

## Letter of Intent

### A. Existing Conditions

This property is commonly known as the Public Safety Building, and it is located at 115 W Doty St, Madison, WI 53703, between the City-County Building and the new Courthouse. The existing building has a footprint of 30,500 square feet (the site is 41,600 square feet), and it consists of a sub-basement plus 5 stories.

The sub-basement is primarily used for underground parking, and it has 68 parking stalls plus 4 handicap parking stalls. In addition to this parking, there is a ground level surface lot along Wilson Street that provides 11 parking stalls plus 1 handicap parking stall.

The basement of the Public Safety Building is primarily used for mechanical support. The first floor is used for booking inmates, short-term holding of inmates, lawyer/family visitation, and jail medical activities. The second floor is occupied by Dane County Sheriff's departmental staff and by Dane County Emergency Management staff.

The third and fourth floors are used for housing long-term inmates, with 200 beds located on each floor. Above the fourth floor, there is a penthouse floor that is used entirely for housing mechanical equipment. Finally, there is a small area over the elevator shafts that extends above the penthouse roof 6' and is used to house the elevator equipment. At this elevator roof, the current building height is approximately 70-85 feet above the ground surface, and the elevation, using the City of Madison Datum, is 128'-10".

### B. Explanation of Proposed Changes

#### Need for Project

As mentioned above, the second floor of the Public Safety Building houses Dane County Emergency Management, which includes the Emergency Operations Center (EOC). The EOC is contained within a hardened, physically secure area and serves to support the command and control functions of local and county government during the response to a major emergency or disaster. Essentially, the EOC is a command center where elected officials, agency heads, department representatives, and others with policy-making authority can meet to coordinate and commit resources to the response and recovery efforts during major emergencies and disasters. As such, effective and reliable communications are essential to minimize the impacts of the disaster.

The purpose of this project is to enhance these critical radio communications into and out of the EOC. The reasons that this improvement is needed are outlined further in the attached copy of our letter to Alderman Verveer. The project will involve placing a metal lattice, guy wired tower that will extend 50 feet above the roof of the elevator shaft of the Public Safety Building. A tower on the roof of the building is needed for four reasons:

1. *To reduce interference problems between existing radios.* Since the EOC is in a hardened area within the building (this is done for security reasons), each radio used there must be connected to a rooftop antenna in order to receive and transmit a clear signal. Presently, these antennas are all mounted on a railing along the perimeter of the roof of the elevator penthouse. All of the existing antennas are mounted at essentially the same height, creating some serious interference problems. Interference arises when the transmitted signal from one radio overloads the receiver on an adjacent radio because the antennas are too close together. This condition inhibits the ability of the receiving radio to pick up a signal on its intended channel. The solution to this situation is to place the antennas at different elevations so the signal from one antenna cannot interfere with those near it. For reasonable performance, on the VHF frequencies used by county public safety agencies, it is recommended that there be at least 2 meters (6.56 feet) of 'vertical separation' between antennas. Tower mounting would be the best way to achieve this separation.
2. *To increase the number of radios available in the EOC.* There currently are three VHF public safety band antennas and two amateur radio band VHF antennas mounted on the roof of the building. There are also a number of smaller, directional antennas linked to the City of Madison's radio system. These are all located within a very small space, and even without the interference problems, the space would be crowded. After-action reviews of past incidents have indicated the need for additional radio communications in the EOC, recommending the capacity for at least two more radios in the county's VHF public safety band. Dane County's Amateur Radio Emergency Service has also requested space for five additional amateur radio antennas to support their operations. (*Amateur Radio is a group that voluntarily provides backup emergency communications to agencies throughout the country in the event that major components of the regular system are disabled.*) There simply is no space for these additional antennas without going up, especially if we also seek to minimize interference.
3. *To support the installation of a cellular telephone amplification system for the EOC.* The EOC is notorious for poor cellular telephone signal strength. Most agency representatives in the EOC have cell phones and rely on them heavily. Cell phones in the EOC, however, work poorly, if at all. After-action reviews of past exercises and actual incidents consistently recommend that a signal strength amplifier be installed. A cellular signal strength amplification system would require two outdoor antennas, separated by at least 20 feet horizontally and 20 feet vertically to work effectively. Again, tower mounting of one of the antennas is needed to achieve the recommended separation.
4. *To improve radio signal coverage.* The Public Safety Building is essentially in a bowl that is created by several taller buildings nearby. Several of these taller nearby buildings, most notably, the new courthouse, block the radio signal path from the Public Safety Building to substantial portions of the county. While these buildings do not obstruct radio communications completely, they do reduce the

signal. Placing the antennas higher up on a tower would greatly increase the range and coverage of the EOC radios.

Based on consultations with personnel in the City's Communications Operations division (a.k.a. the radio shop), we believe that a tower reaching 50 feet above the current roof and careful arrangement of antennas is the only alternative that will meet the present and future radio communication needs in the EOC.

### **Description of Changes**

In order to do this project, we are proposing to amend the PUD-GDP-SIP plan for this site to allow for the critically necessary emergency communications equipment. As such, the Zoning Text would need to be modified to allow for an antenna tower as a supplemental use associated with the already allowed emergency command center operations.

This metal lattice tower will be as visibly unobtrusive as possible. The footprint of the tower will be extremely small (it is a triangle measuring 1'-2 1/2" by 1'-2 1/2" by 1'-4 3/4"), and the tower will not need any special markings or lighting. In addition, the total height of the antenna will be below the height limits imposed near the Capitol. In fact, the top of the antenna will be near the elevations of many of the buildings that surround the Public Safety Building. For example, the tower will be more than 8 feet below the roof of the Courthouse. Also, the tower will be 6 feet above the roof of the CCB and approximately 84 feet below the height of the antenna tower on the CCB roof.

### **Alternatives**

As part of our design process for this project, we have met with Bob Halloway from the neighborhood association and with Alderman Mike Verveer. In addition, we will be holding public meetings with these groups in the coming weeks. As part of our initial design, and in response to Mr. Halloway and Ald. Verveer's questions, Dane County has evaluated two alternatives to constructing a 50-foot tower. Possible options include: remote control of radio equipment located in other nearby buildings and construction of two or more smaller towers. These alternatives were evaluated based on many criteria, including the potential to address all of the identified needs, aesthetics, neighbor impact, and costs. A brief summary of each of the alternatives can be found below.

1. *Remote control of radio equipment and antennas located elsewhere.* Dane County's Public Safety Communications (911) Center is located across the street in the City-County Building, with antennas and microwave links already located on a tower on the roof of that building. As such, we initially looked to somehow build onto the existing system, avoiding the duplication of equipment, and eliminating the need for an additional tower altogether. Remote control of radio equipment associated with the 911 Center, however, is not a viable option for the following reasons:
  - a. Radio communications in and out of the EOC are essential public safety communications. Radio remote control configurations are technically complicated and would add numerous subsystems into the design, each

increasing the potential for failure. A desktop radio with a rooftop antenna is a simple system and would be much less prone to failure or other technical problems.

- b. There is no redundancy in the design. If there would be a problem with equipment or other physical operations in the City-County Building, radio communications in the EOC would also be disrupted. For mission-critical communications, this is an unacceptable risk.
- c. There is no Amateur Radio equipment currently located in the City-County Building, and therefore nothing to which to connect the remote controls. In order to enable the necessary Amateur Radio communications, there would still be a need to put a tower on the roof of the PSB.
- d. The antennas for the cellular telephone signal amplifiers are not designed to be operated by remote control. The amplifier design requires outdoor antennas to operate, with a vertical separation of at least 20 feet, both vertically and horizontally. Again, with this requirement for vertical separation, there is still a need for a tower-mounted antenna.
- e. The remote control option is the highest cost of all the alternatives we evaluated. Being a small public agency with a limited budget, Emergency Management would have difficulty justifying to decision-makers and taxpayers a proposal that does not represent the lowest cost, especially when it is not a technically feasible option.

2. *Place the antennas on two or more smaller towers.* The objective of reducing radio interference can be achieved by separating the antennas vertically or horizontally. In the VHF band, either 2 meters (6.56 feet) of vertical separation or 20 meters (68.65 feet) of horizontal separation will reduce the likelihood of interference to an acceptable level. With this in mind, we looked at the possibility of spreading these antennas out along the rooftop, or perhaps installing them on shorter towers to address the interference problems and still expand the EOC radio capability to the necessary level. Given the configuration of the roof, there would be enough space to achieve a horizontal separation of 20 meters at four points on the roof of the 5<sup>th</sup> floor mechanical space of the building. There are some serious shortcomings with this design, however.

- a. With this configuration the towers could be shorter, perhaps 25 feet high instead of 50 feet, but in order to remain at least 20 meters apart, they would need to be mounted very close to the edge of the roof. This would significantly increase their visibility from the street and would be aesthetically unappealing.
- b. Even at 25 feet, there would still be a need for guy-wire support. This type of support is usually achieved with guy wires located at three points. There will be real problems in finding adequate anchor points when the base of the tower is located close to the edge of the roof.
- c. The roof of the 5<sup>th</sup> floor mechanical space is not as structurally substantial as the roof and support columns in the area of the elevator penthouse. This is important to consider when designing antenna systems to account



for all loading situations. For antennas, we need to account for dead load (antenna weight), snow and ice load, and wind load, just to name a few. The combination of these loads can create large horizontal and vertical directional forces, as well as significant moment forces. To account for these forces, our current design calls for the base of the antenna to be attached to the structurally stronger side walls of the elevator penthouse. This location also allows for the antenna to be located in the area of stronger roof beams and support columns, and the location greatly reinforces the antenna against strong moment forces. With this carefully chosen configuration, the elevator penthouse will support a 50-foot tower without need for additional structural support. However, with the 25-foot towers, it would be necessary to install bearing plates and to reinforce the 5<sup>th</sup> floor roof to support their weight. Additionally, to mitigate moment forces in the 25-foot antenna towers, the bases would need to be seriously strengthened and/or additional guy wires may need to be added. Obviously, these changes would add significant costs to the project and possibly worsen the aesthetics.

- d. The built environment in Downtown Madison has changed since the Public Safety Building was constructed. There are now taller buildings in just about all directions around the building. The new Courthouse, in particular, blocks the radio signal to the southwest and is directly in the path to the Verona Tower. The Verona Tower is the site of the primary repeaters on several of the County's fire, EMS, and law enforcement radio channels. Since radio signals are essentially 'line-of-sight,' the obstructions presented by these higher buildings can severely limit signal quality and coverage of the EOC radios. Mounting antennas on a 25-foot tower does not give enough elevation to get a strong signal out of the bottom of the 'bowl' created by adjacent buildings. Ideally, we would be installing a tower much taller than 50 feet, but we recognize that this would not be acceptable to our neighbors.
- e. The cost to install two, 25-foot antennas would be more than twice the cost of installing one, 50-foot antenna. By far, the largest portion of the cost is in the tower's support/base materials and the installation labor. In comparison, the other tower sections themselves are relatively inexpensive. The increase in cost arises due to the doubling of the time needed to install two towers instead of one, as well as the added cost to reinforce the antenna bases and the 5<sup>th</sup> floor roof, which was not designed to support the weight. As mentioned before, one 50-foot tower could be installed along the elevator penthouse, which would not require additional reinforcement. The County has \$25,000 budgeted toward this project. A doubling of the cost would effectively make this project unattainable.

Good stewardship of public funds necessitates selection of the lowest cost alternative if it is technically feasible. In this case, the lowest cost option is also the one that is the most technically feasible. The alternatives would add cost and would only partially achieve the project goals

### **Timeline and Contact Information**

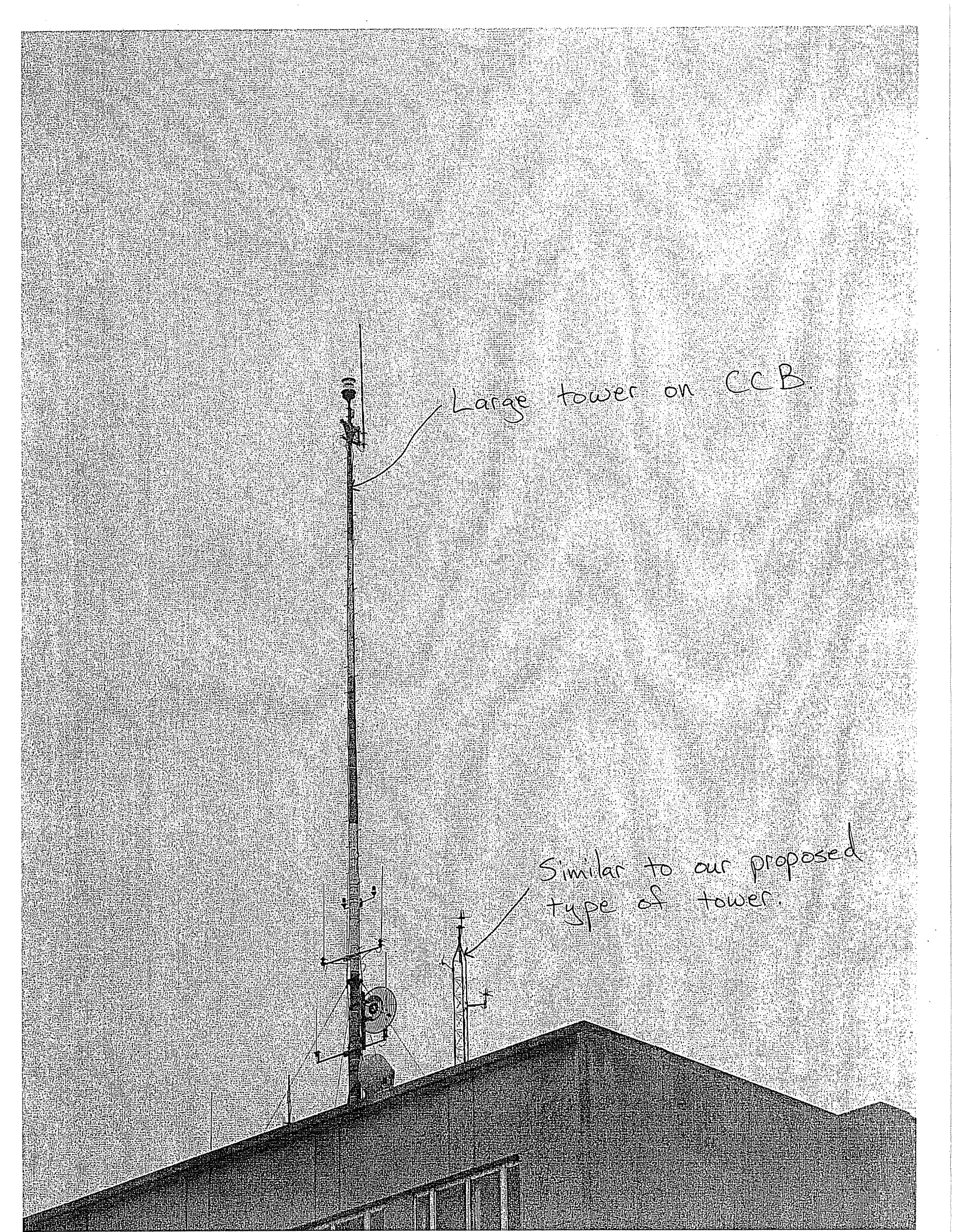
Once this project receives approval, it will take less than 3 weeks to actually construct the tower. However, a contractor has already been approved for this project, and Dane County was only able to "lock in" the contractor's low bid amount for a limited time. Therefore, if approval of this project is delayed, it could result in Dane County losing its low bid amount and its contractor for this project.

The contractor for this project is Wave Communications, and their Project Manager is Robb Repenshek. In addition, John Welch of Dane County Public Works Engineering will act as the County's Construction Supervisor, and Dave Janda, Communications and Warning Specialist with Dane County Emergency Management, will ensure that all of Dane County's emergency communications abilities are sufficient. Please do not hesitate to contact either John Welch or Dave Janda with any questions or concerns. Their contact information can be found below. Dane County is willing and excited to work with the Zoning Board, the Plan Commission, the Urban Design Commission, and the Common Council to resolve any issues with this project so work can remain on schedule, and the reliability and effectiveness of the emergency communications in our area can be greatly increased.

#### **County Contacts:**

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Dane County Public Works Engineer  
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Large tower on CCB.

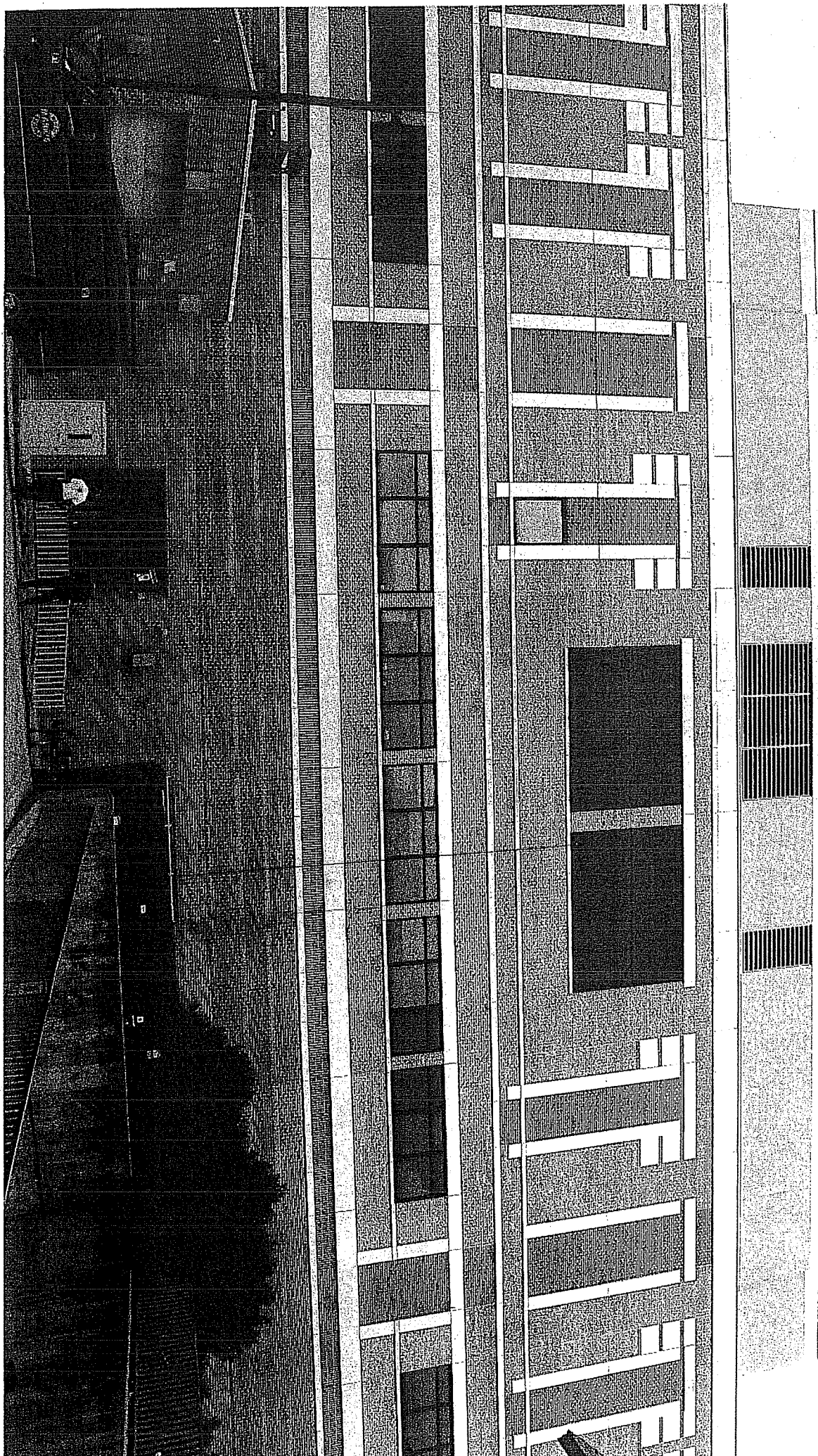
Similar to our proposed  
type of tower.

Examples of Visible Antenna Height  
From Multiple Locations

Location	Dist to Face of Bldg	Dist to Antenna	Visible Height of Antenna
1 Middle of Surface Parking Lot Along Wilson	75	133	0.0
2 Sidewalk on Near Side of Wilson	144	202	18.2
3 Sidewalk on Far Side of Wilson	204	262	25.8
4 In Front of Paisan's Entrance	253	313	28.4
5 NW Corner of Henry & Doty	332	466	22.6
6 SE Corner of Hamilton & Doty	105	218	0.0
7 SW Corner of Hamilton & Doty	163	230	26.2
8 121 S Hamilton's South Entrance (On Doty)	92	141	18.6
9 NW Corner of Doty & Carol	84	174	0.0
10 Sidewalk along CCB on Carol St	75	219	0.0
11 Parking Ramp at Monona Terrace	NA	NA	45.0
12 Parking Ramp Next to Baskerville	NA	NA	50.0
13 Olin Park Along John Nolen	NA	NA	0.0
14 Corner of W Wilson & Henry	NA	NA	0.0
15 Corner of Hamilton, Main, & Carroll	NA	NA	0.0
16 NW Corner of Doty & MLK Jr Blvd	NA	NA	0.0
17 Between Broom & Henry on Doty	NA	NA	0.0



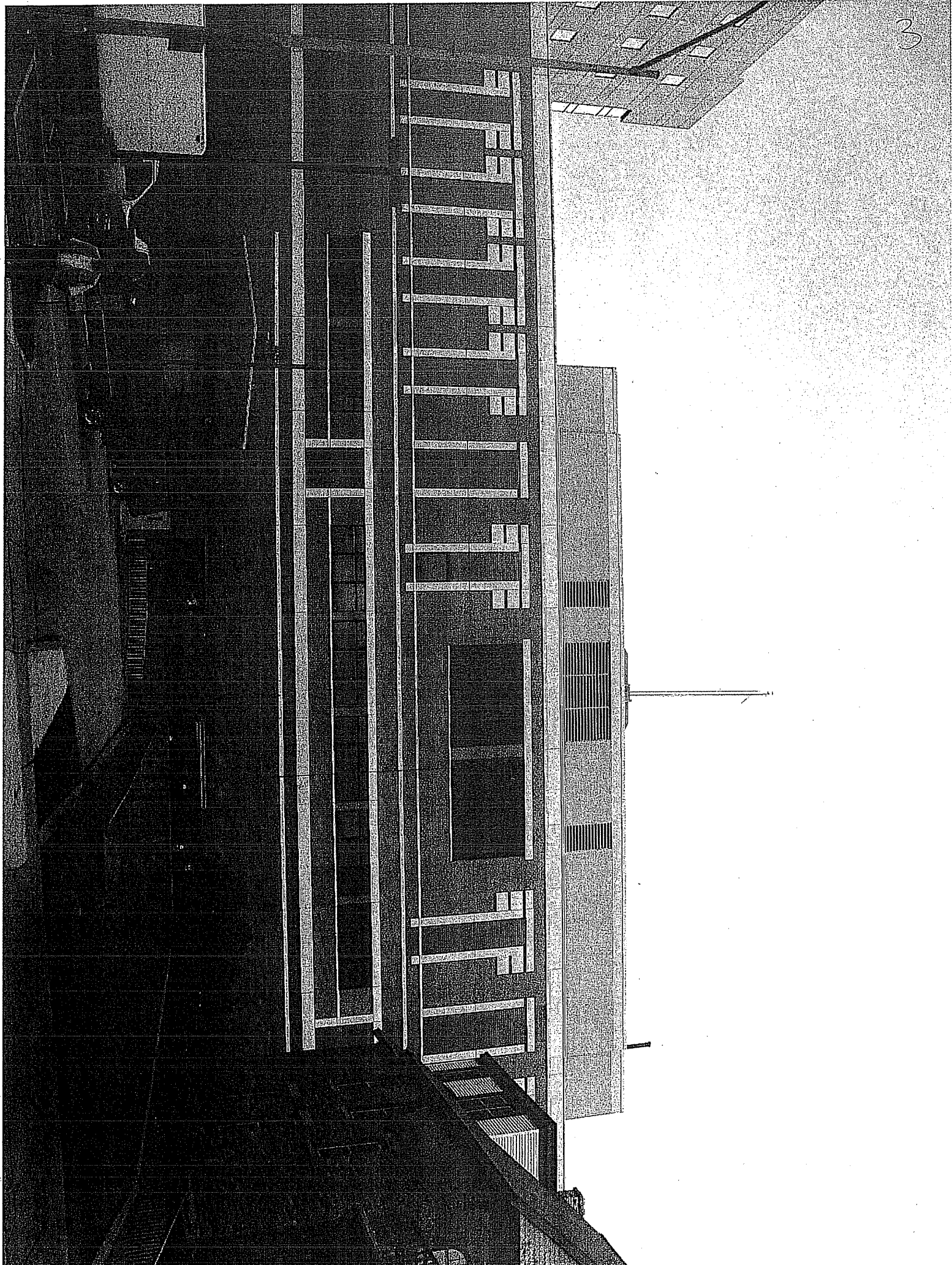




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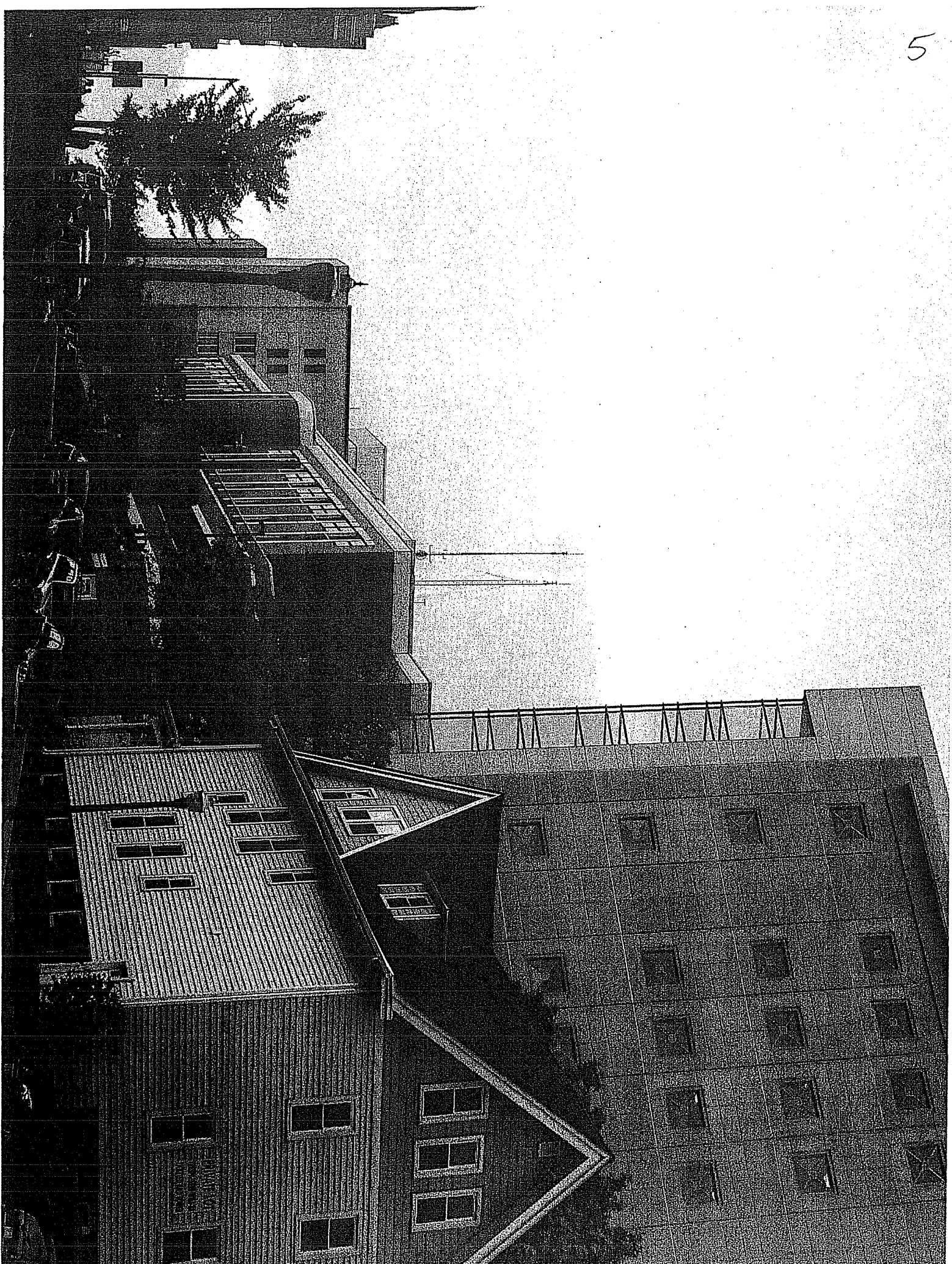
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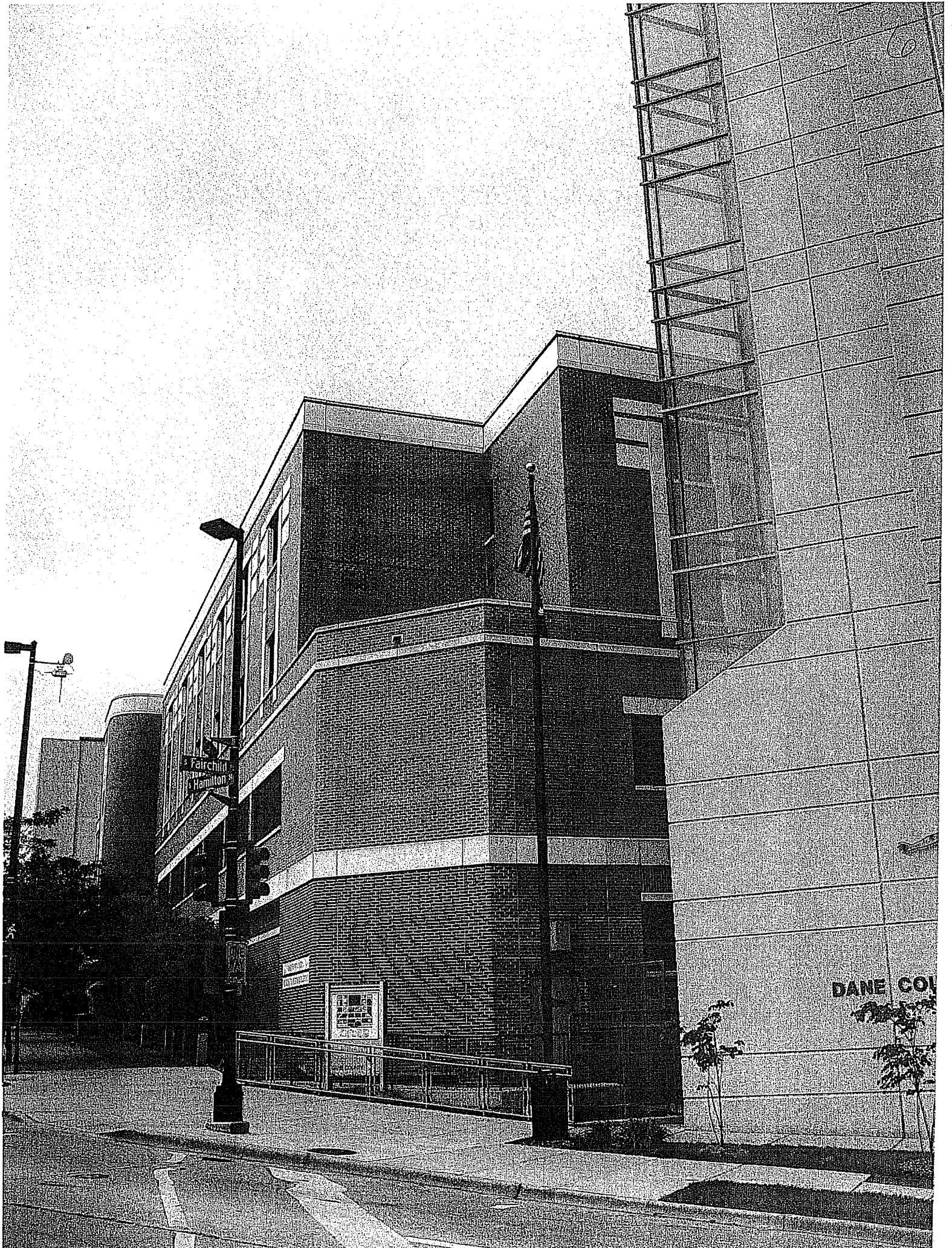










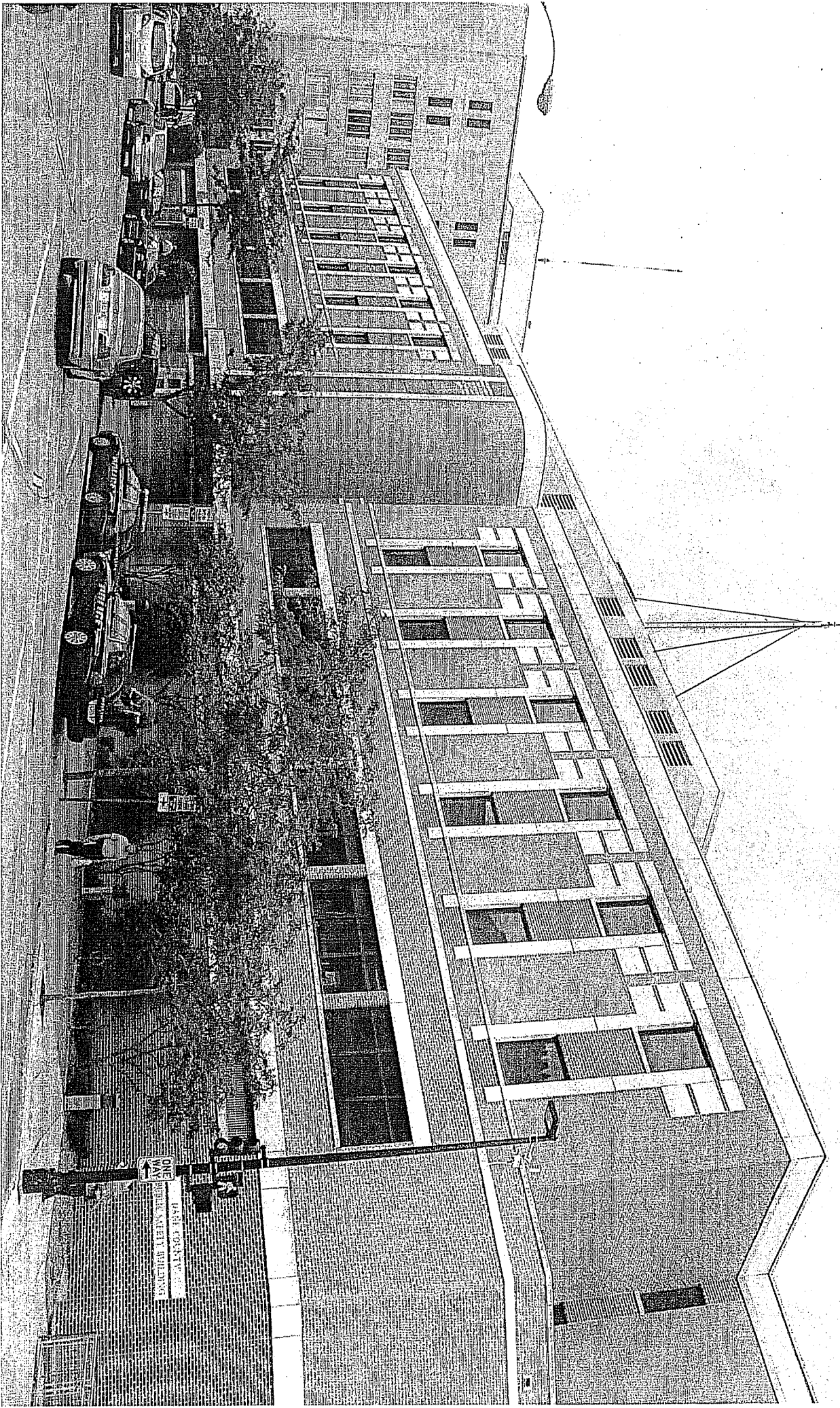


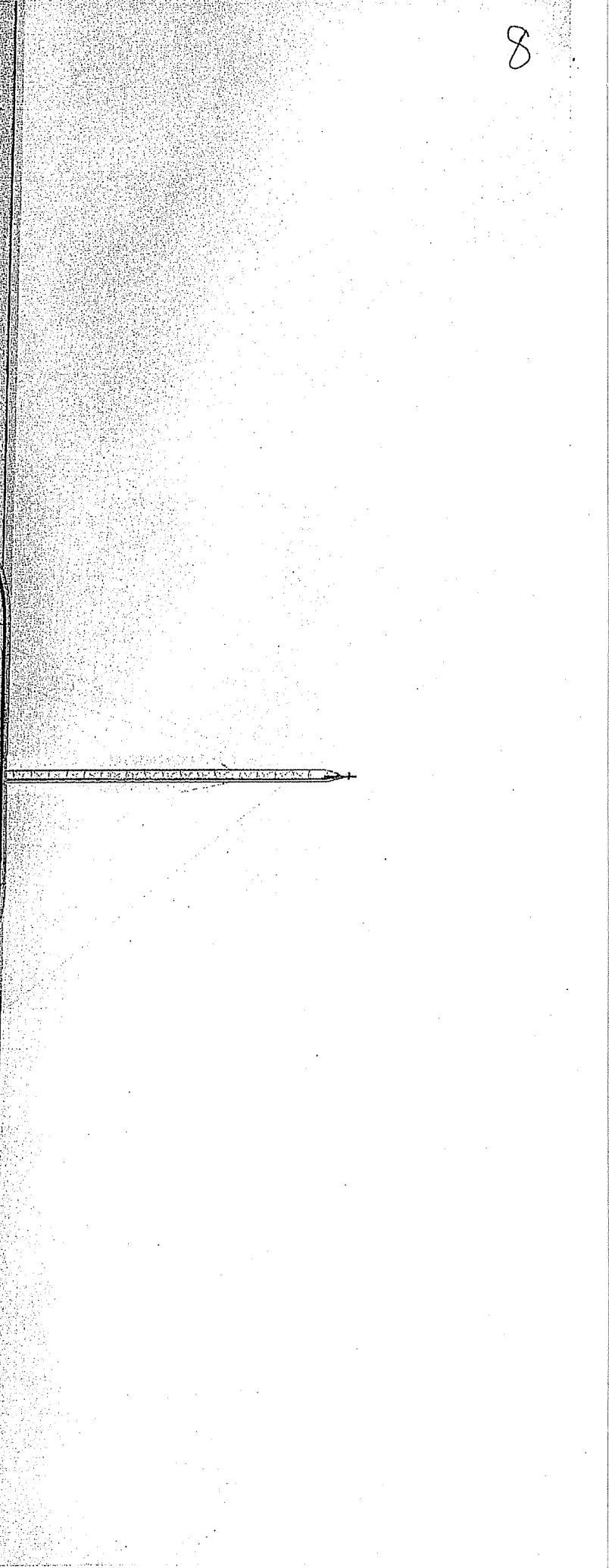
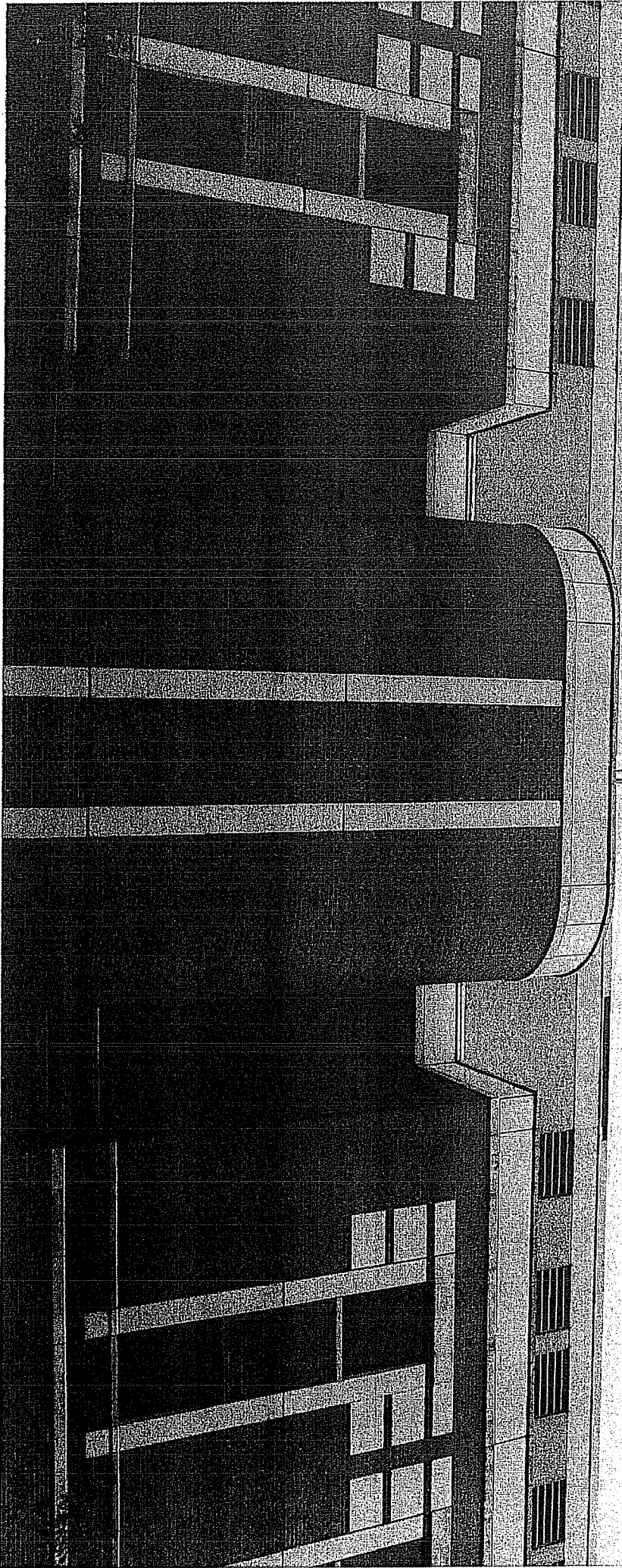
Fairchild  
Hamilton

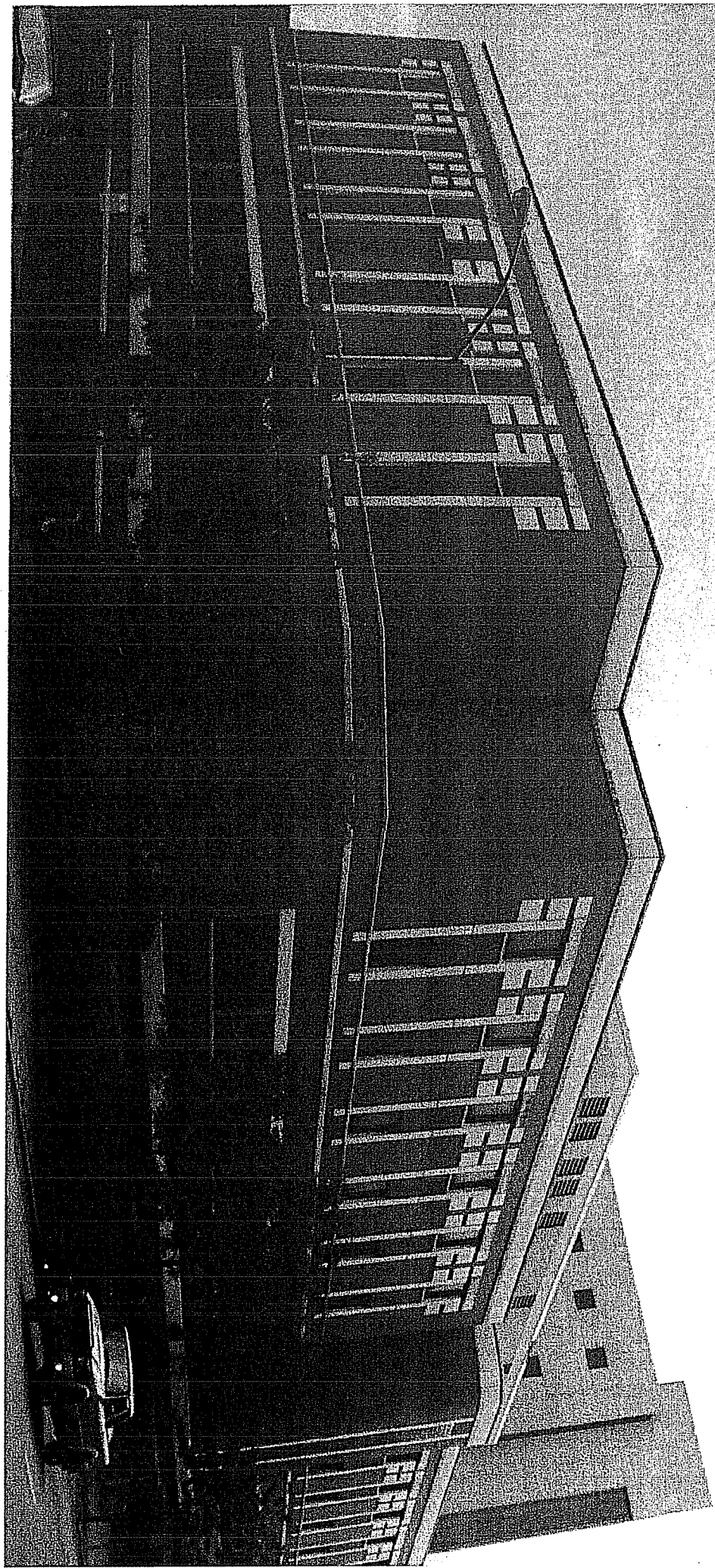
DANE COUNTY

DANE CO





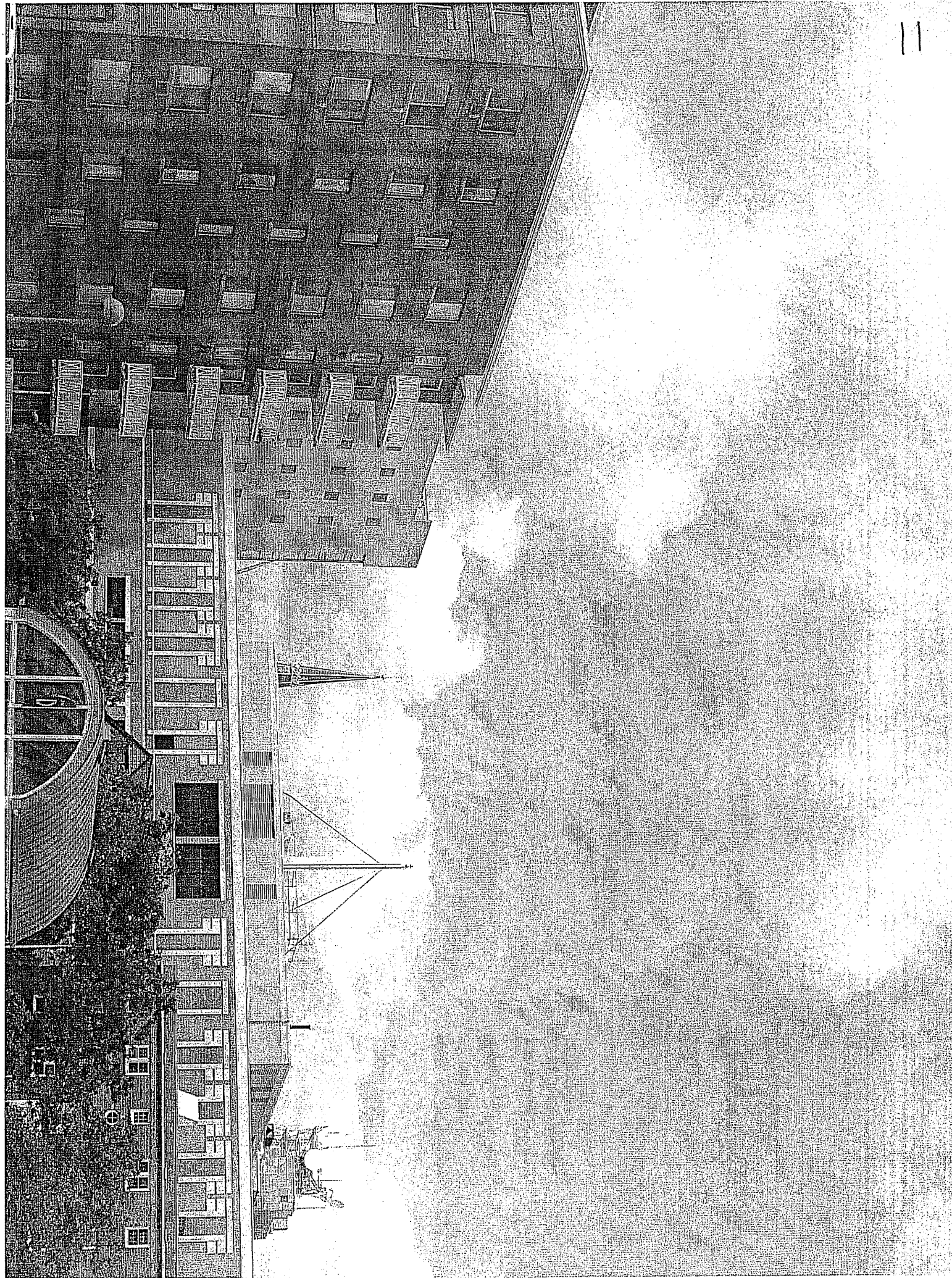




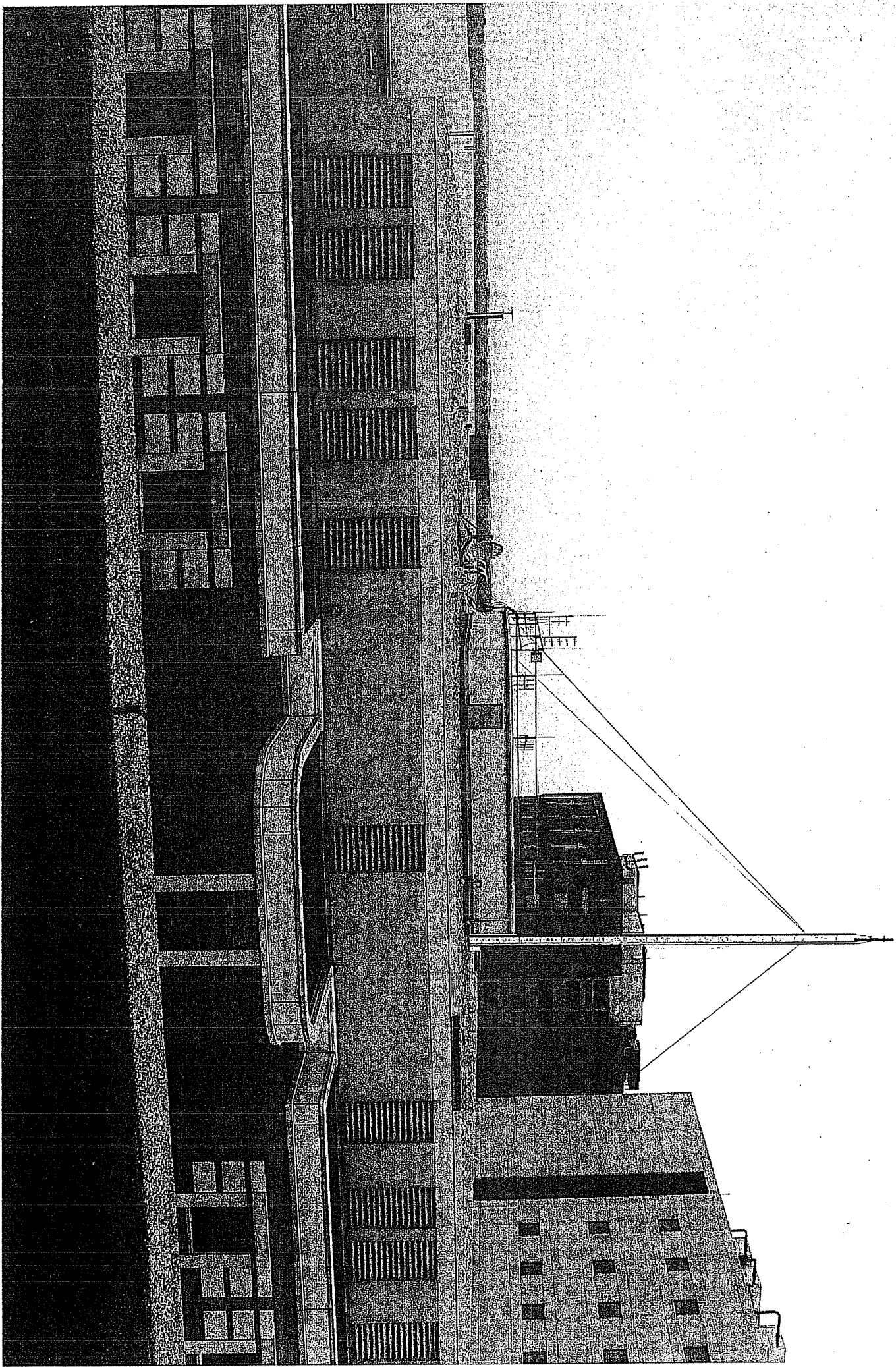




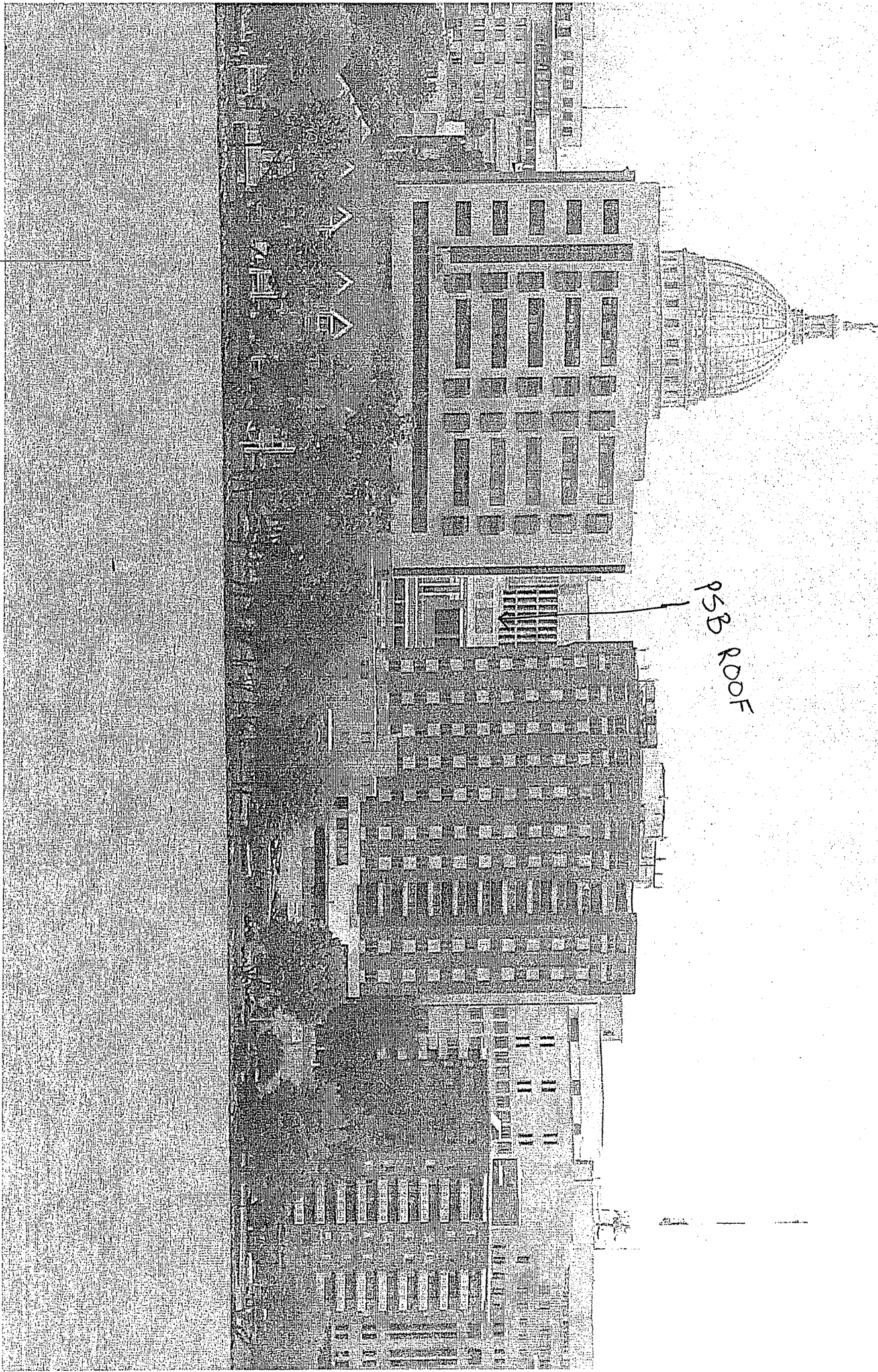
EXHIBIT



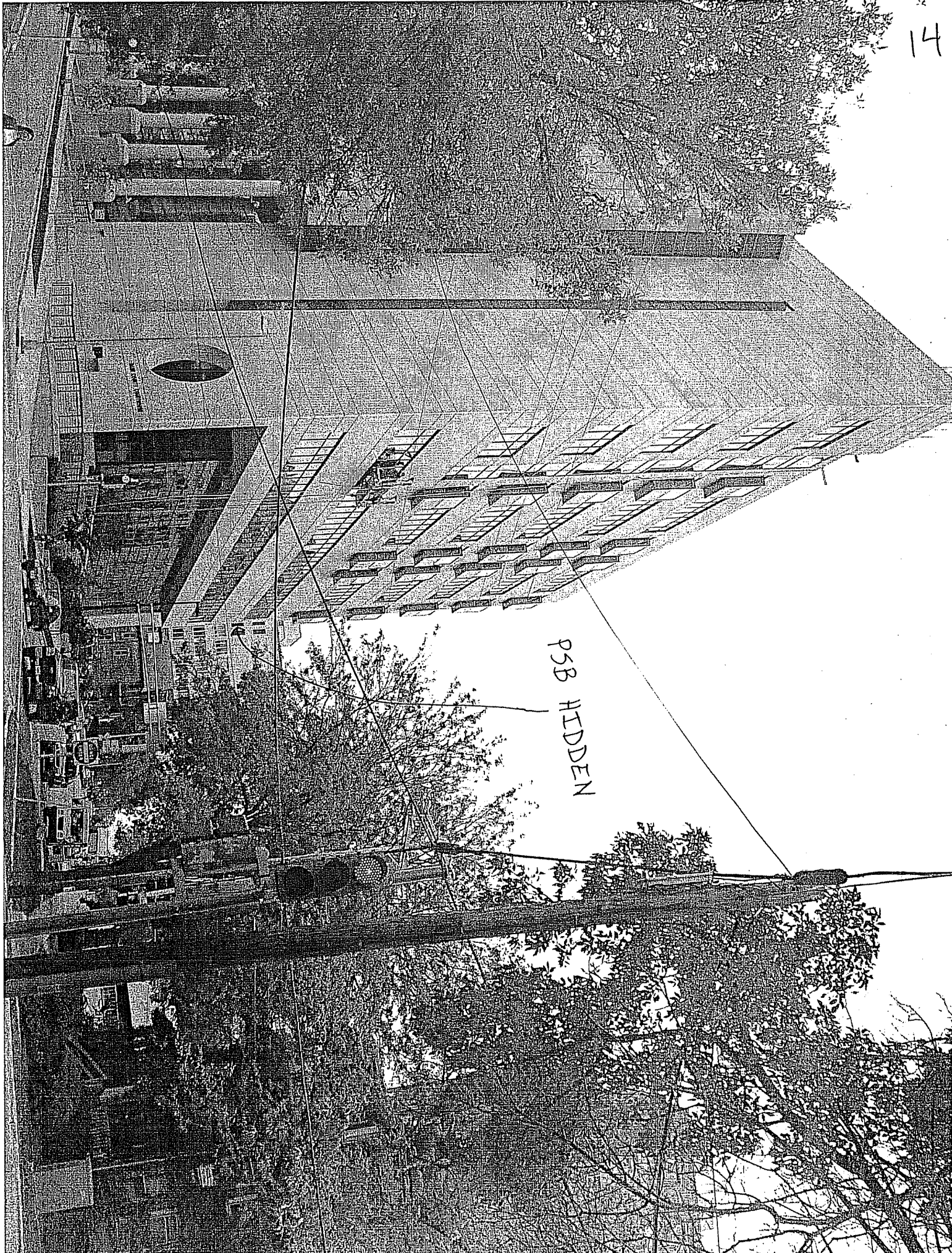






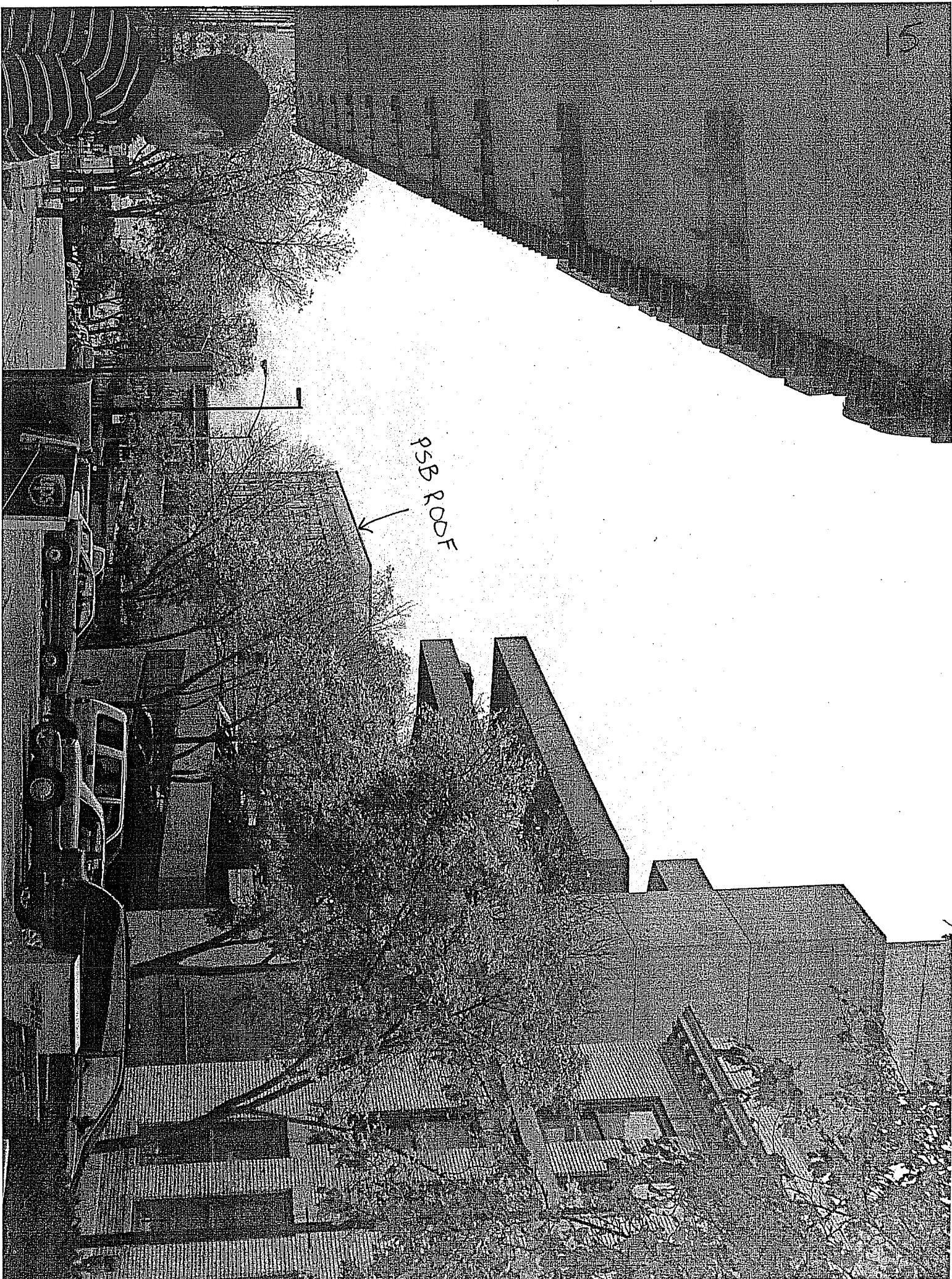


PSB ROOF



P5B HIDDEN

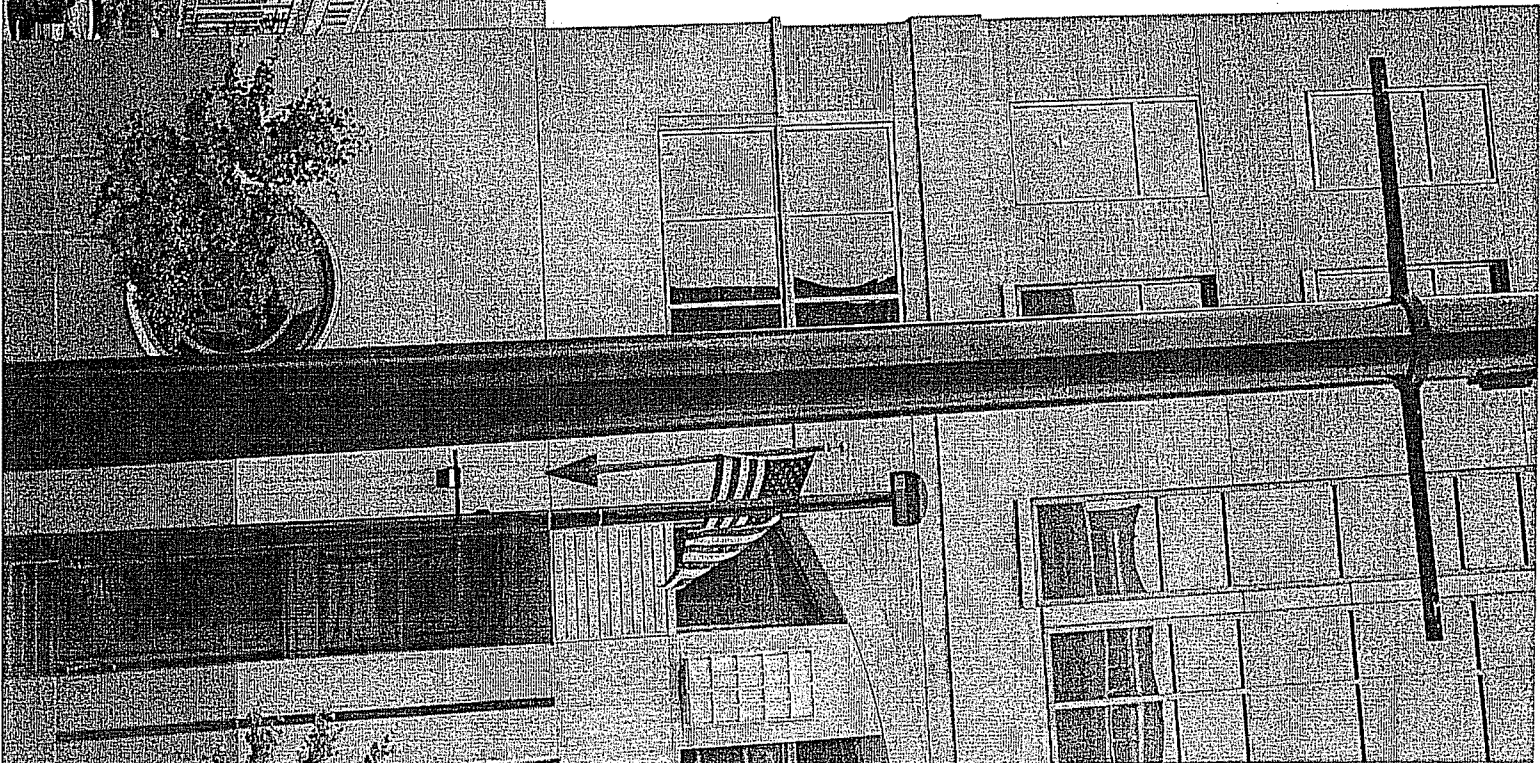




PSB ROOF



PSB ROOF





PSB  
ROOF



Examples of Existing Surrounding  
Building Heights

Picture	Location
18	Monona Terrace Parking Lot - End of Carroll St
19	Monona Terrace Parking Lot - End of Carroll St
20	NW Corner of Doty & Hamilton
21	Sidewalk on Near Side of Wilson
22	NW Corner of Henry & Doty
23	NW Corner of Carroll & Doty



