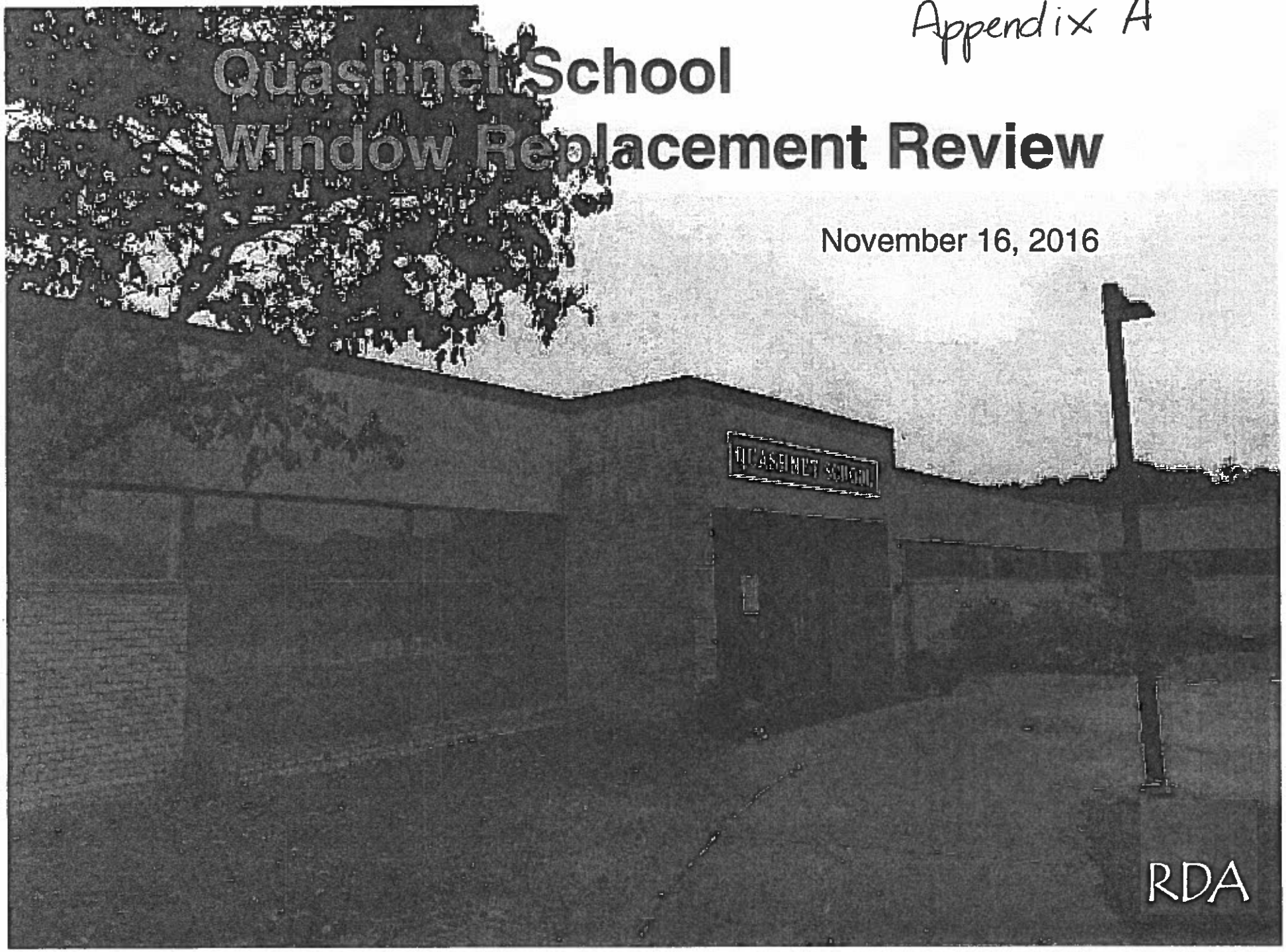
Appendix A

Quashnet School Window Replacement Review

November 16, 2016



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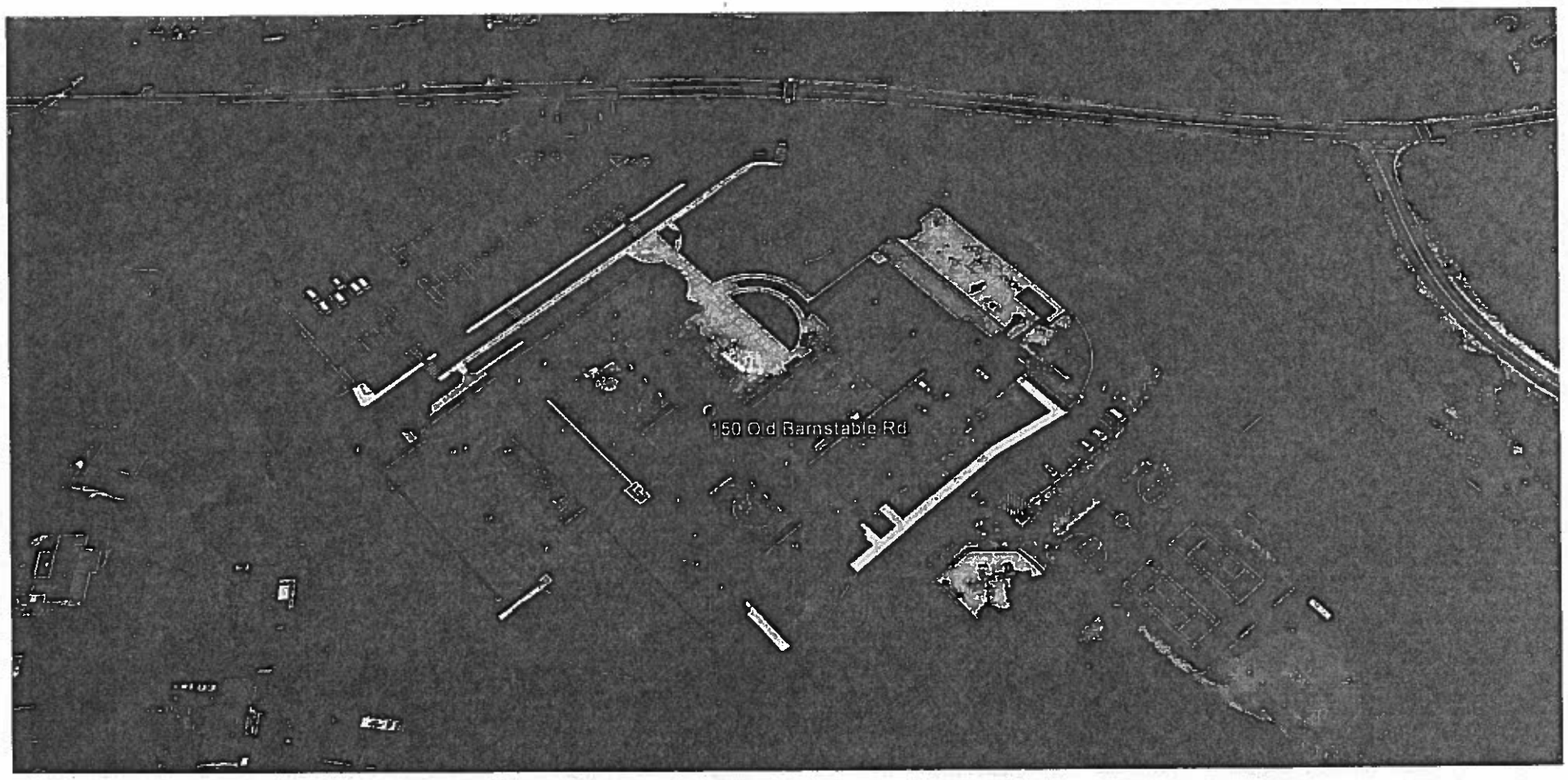

Aerial View

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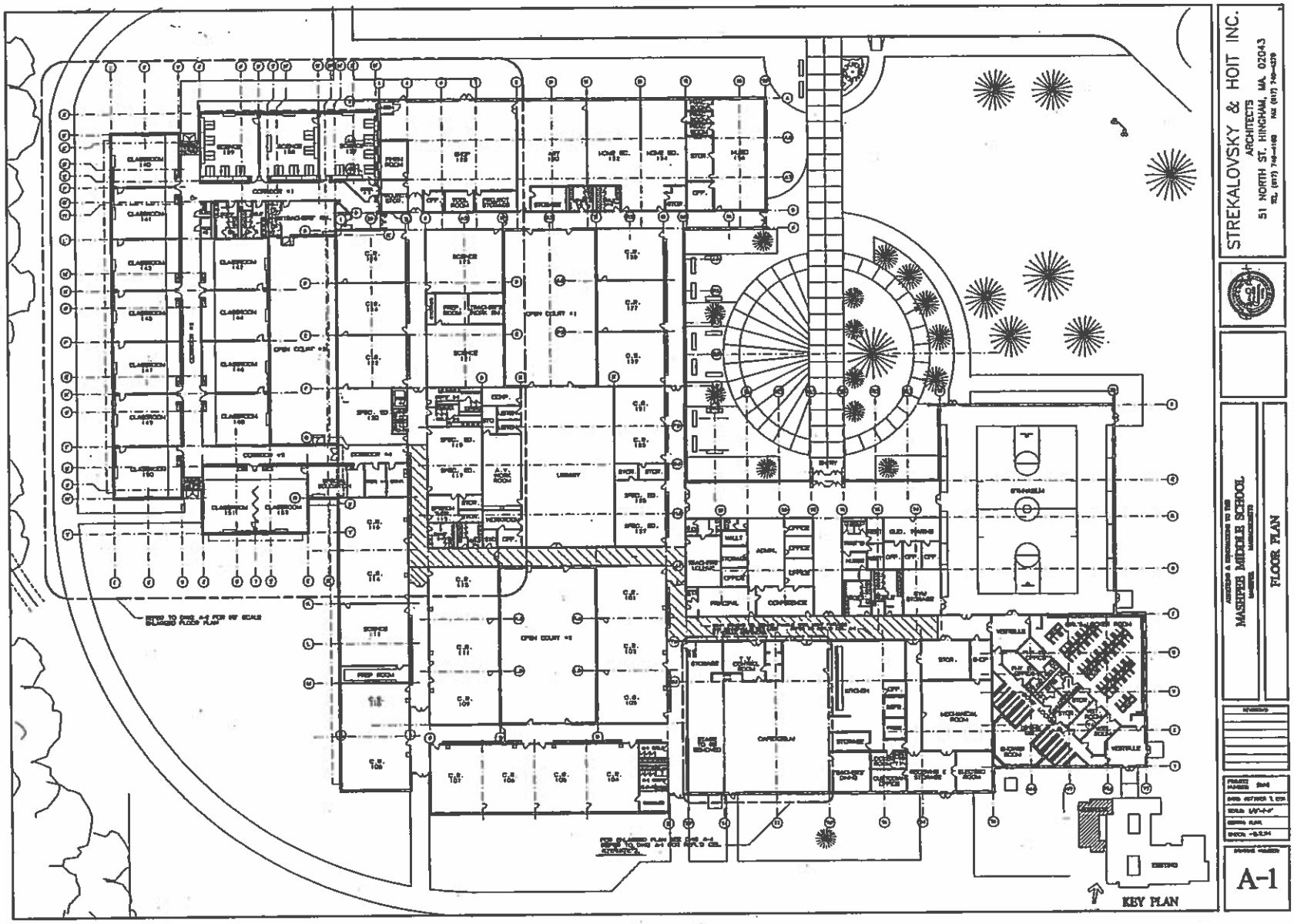
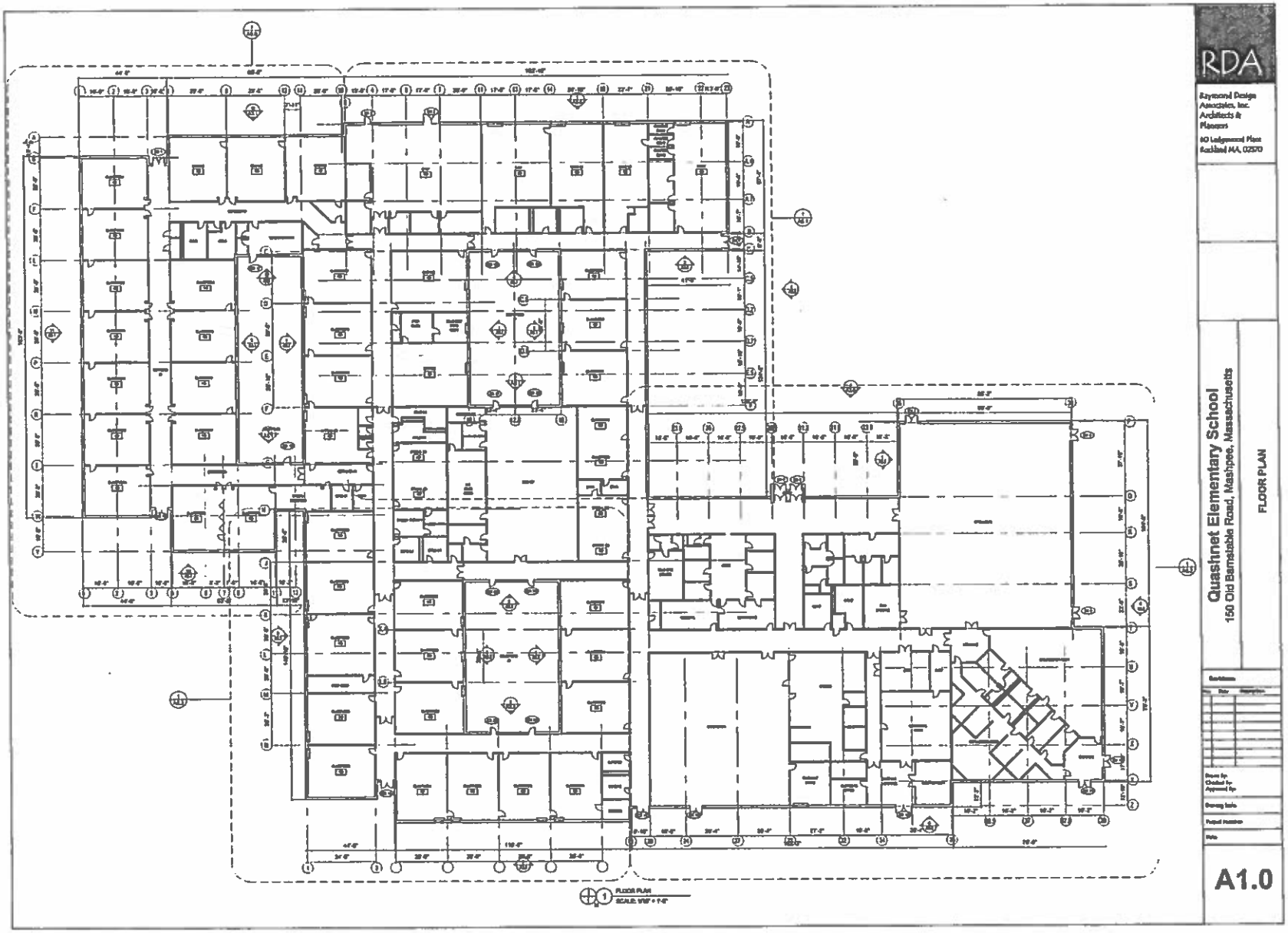


Building / Site Plan

3

RDA


RDA
Raymond Design Associates, Inc.
Architects & Planners
Quashnet Elementary School
150 Old Barnstable Road, Mashpee, Massachusetts
FLOOR PLAN
A1.0

Floor Plan

Adoption of the proposed 9th Edition of the Massachusetts Building Code

At this date, the Proposed 9th Edition of the Massachusetts Building Code has not come back from the Governor's Administration and Finance Committee and is still pending. While none of the Massachusetts Amendments to the IBC 2015 Building Code (Massachusetts 9th Edition Building Code) is guaranteed, it is reasonable to conclude that for now:

1. Any project where permit application is made before March 1, 2017 may be under the 8th Edition.
2. Any project where permit application is made after March 1, 2017 and before September 1, 2017 may be probable to be completed under the 8th Edition either by right (because the effective date slipped, 6 month grace period) or under a variance (possibly administrative variance).
3. Any project where permit application is made on or after 7/1/17, should anticipate needing to comply with the 9th Edition.

There are appreciable and significant changes in this issue between the 8th and 9th Editions. There is now an assignment of ultimate wind speed based on the Risk Category for the building.

In this case under the proposed 9th, the building is a Risk Category III and the wind speed will exceed 140 mph. Therefore, the building is considered to be in a wind borne debris region and the windows must meet 1609.1.2.
1609.1.2 requires impact resistant glazing or protection of openings with impact resistant coverings.

16.00: continued

TABLE 1604.11 GROUND SNOW LOADS; BASIC WIND SPEEDS; EARTHQUAKE DESIGN FACTORS - continued

City/Town	P_g	V	S_s	S_1	City/Town	P_g	V	S_s	S_1
Hudson	55	100	0.26	0.068	Wellesley	55	100	0.27	0.067
Hull	45	110	0.28	0.067	Wellfleet	35	120	0.20	0.054
Huntington	65	100	0.22	0.066	Wendell	65	100	0.23	0.069
Ipswich	45	110	0.34	0.074	Wenham	45	110	0.32	0.073
Kingston	45	110	0.24	0.061	W. Boylston	55	100	0.25	0.067
Lakeville	45	110	0.24	0.061	W. Bridgewater	45	110	0.25	0.063
Lancaster	55	100	0.27	0.070	W. Brookfield	55	100	0.23	0.066
Lanesborough	65	90	0.22	0.068	W. Newbury	55	110	0.35	0.077
Lawrence	55	110	0.33	0.075	W. Springfield	55	100	0.23	0.065
Lee	65	90	0.22	0.066	W. Stockbridge	65	90	0.22	0.066
Leicester	55	100	0.24	0.066	W. Tisbury	35	120	0.18	0.052
Lenox	65	90	0.22	0.067	Westborough	55	100	0.25	0.067
Leominster	65	100	0.26	0.070	Westfield	55	100	0.23	0.066
Leverett	65	100	0.23	0.068	Westford	55	100	0.30	0.073
Lexington	55	105	0.29	0.070	Westhampton	65	100	0.22	0.066
Leyden	65	100	0.23	0.069	Westminster	65	100	0.26	0.071
Lincoln	55	100	0.28	0.069	Weston	55	100	0.27	0.068
Littleton	55	100	0.29	0.071	Westport	45	110	0.23	0.058
Longmeadow	55	100	0.23	0.065	Westwood	55	100	0.26	0.066
Lowell	55	100	0.31	0.074	Weymouth	45	105	0.27	0.066
Ludlow	55	100	0.23	0.066	Whately	65	100	0.22	0.067
Lunenburg	65	100	0.28	0.071	Whitman	45	110	0.25	0.063
Lynn	45	110	0.31	0.071	Wilbraham	55	100	0.23	0.065
Lynnfield	45	110	0.31	0.072	Williamsburg	65	100	0.22	0.067
Malden	45	105	0.29	0.069	Williamstown	65	90	0.23	0.069
Manchester	45	110	0.32	0.072	Wilmington	55	105	0.31	0.073
Mansfield	55	110	0.25	0.063	Winchendon	65	100	0.26	0.071
Marblehead	45	110	0.31	0.071	Winchester	55	105	0.29	0.070
Marion	45	110	0.22	0.057	Windsor	65	90	0.22	0.067
Marlborough	55	100	0.26	0.068	Winthrop	45	105	0.29	0.068
Marshfield	45	110	0.26	0.064	Woburn	55	105	0.30	0.071
Mashpee	35	120	0.20	0.054	Worcester	55	100	0.24	0.067
Mattapoisett	45	110	0.22	0.057	Worthington	65	100	0.22	0.067
Maynard	55	100	0.27	0.069	Wrentham	55	100	0.24	0.064
Medfield	55	100	0.25	0.065	Yarmouth	35	120	0.19	0.052

1605.3.1 Replace Equation 16-3 as follows:

$$2/3[1.2D+(1.6W \text{ or } 1.0E)+f_1L+0.5(L_r \text{ or } S \text{ or } R)+1.6H] \text{ where } f_1 \text{ is defined in section 1605.2.1}$$

1605.3.2 Delete.

Table 1607.1 Item 5. Revise to read as follows:

Balconies (exterior and interior) and decks[k]

Table 1607.1 Item 30. Revise 'Classroom' uniform loading as follows: 50 psf

1607.5 Add a last sentence as follows:

Partition loads are non-reducible live load.

1607.9.1.6 Add section:

1607.9.1.6 Hangers. Live load shall not be reduced for hangers.

City/Town	SNOW LOADS: Ground Snow Load, P_g (psf)	SNOW LOADS: Minimum Flat Roof Snow Load, P_f[1] (psf)	BASIC WIND SPEED, V_{ult} (mph): Risk Category I	Risk Category II	Risk Category III or IV	SEISMIC PARAMETERS (g): S_s	S_1
Manchester	50	30	117	128	139	0.249	0.074
Mansfield	35	30	121	131	142	0.186	0.064
Marblehead	40	30	118	128	139	0.239	0.072
Marion	30	30	129	139	150	0.170	0.058
Marlborough	50	35	114	125	135	0.194	0.068
Marshfield	35	30	124	134	145	0.196	0.064
Mashpee	30	25	131	140	152	0.156	0.055
Mattapoisett	30	30	129	139	150	0.169	0.058
Maynard	50	35	114	124	135	0.206	0.069
Medfield	40	35	118	129	139	0.191	0.066
Medford	40	30	117	127	138	0.221	0.070
Medway	40	35	118	129	139	0.185	0.065
Melrose	40	30	117	127	138	0.227	0.071
Mendon	40	35	118	128	138	0.179	0.064
Merrimac	50	30	112	123	133	0.265	0.078
Methuen	50	30	112	122	133	0.251	0.076
Middleborough	30	30	125	135	146	0.183	0.062
Middlefield	60	40	105	115	120	0.169	0.066
Middleton	50	30	115	125	136	0.245	0.074
Milford	40	35	117	128	138	0.182	0.065
Millbury	50	35	115	125	136	0.178	0.065
Millis	40	35	118	129	139	0.188	0.065
Millville	40	35	118	129	139	0.177	0.063
Milton	40	30	119	130	141	0.205	0.067
Monroe[2]	60	40	105	115	120	0.174	0.069
Monson	40	35	111	122	132	0.173	0.065
Montague	50	35	105	116	122	0.173	0.068
Monterey	50	40	105	116	122	0.170	0.065
Montgomery	40	40	105	117	123	0.171	0.066
Mount Washington[2]	40	40	105	115	120	0.171	0.065
Nahant	40	30	118	128	139	0.229	0.071
Nantucket	25	25	139	140	158	0.113	0.047
Natick	40	35	117	127	138	0.197	0.067
Needham	40	35	118	128	139	0.201	0.067
New Ashford[2]	50	40	105	115	120	0.173	0.068
New Bedford	30	30	129	139	150	0.170	0.058
New Braintree	50	35	111	121	131	0.176	0.066
New Marlborough	50	40	105	115	120	0.171	0.065

[BS] WIND-BORNE DEBRIS REGION. Areas within hurricane-prone regions located:

1. Within 1 mile (1.61 km) of the coastal mean high water line where the ultimate design wind speed, V_{ult}, is 130 mph (58 m/s) or greater; or

2. In areas where the ultimate design wind speed is 140 mph (63.6 m/s) or greater.

For *Risk Category* II buildings and structures and *Risk Category* III buildings and structures, except health care facilities, the wind-borne debris region shall be based on Figure 1609.3.(1). For *Risk Category* IV buildings and structures and *Risk Category* III health care facilities, the windborne debris region shall be based on Figure 1609.3(2).

WINDFORCE-RESISTING SYSTEM, MAIN. See "Main windforce-resisting system."

[BS] WIND SPEED, V_{ult}. Ultimate design wind speeds.

[BS] WIND SPEED, V_{asd}. Nominal design wind speeds.

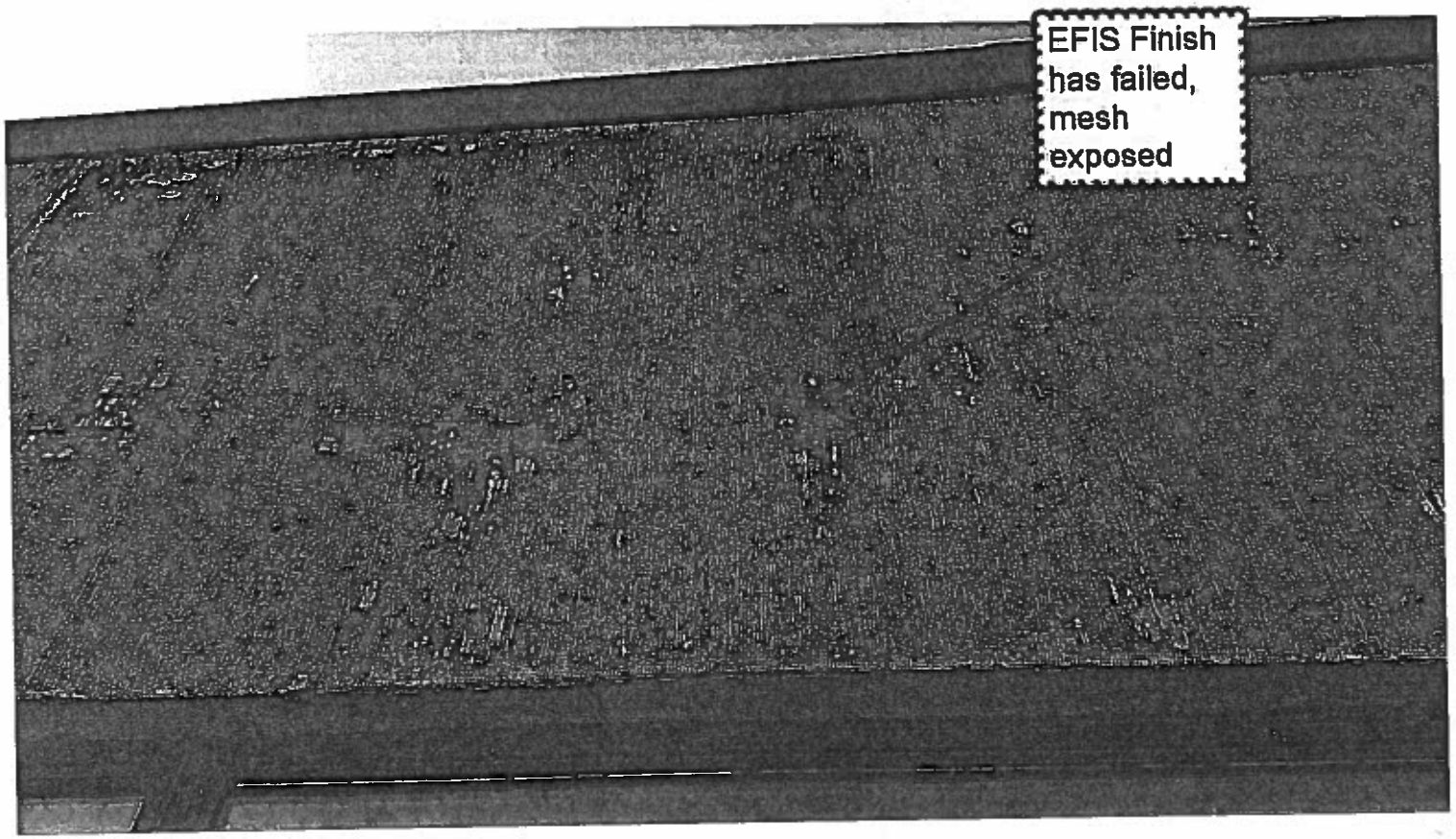
1604.5 Risk category.
Each building and structure shall be assigned a risk category in accordance with Table 1604.5. Where a referenced standard specifies an occupancy category, the risk category shall not be taken as lower than the occupancy category specified therein. Where a referenced standard specifies that the assignment of a risk category be in accordance with ASCE 7, Table 1.5-1, Table 1604.5 shall be used in lieu of ASCE 7, Table 1.5.

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: • Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. • Buildings and other structures containing Group E occupancies with an occupant load greater than 250. • Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. • Group I-2 occupancies with an occupant load of 50 or more resident care recipients but not having surgery or emergency treatment facilities. • Group I-3 occupancies. • Any other occupancy with an occupant load greater than 5,000.[a] • Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. • Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code*; and Are sufficient to pose a threat to the public if released.[b]
IV	Buildings and other structures designated as essential facilities, including but not limited to: • Group I-2 occupancies having surgery or emergency treatment facilities. • Fire, rescue, ambulance and police stations and emergency vehicle garages. • Designated earthquake, hurricane or other emergency shelters. • Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. • Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures. • Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code*; and Are sufficient to pose a threat to the public if released.[b] • Aviation control towers, air traffic control centers and emergency aircraft hangars. • Buildings and other structures having critical national defense functions. • Water storage facilities and pump structures required to maintain water pressure for fire suppression.

Building Code

RDA



1976 Existing Conditions -Soffit

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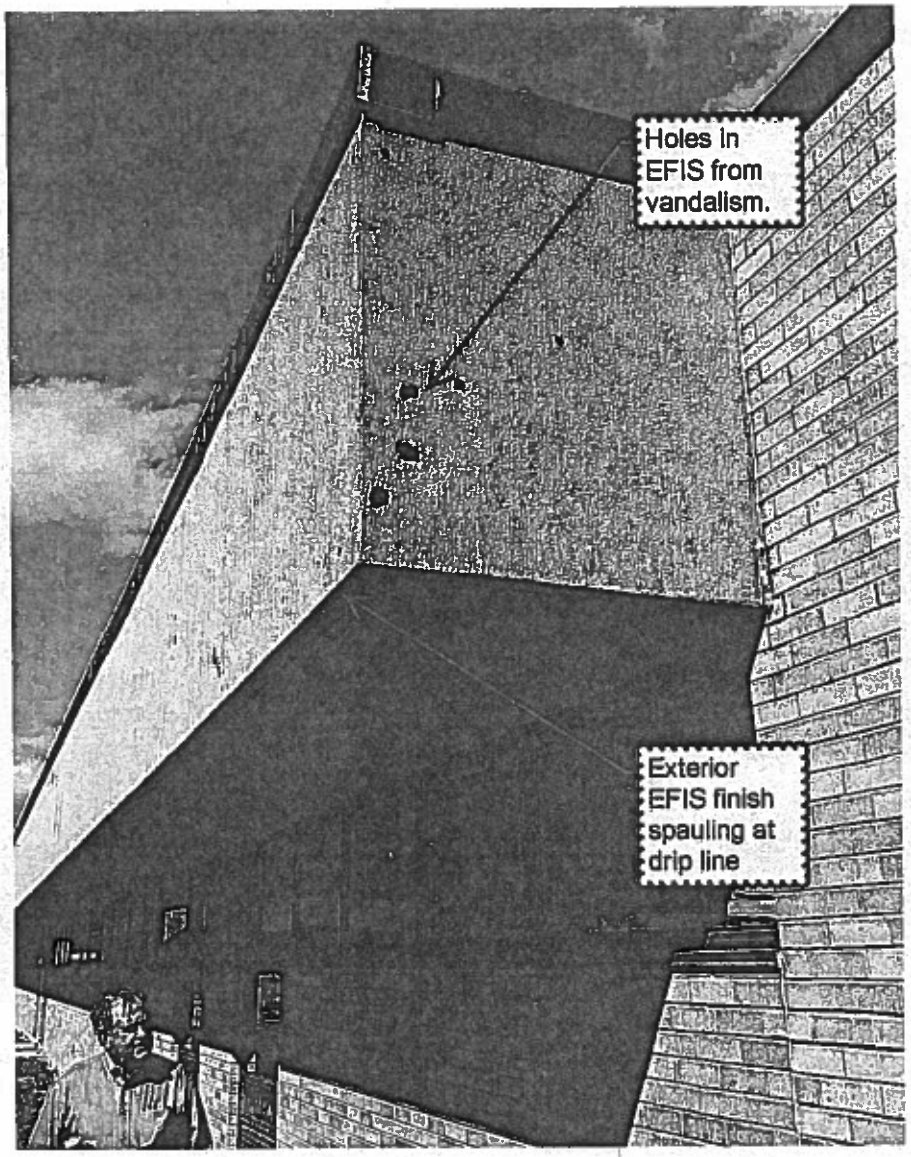

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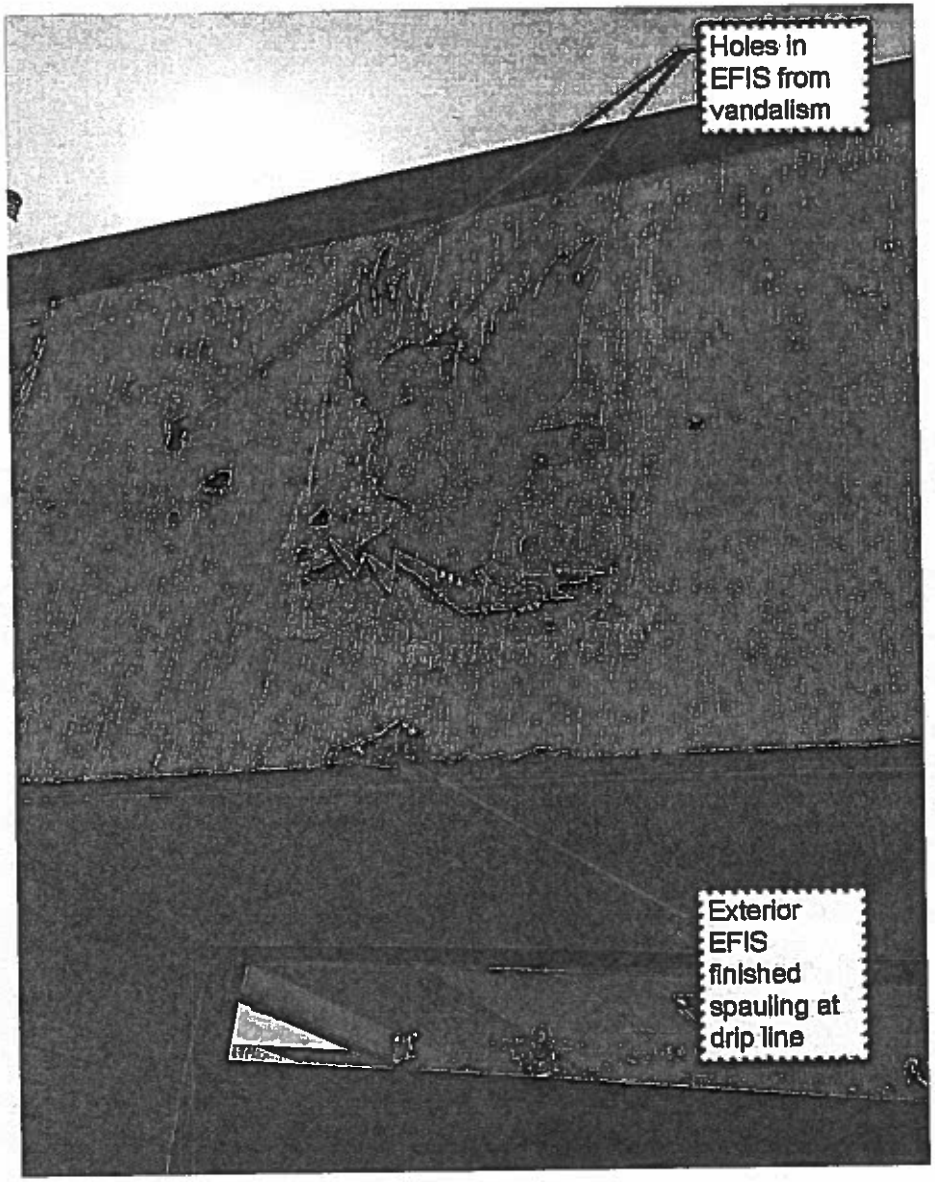

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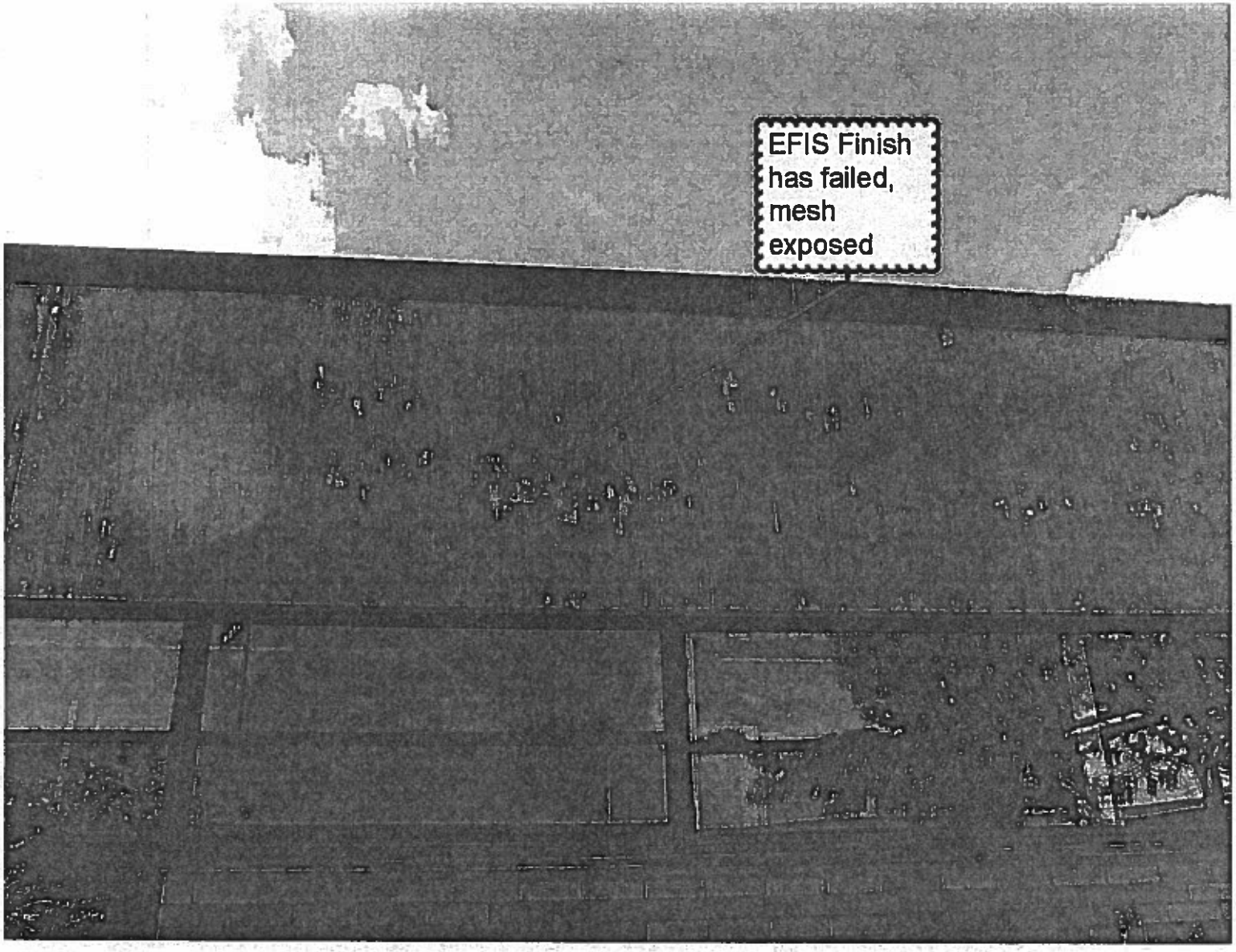

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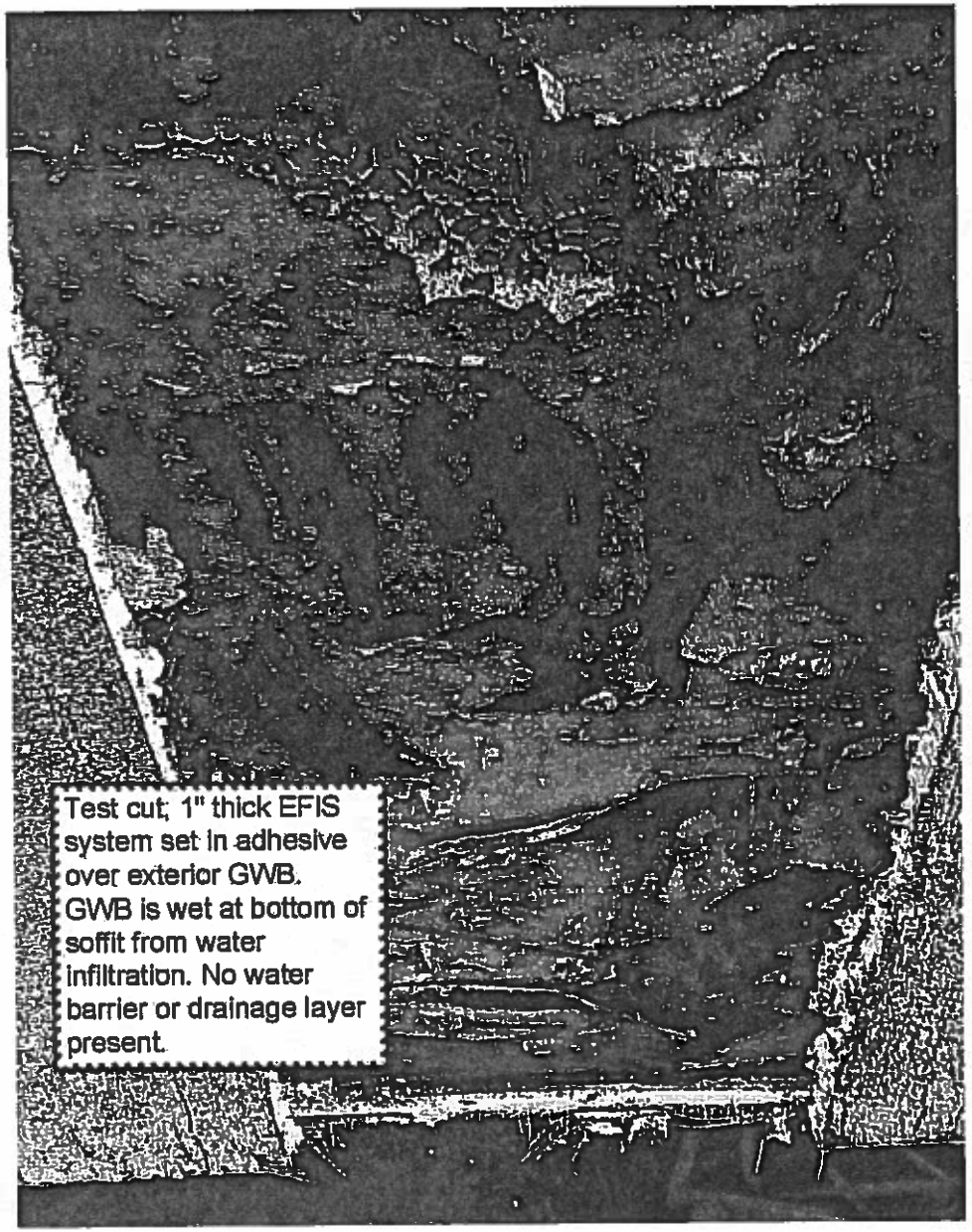

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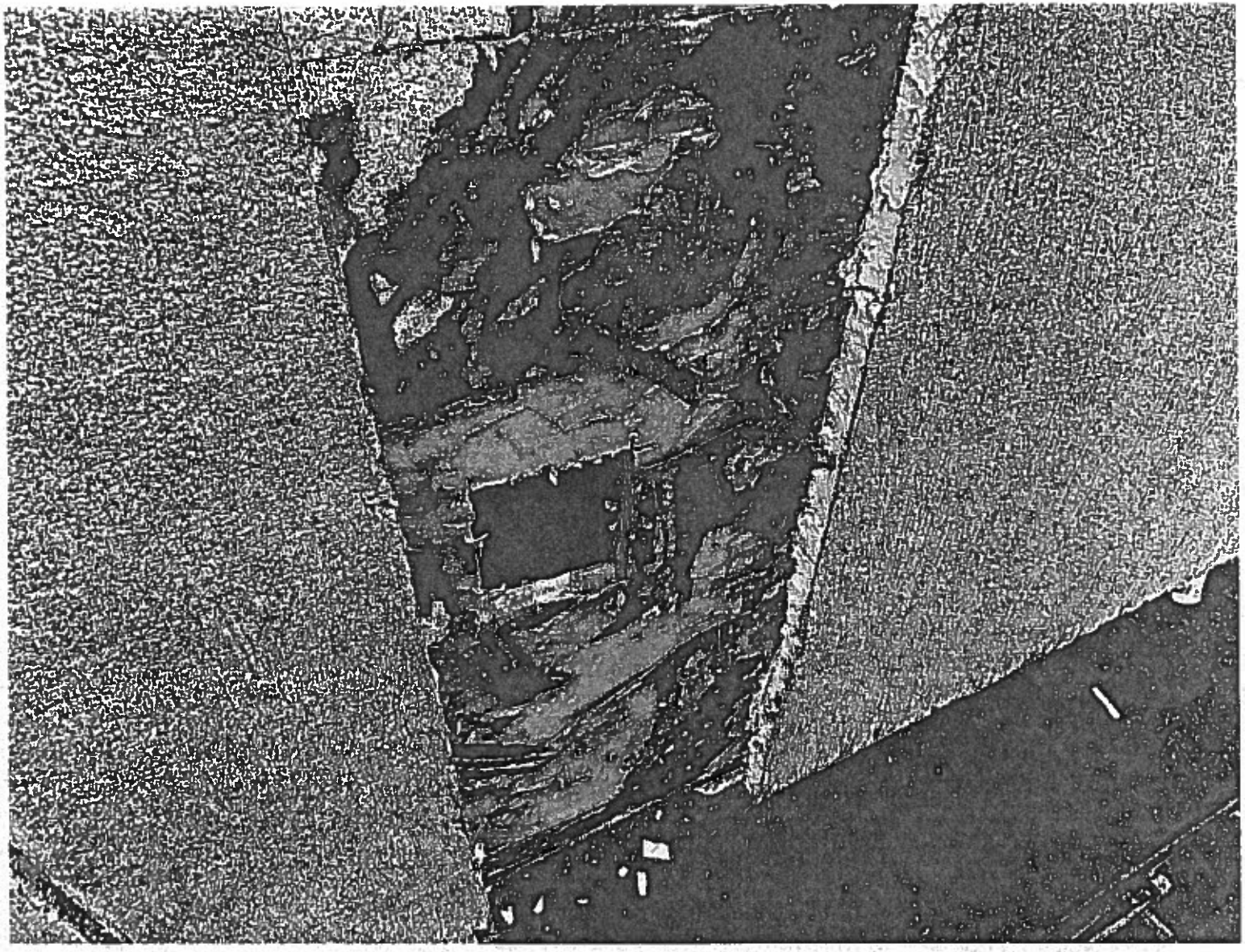

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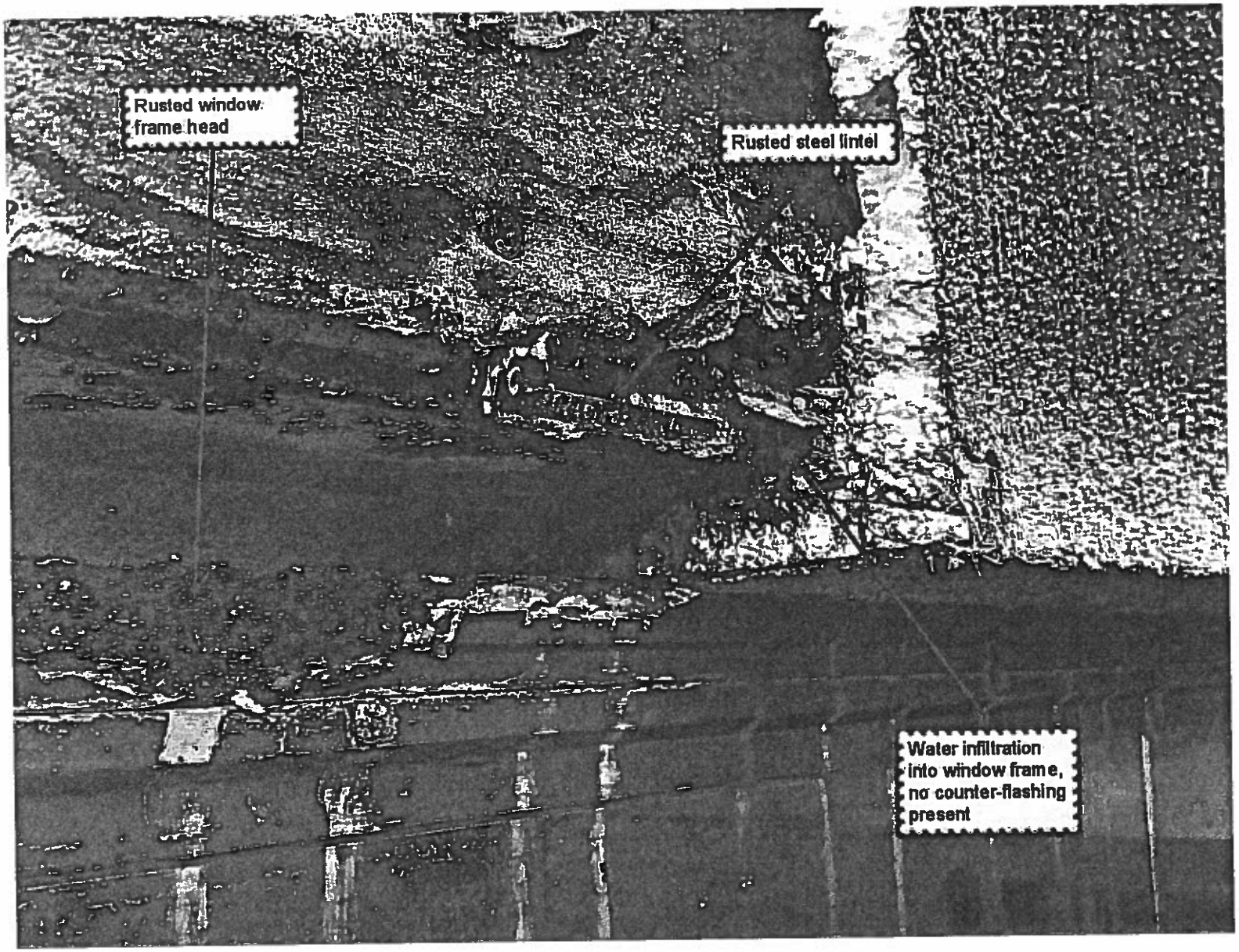

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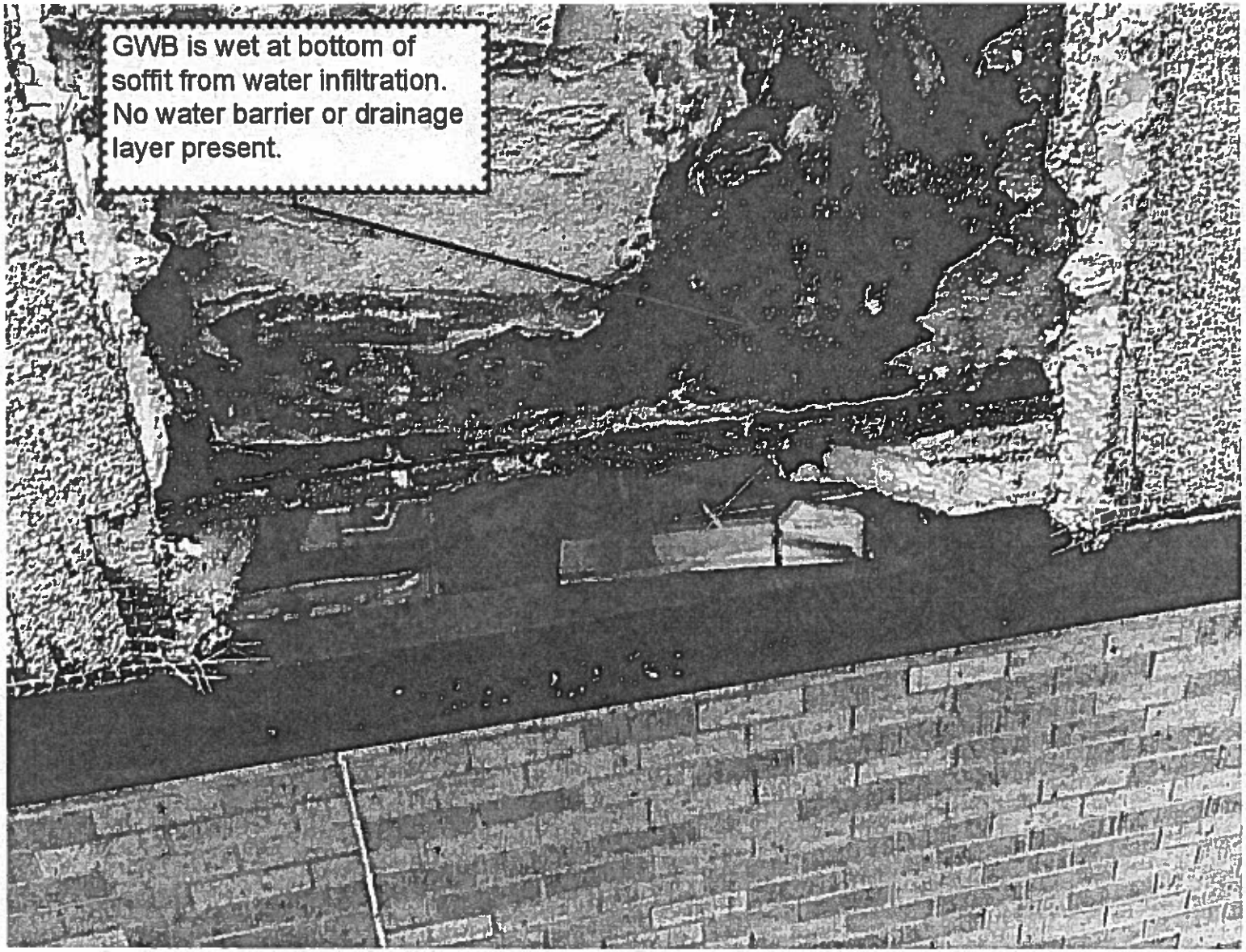

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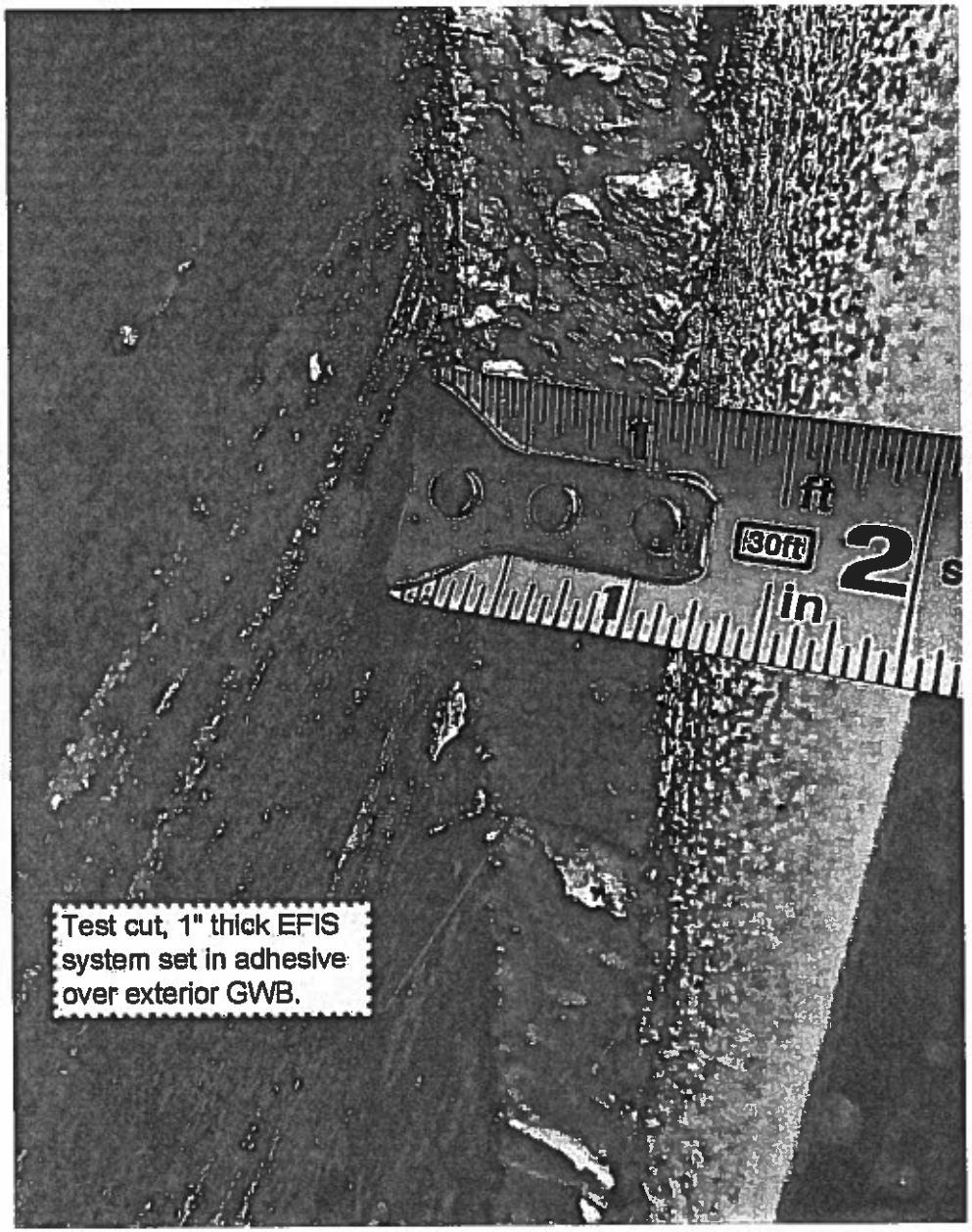

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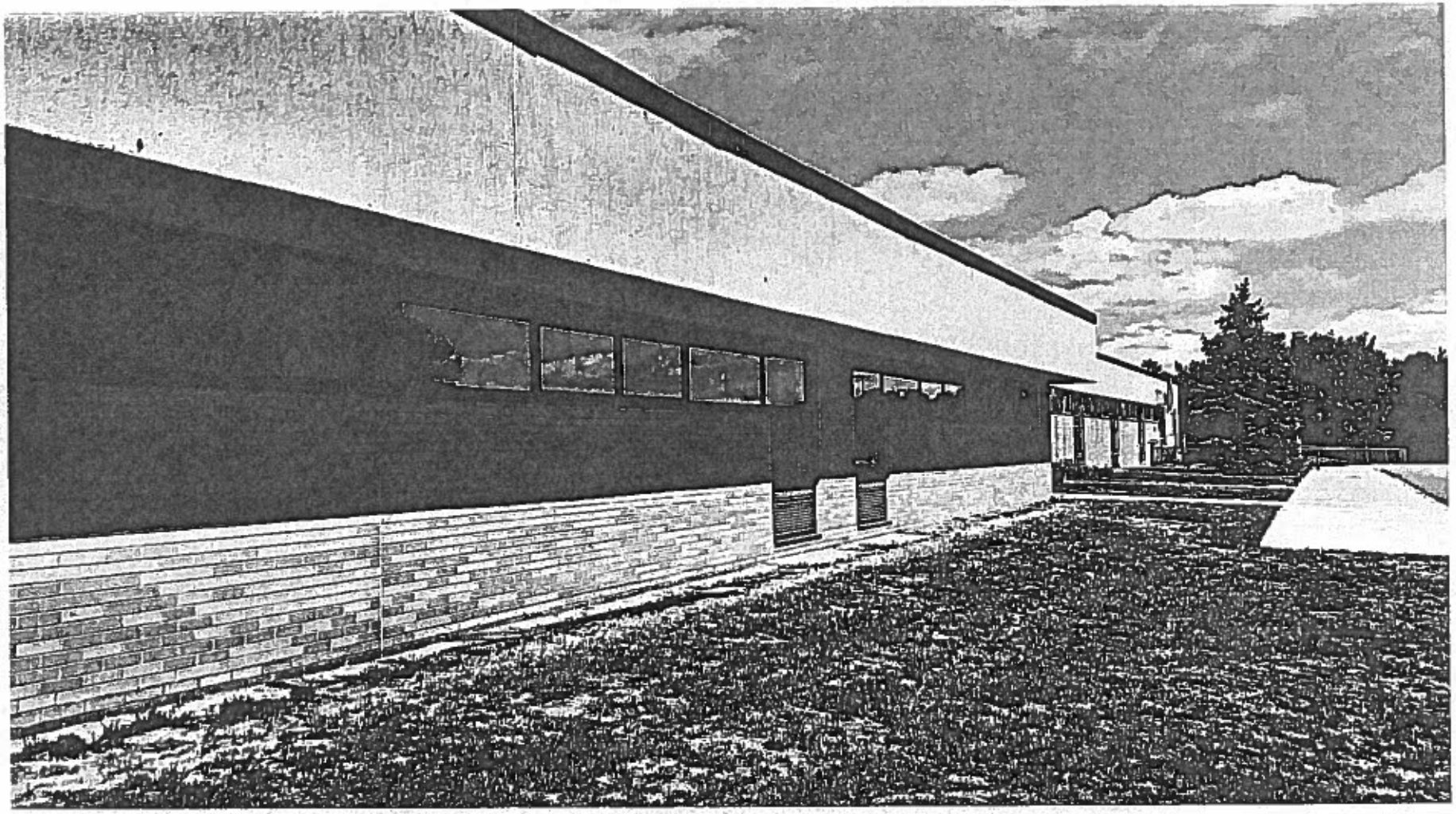

1976 Existing Conditions - Windows

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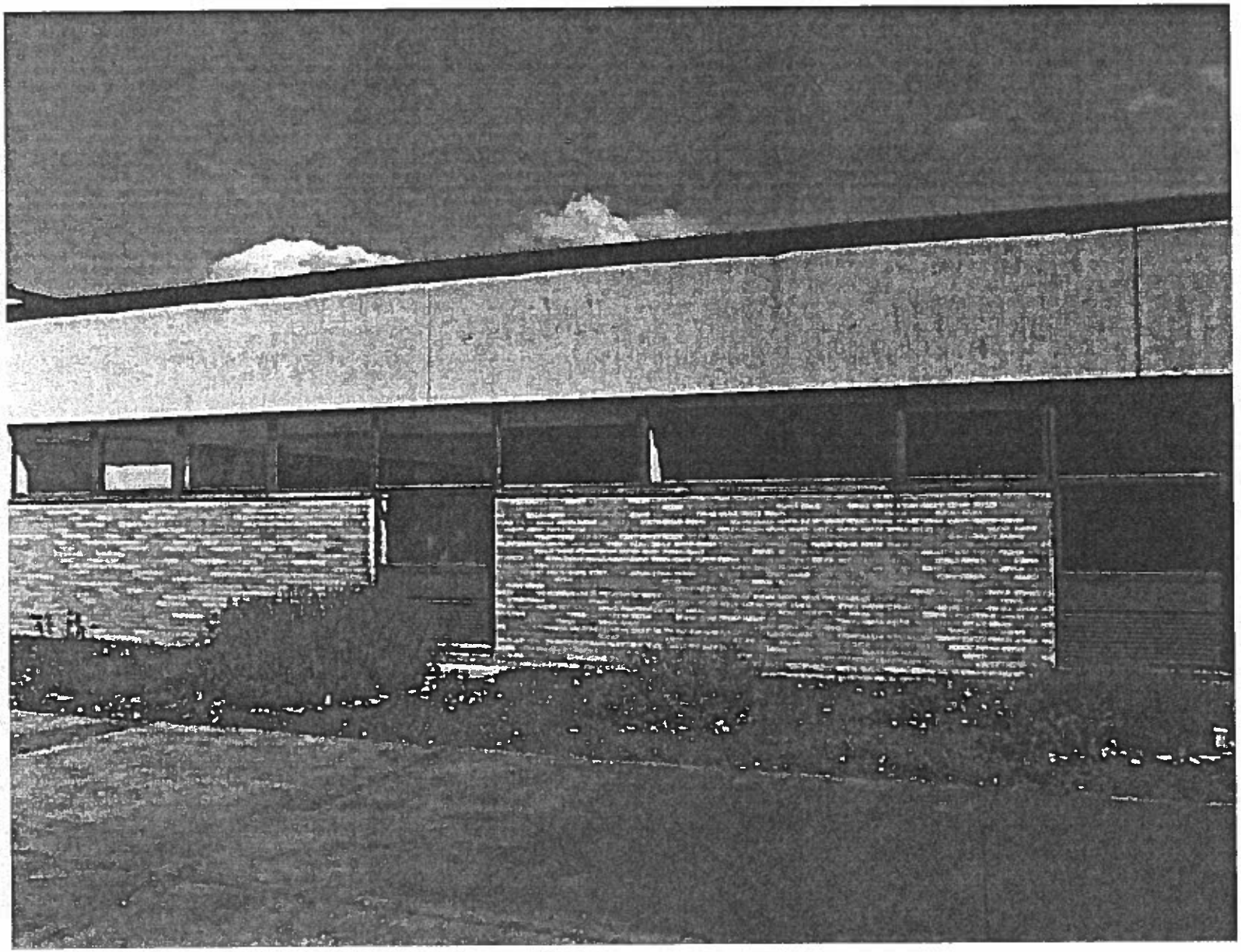

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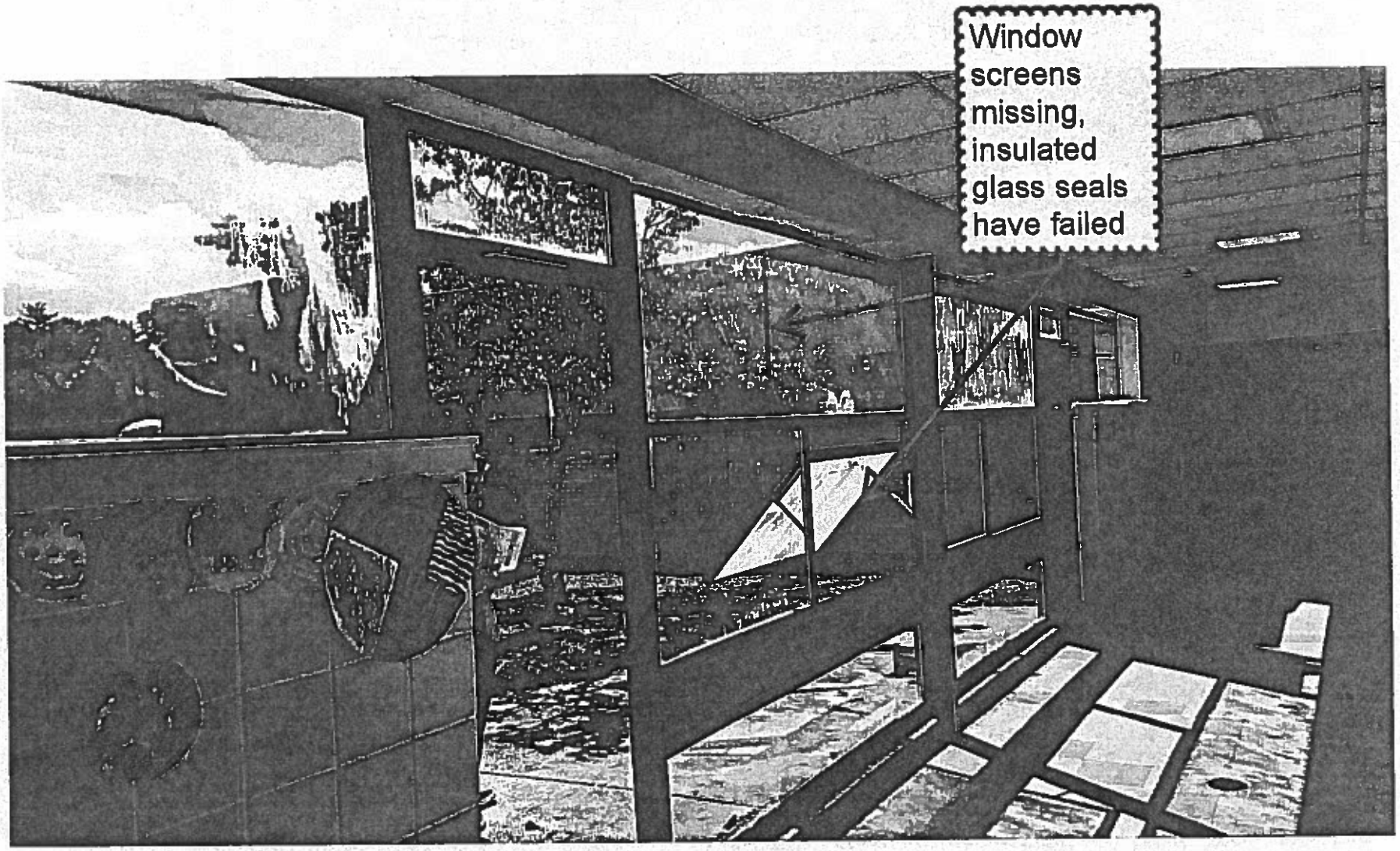

1976 Existing Conditions - Windows

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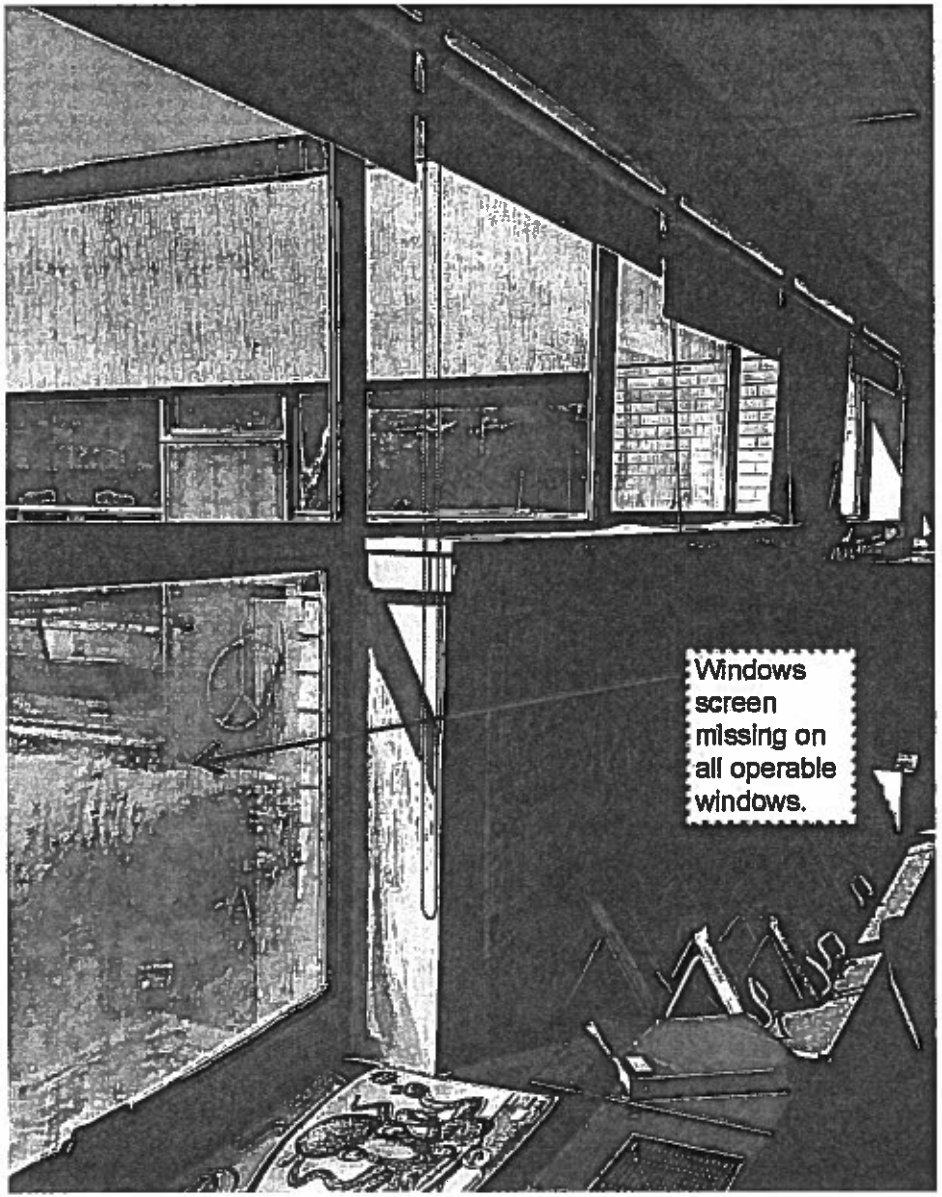

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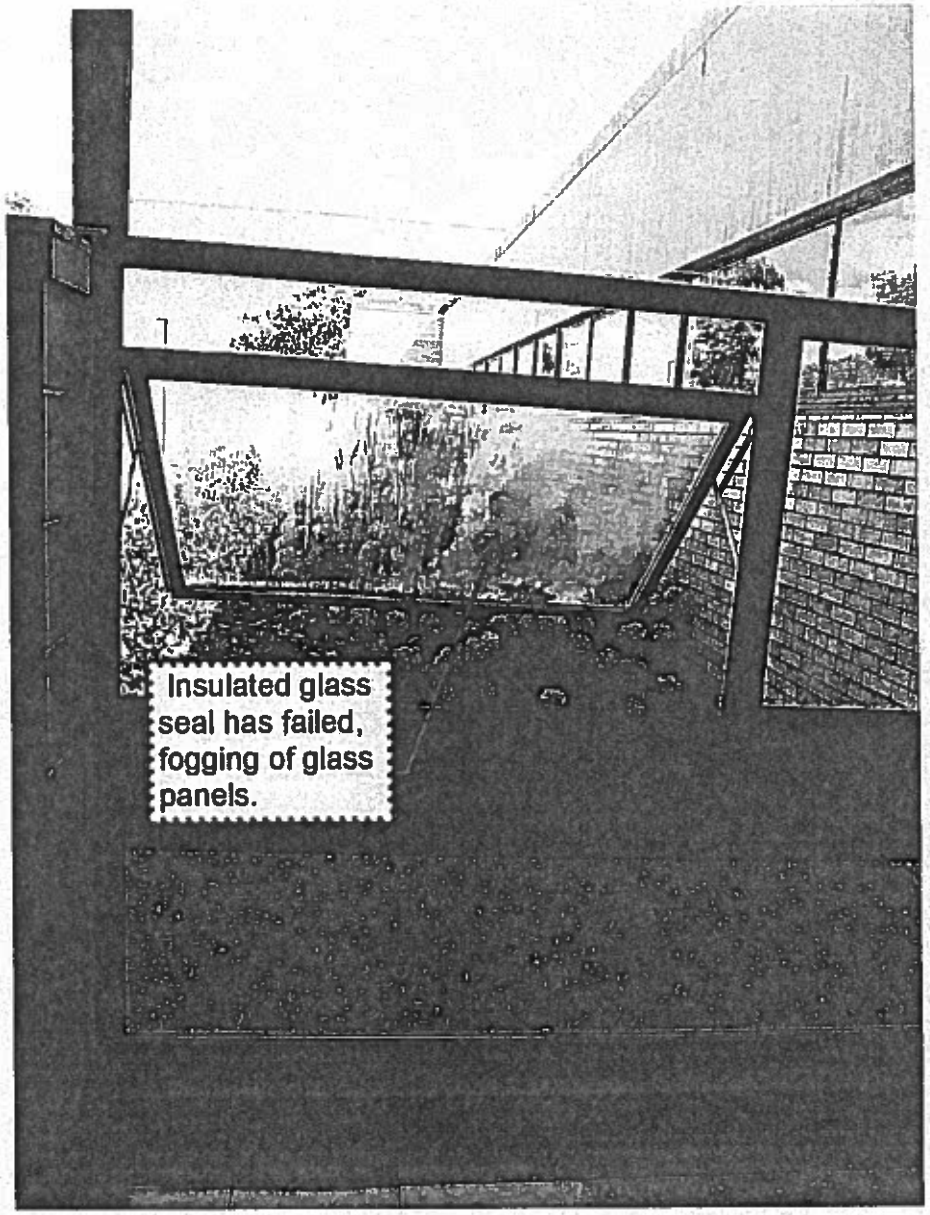

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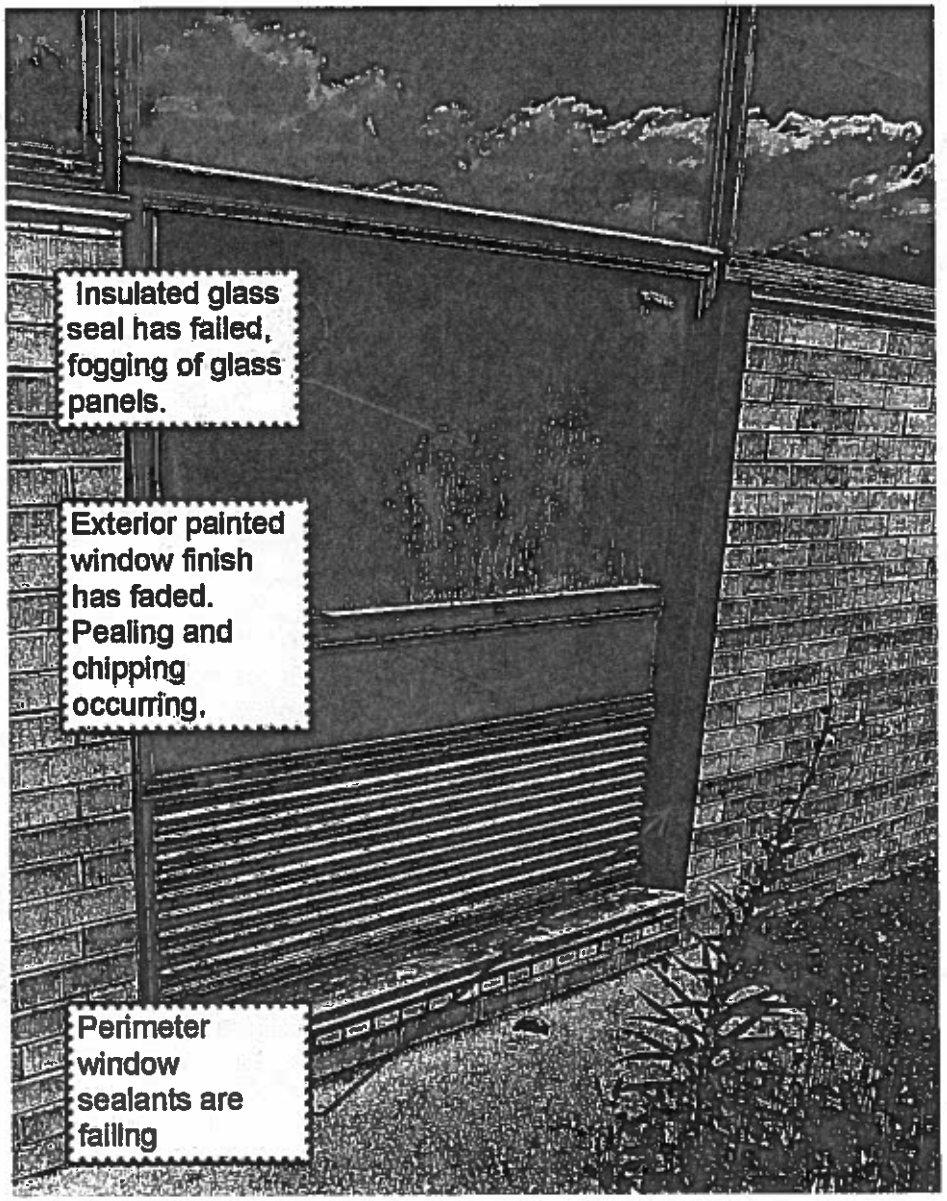

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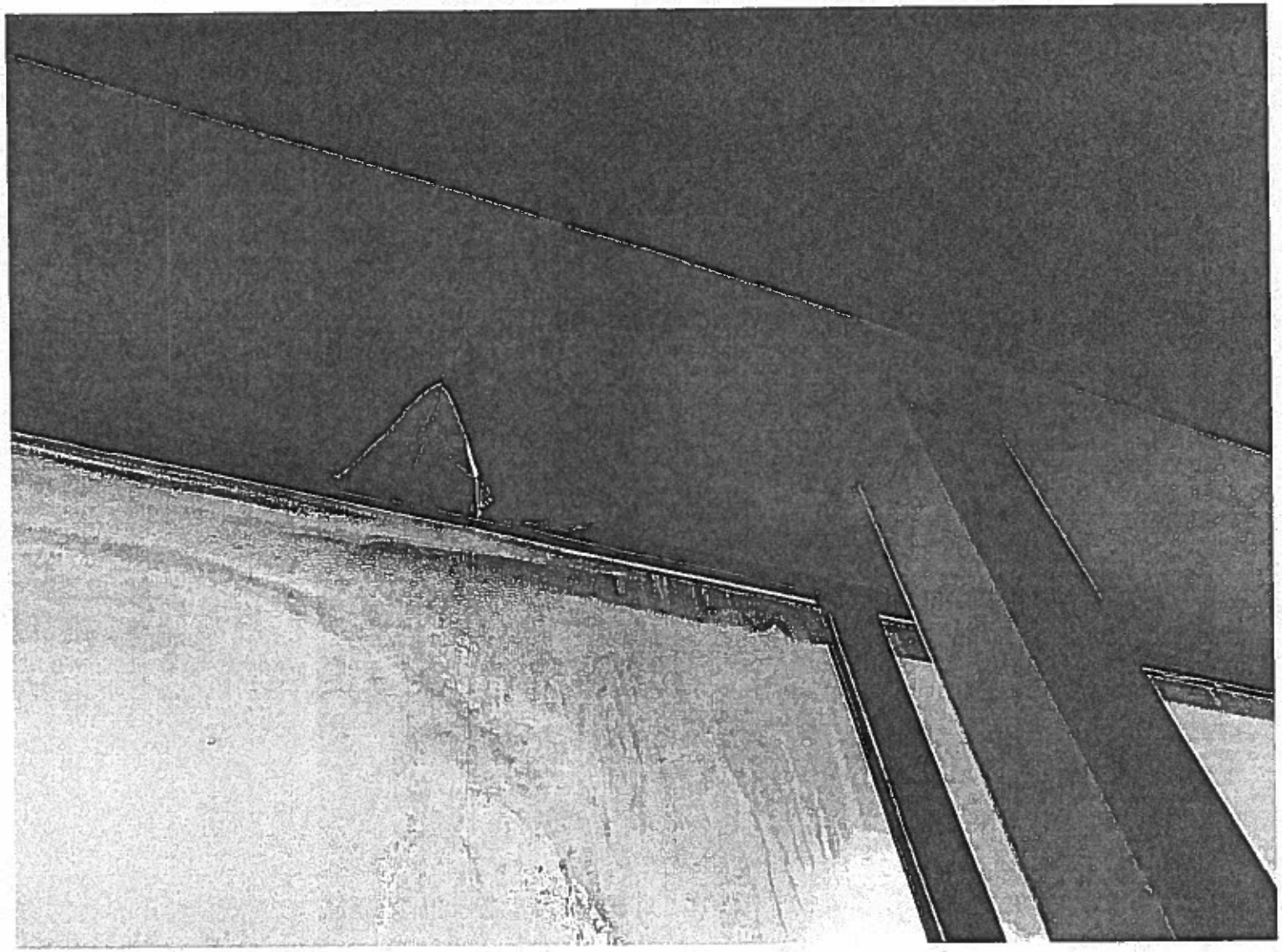

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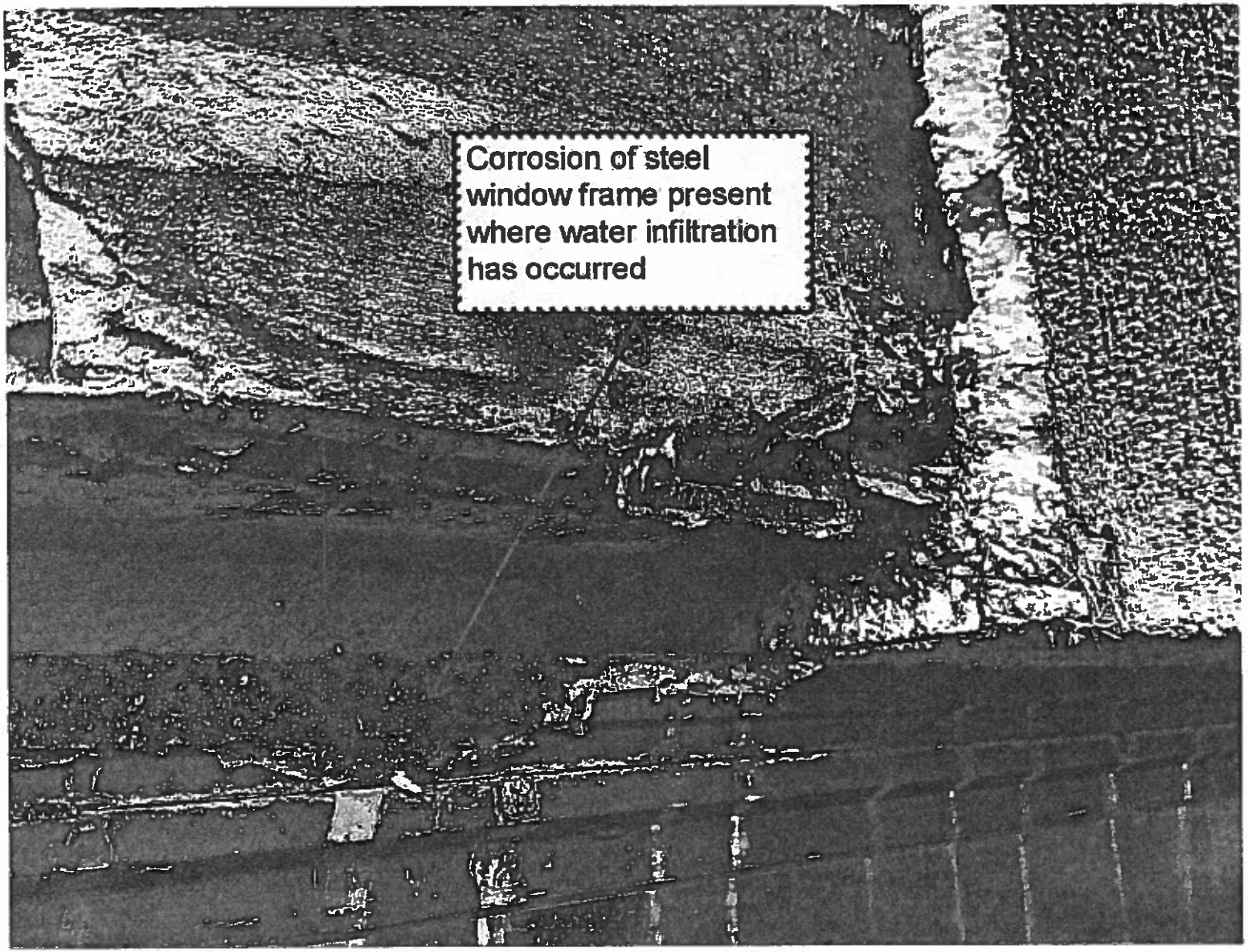

1976 Existing Conditions – Test Cut

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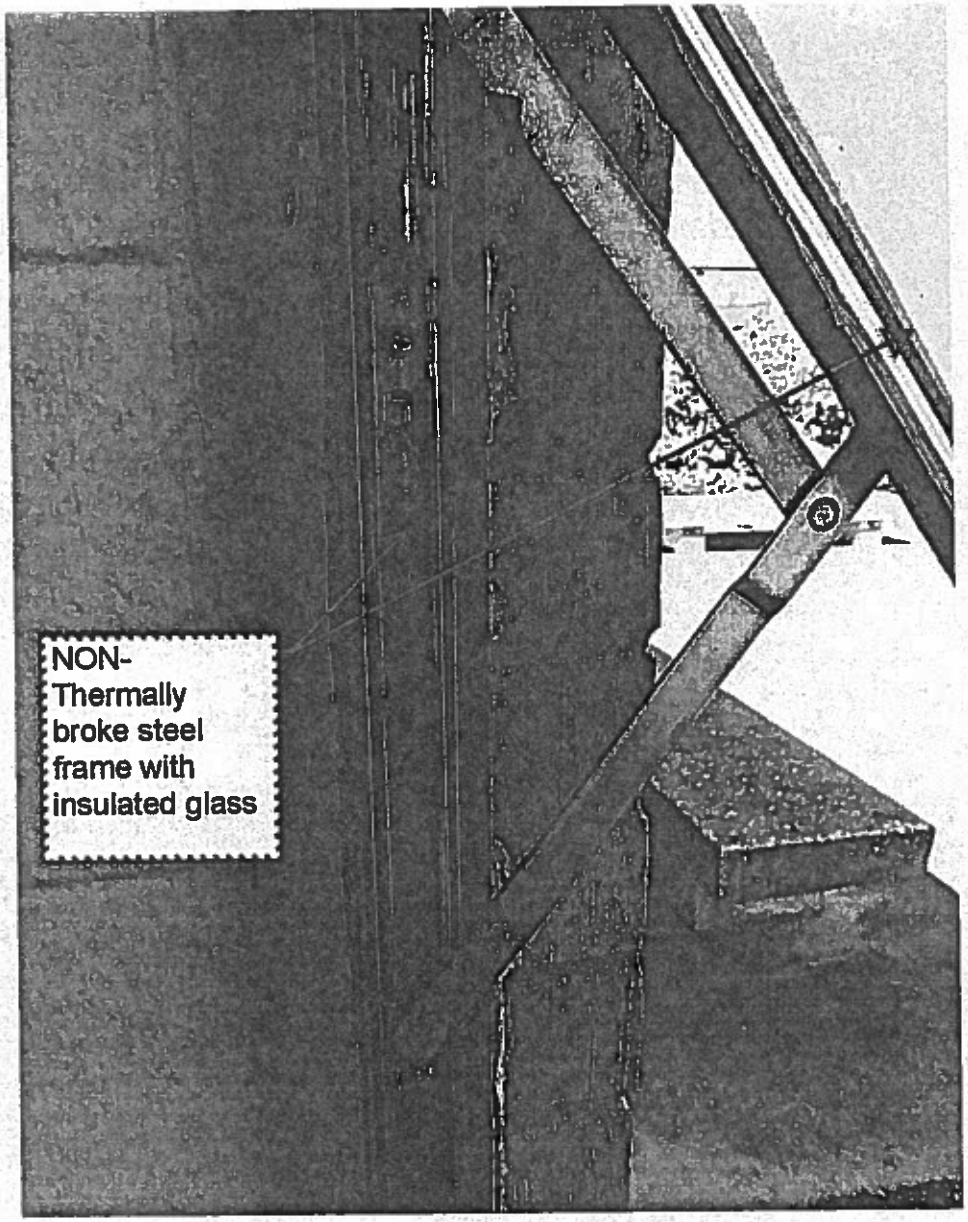

1976 Existing Conditions - Windows

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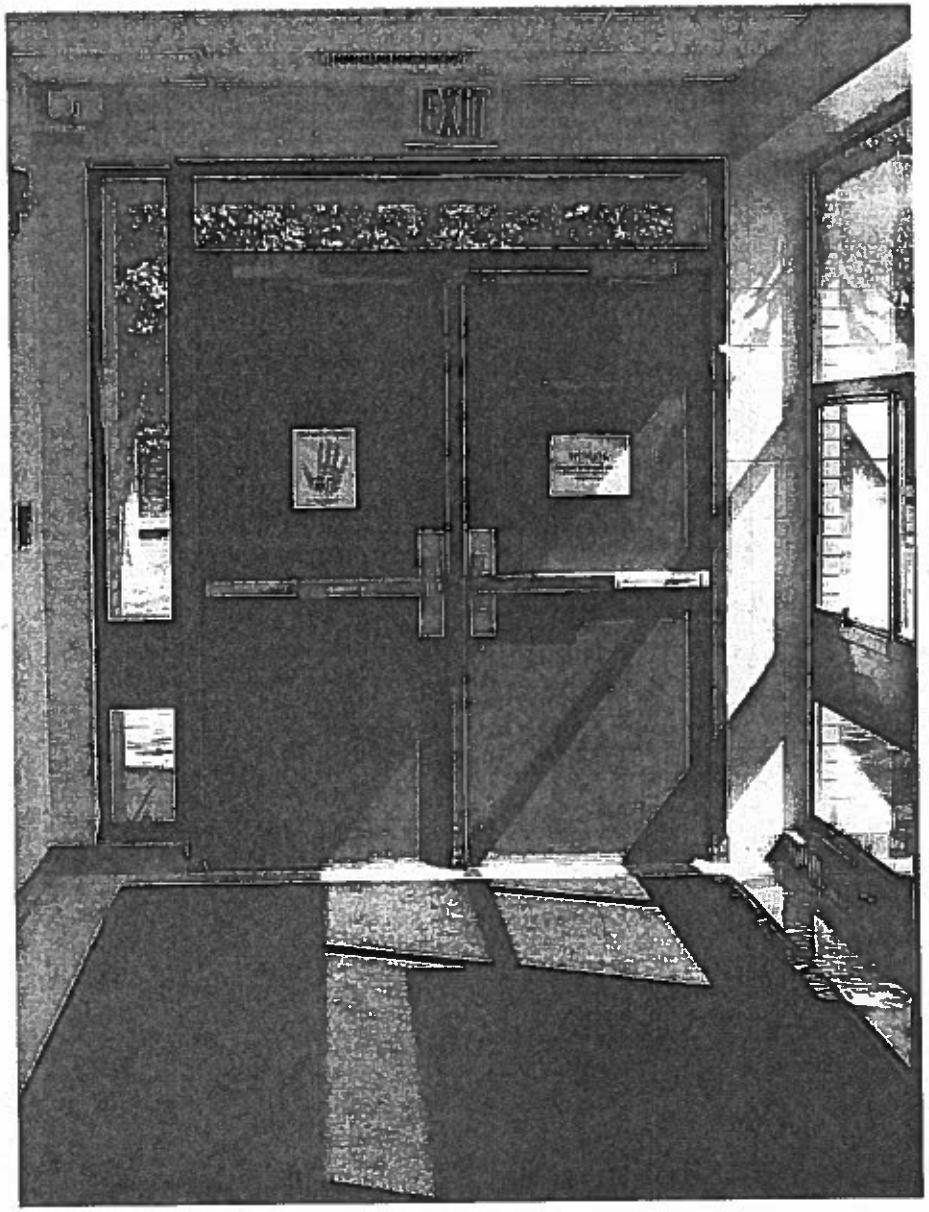

1976 Existing Conditions - Doors

RDA

1976 Existing Conditions - Doors

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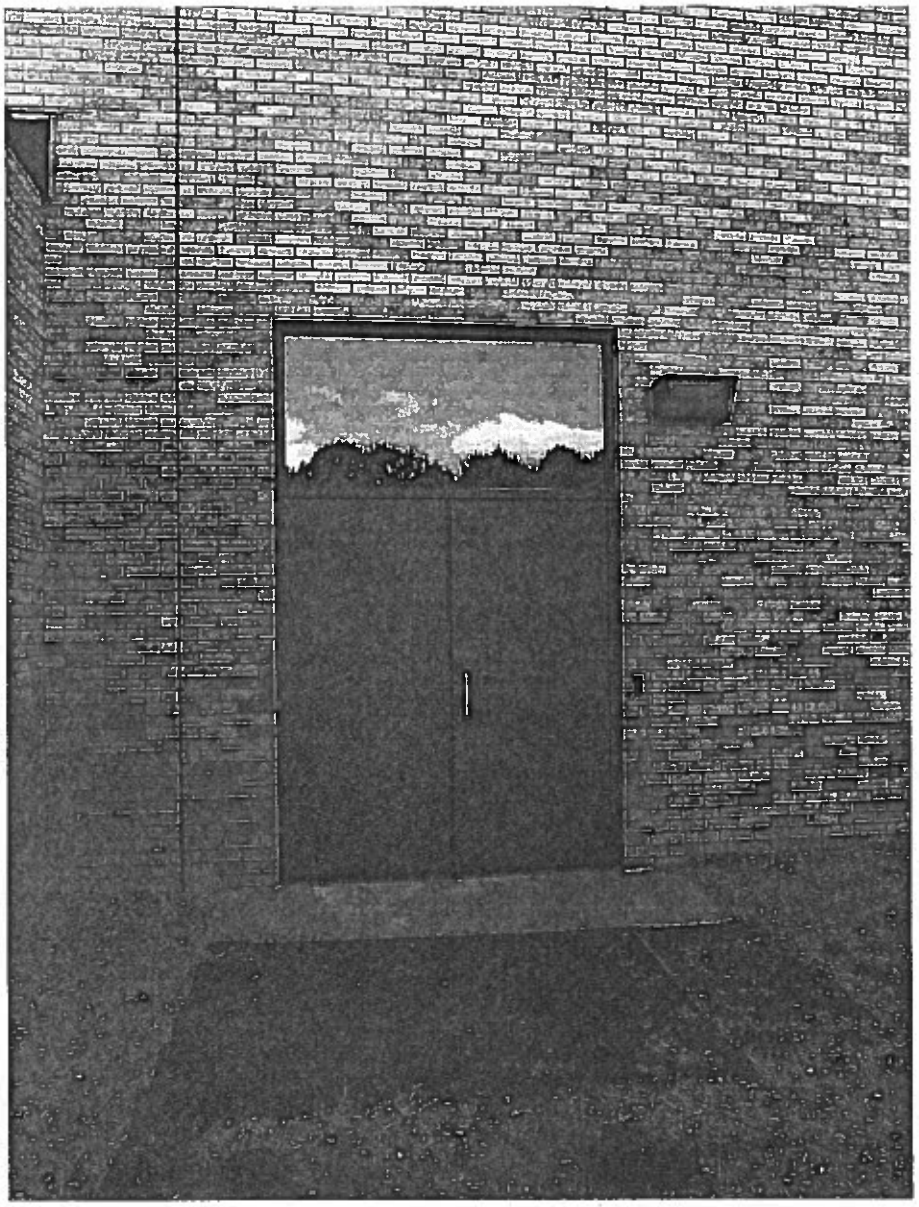

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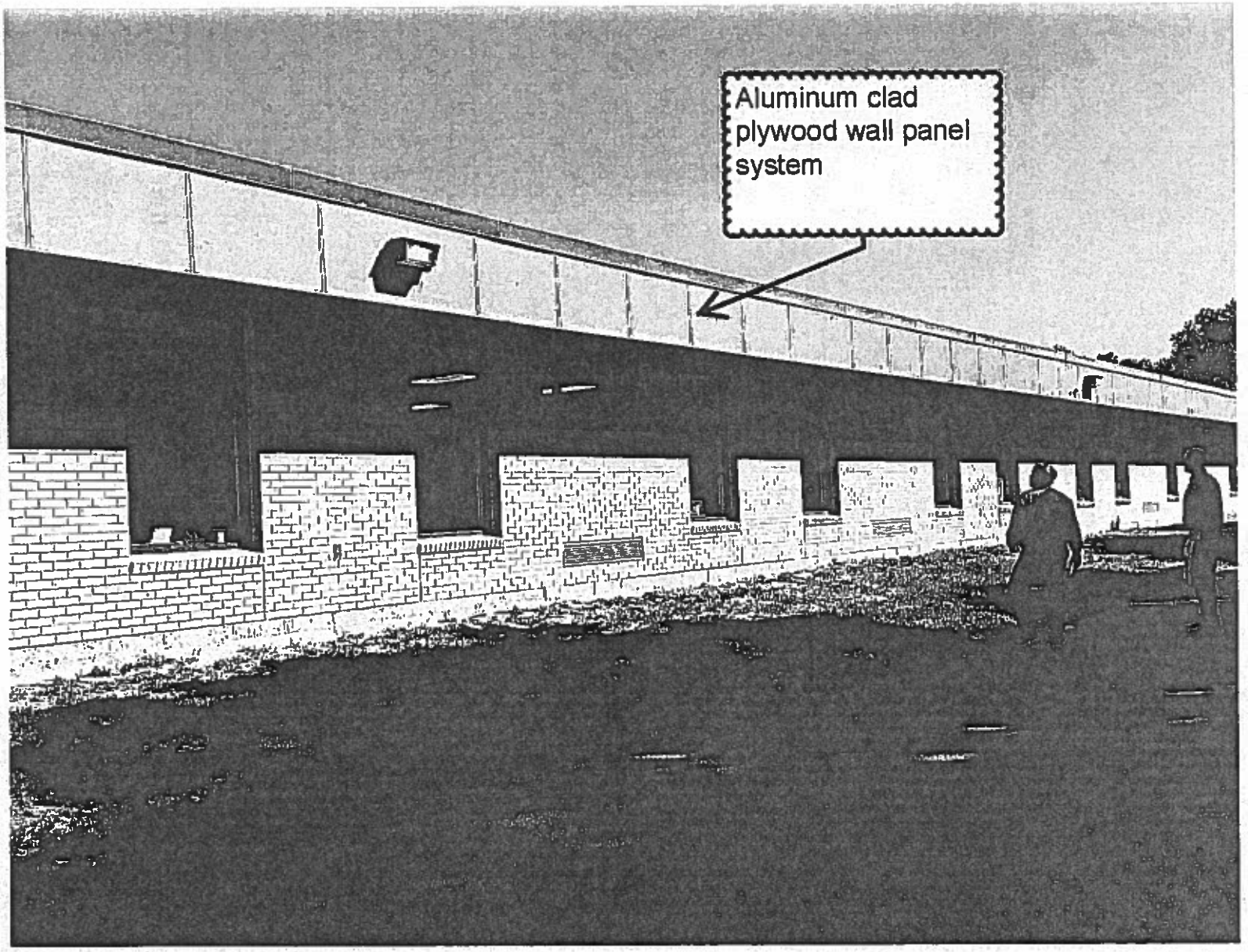

1992 Existing Conditions - Soffits

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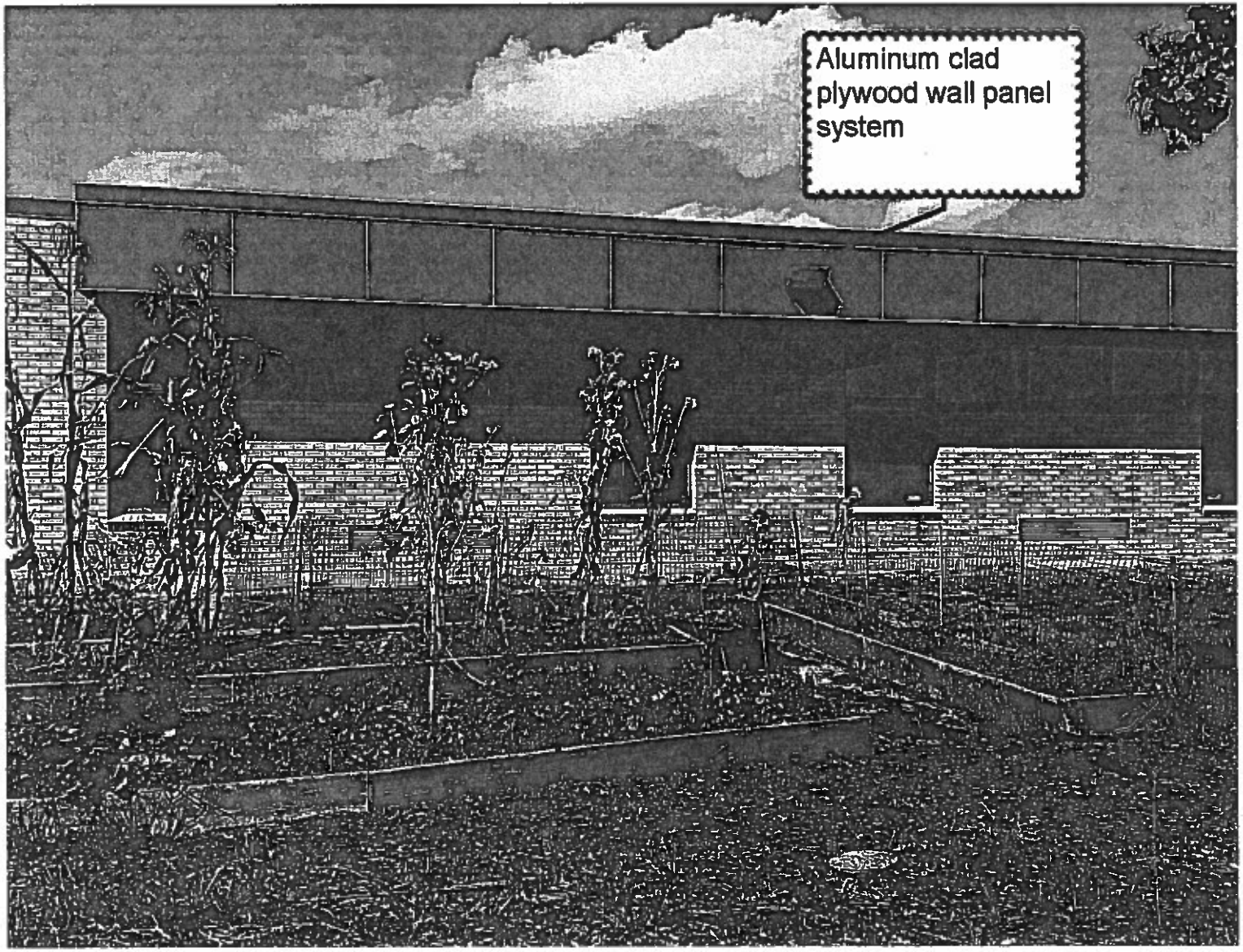

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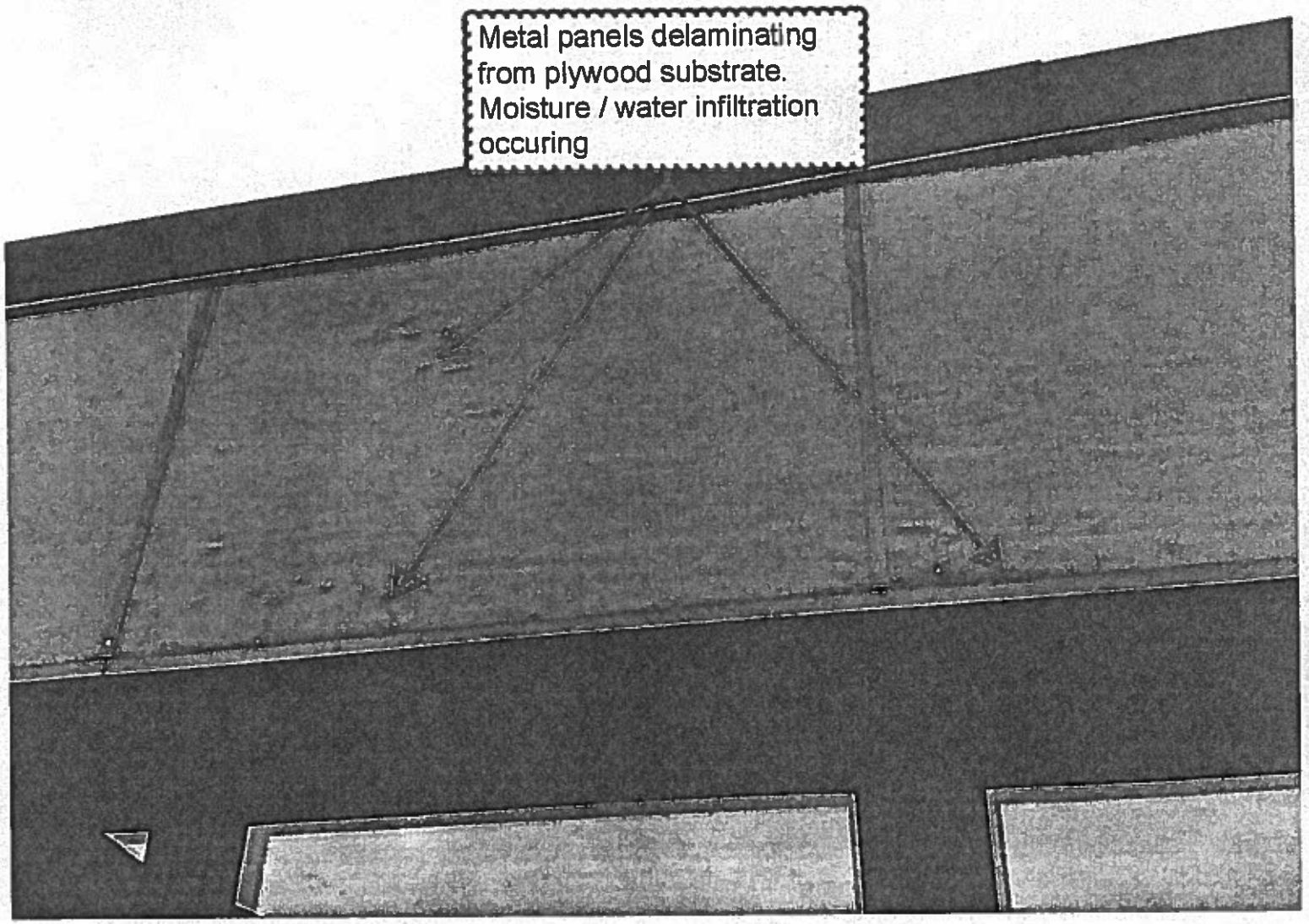

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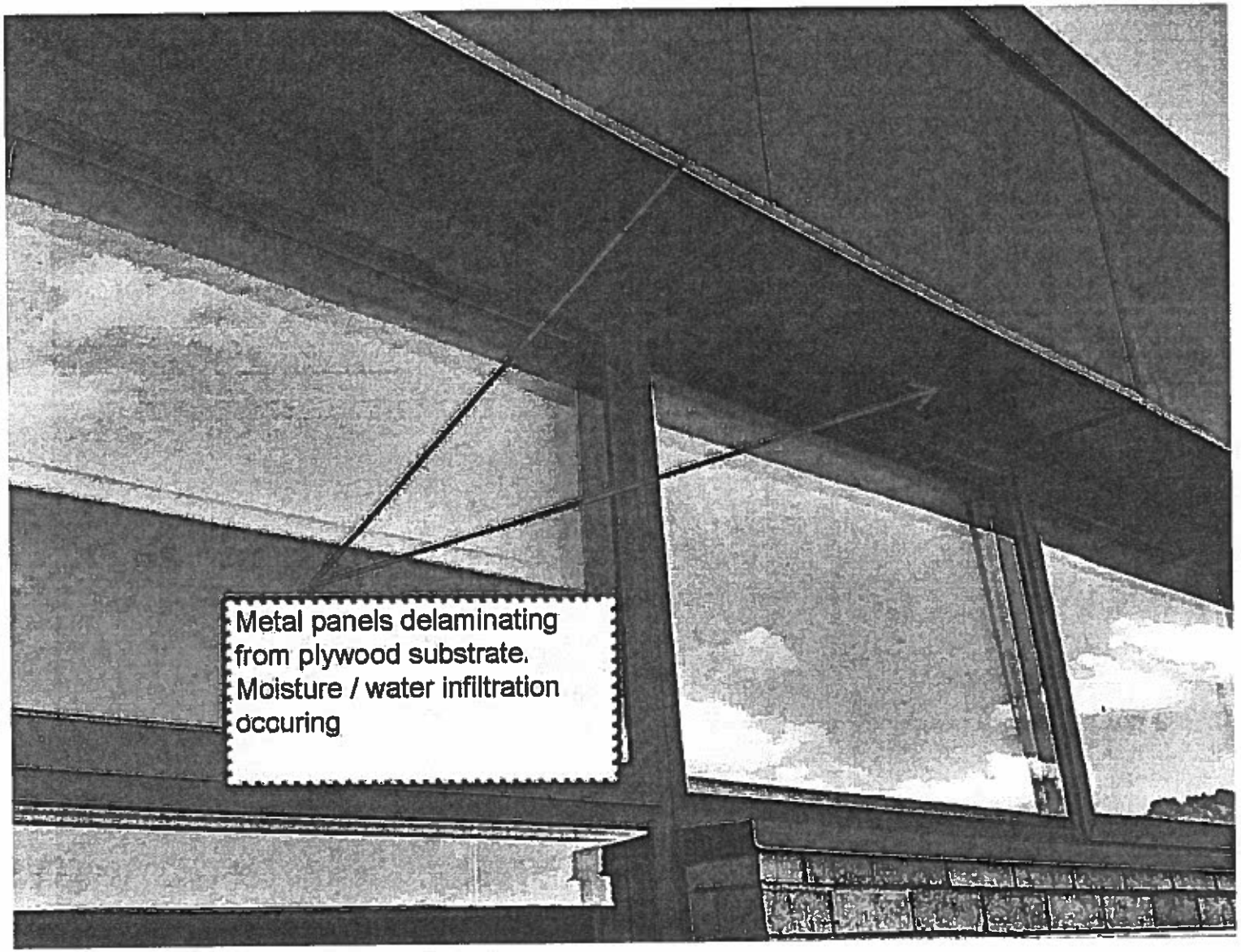

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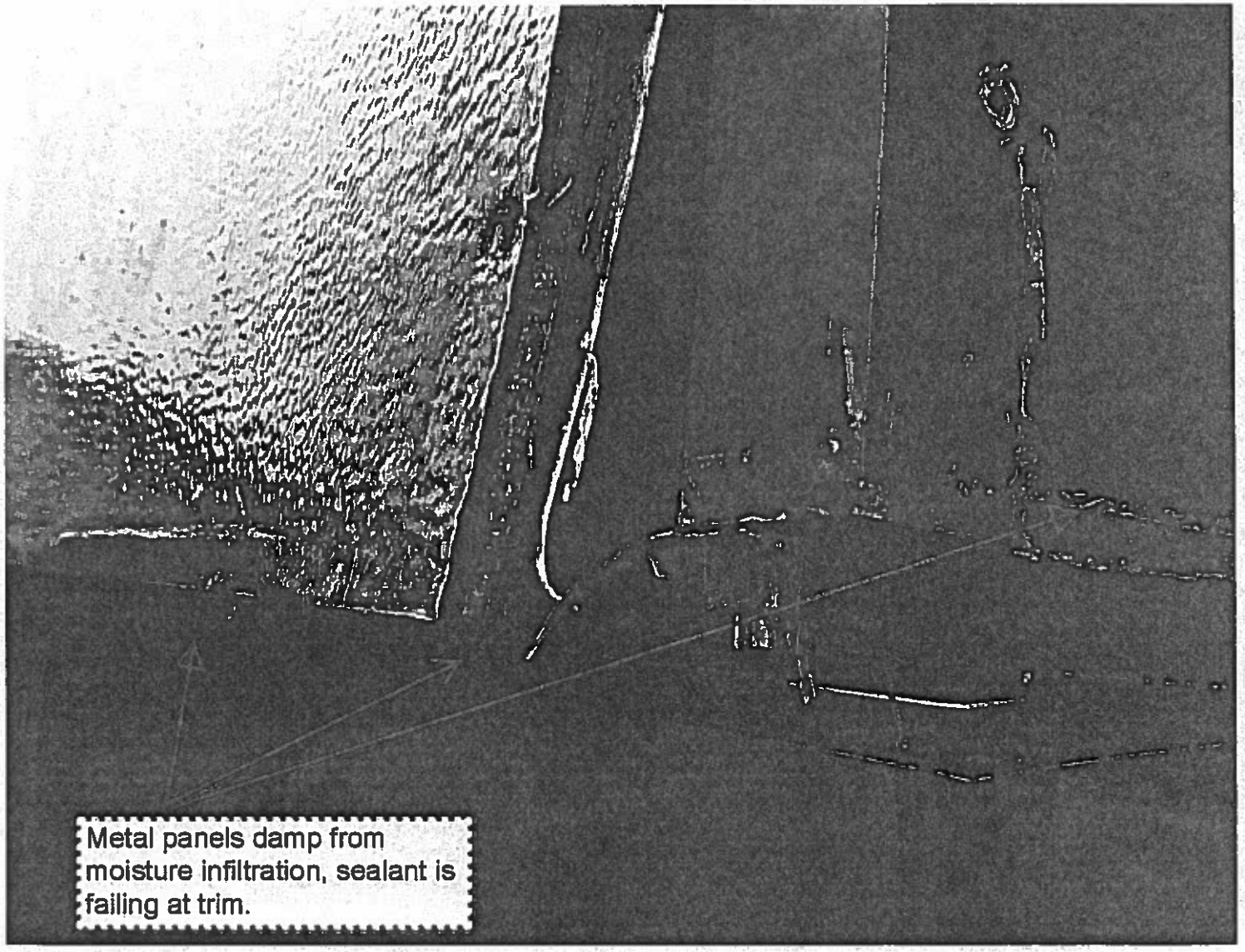

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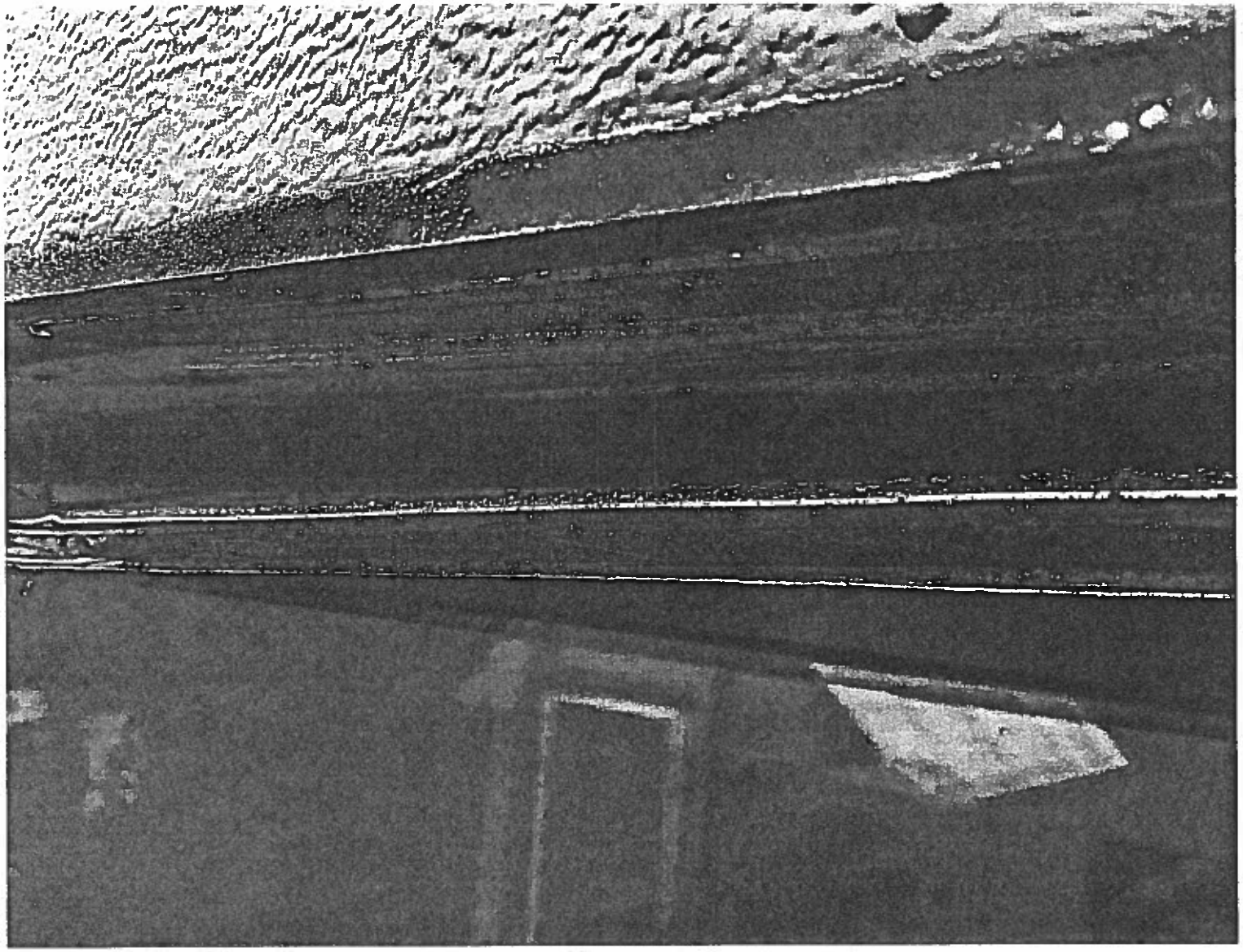

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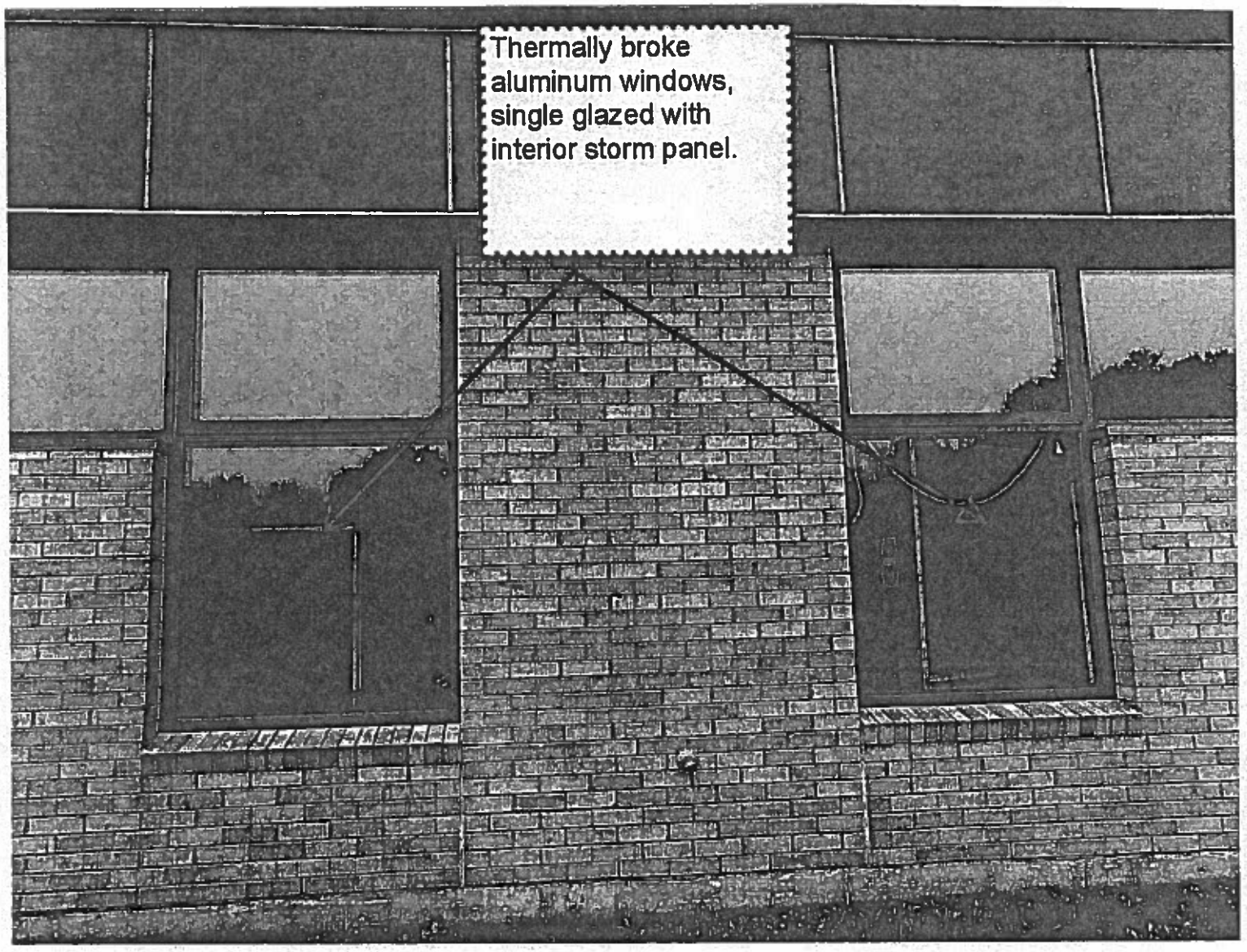
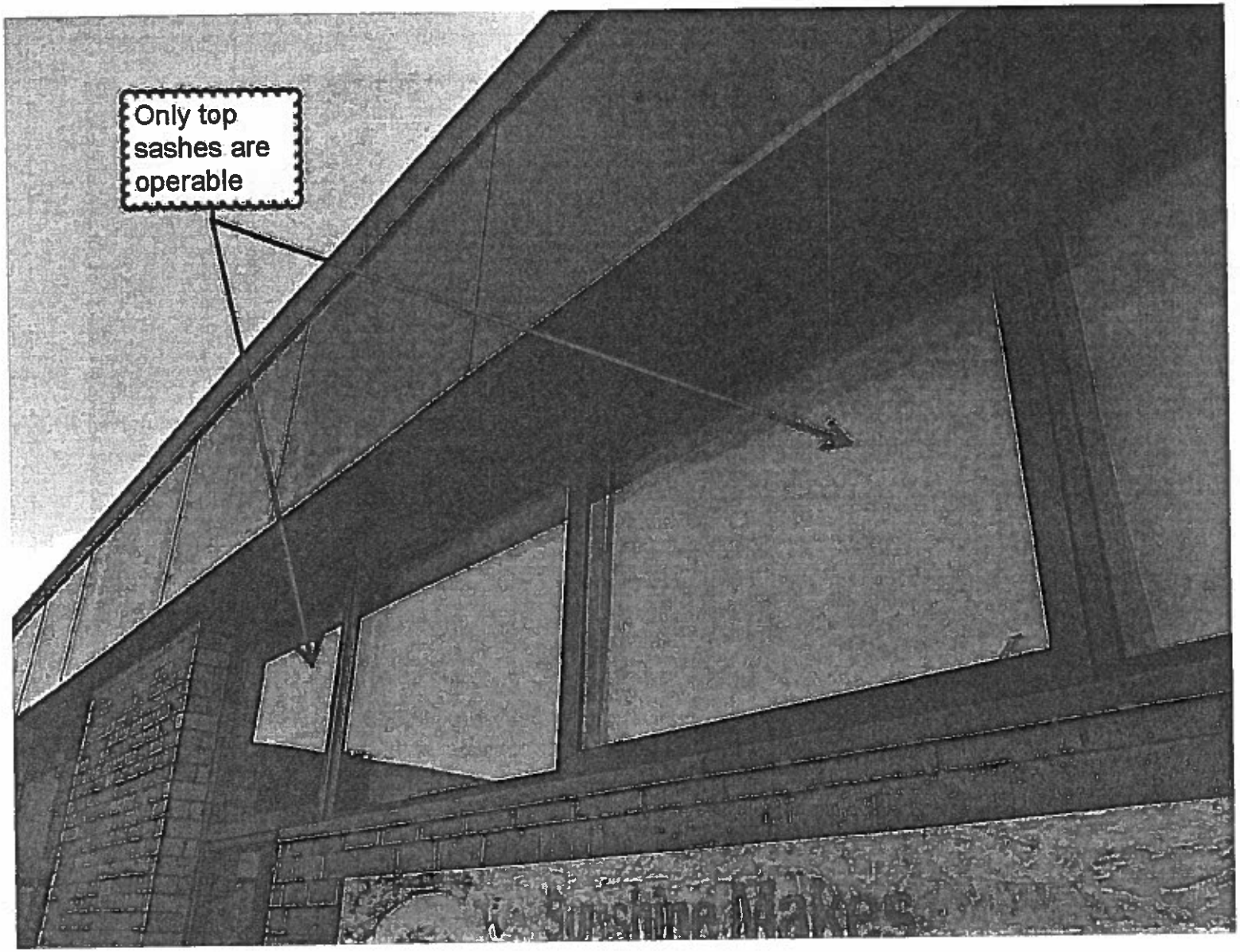


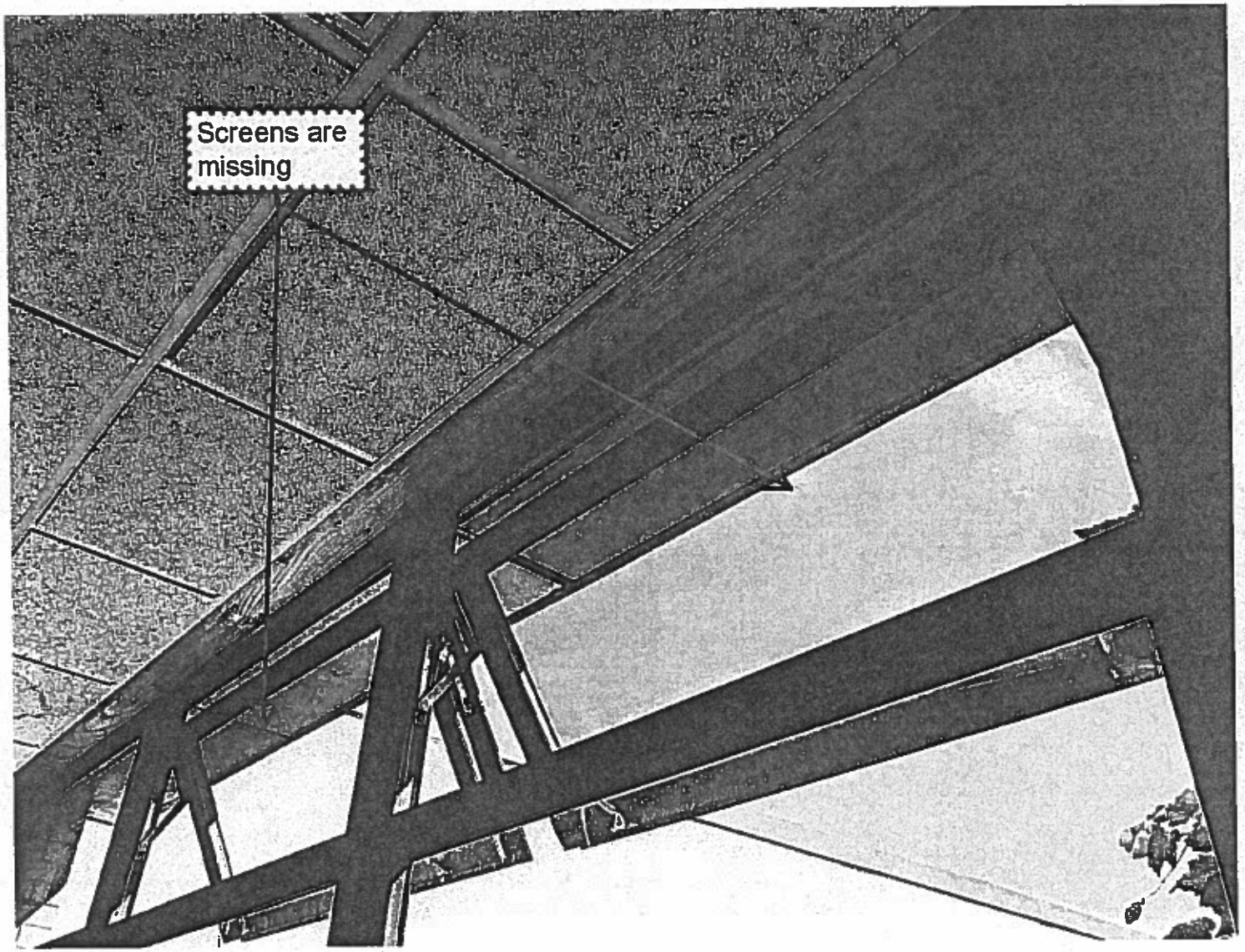
1992 Existing Conditions - Windows

RDA



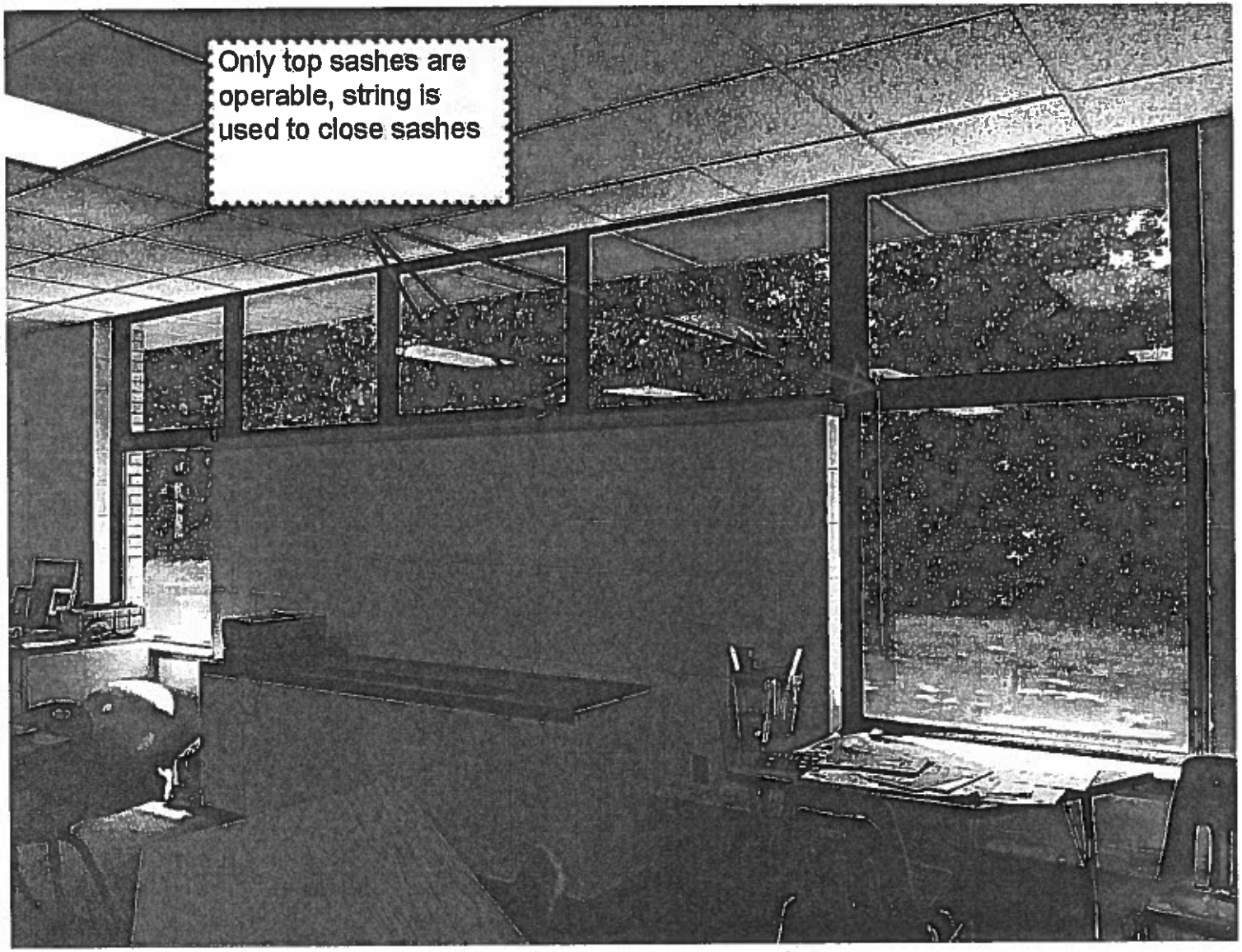
1992 Existing Conditions - Windows

RDA



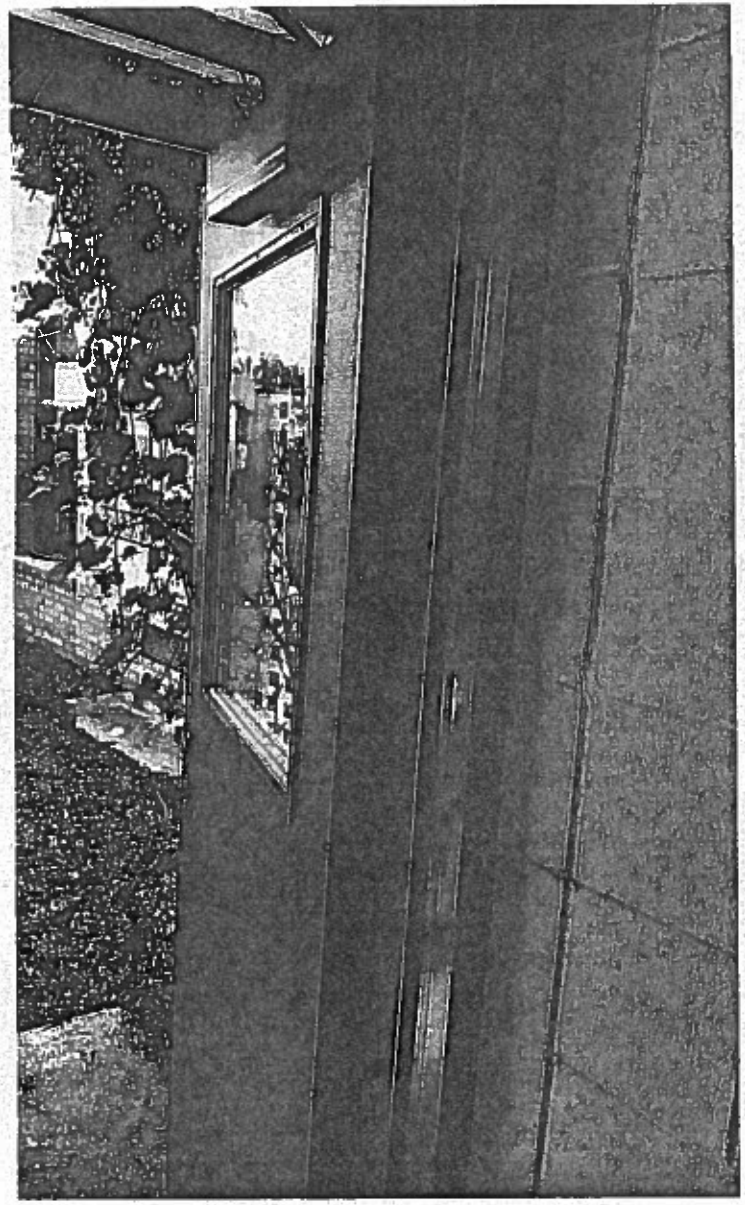
1992 Existing Conditions - Windows

RDA



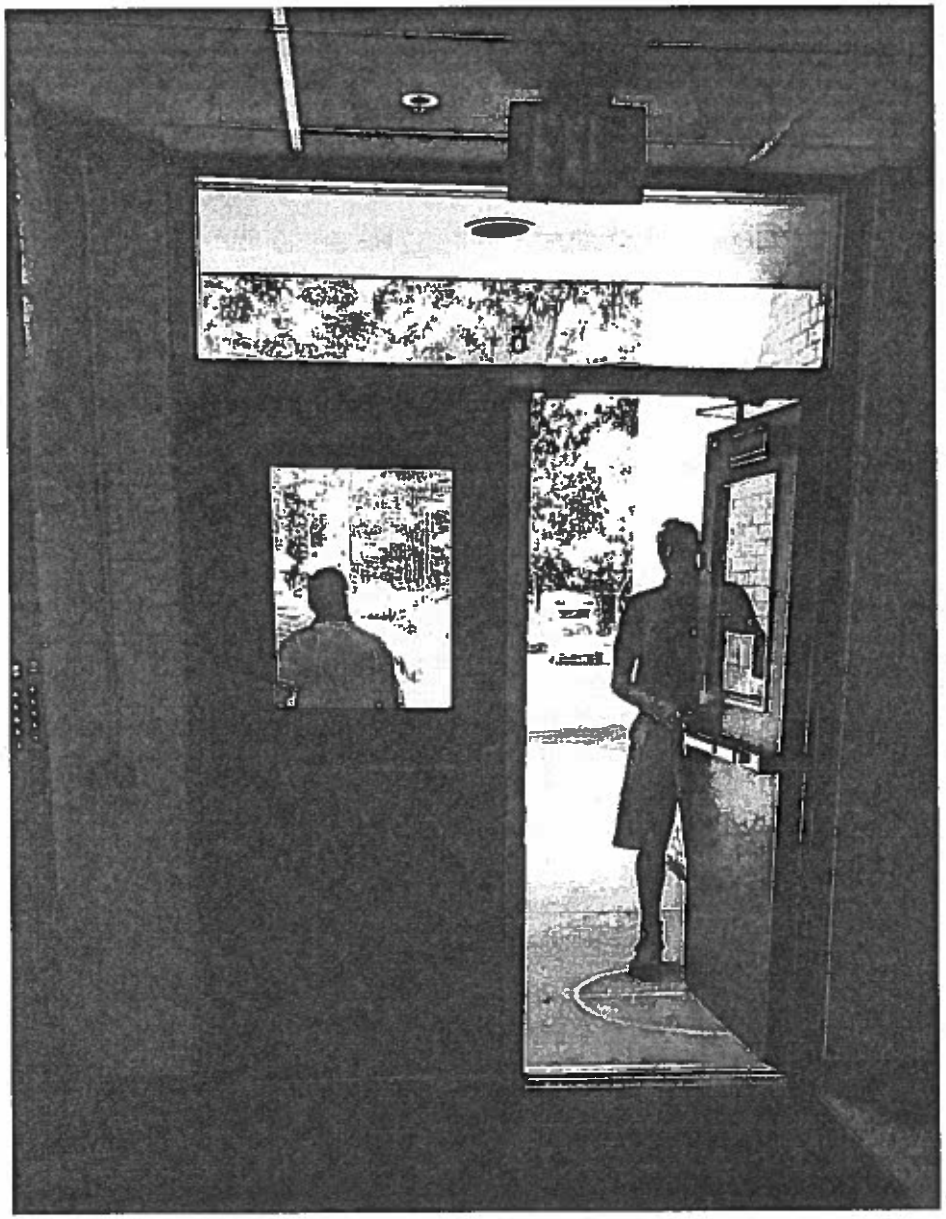
1992 Existing Conditions - Windows

RDA



1992 Existing Conditions - Doors

RDA



1992 Existing Conditions - Doors

RDA

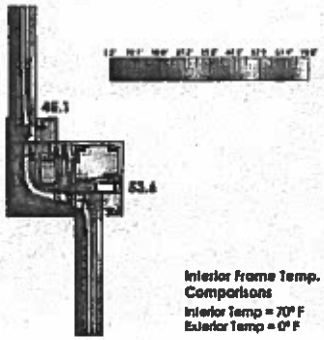
7.1 Evaluation of Alternative Window, Storefront, Curtainwall, and Entry Door Systems

A variety of materials were considered for window sash and frames, such as aluminum, vinyl, fiberglass and wood. All but aluminum were eventually eliminated from further consideration given issues such as strength and stability (vinyl), first cost and lack of life-cycle history in an educational environment (fiberglass), periodic maintenance (wood or aluminum-clad wood), or impact resistance (vinyl, wood).

In order to then understand and evaluate the physical properties and energy performance of alternative *aluminum* window, storefront and curtainwall products, heavy-duty commercial grade products were chosen. Each meets or exceeds the requirements of the Stretch Energy Code and, between them all, they provide time-tested baselines for comparing durability, longevity and energy performance between different window configurations.

First, a summary of the various materials:

- **Aluminum Systems**: The downside of raw aluminum, especially when compared to other materials such as wood, vinyl and fiberglass in their raw forms has been its thermal conductivity, which is worse than even steel. Aluminum conducts heat and cold incredibly easily, which would ordinarily make it the worst possible material in terms of saving energy. However, the integration of oversized 'thermal breaks' within the metal frame assembly effectively negates this potential energy issue. These rigid composite joints have been used for decades and are placed between the interior aluminum extrusions and those on the exterior, effectively segregating what would otherwise be a direct 'thermal bridge' between the interior and exterior environments. As shown in the diagram below (from EFCO corp), the warmer colors on the right side of the window frame represent the interior aluminum's ability to maintain a temperature of 45-53 degrees F inside a room heated to 70 degrees F, while the exterior air temperature is at 0 degrees F.



Window Evaluation - Types

These thermally broken aluminum systems are lightweight, strong, dimensionally stable and durable. In addition, window, storefront and curtainwall systems are commonly available from a single-source manufacturer, assuring uniformity of finish, detailing, and glazing on the building's exterior envelope.

- Vinyl Systems: Vinyl windows are made from pvc, a thermoplastic composite that becomes soft when heated and can even melt under flame. Concern about the effect of heat on vinyl excludes 'dark' color ranges, so vinyl windows are typically manufactured in white. They can not be painted. While energy efficient and commonly used in residential markets, vinyl window systems have not been proven in the commercial/educational market. The design team is concerned about the strength and life-cycle durability of large-size vinyl windows.

- Fiberglass Systems: Fiberglass windows are a thermoset composite of glass fibers and resins. Once bonded under heat, they are dimensionally stable and, unlike vinyl, do not soften or change shape when reheated. As such, they can be used in hot climates, even when painted dark, heat-absorbing colors. The resins provide excellent strength under compression and the glass fibers resist tensile loads surprisingly well. Together, the fiberglass composite has excellent impact resistance, about one and a half times that of vinyl.

  In terms of thermal conductivity, with a U-value of less than 0.5, fiberglass frames are slightly better than wood or aluminum-clad wood and much better than thermal-break aluminum frames which range around a 1.0 U-Value according to published data. Given that the frames account for the smallest proportion by far of an overall window surface, this helps in terms of energy efficiency, but is not as all-important as it may seem.

  The use of fiberglass window systems has increased dramatically over the past seven years and, given their properties, it appears that they will surely gain market share in the residential and commercial markets as time goes on. Unfortunately, for a couple of important reasons, they were not the focus of the study team's recommendation to the district. First, though extremely energy efficient (fiberglass composite is 500 less times conductive than raw aluminum), they are the most expensive option. Second, as a relatively new product, fiberglass window systems do not have proven full life-cycle data in the educational market.

  Though we expect good things of fiberglass going forward, the Quashnet Elementary School is a large project and we feel that a more robust record of successful use in educational/commercial environments, over an extended time period, would be applicable prior to recommending a recently-developed, and more expensive window/door technology. Time proven aluminum window and door systems offer insulating values that exceed the requirements of the Stretch Energy Code at less cost.

- Wood and Aluminum-Clad Wood Systems: Wood window systems are typically specified when a slightly less expensive, but rugged commercial window is required, or when aesthetic or historical issues are paramount. In general, it is not unusual for an aluminum-clad wood window to be 5% to 25% less expensive than a thermally-broken aluminum window with the same characteristics.

Window Evaluation - Types

RDA

For instance, the material used to construct the window, or the relationship of its material to other interior finishes may drive the choice to use a wood window as an aesthetic feature. A clear-finish wood window might be used to seamlessly blend into a paneled wall system, or as a pleasant contrast to a painted wall or trim system. On the other hand, the color of a painted wood window finish on the inside of a building can be changed to harmonize with future changes in the interior color scheme.

In a public school environment however, clear finish paneled walls are rare, as are changes to interior color schemes. Durability and cost effectiveness typically trumps pure aesthetics. Prefinished metal or fiberglass window systems are more rugged (less soft), require less periodic maintenance to preserve their appearance and, in general, are more appropriate in this type of interior environment.

Wood windows on the exterior are almost unheard because they require a high degree of maintenance to avoid periodic rotting, splitting and warping. Painting, and other maintenance issues need to be dealt with on a continuous basis. The industry's answer is to provide aluminum cladding on the exterior of a wood window.

For aluminum clad wood windows the exterior advantages are similar to those of an aluminum or fiberglass window: there is very little maintenance required. From an aesthetic perspective, the exterior aluminum window finish can be the same as the painted metal roof fascias, rain leaders, gutters, or any other exterior metal trim. When specified with the same paint finish, all of these metal surfaces will weather at the same rate.

We have used aluminum-clad wood windows in a K-2 environment once before, and given the age group, it was a very comforting aesthetic feature that was successful because it was not subject to rough use or damage from the pupils. In the vast majority of school environments however, this type of window is not applicable, especially so in a upper elementary school environment where kids are a bit more independent and can cause damage to the soft wood finish, whether intentionally or by accident.

- <u>Glazing Systems</u>: Glazing comes in a variety of different configurations with a wide range of energy-specific characteristics such as U-Value, Solar Heat Gain Coefficient (SHGC) and Visible Light Transmission (VLT), many of which are regulated by the Stretch Energy Code. Window and door manufacturers do not make their own glass and instead, make use of glazing from different glass manufacturers to suit specific project-related requirements, be they aesthetic or performance based. During its comparison of various window/door systems, the design team assumed each used the exact same glazing in order to remove a potential variable from the performance characteristics of the frame and sash systems.

  The study team was able to identify a variety of readily available heavy-duty double-pane window systems that exceeded the requirements of the stretch code in terms of energy savings as well as being impact resistant. Though triple-pane systems are available in the market place, and they would provide additional energy savings, the result is a heavier sash and steeply increased costs.

Because the project will be under construction in 2018, the school needs to be designed with the expected 9th Edition of the Massachusetts Building Code in mind. The new code has Mashpee listed as having a basic wind speed of 152 mph, therefore requiring impact resistant glass. With this in mind, our choices for windows and glazing have been narrowed.

In terms of durability, strength, design flexibility and uniformity between window products, aluminum provides the best value. The downside of aluminum (its thermal conductivity) has been effectively dealt with by the industry through the use of composite 'thermal breaks', effectively limiting the transmission of cold from outside to inside or heat from inside to outside.

Ease of operation, safety, and maintenance considerations were taken into account; and compliance with the Massachusetts Stretch Energy Code was a baseline requirement for every alternative studied.

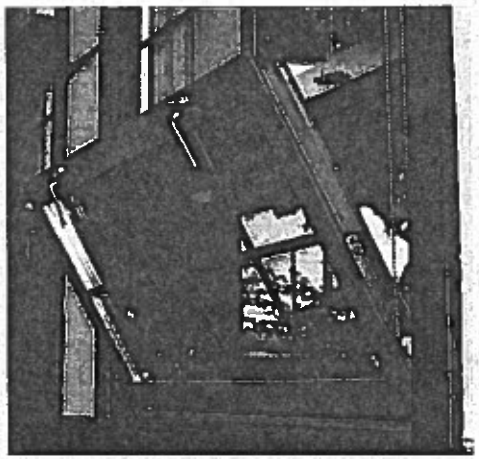
Detailed 'Cut Sheets' describing the various window, storefront and curtainwall options in detail have been compiled and are included for reference in the Appendix under Tabs #12, 13, & 14

Window Evaluation - Types

RDA

***Window Alternative #1*: Projected Window – Inward Swing**

Description: The inward projection window system is constructed of a thermally broke heavy duty aluminum frame system with high energy performance insulated glazing. The operable sash is hinged at the bottom to the window frame and pivots inward to the interior, similar to a hopper style. The screen is to the exterior side of the window frame and is fixed, not impacting operation on the sash. The sash has a cam handle lock is located at the top of the sash. The sash has durable 4 arm side hinges for smooth operation.



Material Cost: $26.00 to $30.00 per square foot depending on operable sash to fixed sash ratio.
Installed Cost: $90.00 to $100.00 per square foot.

Pros:

- High energy performance, increased thermal break isolator within frame system to reduce cold and heat transmission through the aluminum frame from the exterior to interior. High performance 1" insulated, Low E, Argon filled glazing with a center of glass U Value of .24. With an overall U Value of .35 for the fixed portions of the window and an overall U Value of .44 for the operable, the combined U Value will be well below the U Value of .45 required.
- Significant reduced air infiltration through new window assembly.
- Projected energy cost savings average 4-6% annually.
- Ease of user operation in operating window system is excellent. Operation is easier than outward projection and double hung windows.
- Heavy duty window frame system construction, .125 inch wall thickness. Ten year warranty Kynar finish, resist fading, blistering and chalking. Ten year warranty on insulated glazing.
- Heavy gauge insect screen for durability.
- Inward projection window opens over existing mechanical cabinet ventilating units adjacent to walls, does not impact interior circulation.
- With the window sash opening inward, there are no wind impacts creating a sail effect of the open sash.

Window Type – Inward Swing

RDA

Cons:

- Project in windows are not tested for impact resistance.
- Exterior screen location - susceptible to vandalism.
- Reduces room on window sills where sash is in open position.

Warranties and System Life: The industry warranties average 10 years on glass, finish and frames. The life expectancy should exceed ~40 years with minimal maintenance.

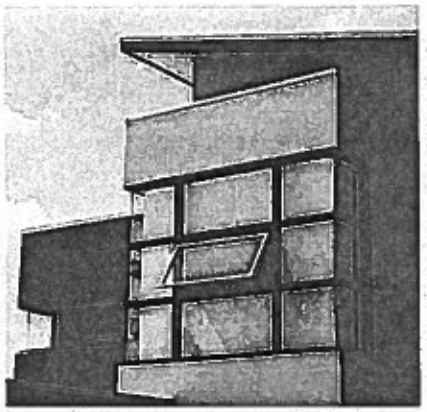
Acceptable Manufacturers: EFCO Corporation, Kawneer Company Inc., Traco Inc., Wausau Window and Wall Systems Inc., Moduline Windows Inc..

Window Type – Inward Swing

RDA

Window Alternative #2: Projected Window – Outward Swing

Description: The outward projection window system is constructed of a thermally broke heavy duty aluminum frame system with high energy performance insulated glazing. The operable sash is hinged at the top of the window frame and pivots outward to the exterior, similar, but opposite to an awning style operation that is hinged at the bottom and is pulled into the classroom. The screen is to the interior side of the window frame and is fixed with a hand crank or with dropped door openings in the screen to access the cam lock handles. The sash can have a cam handle lock or a hand crank to open and close the sash. The sash has durable 4 arm side hinges for smooth operation.



Material Cost: $26.00 to $30.00 per square foot depending on operable sash to fixed sash ratio.
Installed Cost: $90.00 to $100.00 per square foot.

Pros:

- High energy performance, increased thermal break isolator within frame system to reduce cold and heat transmission through the aluminum frame from the exterior to interior. High performance 1" insulated, Low E, argon filled glazing with a center of glass U Value of .24. With an overall U Value of .35 for the fixed portions of the window and an overall U Value of .44 for the operable, the combined U Value will be well below the U Value of .45 required.
- Significant reduced air infiltration through new window assembly.
- Projected energy cost savings average 4-6% annually.
- Ease of user operation in operating window system is fair to good. Operation is easier than double hung windows.
- Heavy duty window system construction, .125 inch wall thickness. Ten year warranty Kynar finish, resist fading, blistering and chalking. Ten year warranty on insulated glazing.
- Heavy gauge insect screen for durability and longevity.
- Tested for impact resistance.

Cons:

- Outward projection windows open out over the exterior. At the elementary and middle school levels, where the window sash projects out at ground level, this has caused a safety issue. The open window sash location is right in-line with the head height of young children.
- Ease of user operation in operating window system is fair to good depending on the opening mechanism. When using the cam lock handle, the openings in the screens to access the cam handles tend to be awkward in full operation of the sash. The other control option is the roto crank which has a history of maintenance with too many moving parts. History has dictated when constant use has occurred; the gears wear out, causing re-occurring maintenance.
- With the window sash opening outward, there may be wind impacts creating a sail effect of the open sash.

Warranties and System Life: The industry warranties average 10 years on glass, finish and frames. The life expectancy should exceed ~40 years with minimal maintenance.

Acceptable Manufacturers: EFCO Corporation, Kawneer Company Inc., Traco Inc., Wausau Window and Wall Systems Inc., Moduline Windows Inc..

Window Type – Outward Swing

RDA

XFORCE

EFCO

Series 321 X, 321 G Thermal Impact
3 1/4" Architectural Grade Projected Flush-Face Window

CONFIGURATIONS

Project-Out • Casement Out • Fixed

The 321X and 321G XForce™ window series, were developed to bring the thermal advantages of the 321X and 321G in an impact version for the coastal impact markets. The deeper strutted thermal break allows for superior thermal separation of the framing materials. This window system is an attractive and versatile product that can be utilized on a wide range of applications from educational, to office and healthcare facilities. Offered with a complete line of thermal subframes, mullions and architectural sills, the 321X and 321G provide the complete solution for your fenestration needs.

Features	Benefits
35 mm E-Strut™ thermal isolator	Exceptional U-Value performance Dual finish capability Eliminates potential for dry shrinkage
Factory Glazed	Assures quality and testing compliance
Florida product approvals	Independent agency tested and approved
Pressure equalization	Superior water resistance
Angle reinforced vent corners	Improves sash/vent rigidity
Accessory line of subframes, mullions, and architectural sills	Allows custom designs with standard product
Anodized or painted finishes available	Multiple options to answer economic and aesthetic concerns
Screen frames of extruded aluminum alloy are available	Stronger, more durable screens
Snap-in grid available with 321G version	Removes grid from glazing pocket Easily removed for exterior glass cleaning

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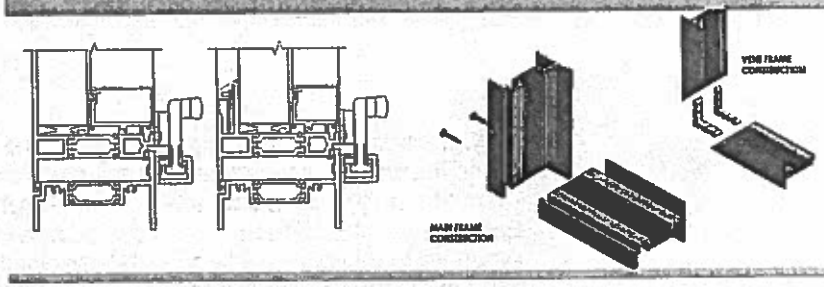
Series 321 X, 321 G Thermal
3 1/4" Architectural Grade Projected Flush-Face Window

EFCO



PERFORMANCE DATA

FIXED ARCHITECTURAL GRADE
AAMA RATING ..... AW-PG 140-FW
AIR INFILTRATION ..... < .10 CFM/FT @ 6.24 PSF
WATER ..... NO LEAKAGE @ 12.0 PSF
CSR-FRAME 71
CSR-GLASS 81

CASEMENT ARCHITECTURAL GRADE
AAMA RATING OSWING AW-PG115-C
AAMA RATING CLOSWING AW-PG95-C
AIR INFILTRATION ..... < .10 CFM/FT @ 6.24 PSF
WATER ..... NO LEAKAGE @ 12.0 PSF
CSR-FRAME ..... [illegible]
CSR-GLASS 77

Note: All performance value data is based on laboratory testing per AAMA 101/I.S.2/A440 for AI/Water/Structural, ASTM E90 and or E413 for Acoustical, AAMA 507 and or NFRC 100/200/500 for U-Factor and AAMA 1503 for Condensation Resistance Factor (CRF). Printed values are subject to change pending the frequency of recertification testing. Field results will vary depending on site, the field installed, the addition of sub-frames, paneling, mullions, accessories and installation into the surrounding condition.

SIZE THERMAL U-FACTORS*			
CD TYP OF GLASS U-FACTOR	CD TYP OF WIDTH AND SIZE		
	PO	PO Cpvd	PX
	36"X 54"	36"X 54"	42" X 36"
0.16	0.59	0.55	0.54
0.24	0.53	0.51	0.49
0.29	0.47	0.46	0.38
0.34	0.45	0.43	0.35
0.37	0.43	0.41	0.32

*BASED ON NFRC 100

U-SIZE GLAZING CHART	POLYCARBONATE		GLASS OR PANEL													
	3/16"	1/4"	3/16"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/8"	1-1/4"	1-3/8"	1-1/2"	1-3/4"	2"
ISOLATED GLASS												A			

U-SIZE GLAZING CHART	POLYCARBONATE		GLASS OR PANEL													
	3/16"	1/4"	3/16"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/8"	1-1/4"	1-3/8"	1-1/2"	1-3/4"	2"
ISOLATED GLASS												A			

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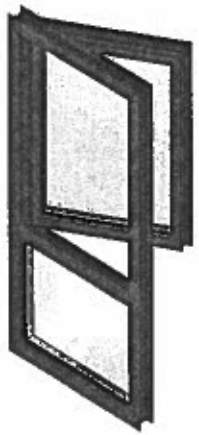
Window Type – Outward Swing

RDA

***Window Alternative #3*: Casement Window**

Description: The outward projection window system is constructed of a thermally broke heavy duty aluminum frame system with high energy performance insulated glazing. The operable sash is hinged on the side of the window frame and pivots sideways to the exterior. The screen is to the interior side of the window frame and is fixed with a roto crank. The sash will have a key release lift arm and a roto crank to open and close the sash. The sash has durable 4 arm hinges top and bottom for smooth operation.



Material Cost: $28.00 to $32.00 per square foot depending on operable sash to fixed sash ratio.
Installed Cost: $90.00 to $100.00 per square foot.

Pros:

- High energy performance, increased thermal break isolator within frame system to reduce cold and heat transmission through the aluminum frame from the exterior to interior. High performance 1" insulated, Low E, argon filled glazing with a center of glass U Value of .24. With an overall U Value of .35 for the fixed portions of the window and an overall U Value of .44 for the operable, the combined U Value will be well below the U Value of .45 required.
- Significant reduced air infiltration through new window assembly.
- Projected energy cost savings average 4-6% annually.
- Ease of user operation in operating window system is fair to good. Operation is easier than double hung windows.
- Heavy duty window system construction, .125 inch wall thickness. Ten year warranty Kynar finish, resist fading, blistering and chalking. Ten year warranty on insulated glazing.
- Heavy gauge insect screen for durability and longevity.
- Tested for impact resistance.

Window Type – Casement

RDA

Cons:

- Outward projection casement windows open out on to the exterior. At the elementary and middle school levels, where window sash projects out at ground level, this has caused a safety issue. The open window sash location is right in-line with the head height of young children.
- With the window sash opening outward, there may be wind impacts creating a sail effect of the open sash creating additional fatigue and future maintenance.
- Ease of user operation in operating window system is fair to good depending on the opening mechanism. When using the cam lock handle option, the openings in the screens to access the cam handles tend to be awkward in full operation of the sash. The other control option is the roto crank which has a history of maintenance with too many moving parts. History has dictated when constant use has occurred; the gears wear out, causing re-occurring maintenance.

Warranties and System Life: The industry warranties average 10 years on glass, finish and frames. The life expectancy should exceed ~35 years with minimal maintenance.

Acceptable Manufacturers: EFCO Corporation, Kawneer Company Inc., Traco Inc., Wausau Window and Wall Systems Inc., Moduline Windows Inc..

Window Type – Casement

RDA

XFORCE

EFCO

Series 321X, 321G Thermal Impact
3 1/4" Architectural Grade Projected Flush-Face Window

CONFIGURATIONS

Project-Out • Casement Out • Fixed

The 321X and 321G XForce™ window series, were developed to bring the thermal advantages of the 321X and 321G in an impact version for the coastal impact markets. The deeper strutted thermal break allows for superior thermal separation of the framing materials. This window system is an attractive and versatile product that can be utilized on a wide range of applications from educational, to office and healthcare facilities. Offered with a complete line of thermal subframes, mullions and architectural sills, the 321X and 321G provide the complete solution for your fenestration needs.

Features	Benefits
35 mm E-Strut™ thermal isolator	Exceptional U-Value performance Dual finish capability Eliminates potential for dry shrinkage
Factory Glazed	Assures quality and testing compliance
Florida product approvals	Independent agency tested and approved
Pressure equalization	Superior water resistance
Angle reinforced vent corners	Improves sash/vent rigidity
Accessory line of subframes, mullions, and architectural sills	Allows custom designs with standard product
Anodized or painted finishes available	Multiple options to answer economic and aesthetic concerns
Screen frames of extruded aluminum alloy are available	Stronger, more durable screens
Snap-in grid available with 321G version	Removes grid from glazing pocket Easily removed for exterior glass cleaning

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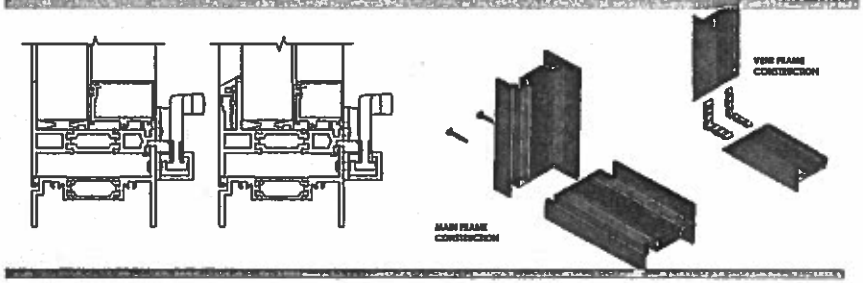
Series 321X, 321G Thermal
3 1/4" Architectural Grade Projected Flush-Face Window

EFCO



PERFORMANCE DATA

FIXED ARCHITECTURAL GRADE
AAMA RATING ..... AW-PG 110-FW
AIR INFILTRATION ..... <.30 CFM/FT @ 6.24 PSF
WATER ..... NO LEAKAGE @ 12.00 PSF
CZF-FRAME 71
CZF-GLASS 81

CASEMENT ARCHITECTURAL GRADE
AAMA RATING OUTSWING ..... AW-PG 115-C
AAMA RATING OUTSWING AW-PG95-C
AIR INFILTRATION ..... <.30 CFM/FT @ 6.24 PSF
WATER ..... NO LEAKAGE @ 12.00 PSF
CZF-FRAME 67
CZF-GLASS 77

Note: All performance value data is based on laboratory testing per AAMA 101/I.S.2/A440 for Air/Water/Structural, ASTM E90 and or E413 for Acoustical, AAMA 507 and or NFRC 500/CSA 500 for Window and AAMA 1503 for Condensation Resistance Factor (CRF). Printed values are subject to change pending the frequency of recertification testing. Field results will vary depending on the, the field test method, the addition of sub-frames, panning, mullions, accessories and installation into the surrounding condition.

3302 THERMAL U-FACTORS*			
CENTER OF GLASS U-FACTOR	CONFIGURATION AND SIZE		
	FIX	FIX Cased	F/C
	59" X 59"	59" X 59"	47" X 59"
0.46	0.51	0.58	0.54
0.35	0.39	0.51	0.42
0.30	0.47	0.48	0.39
0.24	0.40	0.36	0.35
0.20	0.40	0.44	0.32

*BASED ON NFRC 100

S-3321X GLAZING CHART	POST CASSETTES		GLASS OR PANEL													
	3/16"	1/4"	3/16"	.220"	1/4"	1/4**	1/2"	1"	1-1/8"	1-1/4"	1-3/16"	1-1/2"	1-3/4"	2"
INSULATED GLASS											A			

*Clear or tint hardware
**Non-tempered glass 5-sides

A = Available sand-in-system
L = Insert glass gasket on 3 sides with the tops of dual panes flush vent

S-3220G GLAZING CHART	POST CASSETTES		GLASS OR PANEL													
	3/16"	1/4"	3/16"	.220"	1/4"	1/4**	1/2"	3/4"	7/8"	1"	1-1/8"	1-1/4"	1-3/16"	1-1/2"	1-3/4"	2"
INSULATED GLASS													A			

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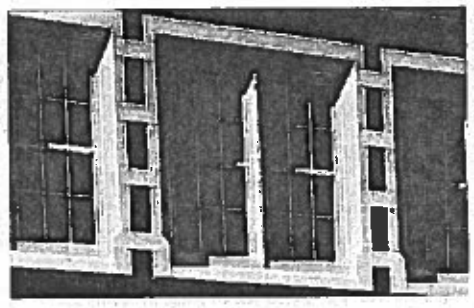
Window Type – Casement

RDA

Window Alternative #4: Single/Double Hung Window

Description: The single / double hung window system is constructed of a thermally broke heavy duty aluminum frame system with high energy performance insulated glazing. The operation of the window unit is by vertical sliding sashes within a single overall frame. The screen is to the exterior side of the window frame and is fixed, not impacting operation on the sash. The sash has a cam handle lock located at the top of the bottom sash. The sashes are controlled by two optional mechanisms, the traditional block and tackle and the more currently used side balances that are spring operated.



Material Cost: $38.00 to $42.00 per square foot depending on operable sash to fixed sash ratio.
Installed Cost: $90.00 to $100.00 per square foot.

Pros:

- High energy performance, increased thermal break isolator within frame system to reduce cold and heat transmission through the aluminum frame from the exterior to interior. High performance 1" Insulated, Low E, argon filled glazing with a center of glass U Value of .24. With an overall U Value of .35 for the fixed portions of the window and an overall U Value of .41 for the operable, the combined U Value will be well below the U Value of .45 required.
- Reduced air infiltration through new window assembly.
- Projected energy cost savings average 4-6% annually.
- Heavy duty window system construction, .080 inch wall thickness. Ten year warranty Kynar finish, resist fading, blistering and chalking. Ten year warranty on insulated glazing.
- Heavy gauge insect screen for durability and longevity. Screen is fixed and does not impact sash operation.
- Both sashes can be operable, or just one of the sashes can be operable. Typically in a single hung window design, the upper sash is fixed with the lower sash being operable. This reduces the amount of air infiltration though the window system.
- Widow operation does not impact circulation around window while the sashes are in the open position. The sashes operate within the vertical plane of the window system.
- Tested for impact resistance.

Cons:

- Ease of user operation in operating window system is good depending on the size of operating sash and mechanism. There are two types of operations in operating the sashes; block and tackle and balancers.

Window Type – Single Hung

RDA

Block and tackle is the traditional operation of the sashes; tend to be more expensive than more currently used spring balancers. With the block and tackle, the side vertical mullion increase in size reducing clear window vision area. With the spring balancer mechanism, over time, tend to need adjustment as the springs balancers fatigue causing re-occurring maintenance.

- When the operable window sash design is large as these are on this design, there is sometimes difficulty in operation by small in stature users. With the existing conditions of perimeter casework and cabinet unit heaters present along the window walls, positioning the user away from the window, there may be additional difficulty in operating the sashes.
- Cost for single and double hung window are increased due to the amount of moving surfaces and operation.
- Air infiltration is greater than casement and projection style windows due to sliding operable sashes within weather stripping.
- Exterior screen location - susceptible to vandalism.

Warranties and System Life: The industry warranties average 10 years on glass, finish and frames. The life expectancy should exceed ~35 years with minimal maintenance.

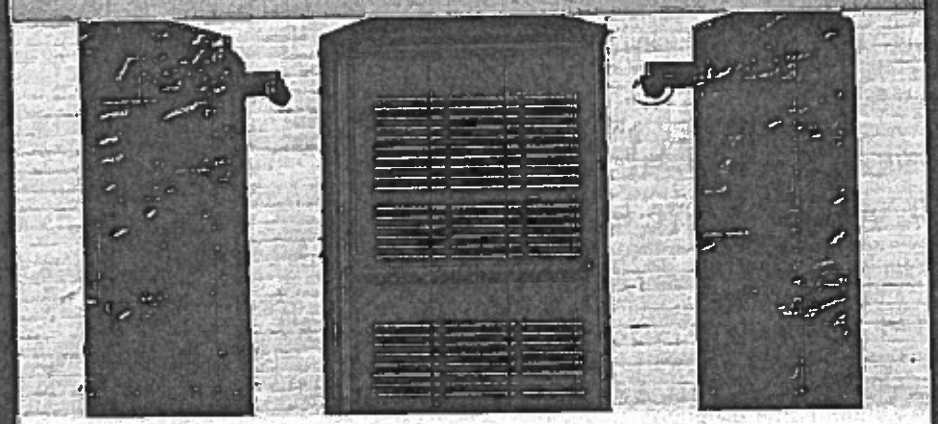
Acceptable Manufacturers: EFCO Corporation, Kawneer Company Inc., Traco Inc., Wausau Window and Wall Systems Inc., Moduline Windows Inc..

Window Type – Single Hung

RDA

Series 663 Single Hung • Series 663G Single Hung
Series 671 Double Hung • Series 6621 Fixed • Series 6621G Fixed

3 7/8" Impact/Blast Grade Thermal Hung Window



CONFIGURATIONS

Single Hung • Double Hung • Fixed

Series 663 and 663G single hung windows retain all the characteristics of the 660 family of window products with the added benefits of an impact grade rating. These window product are approved for use in High Velocity Hurricane Zone (HVHZ) as large missile impact resistant. Florida Product Approval 14627.1.

Series 671 double hung window retains all the characteristics of the 670 family of window products with the added benefit of an impact grade rating. This window product is approved for use in High Velocity Hurricane Zone (HVHZ) as large missile impact resistant. Florida Product Approvals 12907.1.

Series 6621 and 6621G impact rated fixed windows can be used with Series 663 Impact Grade Single Hung and Series 671 Impact Grade Double Hung windows. 6621 and 6621G windows are approved for use in High Velocity Hurricane Zone (HVHZ) areas and are large missile impact resistant. Florida Product Approvals 13767.1 and 14831.7.

Features	Benefits
Thermal barrier in vent and frame	Enhances energy saving potential
	Improves U-Factor performance
Weather-stripped sash and sill	Provides superior air and water performance
Continuous interlock meeting rails	Improves air infiltration resistance
Automatic sash locks available	Increased convenience in operation
Anodized and painted finishes available	Multiple options to answer economic and aesthetic concerns
Snap in Grid *(663G and 6621G only)*	Removeable for glass cleaning and reglazing

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Series 663 Single Hung • Series 663G Single Hung
Series 671 Double Hung • Series 6621 Fixed • Series 6621G Fixed

3 7/8" Impact/Blast Grade Thermal Hung Window

Main Frame Construction
The frames have a depth of 3 7/8" and are constructed of 6063-T6 aluminum alloy. The nominal material wall thickness for the frame is .080", and the sill has a minimum wall thickness of .094". Corners are of screw spline construction and sealed. See Illustration 1.

Sash Frame Construction
The sash consists of aluminum members with .080" nominal material wall thickness of 6063-T6 alloy. Corners are of screw spline construction and sealed. Dual weather-stripped, continuous interlock at the sash meeting rail(s) offers superior weathering and structural performance. See Illustration 2.

Weather Stripping
All sash are weather-stripped with FIN-SEAL® or equal. Two holes or slots per sash through the window frame facilitate weepage.

Screens
Screen frames are extruded 6063-T6 aluminum alloy. Screens are easily removed by retracting two plungers located on the interior face of the screen frame near the sill at each jamb. Full or half screens are available. 18 x 16 mesh screens are available in fiberglass and .011" diameter aluminum. 18 x 18 mesh screens are available in .009" diameter stainless steel.

Thermal Barrier
Sills are thermally isolated with two thermal struts, consisting of glass reinforced polyamide nylon, mechanically crimped in raceways extruded in the exterior and interior extrusions. All other frames and sash are thermally broken using the latest technology in two-part high density polyurethane. See Illustration 3.

Hardware
Sweep locks, access controlled sweep locks, pole ring sweep locks, and keepers are of cast white bronze with a US25D finish. Automatic head and sill locks are fabricated of aluminum alloy and finished to match the window. Two types of balance systems are available. A spring loaded block and tackle balance rated Class 1 with a .70 MAF® ratio is standard. A high performance torsion spring and extension spring balance rated Class 5 with a .30 MAF® ratio is optional. EFCO reserves the right to substitute a higher performance balance as project conditions dictate, i.e., large, heavy sash requiring minimum operating force.

Glazing
Sash is inside glazed with an extruded aluminum screw applied glazing bead. Glazing of 9/16" to 1-1/8" can be accommodated. Series 6621 fixed frame windows accommodate glass or panels from 3/4" to 1 1/4" thick.

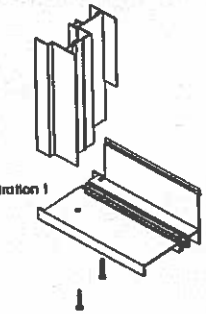

Illustration 1

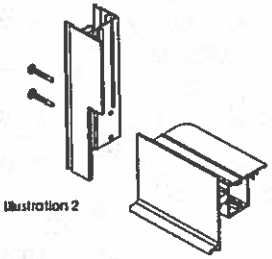

Illustration 2

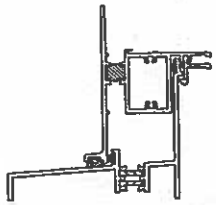

Illustration 3

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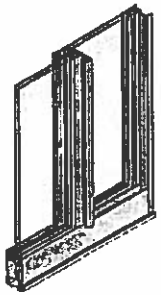
Window Type – Single Hung

RDA

Window Alternative #5: Horizontal Sliding Window

Description: The sliding window system is constructed of a thermally broken heavy duty aluminum frame system with high performance insulated glazing. The operation of the window unit is by horizontal sliding sashes within a single overall frame. The screen is to the exterior side of the window frame and is fixed, not impacting operation on the sash. The window has sweep an auto-spring locks located at the adjoining vertical mullions of both sashes. The sashes are controlled by two optional mechanisms, the traditional block and tackle and the more currently used side balances that are spring operated.



Material Cost: $36.00 to 40.00 per square foot depending on operable sash to fixed sash ratio.
Installed Cost: $90.00 to $100.00 per square foot.

Pros:

- High energy performance, increased thermal break isolator within frame system to reduce cold and heat transmission through the aluminum frame from the exterior to interior. High performance 1" insulated, Low E, argon filled glazing with a center of glass U Value of .24. With an overall U Value of .35 for the fixed portions of the window and an overall U Value of .41 for the operable, the combined U Value will be well below the U Value of .45 required.
- Reduced air infiltration through new window assembly.
- Projected energy cost savings average 4-6% annually.
- Heavy duty window system construction, .080 inch wall thickness. Ten year warranty Kynar finish, resist fading, blistering and chalking. Ten year warranty on insulated glazing.
- Heavy gauge insect screen for durability and longevity. Screen is fixed and does not impact sash operation.
- Both sashes can be operable, or just one of the sashes can be operable. Reduction in operable sashes reduces the amount of air infiltration though the window system.
- Widow operation does not impact circulation around window while the sashes are in the open position. The sashes operate within the vertical plane of the window system.

Cons:

- Ease of user operation in operating window system is good depending on the size of operating sash and maintenance.
- Re-occurring maintenance of cleaning the bottom sill and track for proper sliding operation of the sliding sashes.

Window Type – Horizontal Slider

RDA

- When the operable window sash design is large as these are on this design, there is sometimes difficulty in operation by small in stature users. With the existing conditions of the windows being located high off the finish floor, there may be additional difficulty in reaching and operating the sashes.
- The sliding window design does not work efficiently in large operable sashes; there are limits to the size of the operable sash.
- The costs for sliding window are increased due to the amount of moving surfaces and operation.
- Air infiltration is greater than casement and projection style windows due to sliding operable sash within weather stripping.
- Exterior screen location - susceptible to vandalism.
- Not tested for impact resistance.

Warranties and System Life: The industry warranties average 10 years on glass, finish and frames. The life expectancy should exceed 35 years with minimal maintenance.

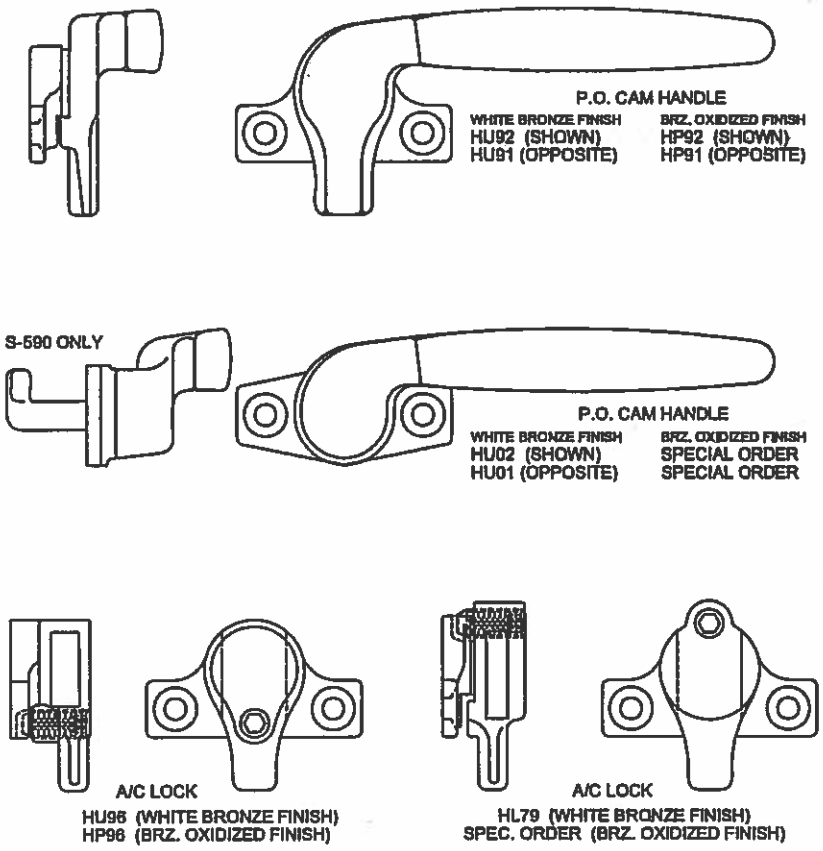
Acceptable Manufacturers: EFCO Corporation, Kawneer Company Inc., Traco Inc., Wausau Window and Wall Systems Inc., Moduline Windows Inc..

Window Type – Horizontal Slider

RDA

PROJECT OUT LOCKING HARDWARE

ALL HANDLES SHOWN ON THIS PAGE ARE FOR RIGHT HAND OPERATION.
SOME HANDLES MAY NOT HAVE BEEN USED ON EVERY JOB.



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R-7.13A

22 PIVOT SHOE OPERATOR

Designed for face-mount applications on single vent swing windows, this operator's unique pivot shoe design allows approximately 10° of opening. The double arm design also helps achieve corner pull-in and sash stability of ventilator. Acetal pivot shoes slide smoothly in the track assuring positive operation and creating a self-cleaning action. Available in both front-mount and rear-mount styles. Also incorporating an adjustable stabilizing tab (optional), which helps reduce flexing of window frame during operation.

LOGO OPTIONS: Have you considered *personalizing* your window with your company name or logo? All of Truth's operator handles are capable of accepting your own "signature". Contact Truth for further details.

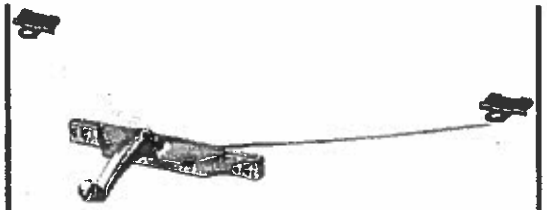
WARRANTY: Protected under the terms of the Truth Warranty for Window and Door Manufacturers and Authorized Distributors. Refer to Truth's Terms and Conditions for further details.

MATERIAL: High-pressure die-cast zinc case, crank handle and knob. Hardened steel worm and gear arm. Acetal pivot shoe. Non-magnetic stainless steel track. Optional stainless steel arms.

CORROSION PROTECTION: Truth's E-Gard® Hardware has a multi-stage coating process that produces a superior physical and aesthetic finish. Plus, it is resistant to a wider range of corrosive materials, including industrial cleaning materials and environmental pollutants. This proprietary process has been tested to be approximately three times better than common zinc plated finishes.

For the severe conditions associated with coastal areas, Truth has stainless steel hardware. See Tech Note #7 for further information about corrosion protection and these special hardware options.

FINISH: Electrostatically applied, durable coatings that provide excellent resistance to chipping, scratching and corrosion while maintaining color stability for years in direct sunlight. Please refer to Truth's Color Chart for examples of Truth's most popular finish options. Truth also offers a wide range of decorative "plated" finishes - contact Truth for additional information on availability of these finishes on specific product lines.



ORDERING INFORMATION & OPTIONS:

1. Choose Operator style desired - specify by part number. See table within drawings for details.
2. Specify finish number.
3. Select mounting hardware (sold separately):
#11454 - Contour Handle (painted) or
#10579 - Roto Gear Operator Handle - shown above (painted).
Optional handle styles, such as Truth's *Folding Handle*, are also available.
Order Track separately - specify by part number. See table within drawings for details (2 per operator).
#12789 - Stabilizing Tab Kit.
#20947 - Backing Plate (2 per operator).
#20189 - Backing Grommet (optional).
#21306 - Protective red plastic spline cap (optional).
#30171 - Rubber-cork adhesive backed gasket (optional).

RECOMMENDED SCREWS: Types of screws required determined by material of profile used. Refer to drawings for complete information on screw type and quantity needed (sold separately). For additional information regarding screw selection - see Truth Tips and Tech Note #11.

TRUTH TIPS:

1. Operator mounting screws must pass through one PVC wall and Truth Backing Plates #20947 or one PVC wall and one insert wall. Track mounting screws must pass through two PVC walls or one PVC wall and one insert wall. For this reason, it is necessary to use a longer screw than is recommended.
2. When selecting mounting screws for Truth hardware, coating compatibility is one of the most important criteria. For best corrosion resistance the coating on the screws should be the same as the coating on the hardware. For more information see Tech Note #11.
3. This operator is intended for single vent applications only, and should not be used on multi-vent applications.
4. For accurate hardware replacement, pre-drilling is recommended.
5. Truth recommends that Backing Plates (#20947) and/or a Stability Tab (#12789) be used for added support to the operator in an effort to reduce the amount of flex experienced in many PVC Profile Systems.
6. For metal window profiles, Truth recommends machine screws. However, in most applications, sheet metal screws will provide adequate holding power.
7. Butt Hinges can be used with the pivot shoe operator, however, some degree of sash chatter will usually occur. Chatter is caused by the weight of the window pushing the operator closed rather than the operator pulling the window closed.
8. A window operator alone provides poor forced entry resistance and must always be used in conjunction with sash locks when forced entry resistance is required.
9. The Pivot Shoe Operator can be used with all Truth 13 Series Awning and 4-Bar Hinges. To insure maximum operator efficiency, it is important that operator, hinge, and sash height is properly matched. Consult sash size table found in the Hinge section of the catalog.

INCLUDE TRUTH SPECS ON YOUR NEXT WINDOW PROJECT
Window operators shall be provided which allow easy adjustment of window position. The mechanism should be crank operated and provide wide range of open positions. Connection to the movable sash should use pivoting slide shoes and stainless steel guide tracks.

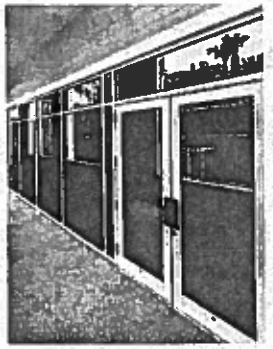
40

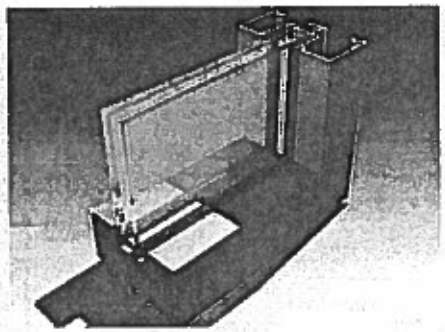
Window Hardware

RDA

***Storefront Alternative #1*: Storefront Series 526**

Description: The storefront system consists of thermally broke heavy duty aluminum 21/2" x 5" frame system with high energy performance insulated glazing. Screw spline construction for shop and field assembly. System accommodates up to a 1 1/16" thick insulated glazing. Storefront system can be outside and inside glazed with snap on glazing bead.





Install Cost: $70.00 to $80.00 per square foot.

Pros:

- High energy performance, thermal break isolator within frame system to reduce cold and heat transmission through the aluminum frame from the exterior to interior. High performance 1" insulated, Low E, Argon filled glazing with a center of glass U Value of .24. With an overall U Value of 0.38. Minimum required U Value 0.42.
- Significant reduced air infiltration through new window assembly.
- Projected energy cost savings average 4-6% annually.
- Heavy duty storefront frame system construction, .080 inch wall thickness. Ten year warranty Kynar finish, resist fading, blistering and chalking. Ten year warranty on insulated glazing.
- Heavy gauge insect screen for durability on ventilation sashes.
- Accommodates up to 1 1/16" thick insulated glazing. Storefront system can be outside and inside glazed with snap on glazing bead.
- Cost effective storefront system that meets and exceeds the Stretch Energy Code for energy performance.
- Tested for Impact Resistance

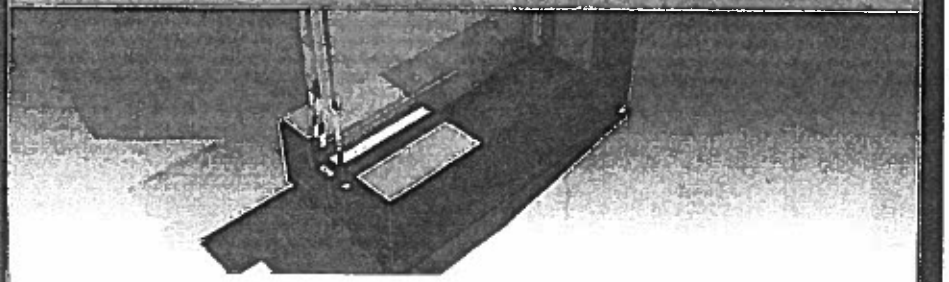
Cons:

- Exterior screen location - susceptible to vandalism.
- Capable of two pane insulated glazing unlike Series 433 with the triple pane insulated glazing.

Warranties and System Life: The industry warranties average 10 years on glass, finish and frames. The life expectancy should exceed 40 years with minimal maintenance.

Acceptable Manufacturers: EFCO Corporation, Kawneer Company Inc., Traco Inc., Wausau Window and Wall Systems Inc., Moduline Windows Inc..

Series 526
2 1/2" x 5" Impact/Blast Grade Thermal Impact Storefront Frame



CONFIGURATIONS
Outside Glazed • Inside Glazed

Series 526 is an impact rated storefront product that incorporates the use of a polyurethane thermal barrier for improved CRF and U values. It can also be used with all standard and heavy-duty EFCO impact rated entrance packages. The series 526 has applications for both small and large missile impact resistant "dry gasket" glazing and has been tested for High Velocity Hurricane Zone (HVHZ) with 1 5/16" insulating glass utilizing inboard 9/16" laminated glass with .090" Dupont™ Sentry Glass® Plus interlayer. Florida Product Approval: 13599.8.

Features	Benefits
Screw spline construction	Allows assembly of sections prior to installation
Thermally broken with E-strut™ at sill and subsill	Decreases installation time
Thermally broken with pour & debridge polyurethane	Enhanced Thermal Properties
Integral door adaptors	Compatible with all 1-3/4" EFCO doors
	Contact EFCO Product Technical Support Department for 2" Doors
Joint fasteners are #12	Strengthens system
	Simplifies fabrication
Horizontals are square cut	Eliminates notching
	Easier fabrication and assembly
Dry Glazed	Assures a positive weather seal for high performance.
	Reduced labor cost.
Interlocking legs at sub-sill	Holds sill in place
	No "blind" seals are required at the sill
Head and jamb anchors are inside the glazing pocket	Anchors are not visible
Accessory line of perimeter anchors, pocket fillers, door adaptors, etc.	Increased product versatility
Anodized or painted finishes available	Multiple options to answer economic and aesthetic concerns

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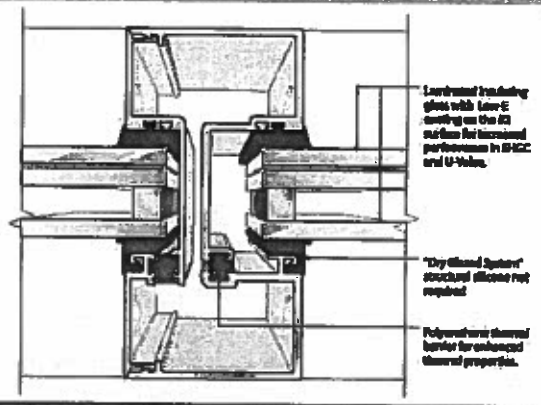
Series 526
2 1/2" x 5" Impact Grade Thermal Impact Storefront Frame



PERFORMANCE DATA

[illegible]

CENTER OF GLASS U-FACTOR	CONFIGURATION AND SIZE	
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[illegible]	[illegible]	[illegible]
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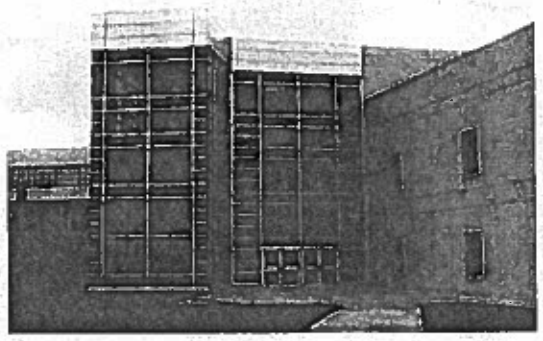
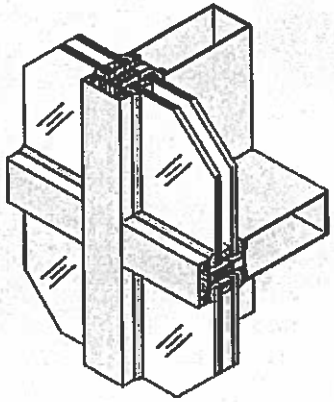
Storefront

RDA

Curtainwall Alternative #1: Series 5600 – Dual Glazed

Description: 2 1/4"-2 1/2" wide curtain wall system that offers exceptional thermal performance using a 38mm Struts which can achieve values as low as .27 U-factor. This system is available in depths of 6", 7" and 8". It can accommodate glazing thicknesses up to 1 5/16".





Intstall Cost: $120.00 per square foot.

Pros:

- High energy performance, thermal break isolator within frame system to reduce cold and heat transmission through the aluminum frame from the exterior to interior. High performance 1" insulated, Low E, Argon filled glazing with a center of glass U Value of .24. With an overall U Value of 0.30. Minimum required U Value 0.42.
- Projected energy cost savings average 4-6% annually.
- Heavy duty curtainwall system construction, .070 to .125 inch wall thickness. Ten year warranty Kynar finish, resist fading, blistering and chalking. Ten year warranty on insulated glazing.
- Accommodates up to 1 5/16" thick insulated glazing. Curtainwall system can be outside and inside glazed with snap on glazing bead.
- Can accommodate glazing panels up to 1" Thick. Triple insulated glaze option for increase U Value.
- Tested for impact resistance.

Cons:

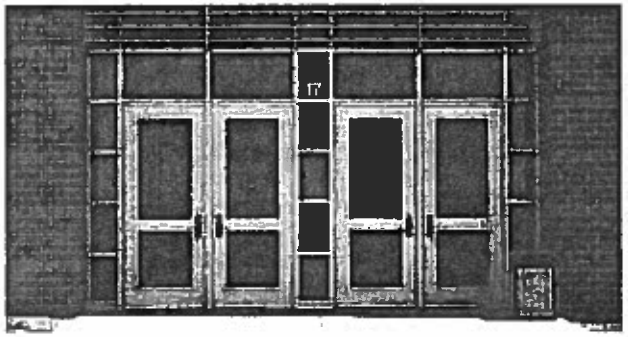
- Capable of two pane insulated glazing unlike Series 5500X with the triple pane insulated glazing.

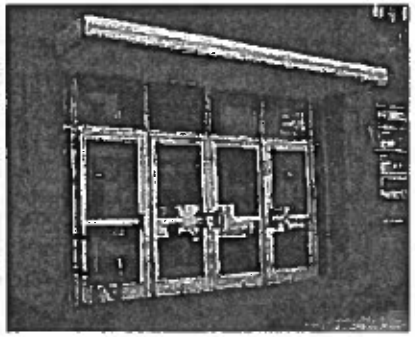
Warranties and System Life: The industry warranties average 10 years on glass, finish and frames. The life expectancy should exceed ~40 years with minimal maintenance.

Acceptable Manufacturers: EFCO Corporation, Kawneer Company Inc., Traco Inc., Wausau Window and Wall Systems Inc., Moduline Windows Inc..

Entry DOOR Alternative #1: Aluminum D500 Wide Series (efco)

Description: The storefront entrance system consists of thermally broke heavy duty aluminum 2" x 5" wide style frame system with high energy performance insulated glazing. Mortise and tenon construction. Accommodates up to a 1" thick insulated glass unit. Continuous piano hinge.





Material Cost: Approximately $3,300 per door leaf.

Pros:

- High energy performance, thermal break isolator within frame system to reduce cold and heat transmission through the aluminum frame from the exterior to interior. High performance 1" insulated, Low E, Argon filled glazing with a center of glass U Value of .24. With an overall U Value of 0.66. Minimum required U Value 0.80.
- Significant reduced air infiltration through new window assembly.
- Projected energy cost savings average 4-6% annually.
- Heavy duty storefront frame system construction, .125 inch wall thickness. Ten year warranty Kynar finish, resist fading, blistering and chalking. Ten year warranty on insulated glazing.
- Accommodates up to 1 " thick insulated glazing. Same insulated unit as storefront system.
- More transparent than FRP door, larger Vision area.

Cons:

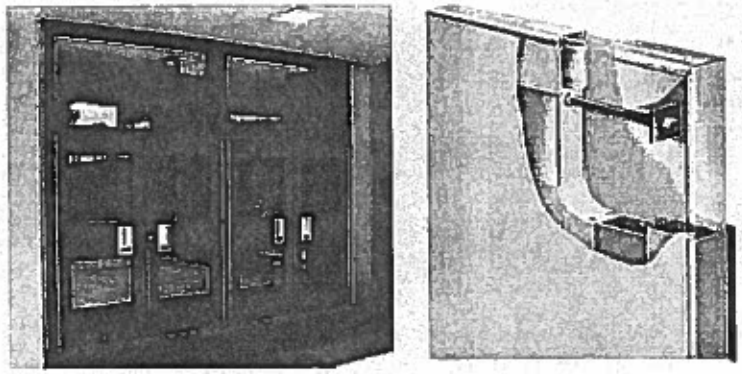
- U door value is .66, is less than FRP door U Value of .29.

Warranties and System Life: The industry warranties average 10 years on glass, finish and frames. The life expectancy should exceed 40 years with minimal maintenance.

Acceptable Manufacturers: EFCO Corporation, Kawneer Company Inc., Traco Inc., Wausau Window and Wall Systems Inc., Moduline Windows Inc.

Entry DOOR Alternative #2: Fiberglass FRP Door SL-17 (special-lite)

Description: The storefront FRP door entrance system consists of 0.7" aluminum styles and rails, internal hardware reinforcement, mitered corner joints, full width 3/8" tie rods, urethane insulted core and .120" fiberglass face sheets each side. Insulated Vision Lites up to 1" thick.



Material Cost: Approximately $2,400 per door leaf.

Pros:

- High energy performance, thermal break isolator within frame system to reduce cold and heat transmission through the aluminum frame from the exterior to interior. High performance 1" insulated, Low E, Argon filled glazing with a center of glass U Value of .24. With an overall U Value of 0.29 (R 3.45). Minimum required U Value 0.80.
- Projected energy cost savings average 4-6% annually.
- Heavy duty construction, easy care finish and maintenance. Ten year warranty Kynar finish, resist fading, blistering and chalking. Ten year warranty on insulated glazing.
- Accommodates up to 1" thick insulated glazing.
- Integral structural steel to accommodate increase width and height openings.
- More durable than regular aluminum storefront entrance systems.
- Better thermal performance the aluminum storefront entrances systems.

Cons:

- Material and finish is not same as aluminum storefront. Color of FRP panel can match aluminum storefront color.

Warranties and System Life: The industry warranties average 10 years on glass, finish and frames. The life expectancy should exceed ~40 years with minimal maintenance.

Acceptable Manufacturers: Special-Lite Inc., Commercial Door Systems, Inc., Edgewater FRP Door, Inc.

7.2 Evaluation of Alternative Soffit Panel Systems

The replacement of the existing EFIS (Exterior Finish Insulation System) and architectural panel systems above the windows in the school is an integral part of ensuring the lifespan of the new windows. A variety of materials were considered for the soffits, such as rainscreen systems clad with coldform metal panels, aluminum composite panels, glass fiber reinforced concrete panels, pheonolic panels, composite panels as well as systems replacing the soffits with insulated metal panels and EFIS.

Rainscreen systems consist of multiple elements to prevent water and vapor from entering an exterior wall. This option is typically a more robust moisture-management system than a barrier-wall system. Regardless of the design choice, rainscreen systems control and direct moisture, preventing it from entering the wall cavity and providing ventilation. A properly designed rainscreen system provides a means for any moisture that may accumulate to dry or evacuate the system.

There are several elements that make up a successful rainscreen system, including an air / water barrier, insulation, ventilation, and exterior cladding. All of these components work together to maintain the sound structure of a building envelope.

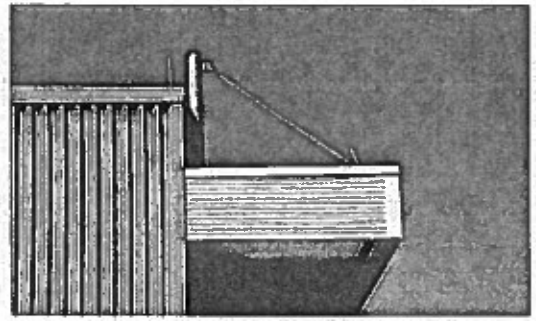
The cladding's job is to protect the wall from elements such as ultraviolet rays, strong winds, and rain, while the insulation reduces the flow of heat (or cool) from the building. The air / water barrier is the element that works to stop any water or vapor that may find its way into the building envelope. Finally, the ventilation part of the rainscreen system helps to dry out any moisture that leaves through the exterior cladding.

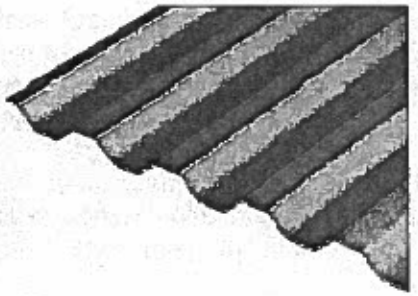
By utilizing a rainscreen system, there is no need for sealants and gaskets which means there is less labor during assembly and no chance of seal failure. Future maintenance is minimalized due to reduction of finished sealants. The air / water barrier back up prevents water from entering the building and flashing which rids the envelope of excess moisture.

Presently the Quashnet School's EFIS barrier-wall system has trapped water within the system and it has seeped into the windows causing rust and other water damage. The existing EFIS system did not have weeps, a drainage matt layer and a water barrier to allow proper drainage when moisture did penetrate the system. Current EFIS system designs now include proper weeps, system flashings, drainage matt layers and water barriers layers with the understanding that moisture will eventually penetrate exterior finish of the system.

Panel Alternative #1: Coldform Metal Panel Rainscreen System (Closed Joint)

Description: The coldform metal panel rainscreen system consists of 1.5" corrugated aluminum panels, 16 ga coated steel rainscreen attachment system , R-16 polyisocyanurate foil faced insulation , 40 mil peel and stick air vapor barrier, and 5/8" exterior gypsum sheathing.





Material Cost: Approximately $10.00 sq ft.
Installed Cost: Approximately $28-$32.00 sq ft.

Pros:

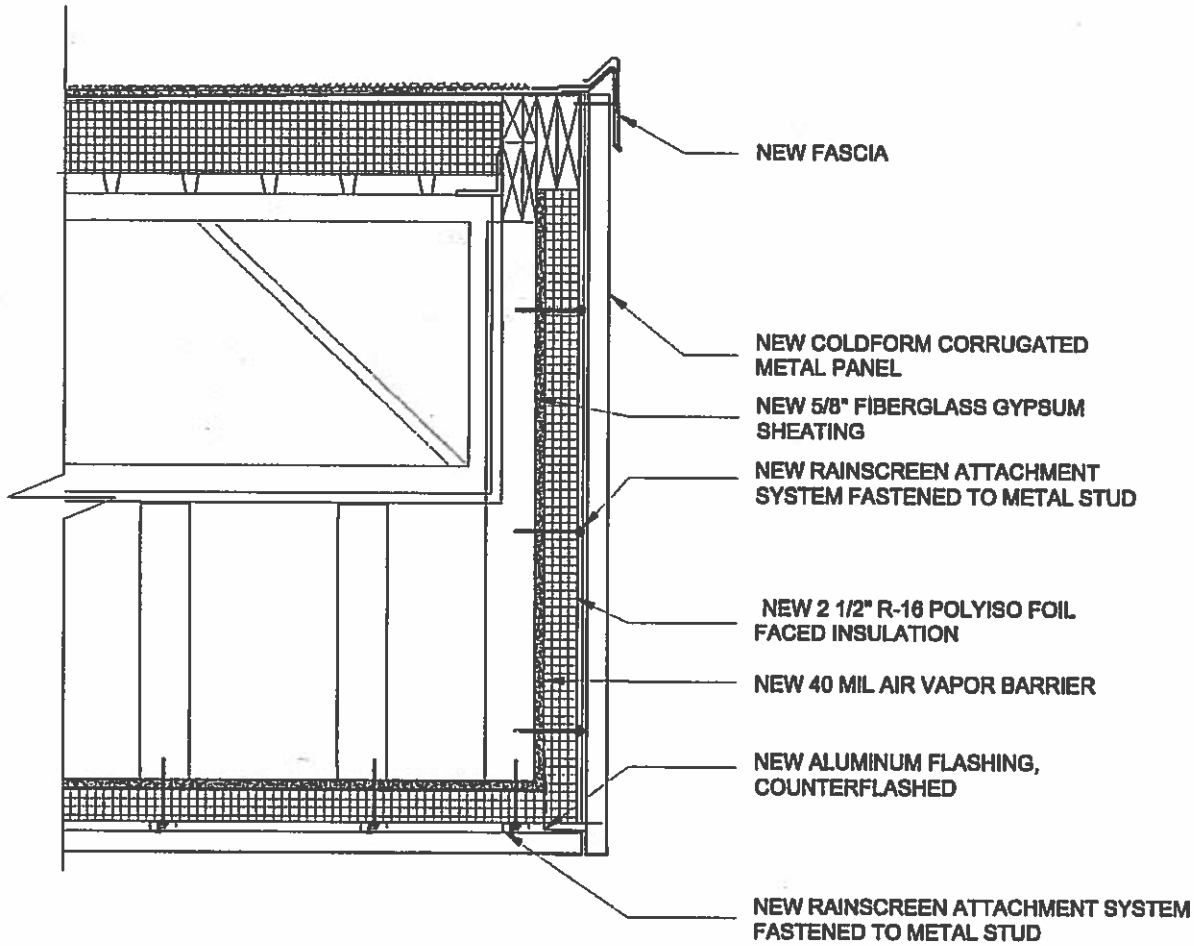
- Rainscreen systems provide buildings with increased thermal performance and water resistance .
- Affordable cladding option
- Variety of colors and styles
- Kynar finish – no maintence required
- Non-combustible

Cons:

- Not Impact Resistant – easily dented
- Exposed fasteners

Warranties and System Life: 20 year finish warranty.

Acceptable Manufacturers: Petersen Aluminum Corporation, Metal Sales Manufacturing Corportation, Centria Architectural Systems.



Cold Formed Metal Panels

RDA

HWP

PRECISION SERIES WALL PANELS

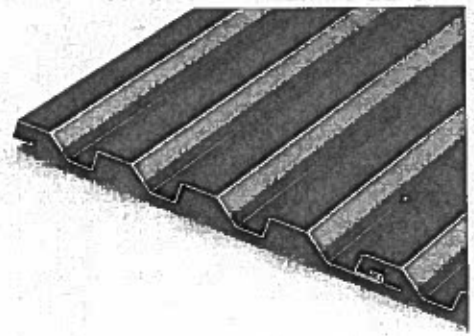
MATERIALS

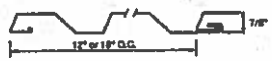
.032 aluminum
.040 aluminum
24 gauge steel
22 gauge steel

SPECS

12" or 16" O.C.
7/8" High

AVAILABLE WITH OR WITHOUT CLIP





PRODUCT FEATURES

- Direct concealed fastener or clip installation
- Multiple rib patterns provide a variety of looks and design options
- 7/8" depth available: HWP
- Cost-effective installation
- Horizontal or vertical installation
- Panel lengths up to 35'

MATERIAL

- 43 stocked colors (24 gauge steel)
- 36 stocked colors (.032 aluminum)
- 15 stocked colors (22 gauge steel)
- 22 stocked colors (.040 aluminum)
- 29 stocked colors (.050 aluminum)
- Galvalume Plus available

TESTS

- ASTM E330
- ASTM E283
- ASTM E331
- ASTM 501.1-05
- ASTM 1592

FLORIDA BUILDING PRODUCT APPROVALS

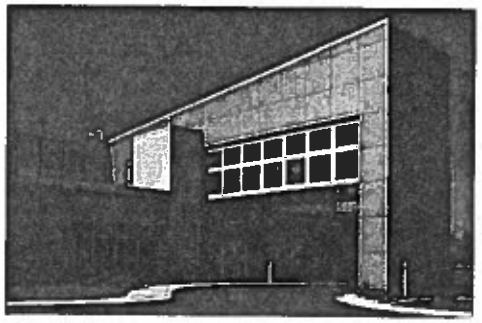
Please refer to pac-clad.com or your local factory for specific product approval numbers for Precision Series panels.

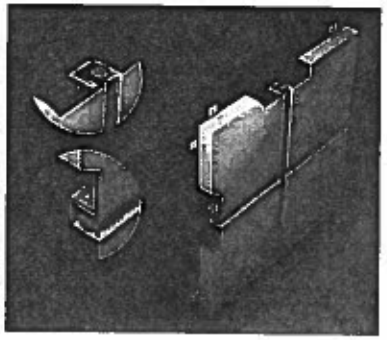
Note: Line drawings may not be to scale.

PAC-CLAD 800 PAC CLAD | PAC-CLAD.COM

Panel Alternative #2: Aluminum Composite Panel Rainscreen System (Closed Joint)

Description: The composite metal panel rainscreen system consists of 4mm thick composite aluminum panels, aluminum extrusions and clips, 16 ga coated steel rainscreen attachment system , R-16 polyisocyanurate foil faced insulation , 40 mil peel and stick air vapor barrier, and 5/8" exterior gypsum sheathing.





Material Cost: Approximately $17.00 sq ft.
Installed Cost: Approximately $50-$59.00 sq ft.

Pros:

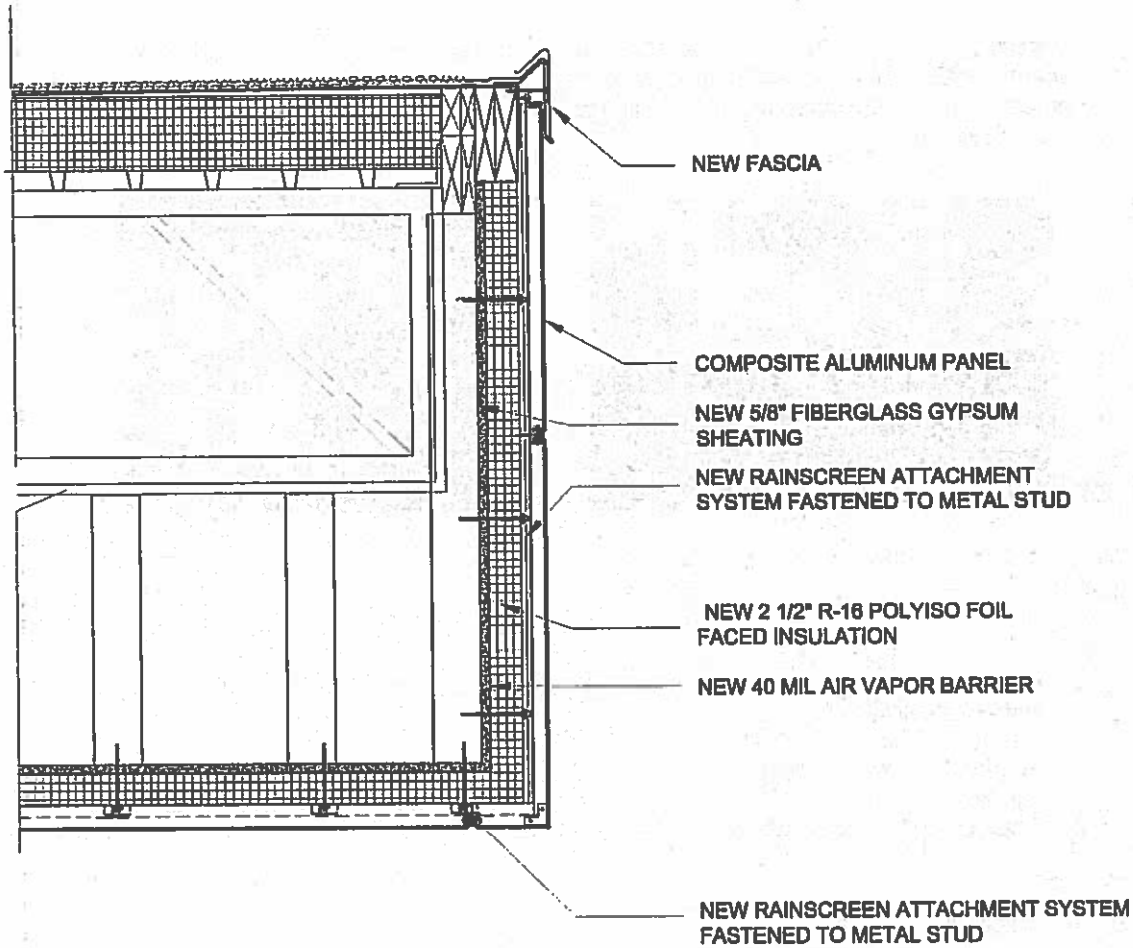
- Rainscreen systems provide buildings with increased thermal performance and water resistance .
- Non-combustible
- Variety of colors
- Rout-and-return fabrication
- Lightweight
- Project specific custom fabricated and engineered panels

Cons:

- Not Impact Resistant – easily dented

Warranties and System Life: 20 year finish warranty.

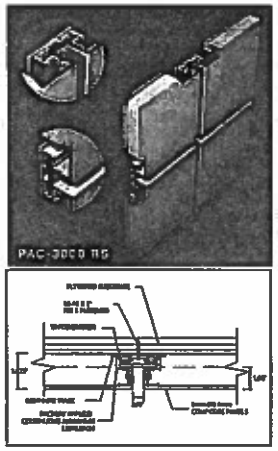
Acceptable Manufacturers: Petersen Aluminum Corporation (PAC-3000) , Larson by Alucoil North America, 3A Composites (Alucobond Plus).

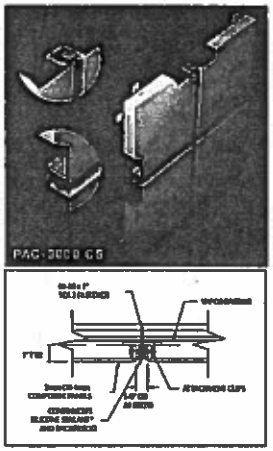


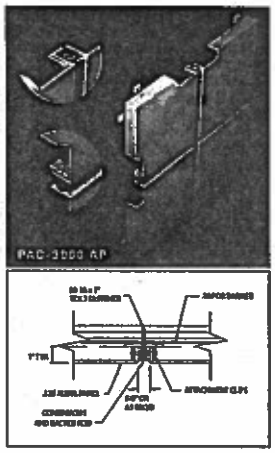
Aluminum Composite Metal Panel

RDA

COMPOSITE WALL PANELS







PRODUCT FEATURES

- Available in a wide variety of colors and finishes
- Precise fabrication to meet exacting tolerances
- Rout-and-return fabrication
- Welded Corners Available

MATERIALS

- 3mm, 4mm, 6mm – Composite
- .063 - .125 Mill Finish Aluminum
- Zinc
- Copper
- Stainless Steel
- Anodized Aluminum

TESTS

- ASTM E283
- ASTM E330
- ASTM E331

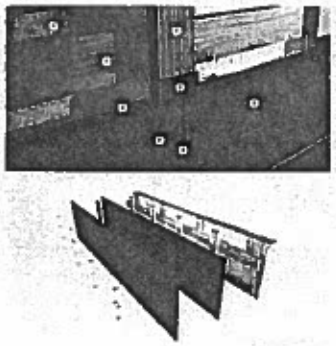
PAC-CLAD
Petersen Aluminum

Aluminum Composite Metal Panel

RDA

Panel Alternative #3: *Glassfiber Reinforced Concrete Panel Rainscreen System (Open Joint)*

Description: The glassfiber reinforced concrete panel rainscreen system consists of 13mm thick glassfiber reinforced concrete panels, 16 ga coated steel rainscreen attachment system , R-16 polyisocyanurate foil faced insulation , 40 mil peel and stick air vapor barrier, and 5/8" exterior gypsum sheathing.



Material Cost: Approximately $21.00 sq ft. (Plank System)
Approximately $30.00 sq ft. (Panel System)
Installed Cost: Approximately $54-$65.00 sq ft.

Pros:

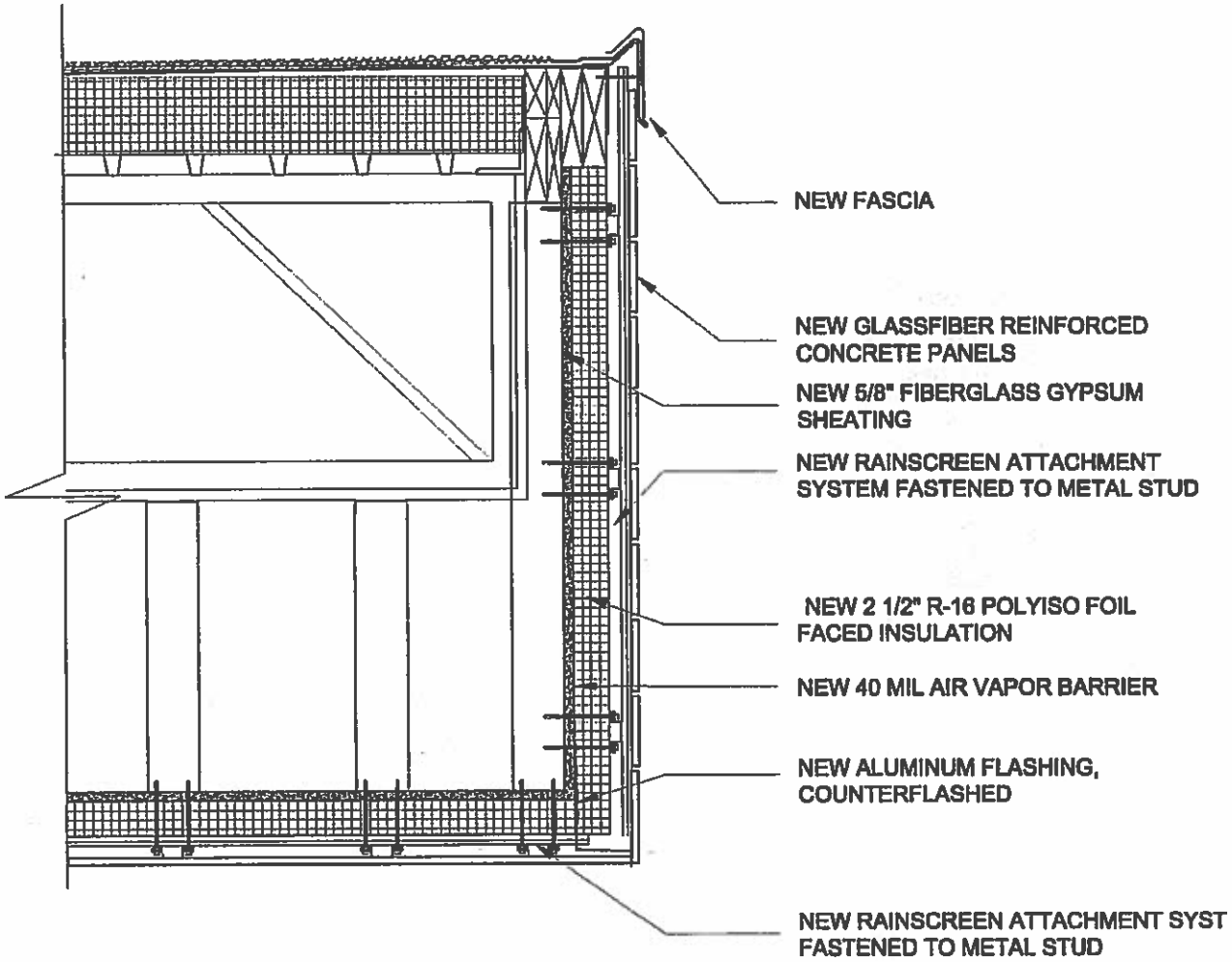
- Rainscreen systems provide buildings with increased thermal performance and water resistance .
- Long-term Durability
- Impact Resistant
- Non-combustible
- Light weight
- Color Integral with a large natural color palette
- Individual elements can be replaced easily
- Concealed fasteners available

Cons:

- High initial cost.

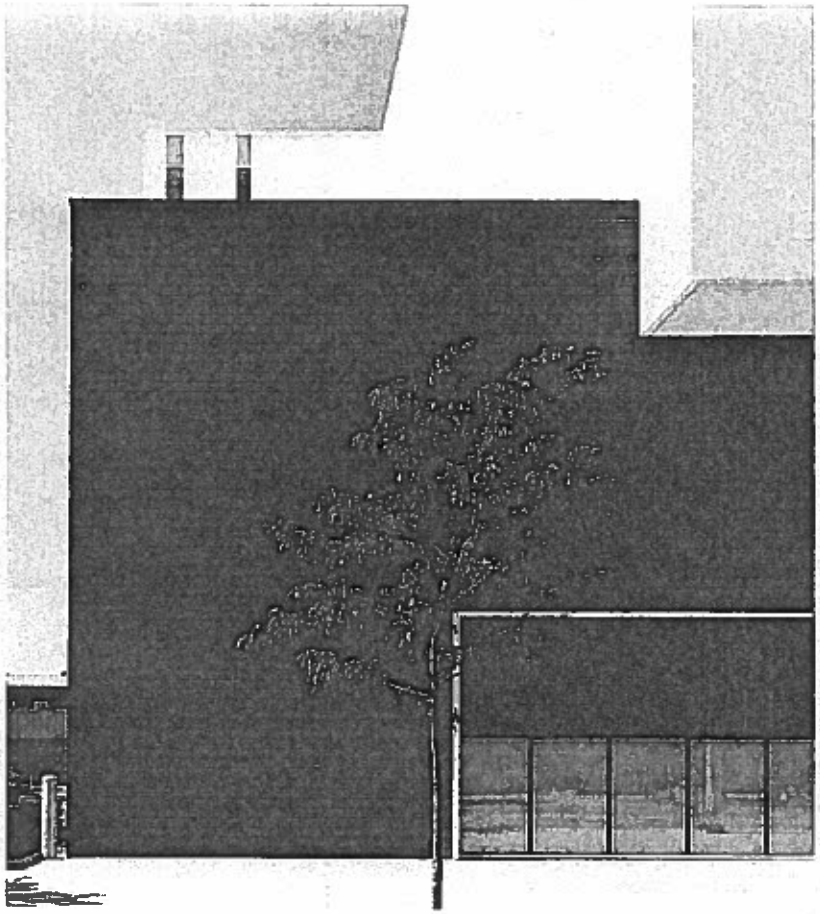
Warranties and System Life: 10 year warranty, 50 year service life.

Acceptable Manufacturers: Rieder (oko skin, fibreC) , Synstone International (Contempo)



Glass Fiber Reinforced Concrete Panel

RDA



öko skin
slat wall panels made of
glassfibre reinforced concrete

Beton tebt.

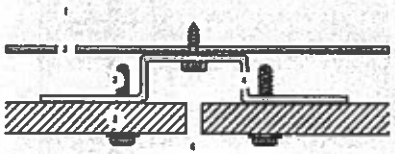
RIEDER

Installation

öko skin slat wall panels are used as facade cladding and mounted on a substructure. They can be installed both horizontally and vertically. öko skin slats can be fastened with screws, rivets or adhesive to an aluminium substructure. Screws and rivets are available in color matched finish. öko skin flat 302 mm | 11.89" can be also installed as lap siding.

For further details on processing and mounting please consult our "Installation instructions" on www.rieder (refer to country-specific applications).

Assembly principle: screws on aluminium substructure



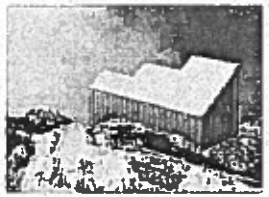
1 insulation
2 horizontal subgirt support
3 screw
4 hat channel subgirt
5 öko skin flat
6 open vertical joint

NEW | Concealed fastening with RPA Rieder Power Anchor

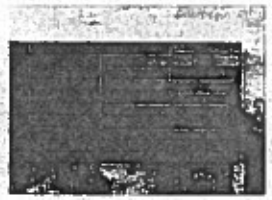
Layout examples

öko skin 147 mm, seamless, vertical installation (1/3 shifted), screwed on aluminum substructure

öko skin flat 125 mm, seam, horizontal installation (1/2 shifted), screwed on wooden substructure



öko skin flat 147 mm, seamless, vertical installation, screwed on wooden substructure



Coming soon! öko skin 147 mm, seamless design, horizontal installation (1/2 shifted), glued on aluminum substructure

Rieder Smart Elements GmbH
Mühlenweg 22 | 6751 Maishofen | Austria
+43 6542 600 644
oekoskin@rieder.co | www.rieder.co

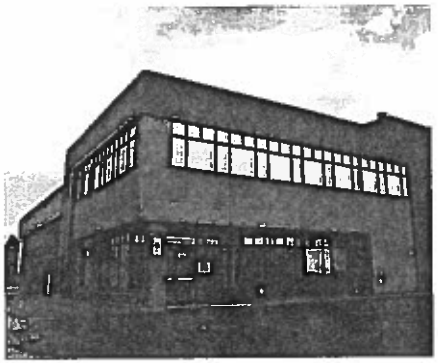
Distributor
fibre Q North America by Sound Solutions Inc.
1-877-740-0305 (toll free)
canada@rieder.co | usa@rieder.co | www.rieder.co

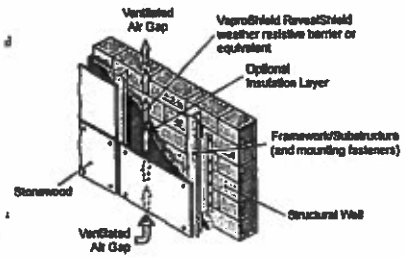
Glass Fiber Reinforced Concrete Panel

RDA

Panel Alternative #4: Phenolic Panel Rainscreen System (Open Joint)

Description: The phenolic panel rainscreen system consists of 10mm thick solid phenolic impregnated kraft paper wall panels, 16 ga coated steel rainscreen attachment system , R-16 polyisocyanurate foil faced insulation , 40 mil peel and stick air vapor barrier, and 5/8" exterior gypsum sheathing.





Material Cost:. Approximately $17.00 sq ft.
Installed Cost: Approximately $48-$54.00 sq ft.

Pros:

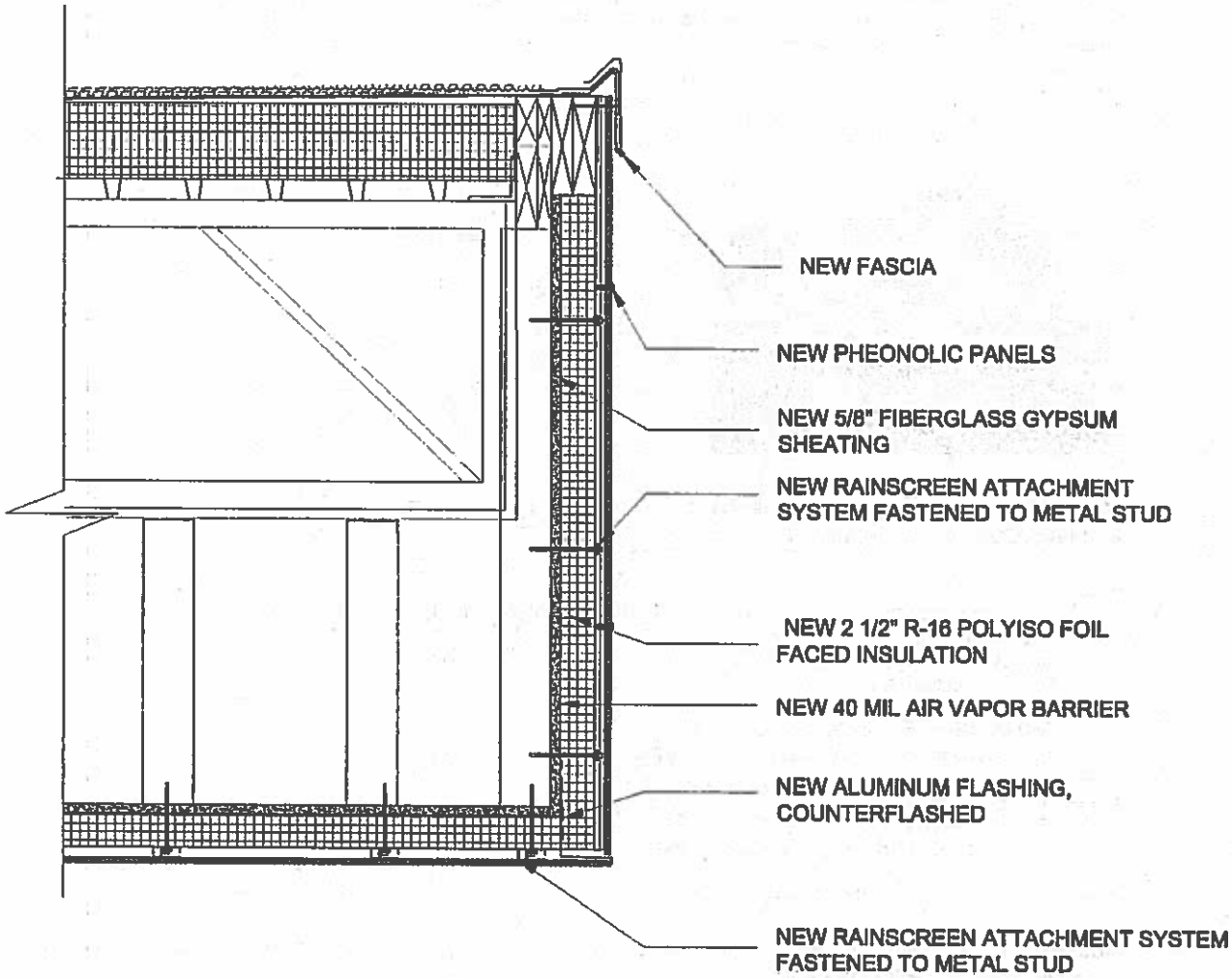
- Rainscreen systems provide buildings with increased thermal performance and water resistance .
- High Durability
- Impact Resistant
- Non-combustible
- Light weight
- Individual elements can be replaced easily
- Project specific custom fabricated and engineered panels

Cons:

- Exposed fasteners
- Only tested in US market over the last 15 years.

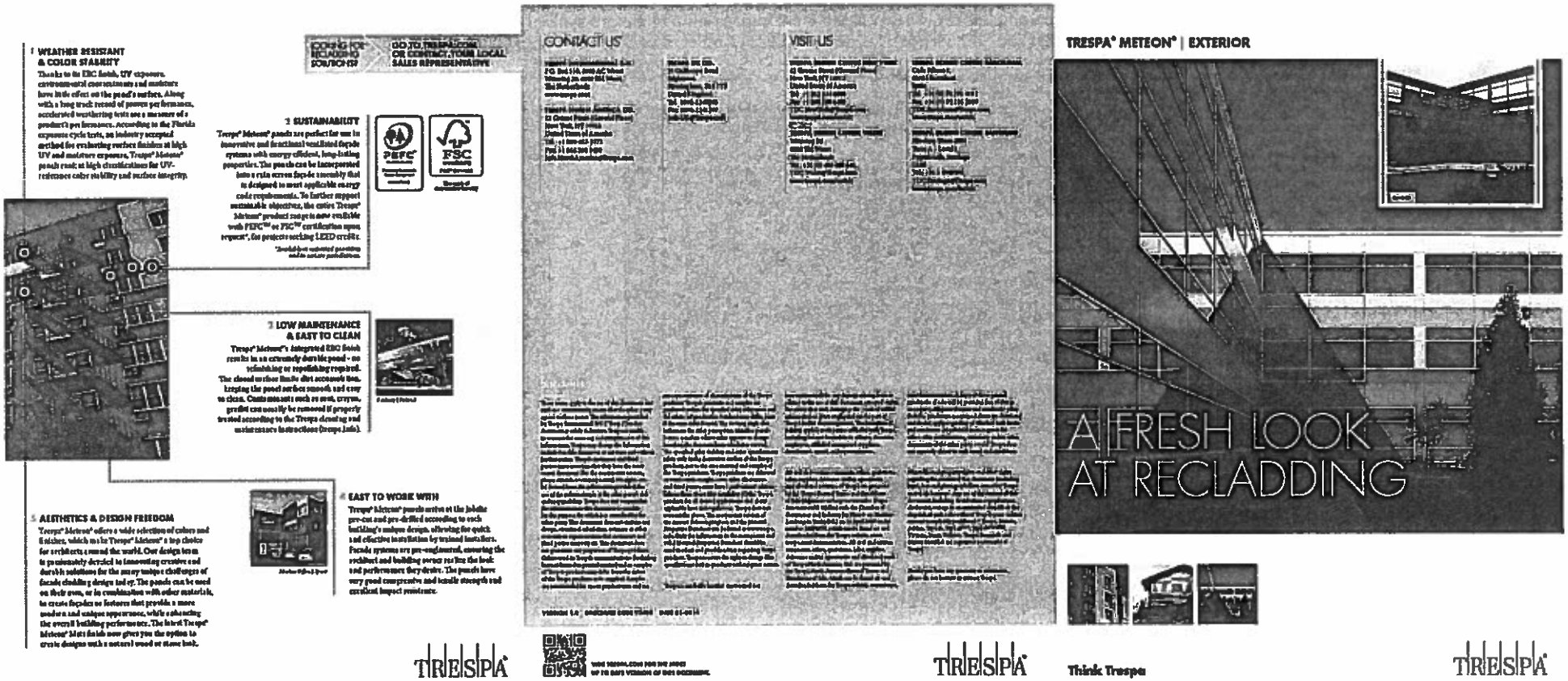
Warranties and System Life: 10 year panel warranty.

Acceptable Manufacturers: Stonewood Architectural Panels , Trespa North America, Fundermax, as distributed by Architect's Surfaces, LLC.



Phenolic Panel

RDA

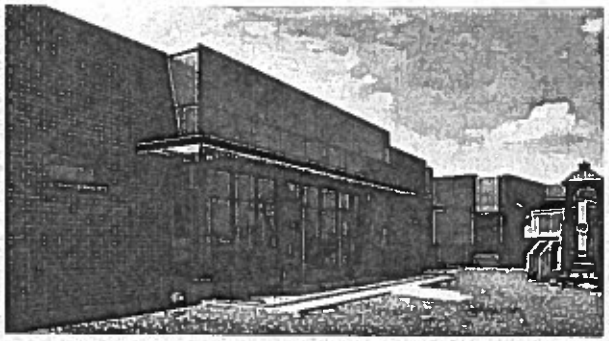


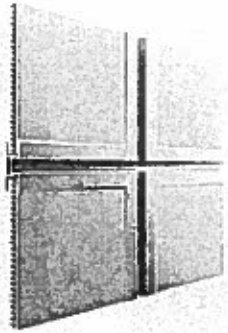
Phenolic Panel

RDA

Panel Alternative #5: Composite Panel Rainscreen System (Closed Joint)

Description: The composite panel system consists of 5/16" thick polypropylene core panel with an aluminum face and backer, 16 ga coated steel rainscreen attachment system , R-16 polyisocyanurate foil faced insulation , 40 mil peel and stick air vapor barrier, and 5/8" exterior gypsum sheathing.





Material Cost: Approximately $14.00 sq ft.
Installed Cost: Approximately $46-$54.00 sq ft.

Pros:

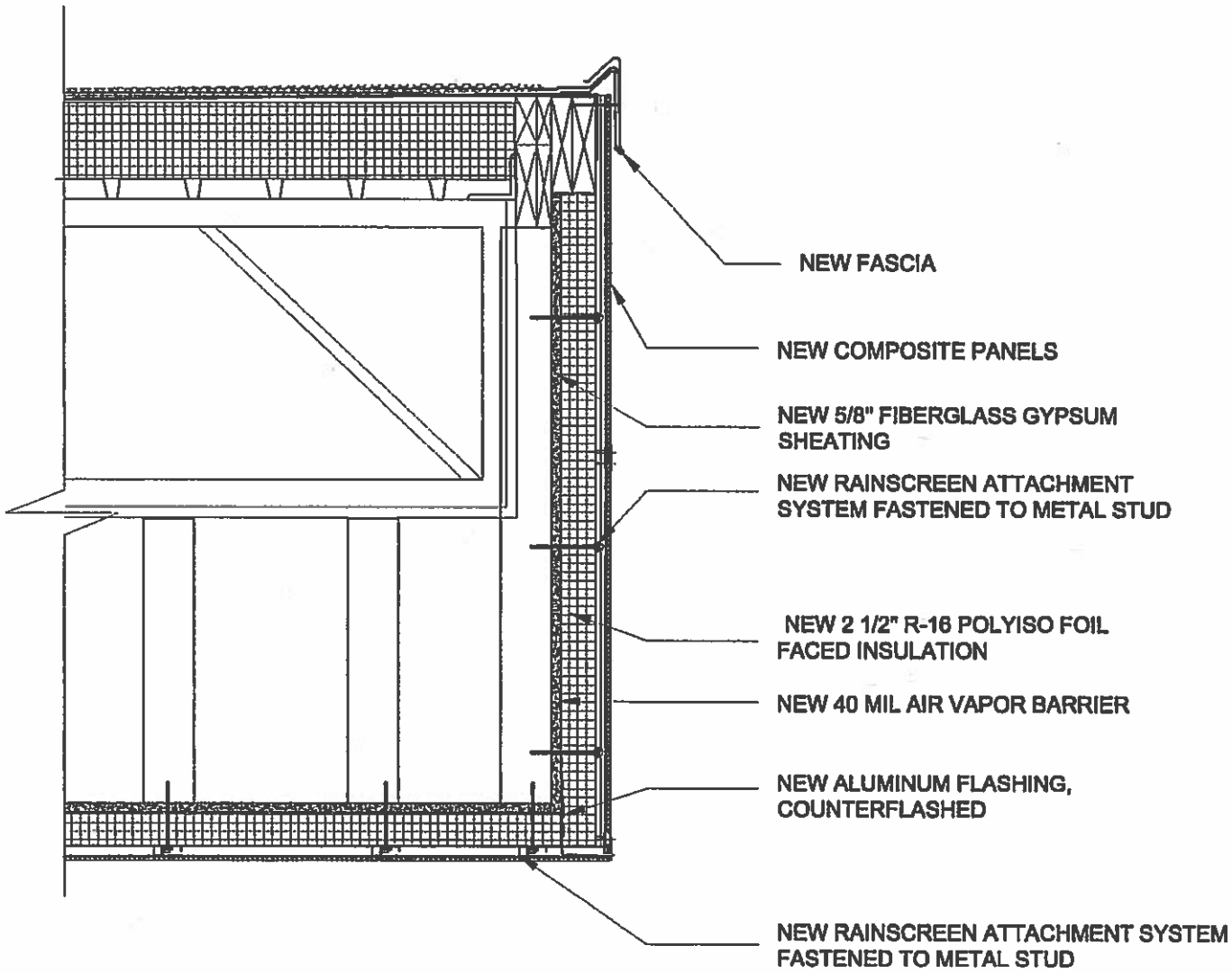
- Rainscreen systems provide buildings with increased thermal performance and water resistance .
- Light weight
- Simple Installation
- Color Matched Mouldings

Cons:

- Exposed, snap-on joints
- Painted finish
- Not Impact Resistant – easily dented.
- Short life span

Warranties and System Life: 5 year panel lamination warranty.

Acceptable Manufacturers: Citadel Architectural Products (ProCore)



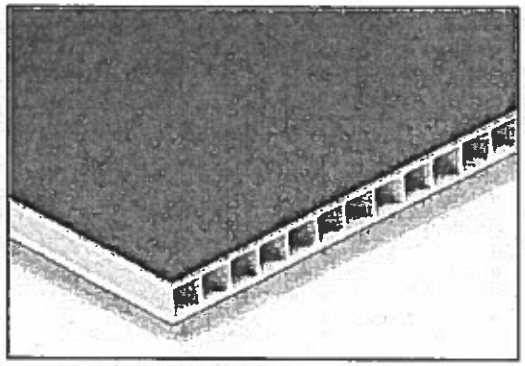
Composite Panel

RDA

Product Data Sheet

PRODUCT NAME:
ProCore™
Prefinished Architectural Panels

MANUFACTURER:
Citadel Architectural Products, Inc.
3131-A North Franklin Road
Indianapolis, Indiana 46226
phone: (317) 894-9400
(800) 446-8828
fax: (317) 894-6333
(800) 247-2635
web: www.citadelap.com
email: info@citadelap.com



PANEL & SYSTEM DESCRIPTION

OVERVIEW:
ProCore™ is a composite panel made by laminating either textured or smooth prefinished aluminum skins to a core of high density polypropylene. A second aluminum skin is added as a backer and provides panel balance.

Panels are furnished with a strippable film (or interleaved microfoam) on the painted surfaces to protect the finish during shipment and installation.

ProCore™ is attached to the substrate using either mechanical fasteners or construction adhesive, depending upon the method selected. Joints are finished using one piece or two piece extruded aluminum trim moldings.

BASIC USES & APPLICATIONS:
As an alternative or complement to other exterior building finishes such as stucco or brick, ProCore™ is designed for applications such as: claddings, fascias, canopies, and accent bands.

ProCore™ is typically used on low and medium rise buildings such as schools, banks, office parks, medical facilities, etc... However, with a variety of finish options, ProCore™ also adds aesthetic interest to otherwise monolithic structures (i.e. preformed warehouse walls).

TABLE 1. COMPOSITION & MATERIALS*:

Component	Standard (in)	Metric (mm)
• Prefinished Textured Aluminum Face	.010"	.254mm
(or) Prefinished Smooth Aluminum Face	.024" (min)	.609mm
• High Density Polypropylene Core	9/32"	7.00mm
• Primed Smooth Aluminum Backer	.010"	.254mm
(or) Primed Smooth Aluminum Backer	.024"	.609mm

* Technical Properties are based upon the Typical Composition. Selecting optional components may alter these properties

FEATURES & BENEFITS:
As a complete exterior cladding system, ProCore™ offers a number of benefits to the building owner, architect, and installer including:

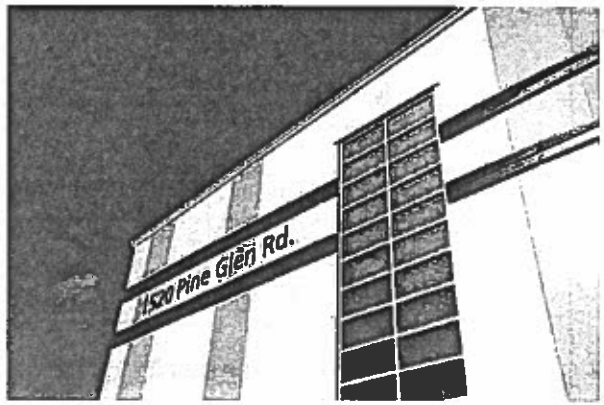
- **Lightweight**
  With an innovative polypropylene core, ProCore™ is lightweight making it easier to handle, cut in-the-field, and install.
- **Easy Installation**
  Simple sheets/trim concept easy to understand. Standard carpentry knowledge and tooling is all that is required for installation.
- **Curveable**
  While tight radius requirements are not recommended with ProCore™, panels can be gently curved in-the-field to achieve graceful lines.
- **Color Matched Moldings**
  Several different profiles available to complete the system look. Moldings are painted to color match or complement panels.
- **Versatile**
  With textured or smooth skins available, ProCore™ can provide a number of different looks for your project including metallic and anodized finishes.
- **Water Resistant**
  Virtually unaffected by water, ProCore™ provides an attractive alternative for situations where moisture is a primary concern.

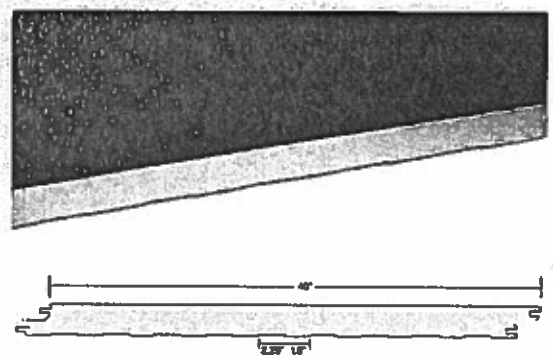
Composite Panel

RDA

Panel Alternative #6: *Insulated Metal Panel System*

Description: The insulated metal panel system consists of 3" thick polyisocyanurate with galvanized steel exterior metal faced wall panels, 16 ga 1" girts, 40 mil peel and stick air vapor barrier, and 5/8" exterior gypsum sheathing.





Material Cost: Approximately $13.00 sq ft.
Installed Cost: Approximately $42-$45.00 sq ft.

Pros:

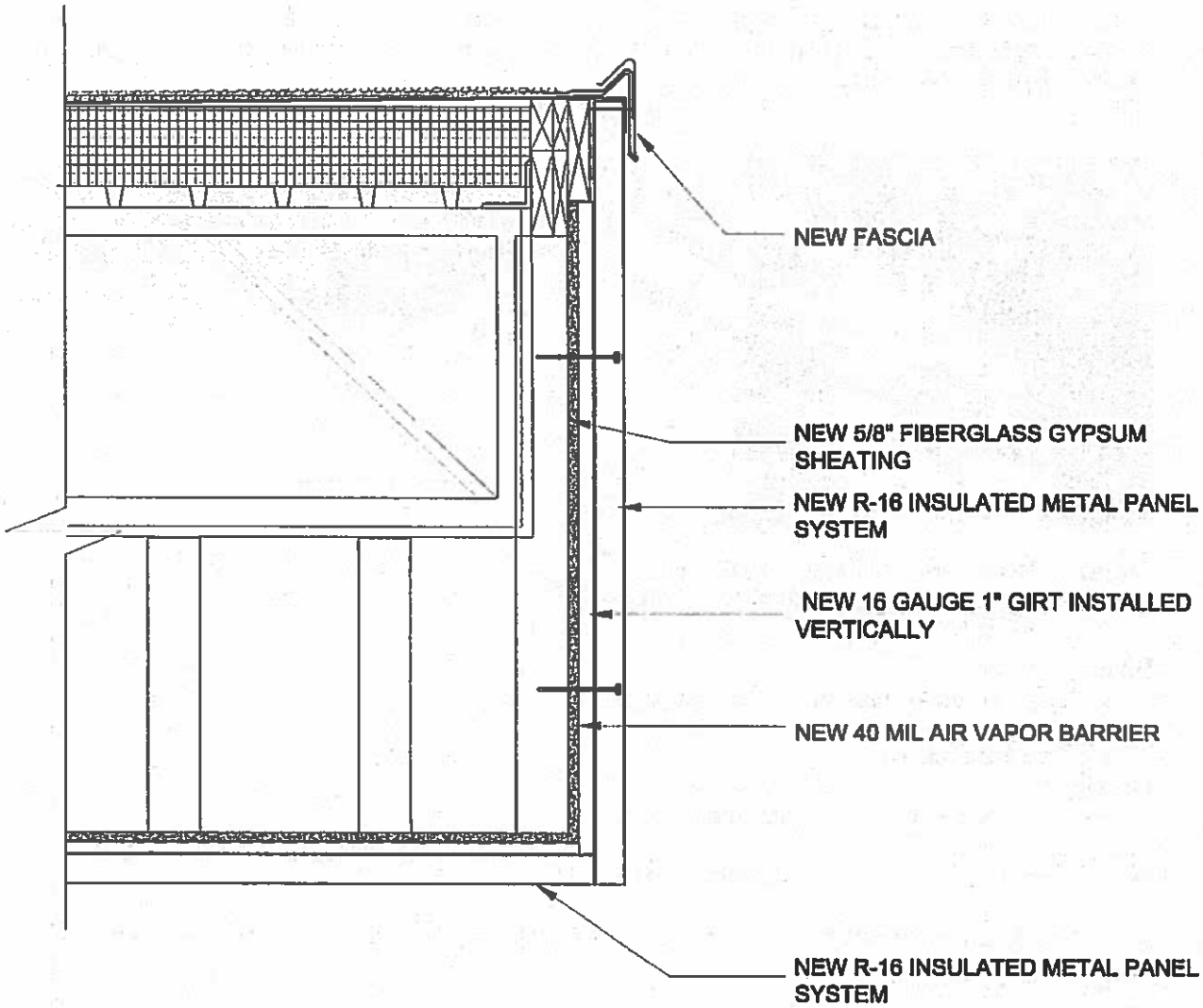
- Less wall thickness than a rainscreen system.
- Concealed fasteners
- Fast Installation

Cons:

- Not Impact Resistant – easily dented.

Warranties and System Life: 2 year panel warranty.

Acceptable Manufacturers: Metal Sales Manufacturing Corp. (IMPower Series) , Metl-Span (Santa Fe), Centria.



Insulated Metal Panel

IMPower Series™ Insulated Metal Wall Systems

IMPower Series™ insulated metal wall panels deliver a high performance, thermally efficient building envelope in a variety of classic and modern profiles. Ready to be installed vertically or horizontally, and available in a wide array of high performance PVDF and SMP coated coatings, these insulated metal wall panels offer the ultimate in design freedom.

As a single component system, IMPower Series™ insulated metal wall panels apply directly onto open structural steel, meaning they are faster to install than traditional wall assemblies. Concealed fasteners offer a clean, uninterrupted aesthetic and virtually eliminate thermal breaks. The panel's slip create a continuous air barrier to prevent unwanted infiltration and exfiltration through the wall field, the most leaky component of a typical building envelope. Depending on the project, IMPower Series™ insulated metal wall panels can meet or exceed ASHRAE 90.1 energy standards.

The double tongue and groove joinery can be sealed on site at side of the panel depending on the direction of the vapor drive, to ensure the most weathertight system possible.

Install IMPower Series™ insulated metal wall panels with confidence for a beautiful, durable, energy efficient and high performance wall solution.

WALL SYSTEM CHARACTERISTICS

Panel Thickness:	2"	2.5"	3"	4"
R-Value (per inch):[1]	7.1 @ mean temperature of 75° 7.9 @ mean temperature of 40°			
Panel Width:	40"			
Panel Length:[2]	8'-0" minimum to 50'-0" maximum			
Application:	Vertical or horizontal wall			
Insulation Material:	Factory-foamed polyisocyanurate (2.1 to 2.5 pcf density)			
Joint Configuration:	Off-set tongue and groove with concealed fastener			
Accessories:	Fasteners, concealed fastened clips, sealants, trims and brake formed flashing			
Exterior Coating:	PVDF or SMP			

1. R-Values shown for general use only. They do not reflect system or specific end-use values. Please contact Metal Sales for project-specific analysis.
2. Information shown is all-inclusive. Please see product pages for details.

FL40 Flat Wall Panel

- Concealed fastener designed for uninterrupted aesthetic and virtually zero thermal bridging
- Self-aligning tongue and groove joinery
- Panel width: 40" standard
- Panel length: 8'-0" minimum – 32'-0" maximum
- Gauges: 22 ga. standard smooth, 24 ga. standard light embossed
- Flat profile delivers monolithic aesthetic, either vertically or horizontally

Panel Thickness	2"	2.5"	3"
Insulating Value	R-16	R-20	R-24

HE40 Heavy Embossed Wall Panel

- Concealed fastener designed for uninterrupted aesthetic and virtually zero thermal bridging
- Self-aligning tongue and groove joinery
- Panel width: 40" standard
- Panel length: 8'-0" minimum – 40'-0" maximum
- Gauges: 20 ga. standard, 24 ga. optional
- Pre-painted heavy embossing adds surface rigidity and a unique patterned design; can be field-sprayed with elastomeric coatings for additional texture

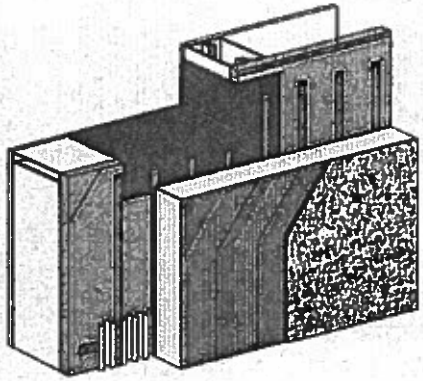
Panel Thickness	2"	2.5"	3"	4"
Insulating Value	R-16	R-20	R-24	R-32

Insulated Metal Panel

RDA

***Panel Alternative #7*: Exterior Insulation and Finish System (EFIS)**

Description: The exterior insulation and finish system consists of a finish coat over two layers of base coat and reinforcing mesh, , R-16 extruded polystyrene (EPS) insulation board , adhesive/drainage medium, 40 mil peel and stick air vapor barrier, and 5/8" exterior gypsum sheathing.



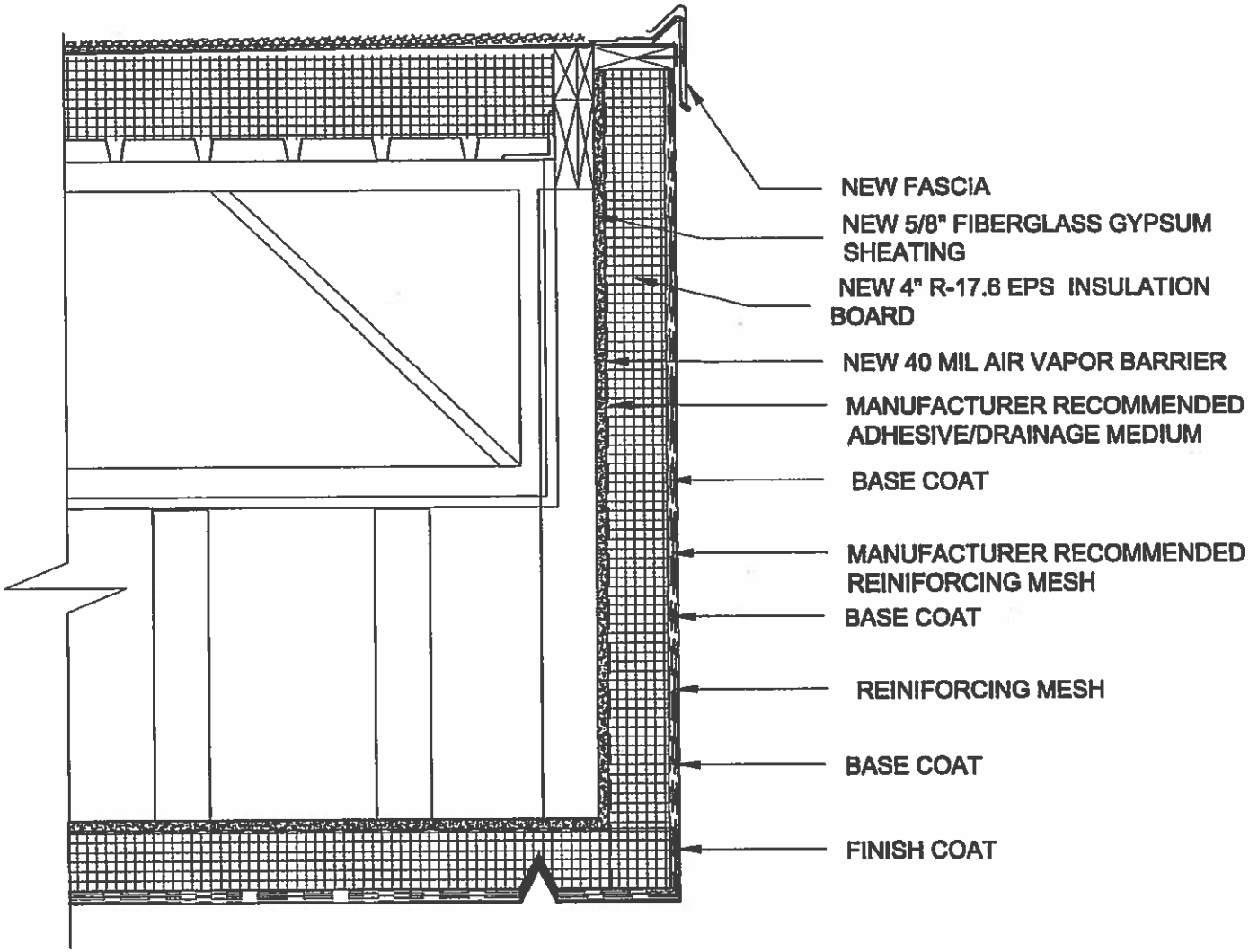
Material Cost: Approximately $14.00 sq ft.
Installed Cost: Approximately $23-$26.00 sq ft.

Pros:
- Light weight
- Matches current look of school building.

Cons:
- Painted finish
- Not Impact Resistant – easily dented.
- History of permeability

Warranties and System Life: The impact resistance is backed by a 20 year performance warranty.

Acceptable Manufacturers: Dryvit (Outsulation System), Sto Corp.(StoTherm)



Exterior Insulation Finish System - EFIS

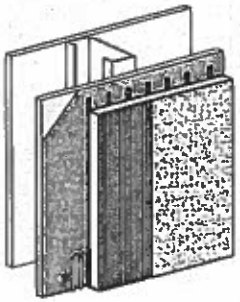
RDA

Outsulation® HDCI™

DS863

A Highly Durable Exterior Cladding System with Continuous Insulation

Summary
Dryvit offers a family of performance-based systems that allows architects and owners to meet the specific demands of today's buildings and associated energy codes, including continuous insulation and an air/water-resistive barrier. Dryvit's Outsulation Systems have been installed on over 450,000 buildings worldwide, in all climate zones. Over the past 45 years, the Outsulation concept has grown into a family of related systems, each building upon the other to achieve specific performance goals.



Outsulation HDCI System Components

1. Dryvit Air Barrier/Water-Resistive Membrane
2. Dryvit Grid Tape™
3. Dryvit AquaFlash® System Transition Membrane
4. Dryvit Drainage Strip™
5. Dryvit Adhesive/Basecoat
6. EPS Insulation Boards
7. Dryvit Panzer® 20 Reinforcing Mesh
8. Dryvit Corner mesh
9. Dryvit Standard Reinforcing Mesh
10. Dryvit Finish

Durable and Impact Resistant
Outsulation HDCI provides a durable and damage resistant cladding system adaptable to all building types. Using the strongest available reinforcing mesh combination, Outsulation HDCI provides a cladding that minimizes potential for damage from impact and is combined with a comprehensive warranty to the owner that includes repair of areas that may become damaged – contact Dryvit Systems Inc. for full details.

Cladding, Air Barrier, Water-Resistive Barrier and Continuous Insulation
Most jurisdictions in the U.S. now require that exterior walls include an air barrier, a water-resistive barrier, as well as continuous insulation. Outsulation HDCI incorporates all these necessary components required to complete the exterior wall assembly in a single product, supplied by a single manufacturer and installed by a single trade. This makes the product easy to specify, detail and install, eliminating complexities involved with multi-component assemblies.

Dryvit...Proven For Over 45 Years
Dryvit Systems, Inc. is an ISO 9001:2008 and ISO 14001:2004 certified company. ISO standards have been established worldwide as a common denominator for product quality and excellence. Dryvit is the recognized leader in construction technology. With leadership comes an obligation and commitment to research and development. The Outsulation HDCI System is an example of our determination to continuously evaluate market demands and develop products and programs to meet them.

Warranty
Dryvit Systems, Inc. will provide a written limited materials warranty against defective material upon written request. Additionally, for wall surfaces using the Outsulation HDCI System, Dryvit agrees to repair damage resulting from impact during the warranty period. Some exclusions will apply, please contact Dryvit Systems Inc. for complete details. Workmanship is not warranted by Dryvit.

Dryvit Systems, Inc.
One Energy Way
West Warwick, RI 02893
(800) 556-7752
www.dryvit.com

For more information on Dryvit Systems or Continuous Insulation, visit these links.

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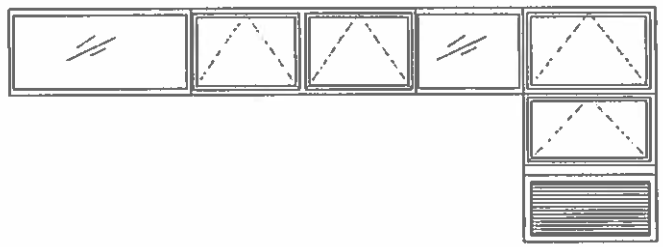
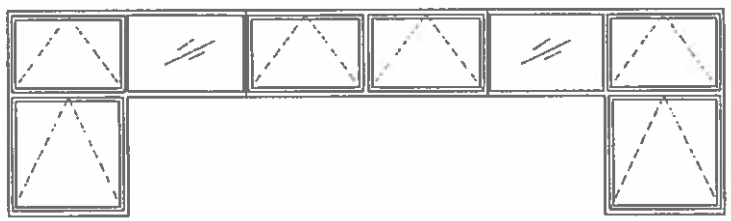


1976 CLASSROOM

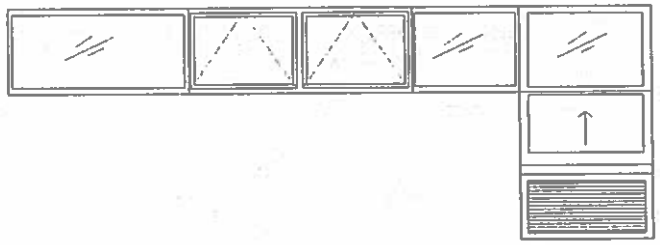


1992 CLASSROOM

AWNING WINDOWS ONLY

Window Operation Types

RDA



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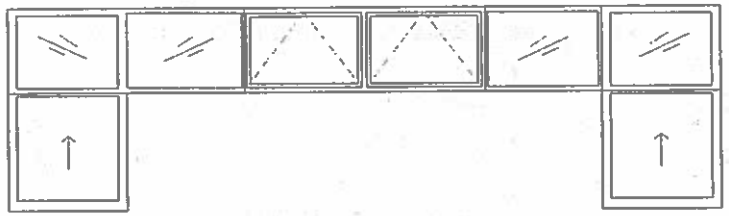
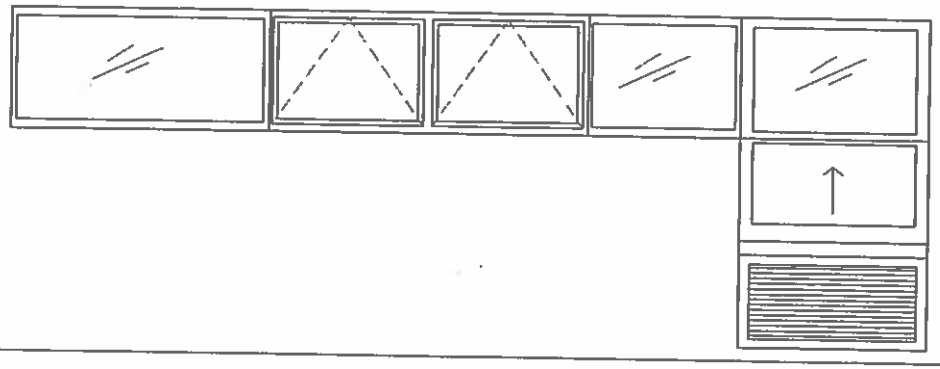


1992 CLASSROOM

AWNING AND SINGLE HUNG WINDOWS

Window Operation Types



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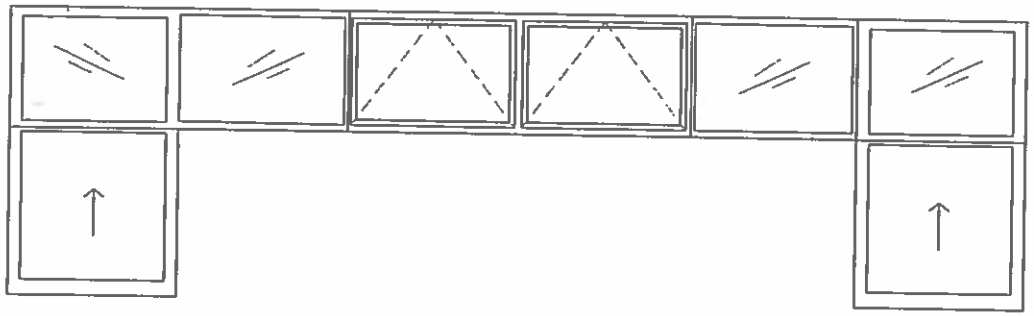
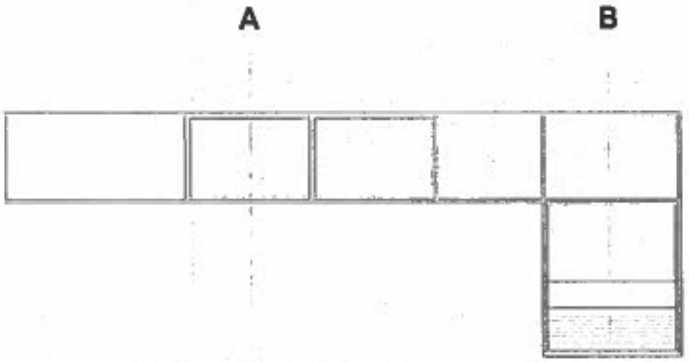


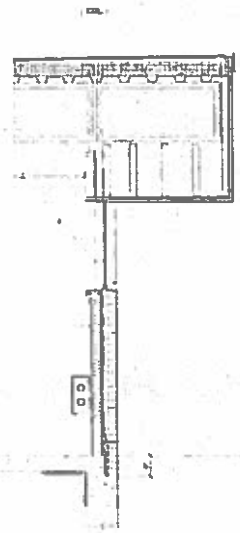
1992 CLASSROOM

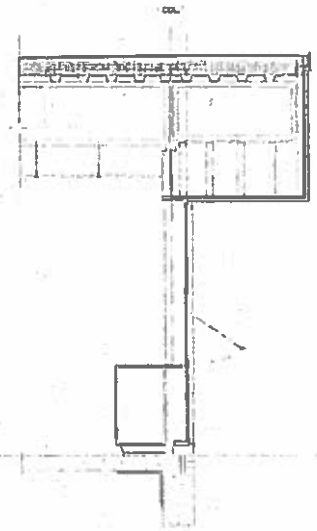
AWNING AND SINGLE HUNG WINDOWS

Window Operation Types

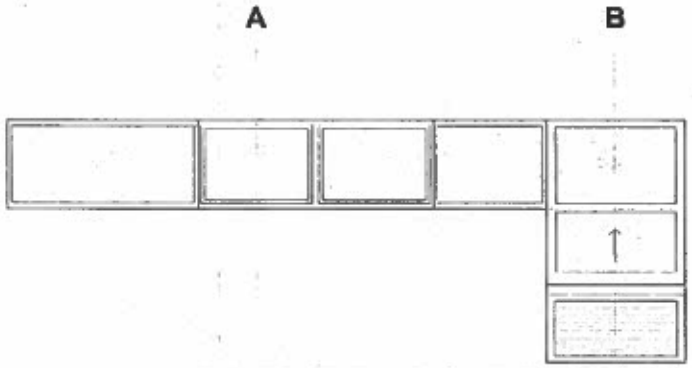
RDA

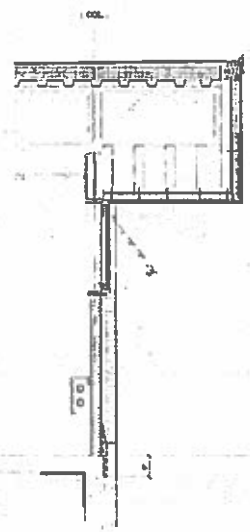


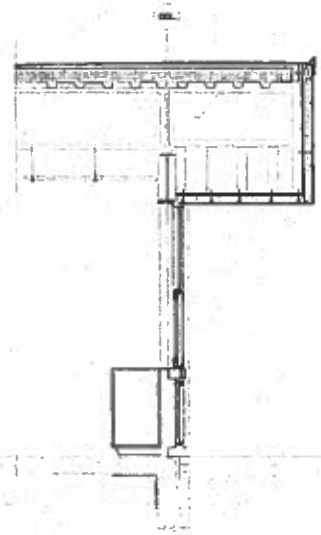




EXISTING WINDOW AND WALL SECTIONS AT CLASSROOMS

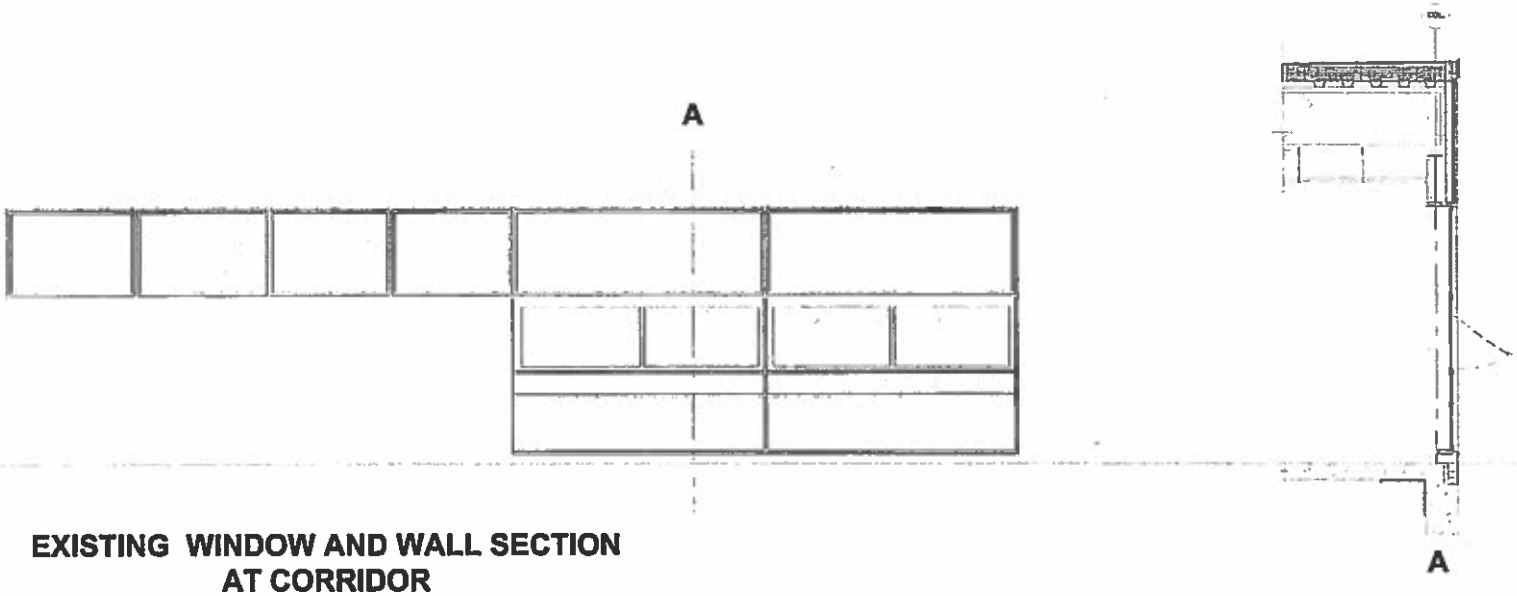




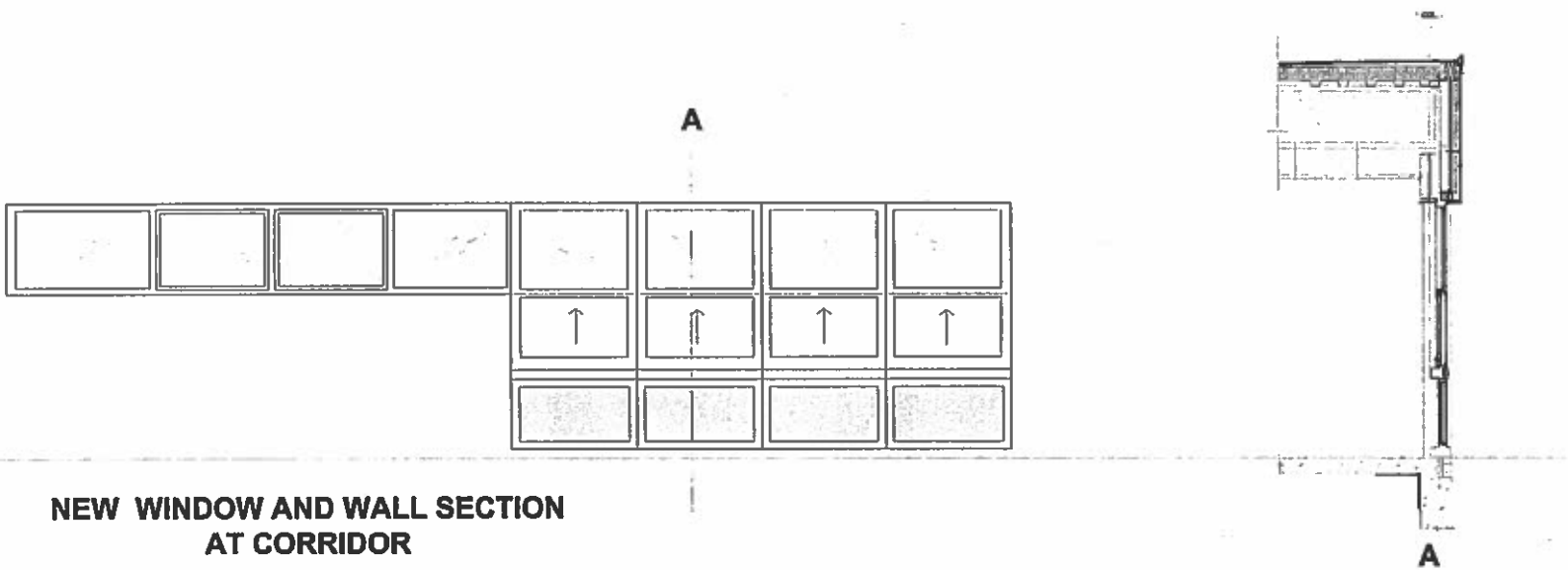


NEW WINDOW AND WALL SECTIONS AT CLASSROOMS

Window Operation Types



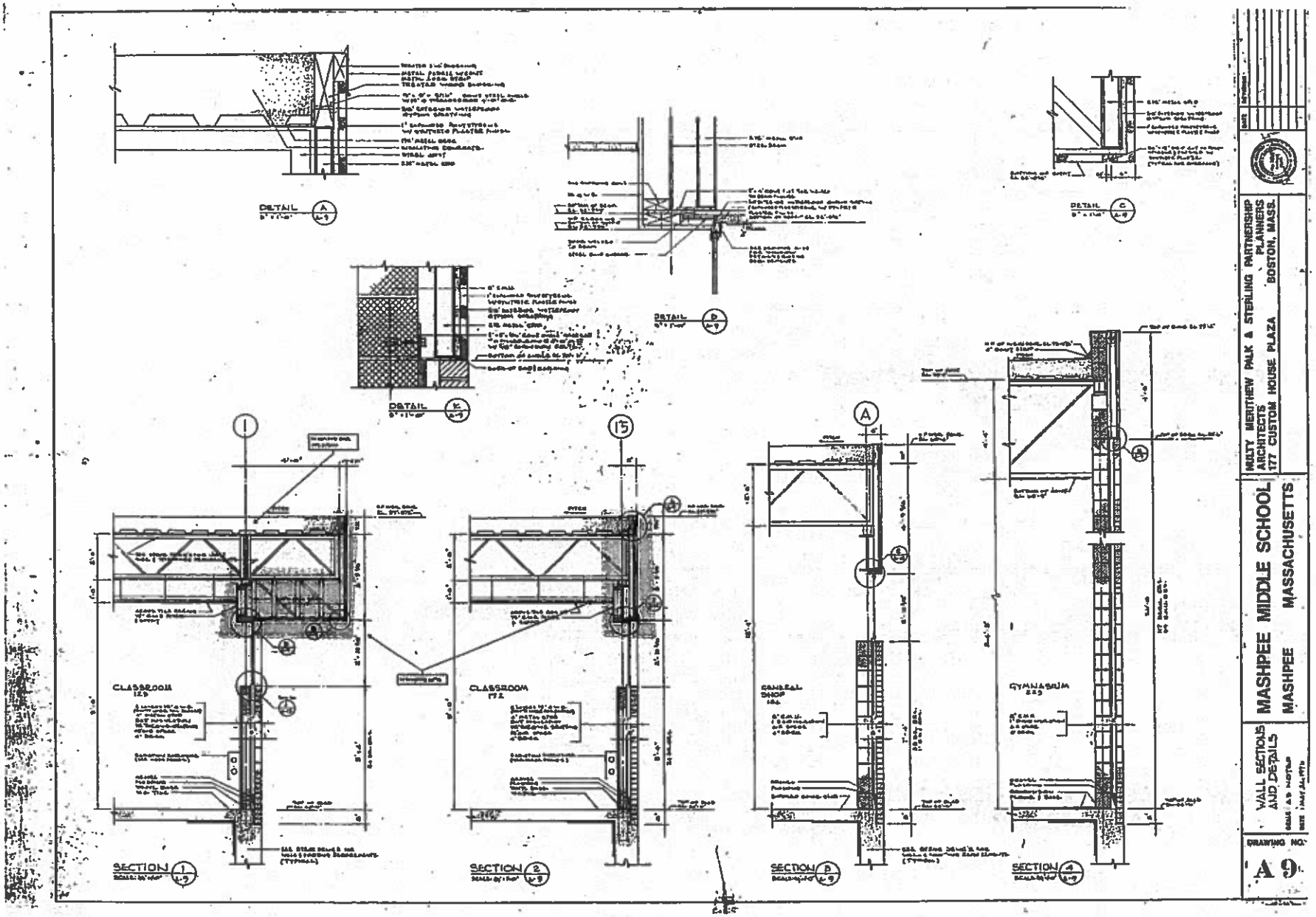
EXISTING WINDOW AND WALL SECTION
AT CORRIDOR



NEW WINDOW AND WALL SECTION
AT CORRIDOR

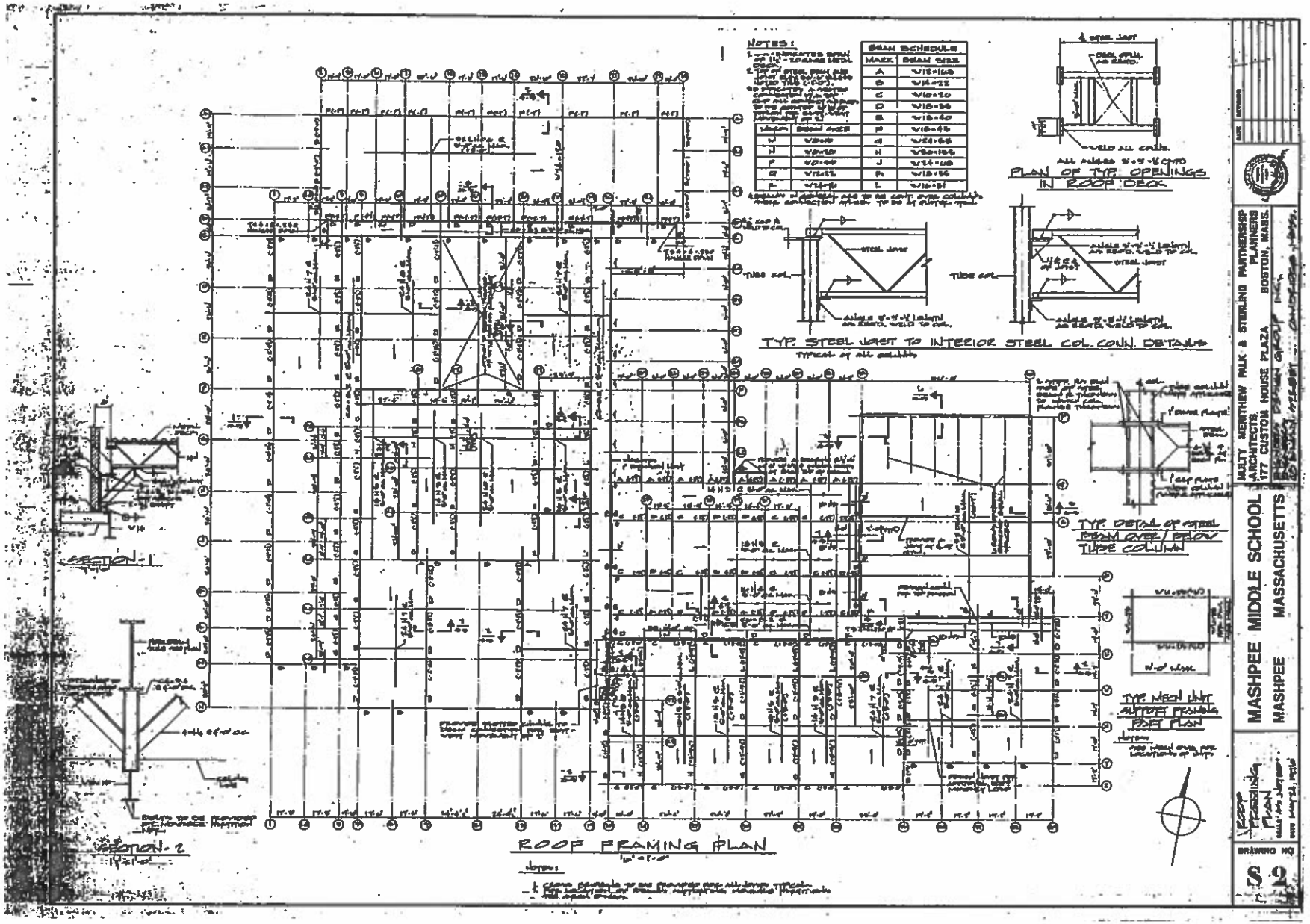
Window Operation Types

RDA



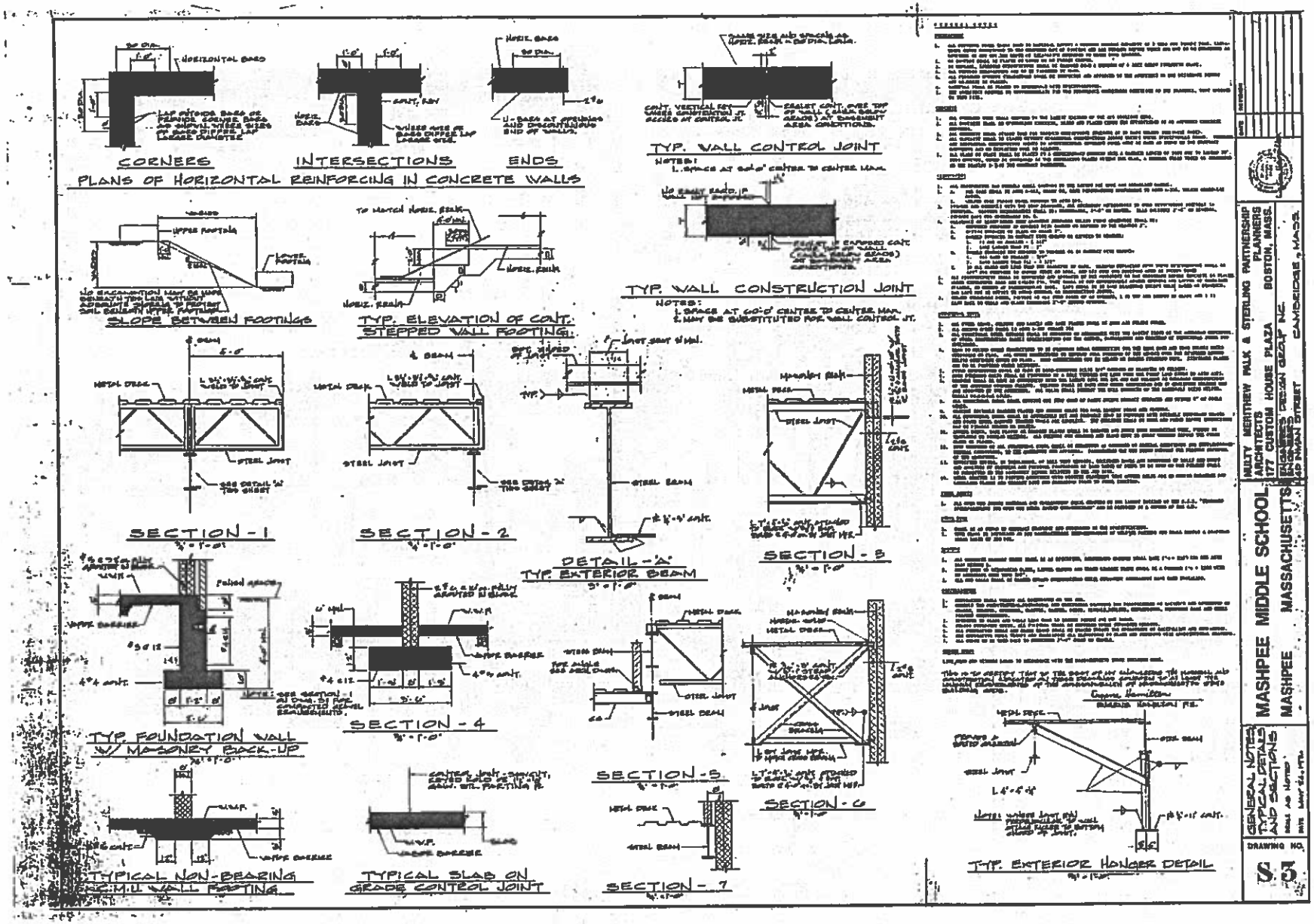
Existing Drawing – Wall Sections

RDA



Existing Drawings - Structural

RDA



Existing Drawings - Structural

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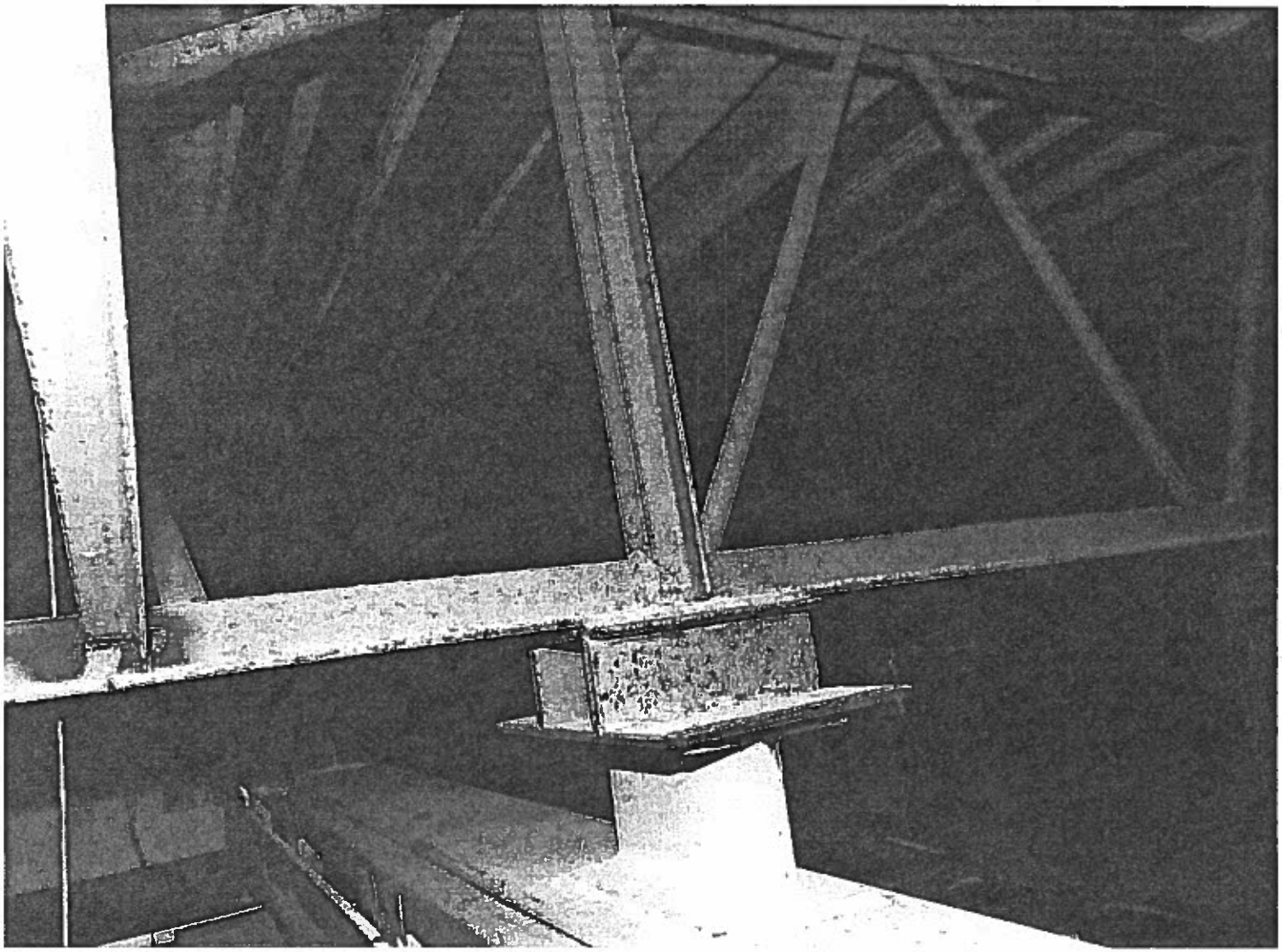

Existing Conditions Photo

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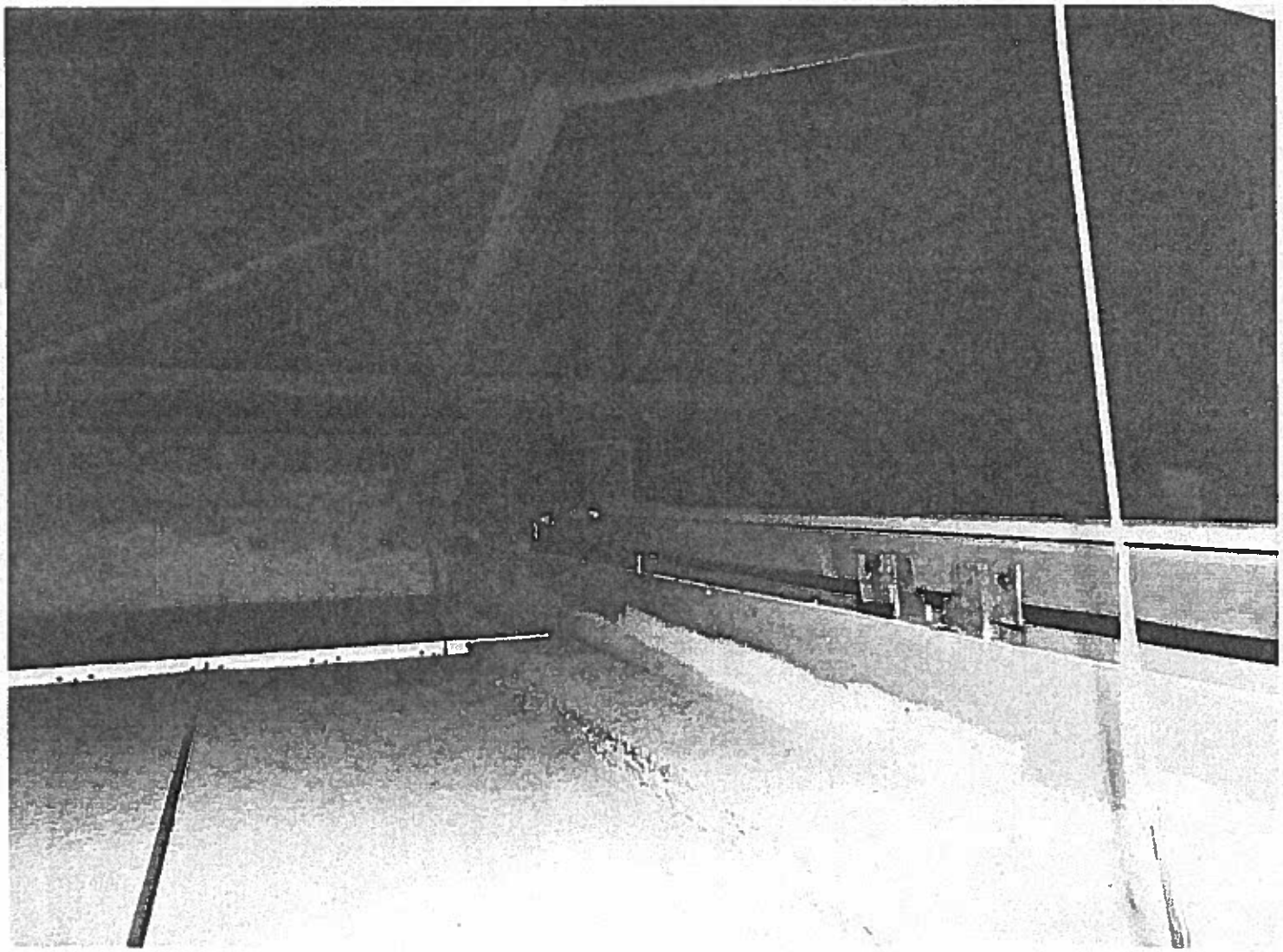

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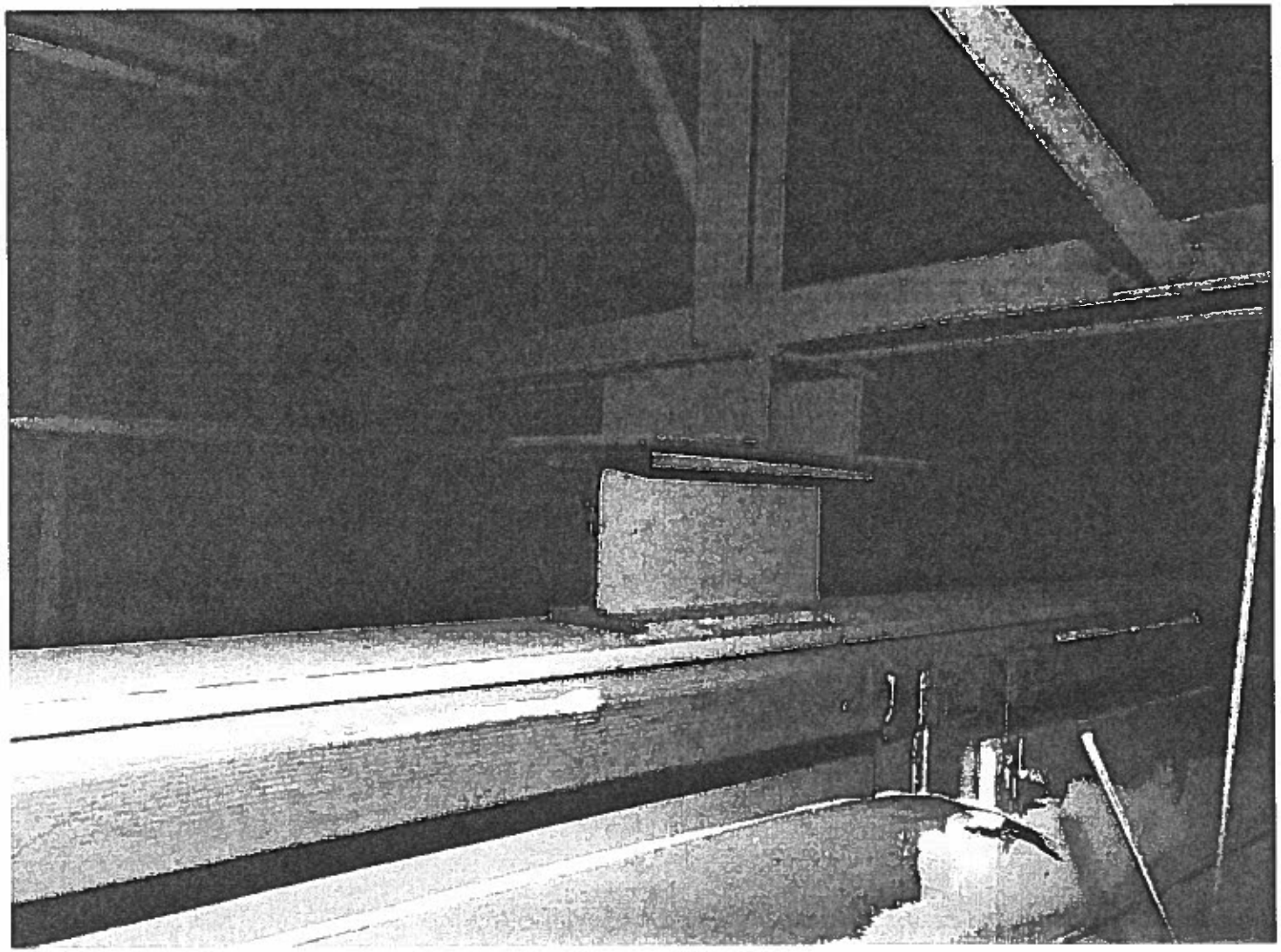

Existing Conditions Photo

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