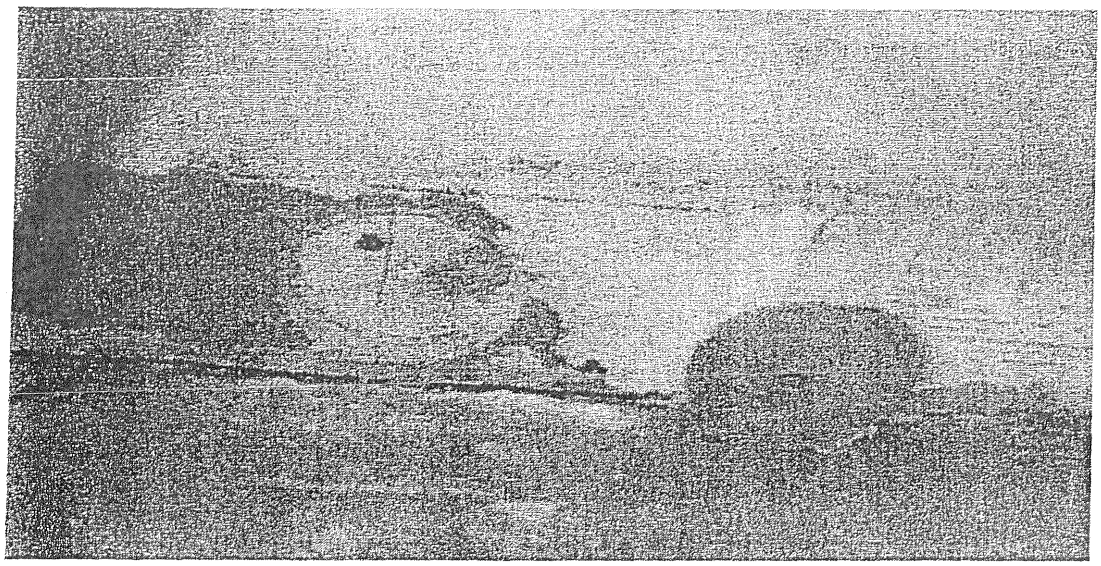


Photo 37: 11TS5, West Wall, Drilled Core South of Door.
Mold is shown on the back of the 1st layer of sheetrock and on the front of the concealed layer in Room 11TS5. This area was known to have had water leaks, therefore the base was pulled and cores were drilled in order to evaluate the possible presence of mold.

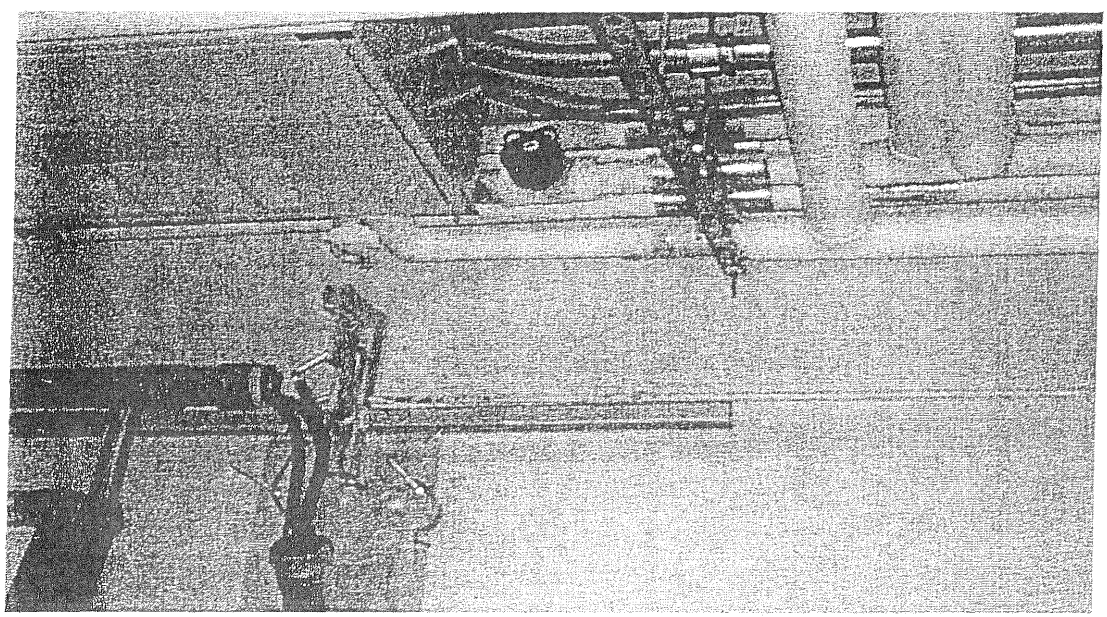


Photo 38: 11TS5, East Wall Fan Coil Unit.
Pipe insulation is shown with visible water stains in Room 11TS5. Water stained insulation should be checked regularly if in close proximity to sheetrock.

Photo 39: 10TS5, NW Corner.
Mold was found behind the vinyl base in this location of Room 10TS5. The core openings shown in the upper left corner and middle of the photo provide an example of how holes are drilled to estimate total quantities of mold for the subsequent remediation. It appears that all mold found on this level was the result of water damage from the clogged floor drain on the Sub Junction level.

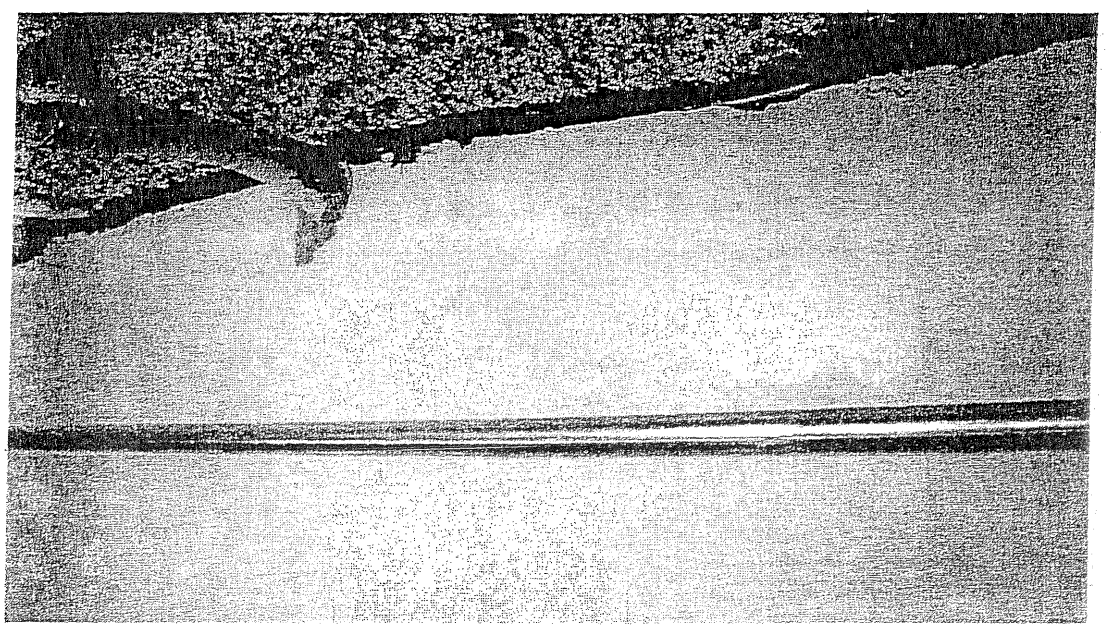


Photo 40: Yellow stained South Wall (Elevator Shaft) of 10TS5.
The yellowed areas shown on the sheetrock in Room 10TS5 often indicate the initial stage of underlying mold growth. In this case, however, the core sample obtained was negative.

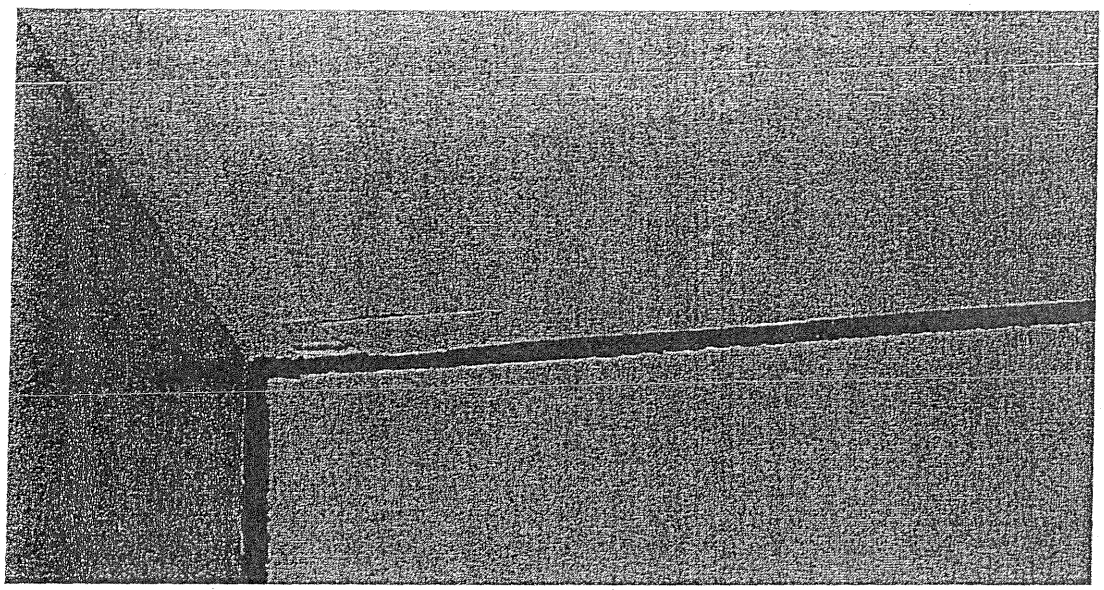


Photo 41: Water stained ceiling of 9TS1, West End.
Visible water stains, several inches wide, were found on the perimeter of the ceiling of corridor 9TS1, adjacent to the west exposed precast concrete wall and the south gypsum board wall, adjacent to the stair vestibule and stairway as shown above. The stain extends the full length of the west wall and the taped joint on the gypsum board ceiling was peeling loose. The water stain then followed along the south wall toward the east for approximately 10 feet.

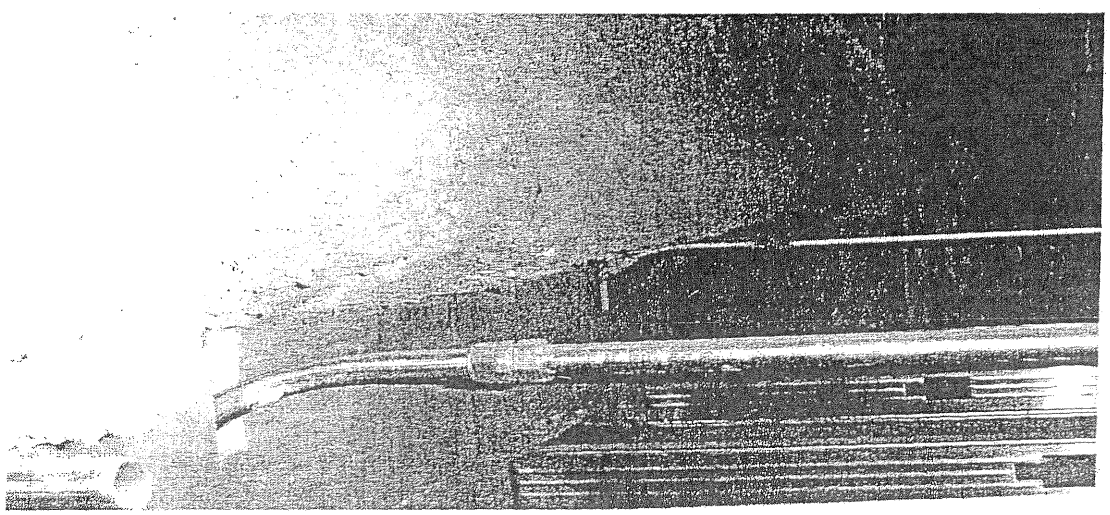


Photo 42: 9TS1, Above Ceiling, South Wall.
The area above the corridor ceiling was inspected through the access panel. Some water stains were found on the unfinished fire taped south wall above the ceiling as shown above.

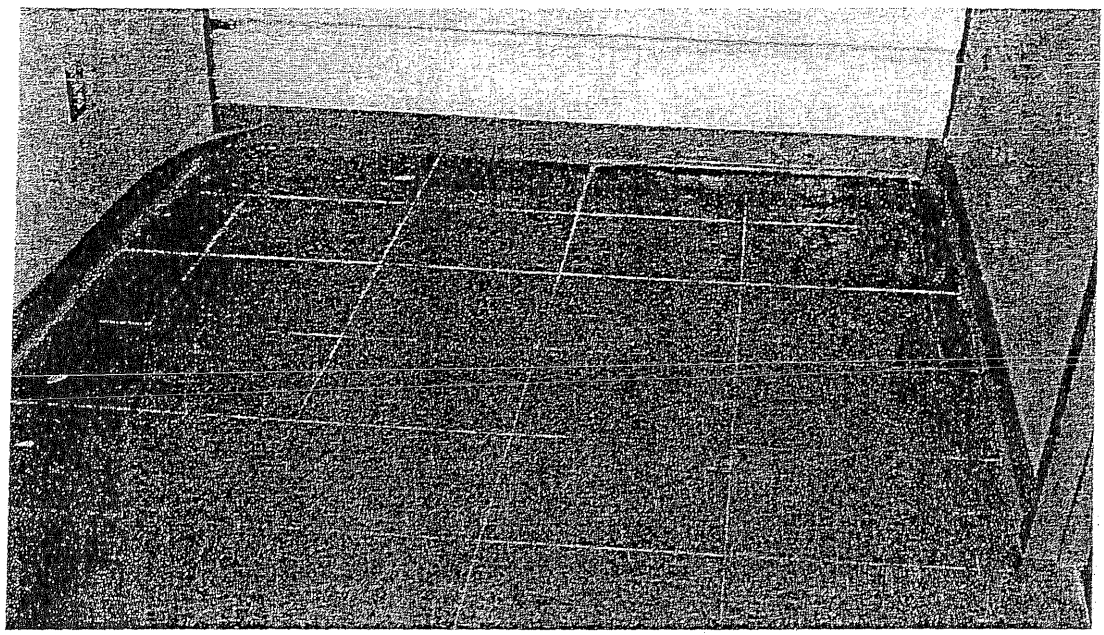


Photo 43: 9TS1, West Wall.

The floor tile at the west end of the corridor had water stains and white residue especially between the tiles as shown above. The base was pulled away for an evaluation but no mold was found. There are visible water stains on the ceiling and wall directly above this area, as shown in Photo 41.

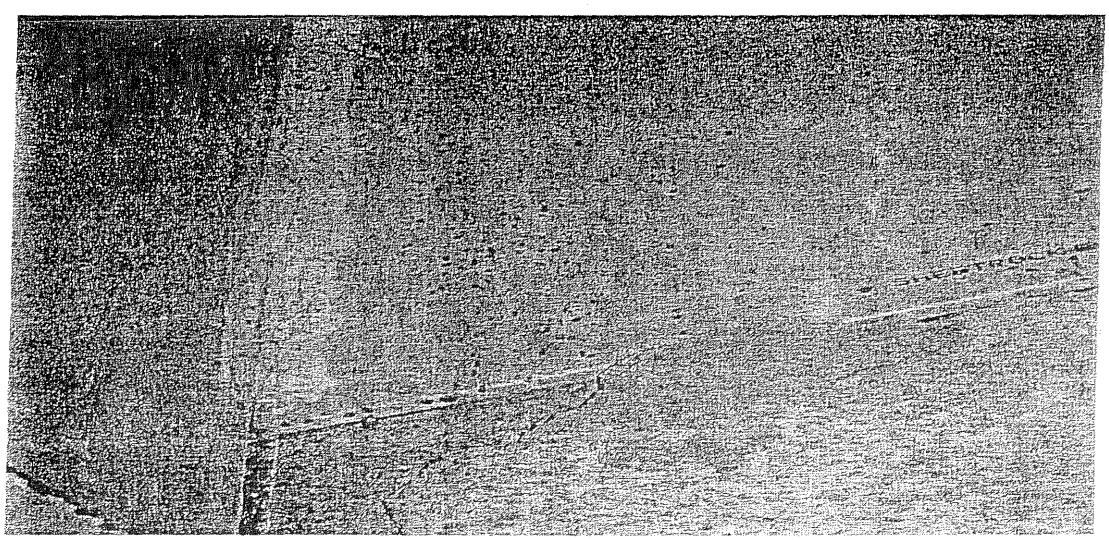


Photo 44: 9TS6, Above Ceiling, East Wall.

A visual inspection conducted by looking through the access panel in the ceiling of stair vestibule 9TS6 showed heavy water stains on the north, east, and west walls above the ceiling. The heaviest stains were near the northeast corner as shown above. No signs of mold were found.

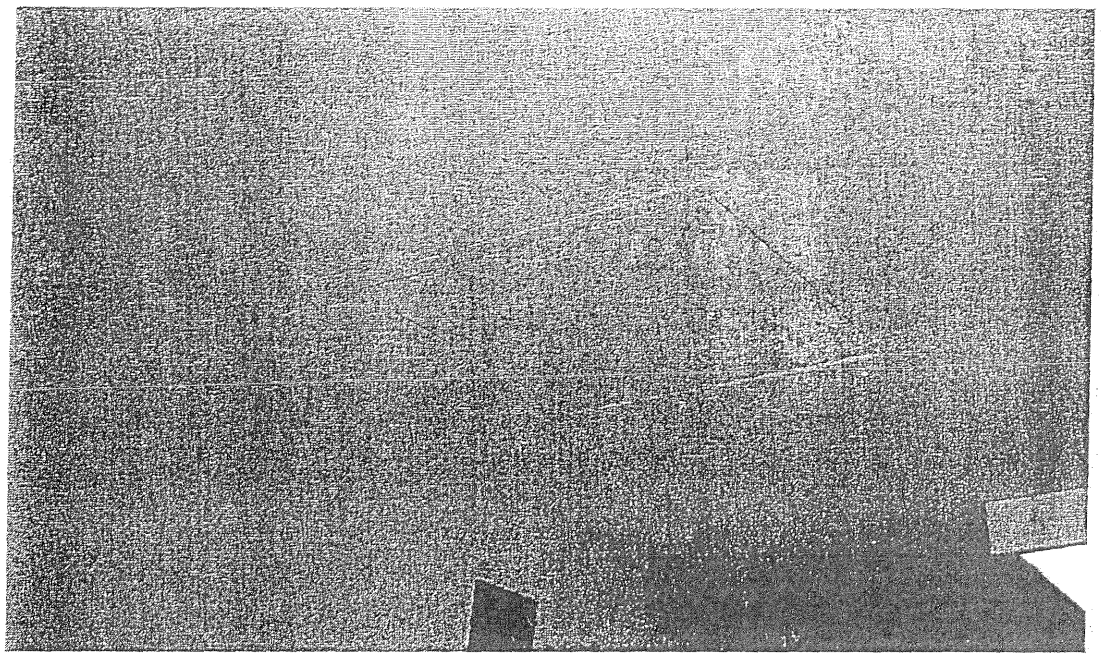


Photo 45: 9TS1, Typical Access Panel.
A typical access panel is shown in Room 9TS1. Several areas above the ceiling and other locations cannot be observed for a thorough mold and moisture evaluation. Access panels should be installed in these locations.

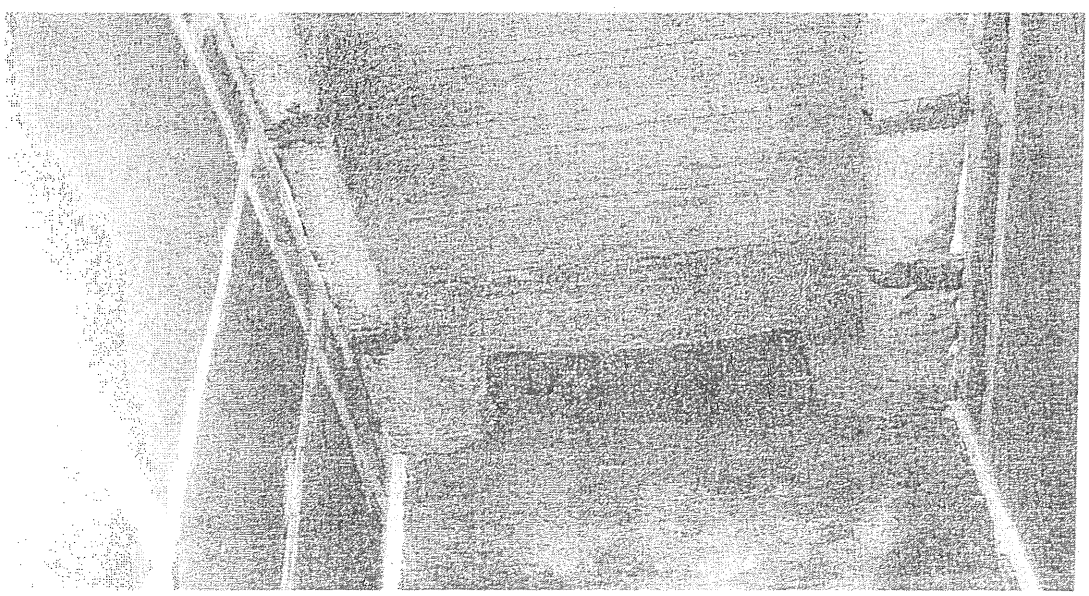


Photo 46: Underside of 9th Floor Deck, West End, Above 8TS1.
A visual inspection conducted by looking through the access panel in the ceiling of corridor 8TS1 revealed discolored and water stained fireproofing on the underside of the 9th floor metal deck as shown above.

Photo 47: South Wall of 8TS1 Above Finished Ceiling.
A suspect mold area was observed on the south wall above the horizontal beam in the unfinished space above the ceiling as shown above. This spot can't be reached from the access panel.

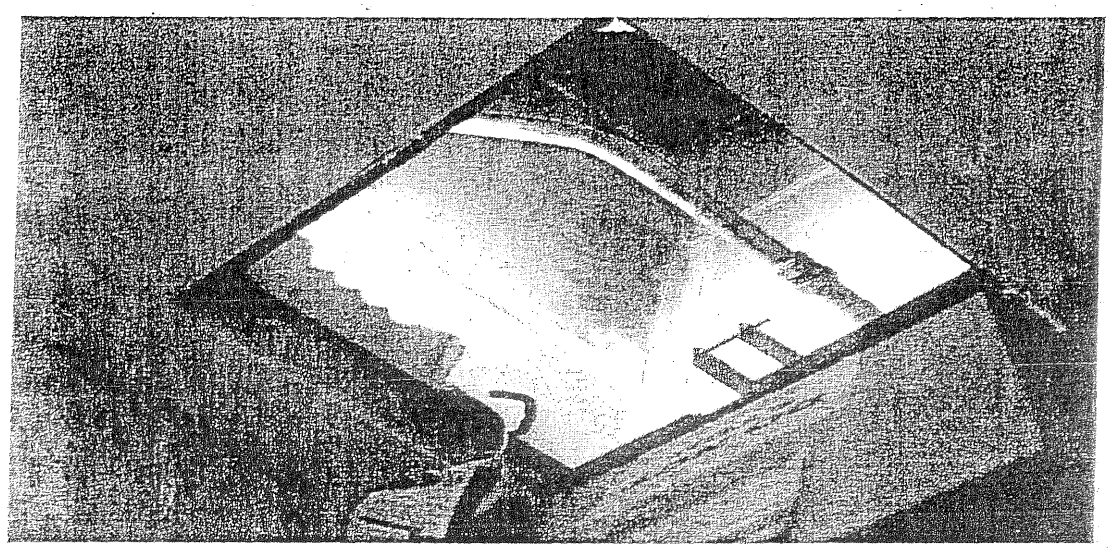


Photo 48: 8TS6 12" by 12" Access Panel Above Ceiling.
Further investigation through the access panel in the ceiling of the stair vestibule 8TS6 revealed a larger area of mold on the west wall of the fire taped gypsum board wall as shown above. This wall intersects the south wall above the corridor ceiling where the mold was found above the ceiling of 8TS1.

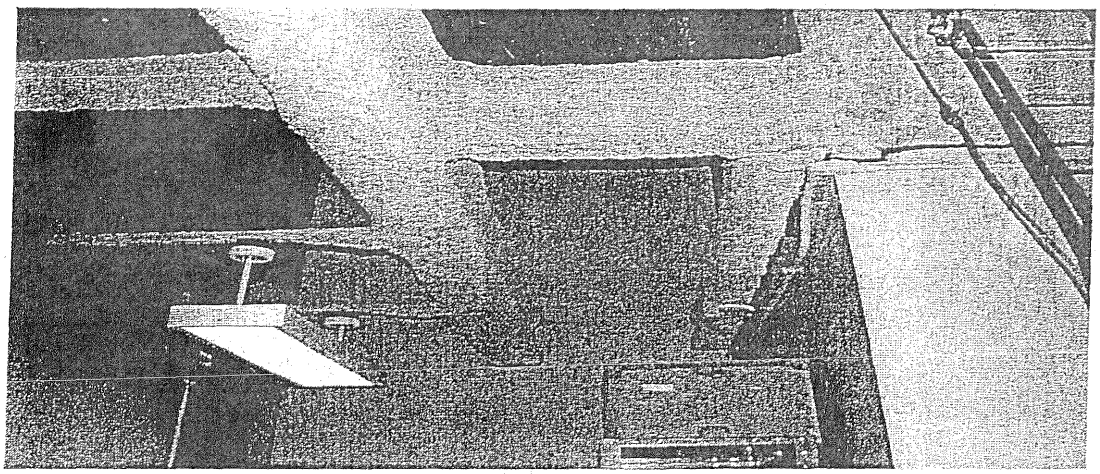


Photo 49: Yellowed Fireproofing, Intermediate Level Beam, 7TS5.
Aspergillus (3704 counts/gram) was detected in 7TS5, in a yellowed fireproofing sample. Similar yellowed fireproofing samples were collected in 7TS5 in the center of the room; in 7TS5 at the ceiling level; in 7TS5 on the metal deck; in 7TS5 on the west side of the elevator shaft; in 7TS5 on the middle of the beam on the north side of the elevator shaft; in 7TS1 above the west access panel; and in 7TS4 on the lower beam, on the west side of the elevator. All contained mold spore concentrations below the limit of detection.

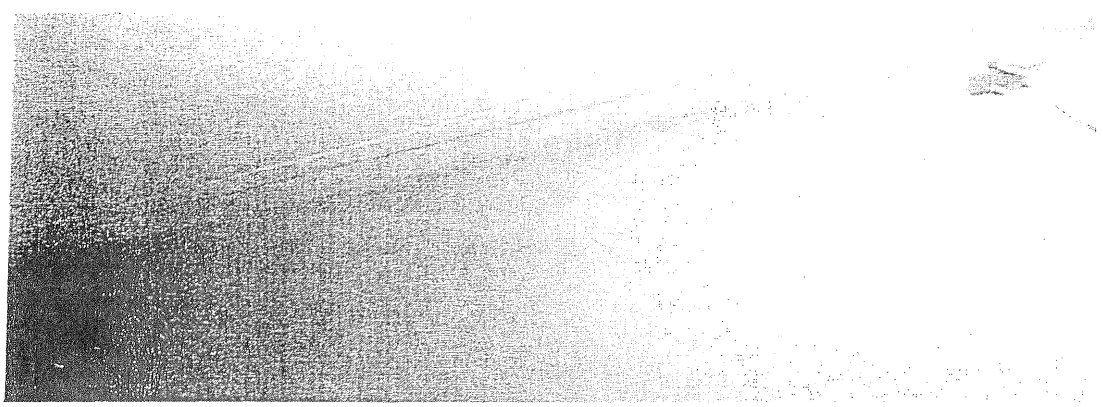


Photo 50: 3TS1, South Wall, Across from Elevator Door.
Alternaria (231 counts/cm^2), *Aspergillus* (77 counts/cm^2), *Cladosporium* (9240 counts/cm^2), *Nigrospora* (31 counts/cm^2), *Pithomyces* (62 counts/cm^2), *Smuts* (77 counts/cm^2) and *Ulocladium* (15 counts/cm^2) were detected in 3TS1, on the South wall along the ceiling, directly across from the elevator door. After biocide cleaning, *Cladosporium* (15 counts/cm^2) was detected in the same location, however, no mold spore concentration levels were detected after a 2nd biocide cleaning treatment. Surface temperature readings were being taken as shown by the Humilog sensor in the upper right corner.

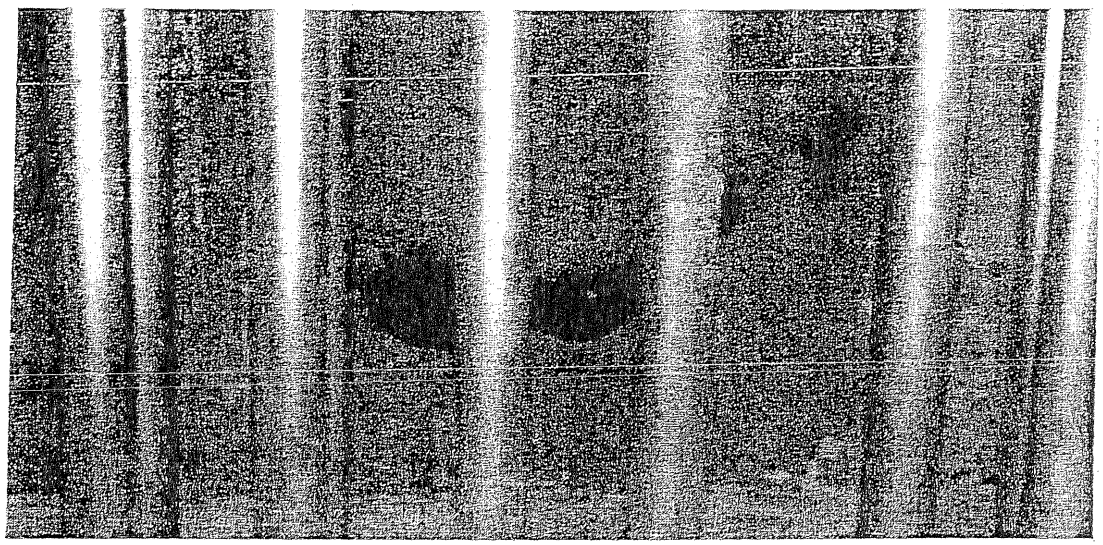


Photo 51: 3TS4, Suspect Stain on Concrete, North Wall.
A tape lift sample collected from the black material shown in Room 3TS4 did not contain mold.

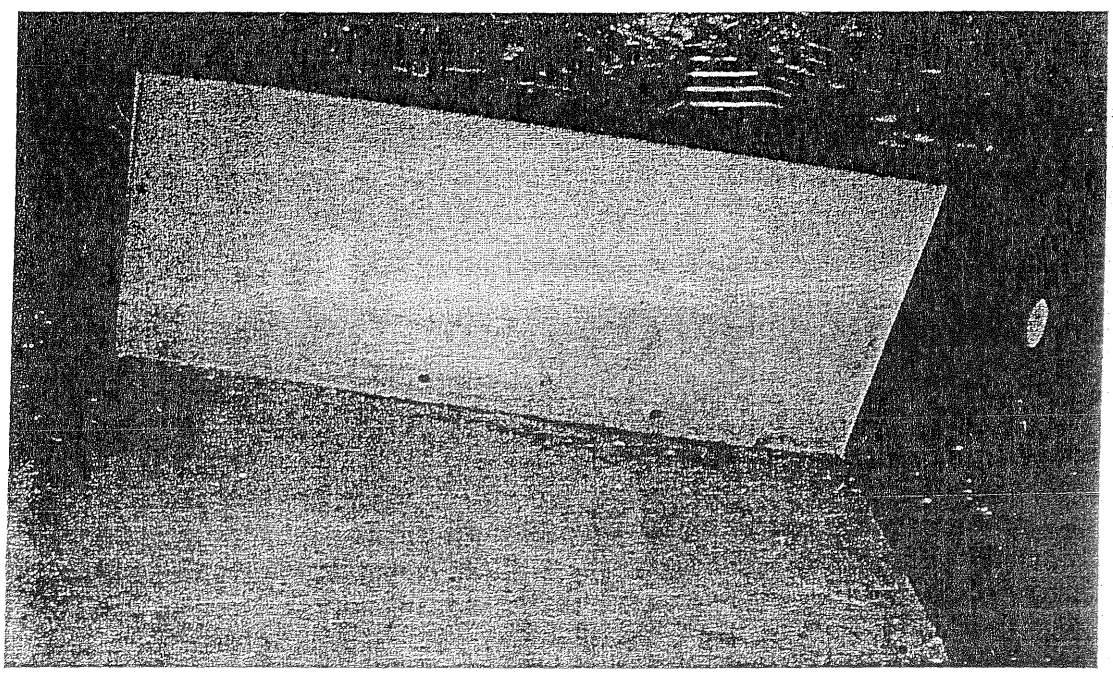


Photo 52: 3TS5, Below Fire Sprinkler Equipment, North of Elevator Shaft.
Vinyl base was pulled at multiple locations in 3TS5 where there were any signs of recurring water damage. The inspection revealed mold throughout the room. The majority of this damage has resulted over time from testing, maintenance, and repair of fire pumps and sprinkler systems.

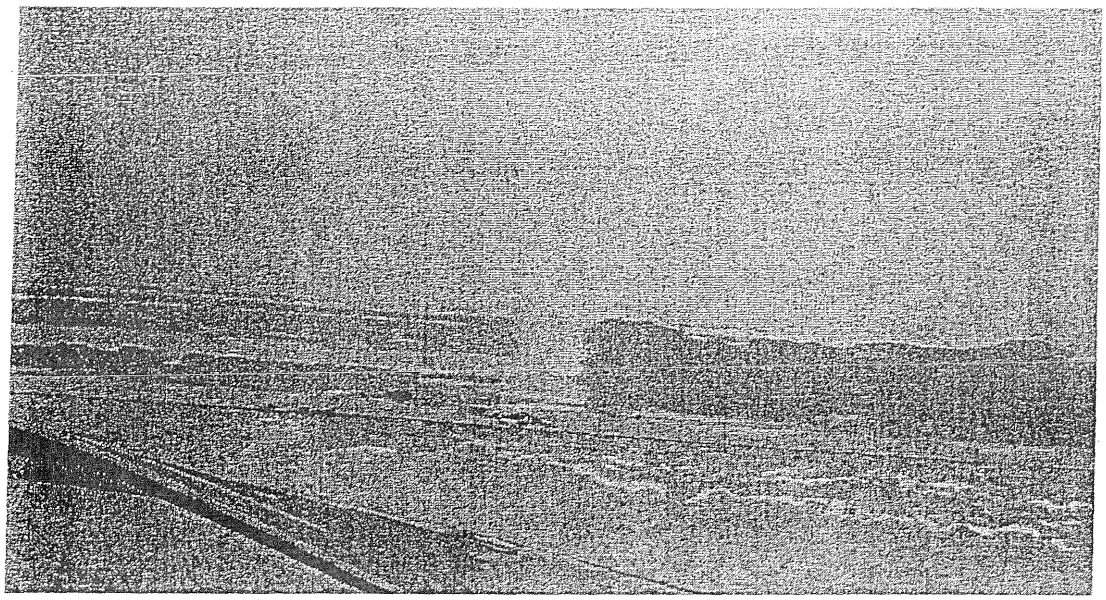


Photo 53: 3TS5, North Wall.
Mold is shown behind the base on the north wall of Room 3TS5.

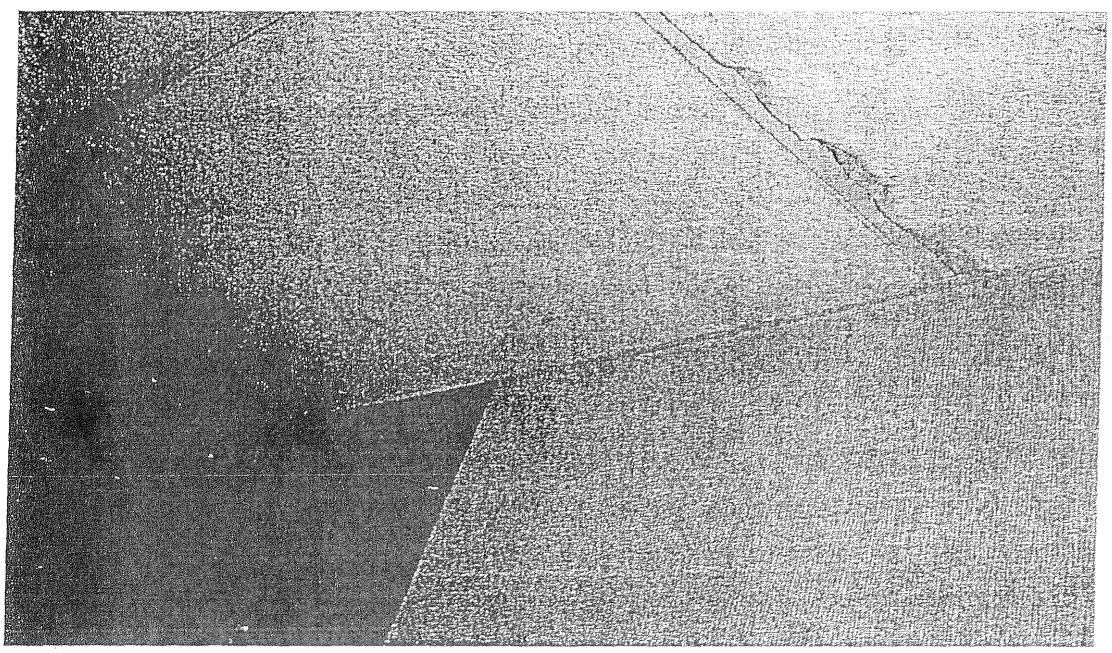


Photo 54: 2TS1, Stained Ceiling Tile.
A water stain was found on the tile adjacent to the wall outside of 2TS5 as the result of condensation from an uninsulated section of cold water return piping as shown above. The pipe is routed through the wall between two metal studs framing the door opening and there was no room to install the pipe insulation used throughout the rest of the facility.

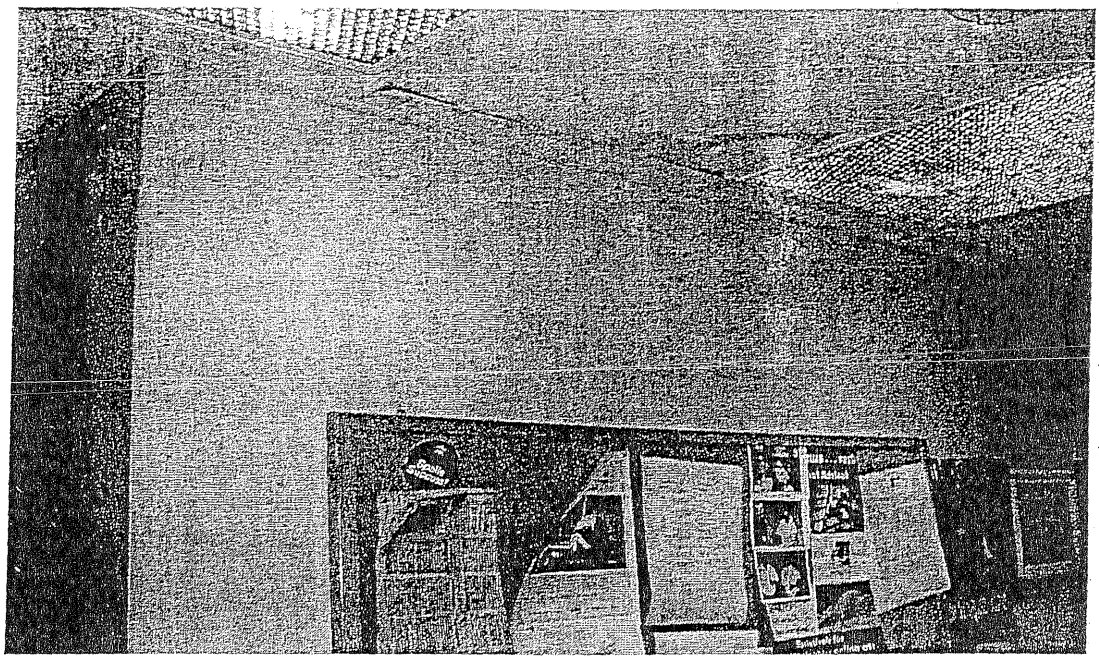


Photo 55: 2TS5, West Side of Elevator Shaft.

Several large water stains were found on the suspended acoustical ceiling in 2TS5 as shown above. Water streaks/stains were visible on the walls forming the elevator shaft and the base below was evaluated, however, no mold was found.

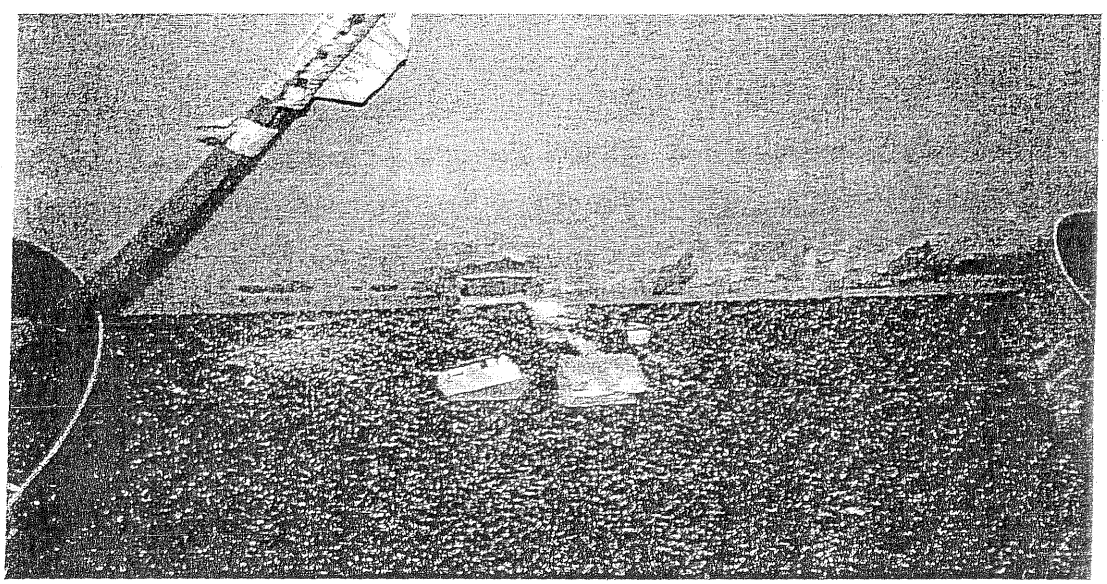


Photo 56: 2TS5, North Wall.

A small amount of mold was found behind the base on the north wall in Room 2TS5. This furred out gypsum board wall was installed adjacent to the precast concrete wall at some point after the ATCT was constructed. The source of water appears to be from old building joint leaks and water leaks from 3TS5.

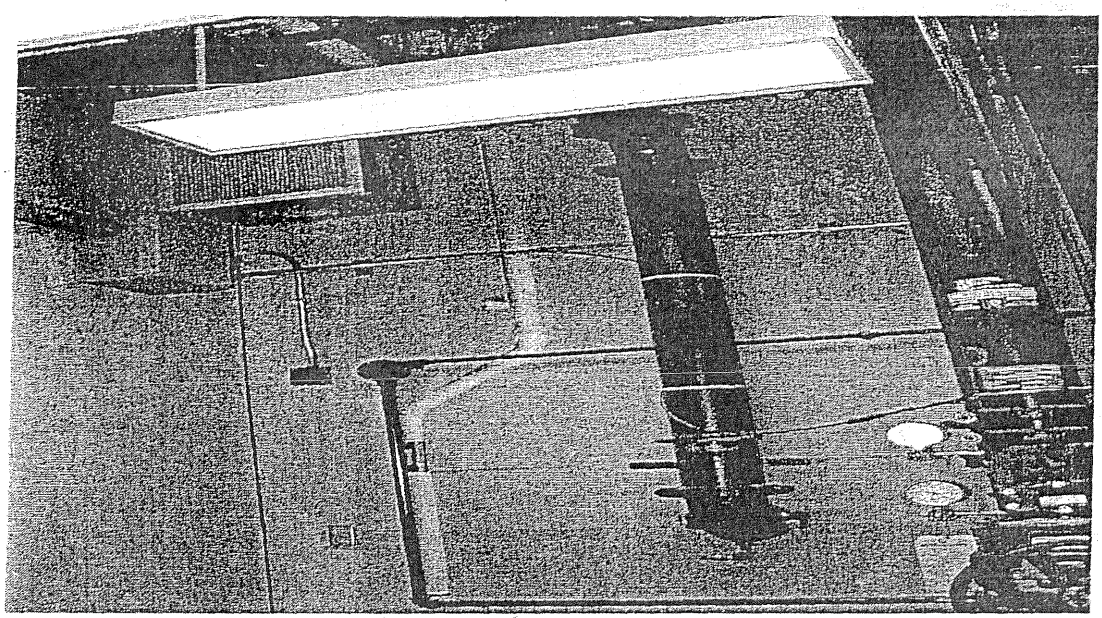


Photo 57: G4, Southwest Corner.

Water stains were visible on the unfinished gypsum board in room G4 adjacent to the outside air duct. It appears that water either leaks around or enters through the 4th floor outside air intake louver and runs down the inside, or exterior of the vertical duct run to the ground floor. This gypsum board serves as a thermal barrier over foam insulation and is not taped, finished, or painted.

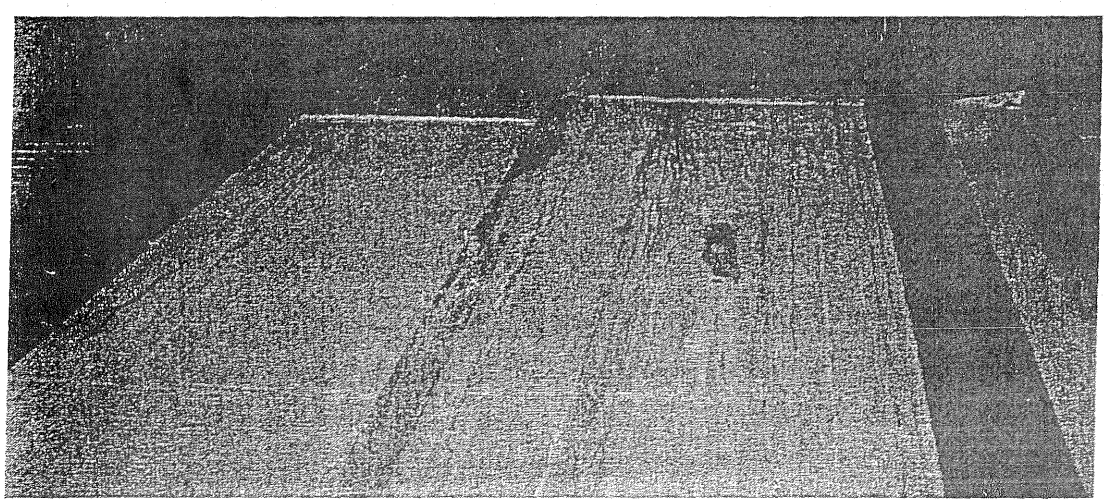


Photo 58: Elevator Shaft.

The elevator shaft was visually inspected on June 19, 2006 by personnel riding on top of the elevator car and making stops at approximately five to ten foot intervals based on conditions observed. The gypsum board shaft liner panels had water streaks or stains at many locations as shown above.

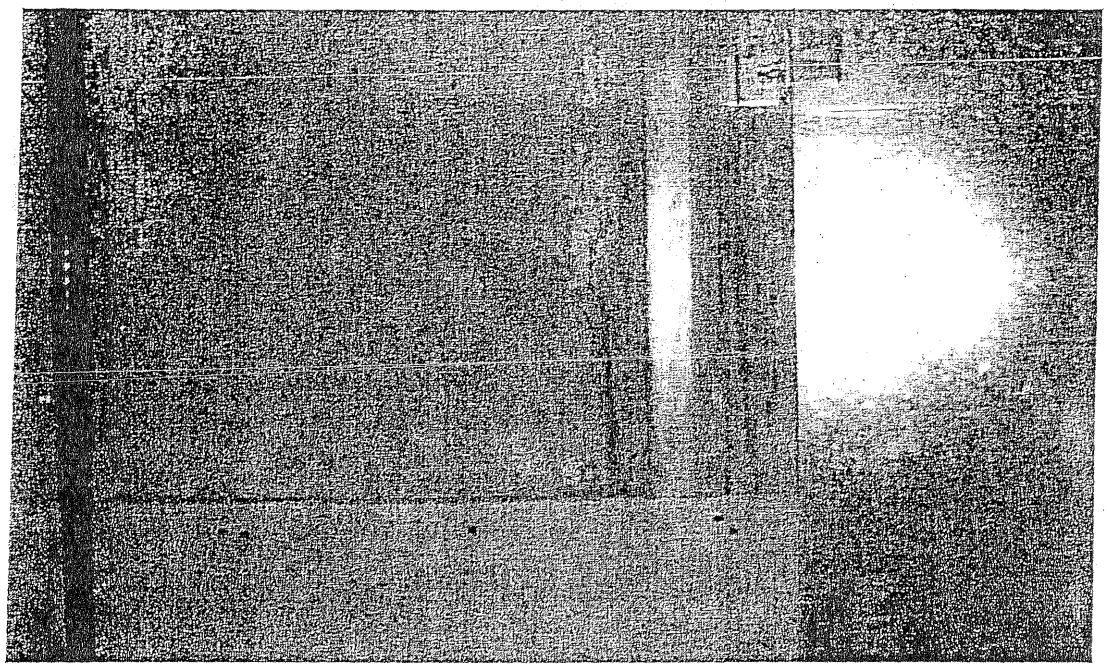


Photo 59: Elevator Shaft.
The only visible mold found on the elevator shaft was in a band approximately two feet high on the north, west, and east sides of the elevator shaft approximately ten feet below the 9th floor slab elevation as shown above.

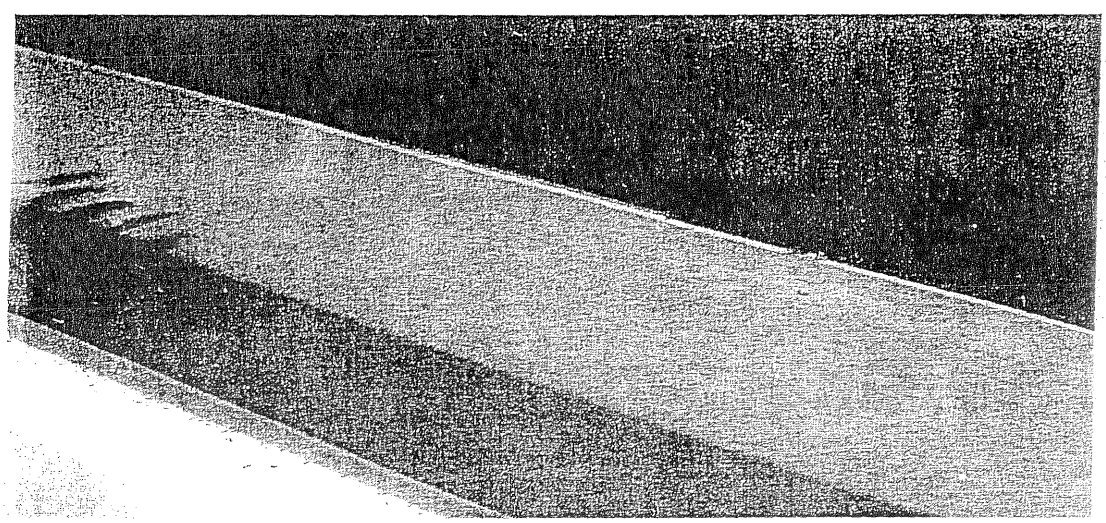


Photo 60: Stairway, Between Junction and Sub Junction Levels, Window Ledge.
Alternaria (123 counts/cm^2), *Ascospores* (31 counts/cm^2), *Basidiospores* (31 counts/cm^2), *Cladosporium* (108 counts/cm^2), *Epicoccum* (62 counts/cm^2), *Nigrospora* (15 counts/cm^2), and *Smuts* (31 counts/cm^2) were detected on the horizontal aluminum ledge of the window. HEPA-vacuuming, followed by biocide cleaning measures, will be required in the areas represented by these sample locations.

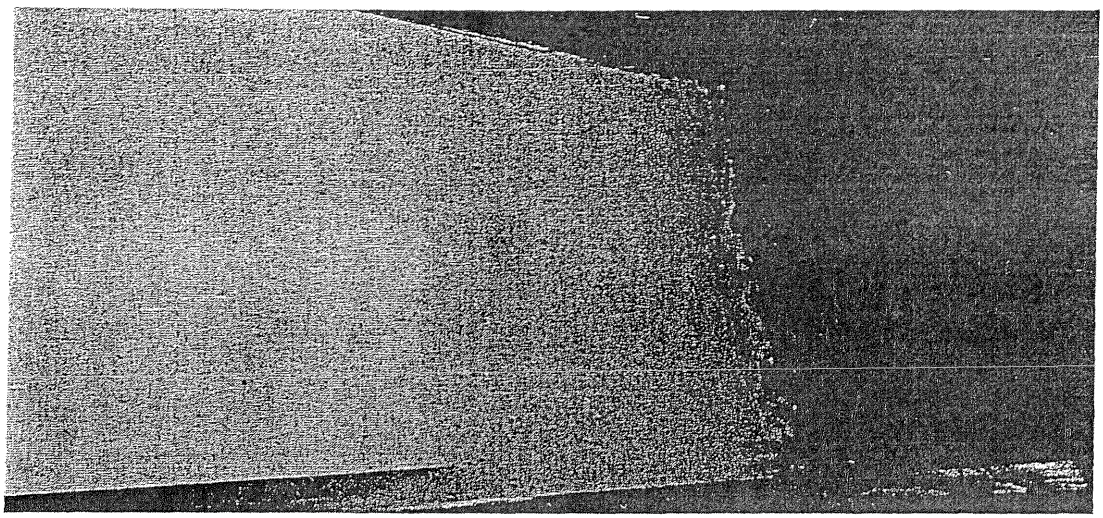


Photo 61: Stairway, Between Junction and Sub Junction Levels, Gypsum Board Cover.

Alternaria (262 counts/cm^2), *Aspergillus* (108 counts/cm^2), *Basidiospores* (108 counts/cm^2), *Bipolaris* (46 counts/cm^2), *Cladosporium* (1140 counts/cm^2), *Epicoccum* (108 counts/cm^2), *Nigrospora* (15 counts/cm^2), *Smuts* (293 counts/cm^2), and *Stachybotrys* (92 counts/cm^2) were detected on the gypsum wallboard cover between the stairs. A significant quantity of dust was observed in the area. Dust, when present in substantial amounts, provides a food source for mold. HEPA-vacuuming, followed by biocide cleaning measures, will be required in the area represented by this sample location.

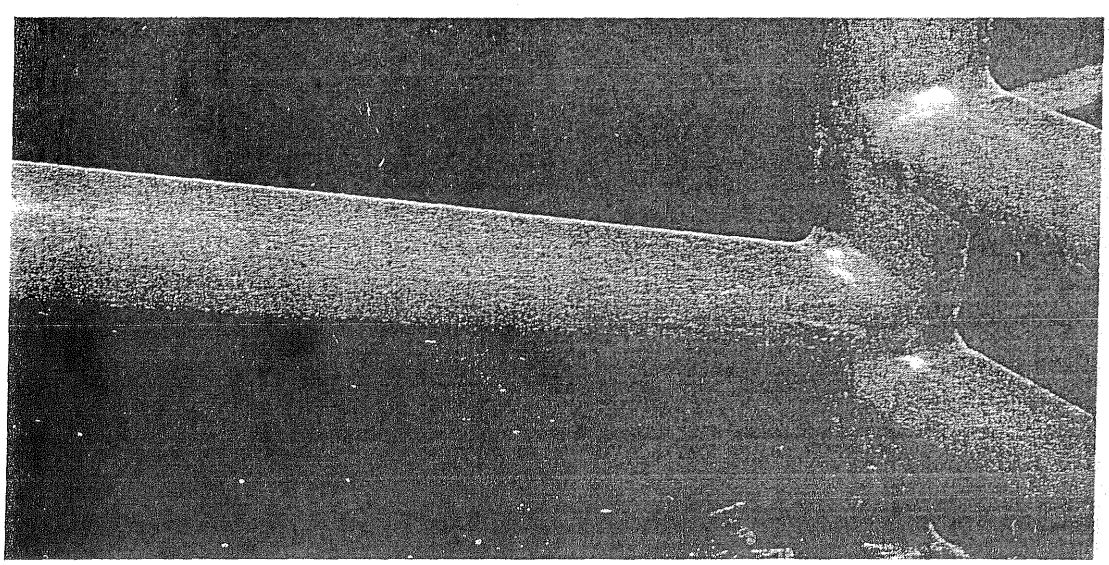


Photo 62: Stairway, Between Junction and Sub Junction Levels, Dusty Handrail.
A dusty handrail is shown above the gypsum board cover in Photo 61.

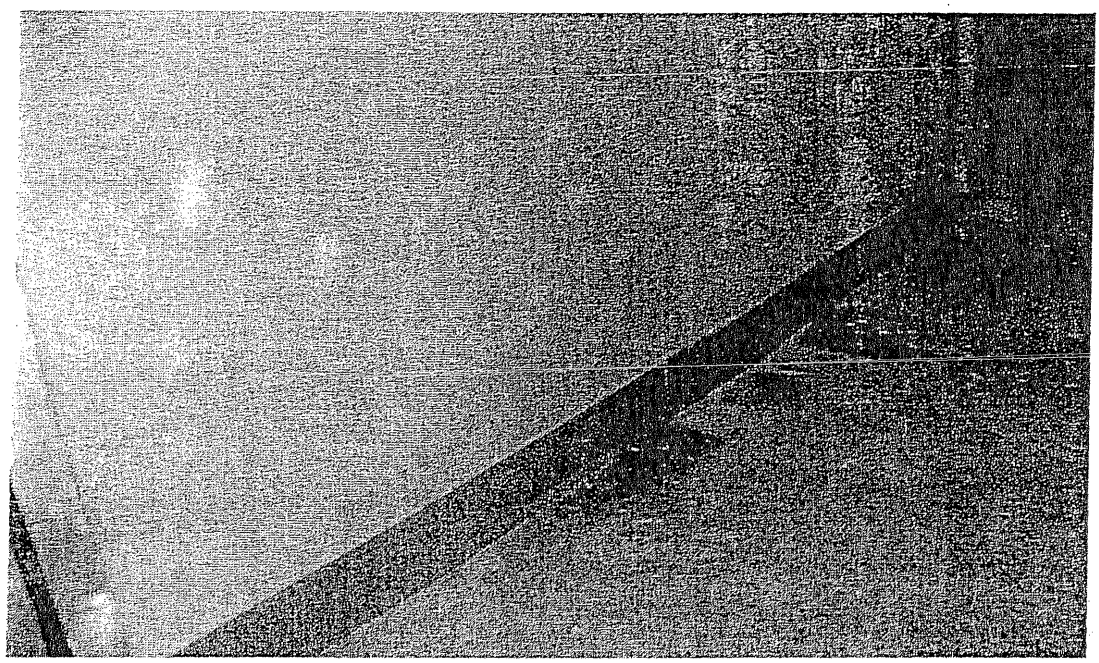


Photo 63: 8TS4, West Wall.
Condensation and frosting are shown on the west wall of Room 8TS4, on January 18, 2007.

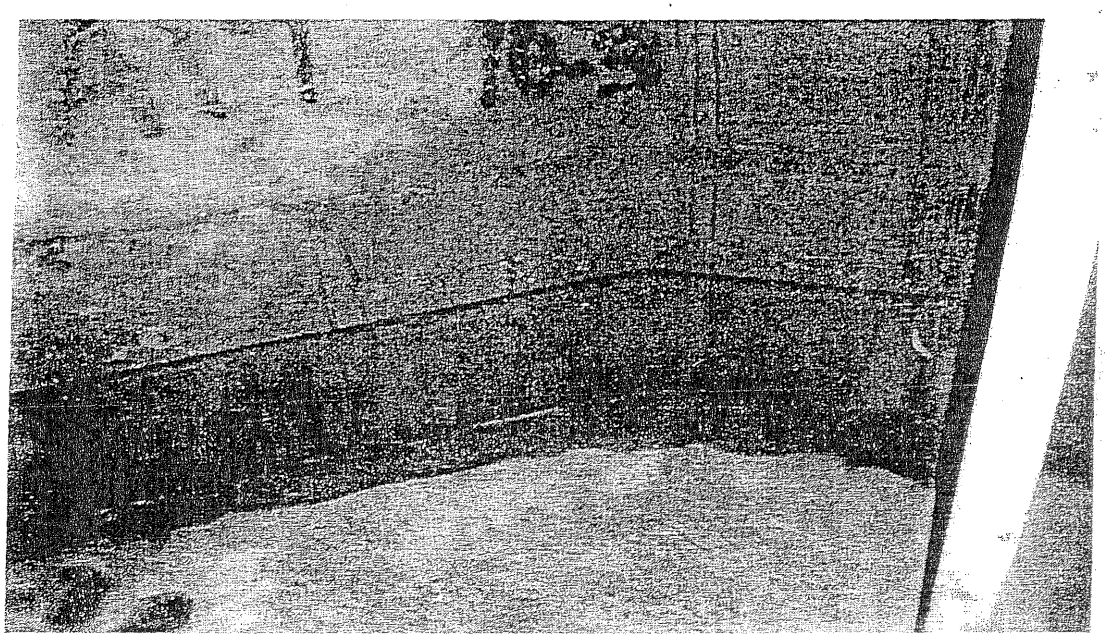


Photo 64: 8TS4, Northeast Wall.
Water and condensation is seen on the northeast wall of Room 8TS4. After a period of warmer outside temperatures, frost has melted and water is seen accumulating on the floor on January 19, 2007.

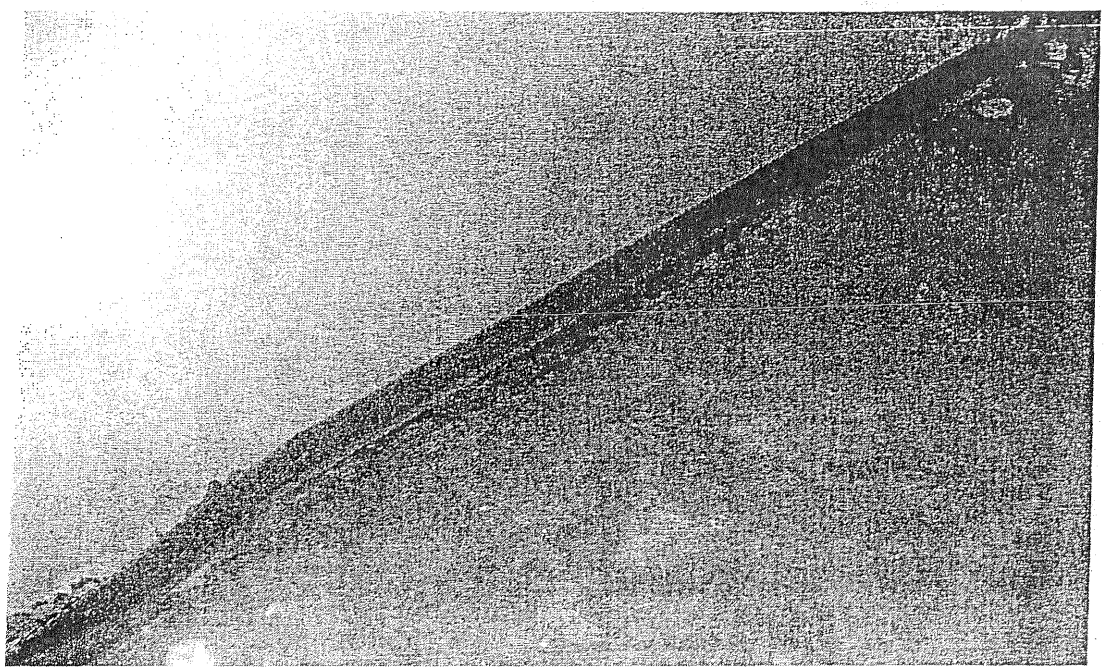


Photo 65: 10TS5, West Wall.
Standing water is seen along the base of the west wall in Room 10TS5, on January 18, 2007.

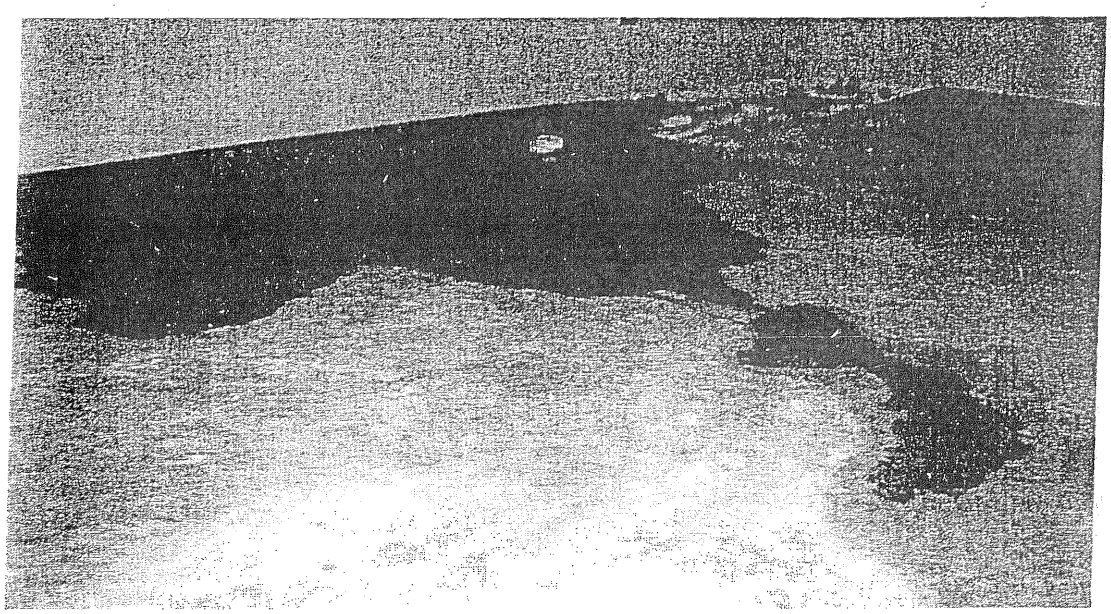


Photo 66: 10TS5, North Wall.
After warmer outside temperatures on January 19, 2007, frost on the precast panels begins to melt. Water begins to accumulate on the floor slab.

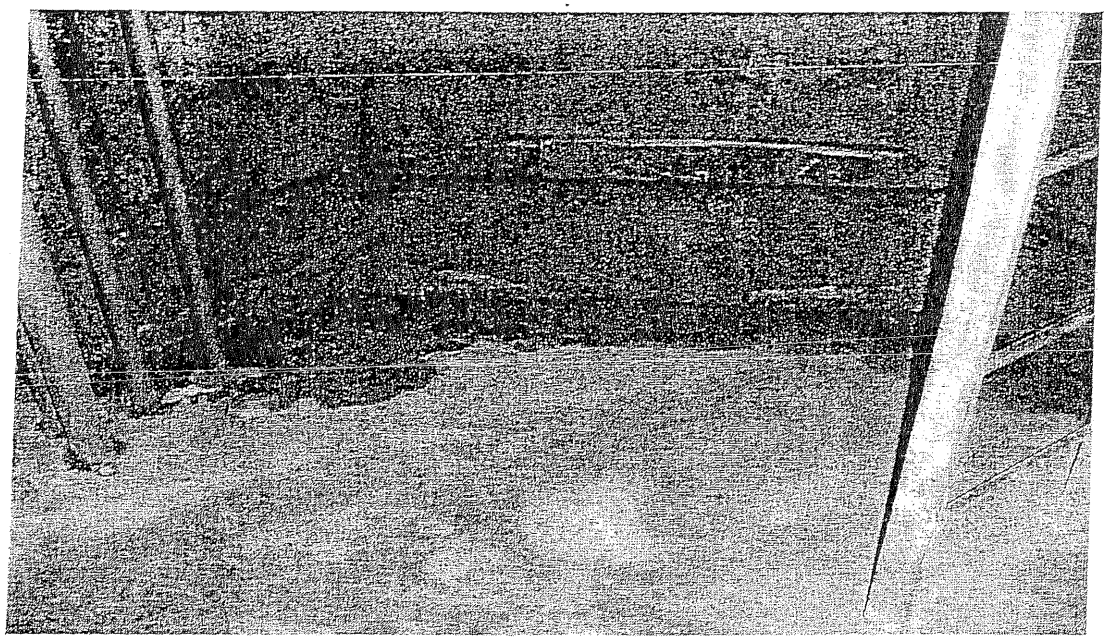


Photo 67: 9TS4, North Wall.
Melting frost and condensation are shown by the north wall of Room 9TS4, on January 18, 2007.

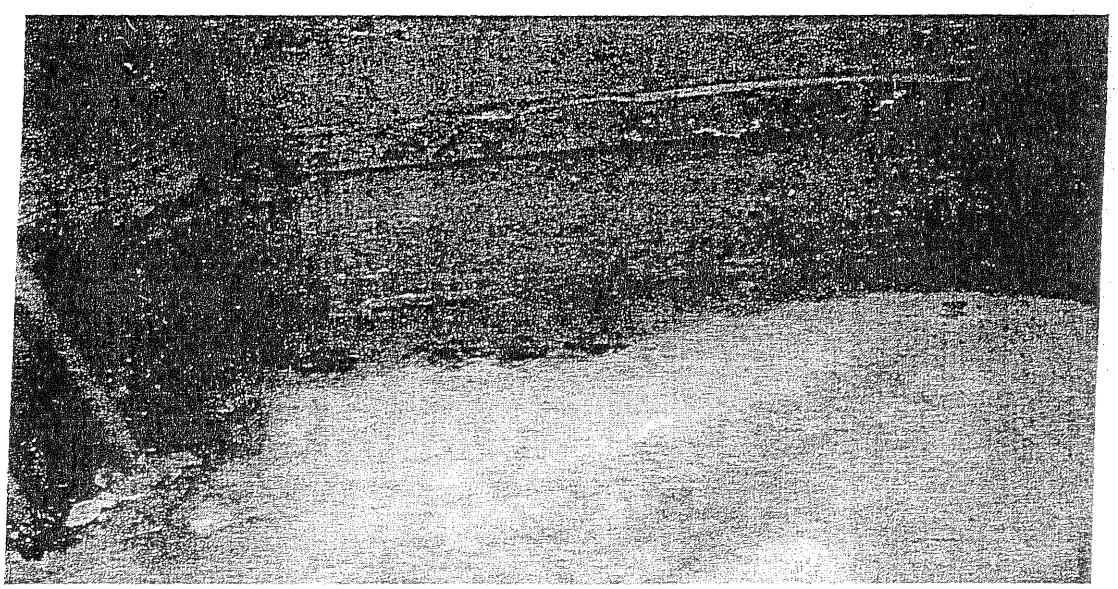


Photo 68: 9TS4, East Wall.
Melting frost and condensation are shown by the north wall of Room 9TS4, on January 19, 2007. Higher outside temperatures caused the surface temperature to rise and more water is seen accumulating on the floor.

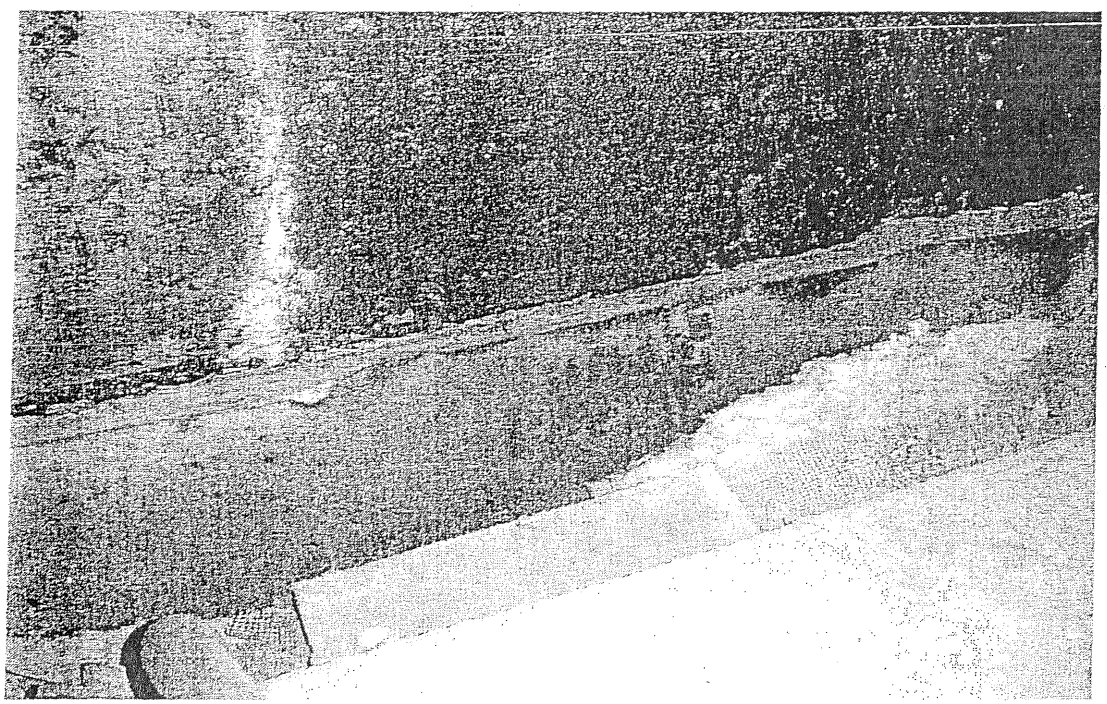


Photo 69: 11th Floor Outer Ring.
Condensation and frosting are shown on the precast walls in the 11th Floor Outer Ring, on January 18, 2007.

25b

WONDER MAKERS
ENVIRONMENTAL

June 29, 2009

Mr. Vince Sugent
7768 Pleasant Lane
Ypsilanti, MI 48197

RE: Review of Report on Mold and Moisture Inspection, Kansas City International Airport, Airport Traffic Control Tower; Wonder Makers Project GC09-8593

Dear Vince:

As part of the FAA's response to your whistleblower complaint to the Office of Special Counsel, the Agency submitted a number of documents to support their contention that mold and other indoor air quality problems at the Detroit Metro Tower were handled properly. A review of the first set of FAA submittals revealed a number of referenced documents that were missing. Over the past weeks we have been examining the second set of documents submitted by the FAA and offering our insights regarding the Agency's response to mold at DTW and other facilities.

This is a review of the Report on Mold and Moisture Inspection, Kansas City International Airport, Airport Traffic Control Tower. The inspection was conducted between June and August 2006. Additional periodic inspections were conducted as necessary to monitor conditions in the ATCT.

In the PURPOSE section of the report it states, "This inspection was conducted as the preliminary step in developing the Independent Solution for OPS Requirement 0682MH572. This requirement addresses the need for mold remediation and restoration in the ATCT." In the INSPECTION PROCESS section the report states:

> "It was known that the mold and moisture inspection needed to be very thorough to identify to the maximum extent possible any water sources that might contribute to mold growth within the facility as well as to fully address the quantity of affected building materials that must be addressed in the remediation and restoration project."
>
> "Any remediation effort undertaken without first solving the cause of the moisture problem will be futile and costly. Lessons learned from the previous mold remediation project showed that the inspection process needed to be more thorough and invasive than a visual inspection of the surface of walls. The quantity of mold was typically more on the concealed layers of gypsum board in a fire rated wall assembly since they remained wet for longer periods of time then [*sic*] the visible surface layer.

> The majority of walls in the ATCT are fire rated partitions and consist of up to 4 layers of gypsum board."

This appears to be a good understanding of the water intrusion issues and subsequent mold contamination problems that exist within not only the Kansas City International ATCT but in numerous other ATCTs throughout the country. It also indicates that over three years ago individuals in the FAA were in agreement with the NATCA contention that a thorough and invasive comprehensive investigation needed to be conducted at the Kansas City and other ATCTs.

The mold and moisture inspection conducted in the Kansas City ATCT included a civil engineer, a mechanical engineer, and a certified industrial hygienist. Despite questionable invasive inspection procedures and sampling techniques the inspection provided what appears to be good information needed to develop a comprehensive water intrusion and mold remediation solution. As such, it is puzzling that the FAA resisted this sort of investigation at the DTW facility for two years until forced into it by the Office of Special Counsel and the Department of Transportation.

Although the team approach used in Kansas City seemed to go a long way in determining the sources of moisture intrusion and mold contamination in that ATCT, this was difficult to determine because numerous appendices that are vital to the understanding of this report have not been made available. That information includes the laboratory results in appendix 2 of the report, quantities of materials requiring mold remediation in appendix 3, additional work required in appendix 4, and additional inspections, testing, and engineering analysis that must be completed to fully address mold and moisture related problems or issues in appendix 5.

While this lack of information sharing by the FAA with NATCA has made it difficult to review the process and determine if it was effective in dealing with the moisture intrusion and mold contamination issues at that ATCT, the primary concern is that withholding information regarding other facilities may have lead to additional years of suffering from the effects of exposure to mold contamination by NATCA personnel. If a comprehensive invasive mold and moisture inspection had been conducted in Detroit in 2005 as was suggested, it is quite possible that NATCA personnel at DTW would not continue to suffer from the effects of exposure to mold contamination as they are today.

In the INSPECTION PROCESS of the report it states, "Past experience proved that the inspection would need to be more thorough than that performed originally in 2004." From the information provided it appears that the more thorough inspection included additional inspection procedures such as:

- Pulling back vinyl cove base on gypsum board walls at any area that could have been wet at some time, and collecting core samples of gypsum board with an asbestos inspection coring tool at suspect areas to detect visible mold on concealed layers of gypsum board.

- Collecting approximately 2" diameter core samples at locations that showed signs of being wet at some time.
- Cutting larger access holes to expose concealed areas where it seemed likely that water leaks could occur or may have occurred in the past.

Again, the extent to which these additional inspection techniques were used and the information they added to the inspection were hard to determine due to the missing appendices. However, there appear to be problems with the invasive sampling techniques used in the mold and moisture inspection at Kansas City.

One problem involved the sampling techniques used. The Wonder Makers Environmental asbestos core sampling tool was used to collect core samples of wallboard to determine if the wallboard was contaminated with fungal spores. This coring tool was developed to collect full-depth core samples of suspected asbestos-containing materials. In that respect it is best utilized for homogenous materials, not for blind sampling where the small diameter means that fungal growth just a fraction of an inch away from the core hole would be missed.

Another problem with the invasive sampling techniques that appeared to be used in the inspection was the removal of large sections of mold-contaminated drywall without the use of negative pressure enclosures. Disturbance of large areas of mold-contaminated material during a mold inspection requires engineering controls similar to those used during mold remediation to contain the mold disturbed during the inspection process. Without these controls in place building occupants could be exposed to mold hazards caused by the disturbance. This professional opinion is supported by the reference document *AIHA: Recognition, Evaluation, and Control of Indoor Mold*, page 78, Section 6.7, where it states, "Extracting several wall plugs in an enclosed indoor environment may pose sufficient hazard to warrant the assistance of a remediation contractor in containing the inspection sites and accessing the inspection area."

Confirmation that inspectors did not employ adequate engineering controls is found in photo #24 in the report taken on the Sub Junction Level. This photograph shows visible mold on the Room SJ1 side of 1" gypsum wallboard cut from the west wall, south end. Four openings approximately 12" square were cut through the perimeter 2-hour rated shaft wall. A mold-contaminated section of the shaft liner is shown in the photo sitting on what appears to be a chair. This image makes it clear that no engineering controls were used during this process.

By not containing the mold hazard during the inspection the inspectors demonstrated a lack of knowledge and concern for the indoor mold contamination hazard that was created. This may have resulted in adverse health effects to Kansas City International Airport ATCT personnel. Refer to the information that fungal contamination can cause allergic, infectious, and poisonous health effects in the following documents:

- American Conference of Governmental Industrial Hygienists; *Bioaerosols: Assessment and Control*; 1999, Section 19.2.

- American Industrial Hygiene Association; *Report of Microbial Growth Task Force*; 2001, page 20.
- Restoration Industry Association; *Recommended Practices for Remediation of Mold Contamination in Building Interiors*; 2003, #2.
- Environmental Protection Agency; *Mold Remediation in Schools and Commercial Buildings*; 2001, Intro, Appendix B.
- Health Canada; *Fungal Contamination in Public Buildings*; 1995, pages 1, 3 & Appendix A.
- Institute of Inspection Cleaning and Restoration Certification; *S520 Standard and Reference Guide for Professional Mold Remediation*; 2003, pages 43-46.
- New York Department of Health; *Guidelines on Assessment and Remediation of Fungi in Indoor Environments*; 2000, Executive Summary, Intr, section 1.
- Occupational Safety and Health Administration; *A Brief Guide to Mold in the Workplace*, SHIB 03-10-10; 2003, page 2, Par. X, Xl, Xll, Xlll.

It is also clear that some areas within the Kansas City International Airport ATCT were not inspected during the invasive mold and moisture inspection. Photo #45 shows a typical access panel in Room 9TS1. The photograph description states, "Several areas above the ceiling and other locations cannot be observed for a thorough mold and moisture evaluation." This comments leads to the question: Why were invasive sampling techniques not used in these areas?

In photo #59 taken in the elevator shaft the photograph description reads, "The only visible mold found on the elevator shaft was a band approximately two feet high on the north, west, and east sides of the elevator shaft approximately ten feet below the 9th floor slab elevation as shown above." Invasive sampling techniques were used in other areas in Kansas City during the inspection. Why is there a concern for only visible mold in the elevator shaft? Large amounts of hidden mold within wall cavities and between layers of drywall may not have been accounted for in the elevator shaft. A strong consensus exists in the authoritative reference documents that make up the mold remediation industry standard of care that hidden fungal growth should be considered when determining the scope of a project.

While the self-described comprehensive approach to the invasive mold and moisture inspection at the Kansas City tower appears to be an improvement over the previous mold investigations conducted at the Kansas City ATCT and the inspections conducted by Applied Environmental, Inc. at the Leo J. Daly designed towers, there are still numerous inadequacies concerning this inspection and the lack of information sharing within the FAA concerning this approach to mold and moisture inspections within ATCTs.

A comprehensive approach to an invasive mold and moisture investigation at the DTW ATCT, along with a comprehensive approach to the remediation and restoration associated with those problems, is promised by the FAA. At this point we have not seen those promises come to fruition. More important, if the FAA believes that the Kansas City inspection represents a model for the comprehensive type of inspections called for

by NATCA, the Agency promise will never be fulfilled as there is no way that the inspection in Kansas City can objectively be described as "comprehensive".

Sincerely,

Michael A. Pinto, CSP, CMP
CEO