180-27

WORLD TRADE CENTER

EVALUATION OF ARCHITECTURAL FIRMS

BOOK II

THE PORT OF NEW YORK AUTHORITY

ARCHITECT: CARSON, LUNDIN & SHAW

425 PARK AVENUE
NEW YORK 22, NEW YORK

CARSON, LUNDIN & SHAW ARCHITECTS
425 PARK AVENUE NEW YORK 22

PLAZA 4-1040

ROBERT CARSON
1960
EARL H LUNDIN
ARVIN SHAW III
WILLIAM B HELLER

June 29, 1962

Mr. Richard C. Sullivan, Director
World Trade Center
111 8th Avenue
New York, New York

Dear Mr. Sullivan:

We appreciated the opportunity of discussing the World Trade Center program with you and your associate. The more you told me about this great development, the more fascinating it became. This letter will try to answer the various questions you asked regarding our office organization, the status of work in our office, our method of working with engineers, etc.

Our personnel is comprised of three Partners, eight Associates (Job Captains and Chief Designers), 60 architectural employees (architectural designers, draftsmen, modelers, specifications writers, superintendents), and 12 office workers (secretaries, typists, bookkeepers, plan desk employees, receptionist-telephone operator). We feel that our present staff could readily handle that Phase of the work on which you contemplate completion by July 1, 1963.

Listed below are jobs now in our office - the status of each, and comments that may be of interest.

Buildings that are now nearing completion and only checking of shop drawings and supervision remain to be done.

1. Federal Court House and Office Building, Brooklyn, New York. A complete courthouse incorporating eleven large court rooms, judges' suites, U.S. Attorney main offices and other auxiliary functions. Attached to it is an office building to house the Internal Revenue Service and below the structures, a large garage. One of the biggest problems here was the circulation of the various people using these buildings - judiciary, public, prisoners - and their separation in turn from Internal Revenue. Approximate cost - $15,000,000.

2. New York Life Insurance Company. Additional Home Office Building. Madison Avenue at 27th to 28th Street. A 15-story office building joined to their present building by a two level tunnel below 27th Street, and connecting in turn to the 4th Avenue Subway. The problem here was to afford the maximum number of large open floors of identical size, and resulted in a building held back from the property line with the first set-back at

the 13th floor. Elevators and escalators had to be designed to meet intense peak load demands. Approximate cost $22,000,000.

Buildings and alterations now under construction with working drawings 80 to 90 per cent completed and shop drawings being checked.

1. 40 Wall Street. This is an interesting alteration for the Manufacturers Hanover Bank who recently acquired this banking area and are remodelling the lower six floors of the building. The alteration and additional work include a complex vault, installation of escalators, modernization of the banking room and installation of a large cafeteria and kitchen. Drawings will be completed within two months. The expected construction cost will be about $7,000,000.

2. A seven story addition to the present Aetna Life Insurance Company building which is being remodelled, at Fulton Street. This building presents a major foundation problem. Though the new building is a connecting addition to their present building, it had to be so designed that it could be sold, if they so desired, as a separate building. The total cost is approximately $3,500,000.

3. Connecticut Bank & Trust Company, Hartford, Connecticut. A 20 story office building in which one of Connecticut's largest banks will maintain its new headquarters. It is part of the Urban Renewal Development of Hartford and ties in with the main plaza and three level garage below same. Approximate cost - $10,000,000.

4. Irving Trust Company - uptown headquarters in new Rockefeller Center building. Area involved is approximately 50,000 square feet, and the banking cost approximately $5,000,000. This new headquarters is to replace facilities now occupied by the Bank, which facilities were designed by this office about fifteen years ago.

Alteration now under construction with working drawings approximately 50 per cent completed.

1. 15 Broad Street and 23 Wall Street. This is a complicated alteration for the Morgan Guaranty Trust Company including the modernization of a multi-purpose 30 story office building and the adjacent Morgan headquarters to suit the new requirements of the Morgan Guaranty bank. The job involves installation of 30 new elevators, complete toilet facilities, modernization of electrical work, new air conditioning and re-design of the main banking headquarters, for a total construction cost of approximately $25,000,000. In 1960 we completed a $22,000,000. job for the same client on a square block at 140 Broadway.

Projects approximately 50 per cent completed.

1. Civic Center, White Plains, New York. Preparation of a brochure based on plans developed by our office for a Civic Center in the White Plains Urban Renewal Area. Sketches and models are now being prepared by this office. We are involved in the general plan of the entire Civic Center, which includes a City Hall, County Court House, Public Library, Post Office, Auditorium, etc. Our responsibility to date is the final plan of location and size of the various buildings, plus the complete architectural problem of the County Court House.

Projects less than 25 per cent completed.

1. 399 Park Avenue (First National City Bank of New York). Last year we completed this $40,000,000 building and are now working on an added structure, involving principally an auditorium, to be erected on a set-back. The cost will be about $1,125,000.

2. Lincoln Rochester Trust Company - Rochester, New York. Modernization of a large office building with bank headquarters in the existing building. Construction cost will run about $5,000,000.

3. Manufacturers and Traders Trust Company, Buffalo, New York. A complete new building in which there will be considerable rental space in addition to the Bank's headquarters. Building being designed to fit into Urban Renewal Area, but due to a local political situation sketches have been delayed.

4. Columbia Broadcasting System. We have recently been retained to do the architecture for the tenant change layout for CBS occupancy in the new building on Sixth Avenue between 52nd and 53rd Streets. This 39 story building will be the headquarters of the System and its many subsidiaries. Work on this job has just started.

On all of our jobs we retain consulting mechanical and structural engineers; we prefer this arrangements as in this way they are under our control. If specific engineers are suggested by the client, we accept them only if we consider them capable, and we insist that they work under our control. This is done so that we can coordinate their work into the complete program. Engineering consultants are retained for all phases of work, such as the usual heating, ventilating and air conditioning, electrical, plumbing, elevators and sprinkler work, as well as for foundations, normal floor framing, acoustics, etc.

With reference to our experience in handling public work, we have designed a large housing project for New York City and New York State - Cypress Hills Houses in Brooklyn. This was completed about ten years ago. In addition we designed Public School #175 for the City of New York; two public schools for the City of White Plains, a Firehouse for the City of

New York and, as mentioned above, the Federal Court House and Office Building under construction in Brooklyn and the Civic Center in White Plains. We are proud of all of these jobs and happy to offer them as reference.

We are enclosing a list of other jobs that we have designed, and to which we point with pride. Realizing that you are concerned with costs and a comparison between budget figures and construction costs we have singled out the First National City Bank building at 399 Park Avenue as an example. This 39 story office building, built by George A. Fuller Company had a base building cost of $25.20 a square foot, or $1.89 a cubic foot. The cost of the base building, plus tenant changes, which involved three 15,000 square foot vaults, large banking rooms, floors of executive suites, 15,000 square foot cafeteria and kitchen and 30,000 square feet of executive dining rooms was $34.00 a square foot and $2.55 a cubic foot. The budgeted cost of this building was $42,760,000. - the actual cost was $39,910,000. We would be very happy to get figures together for you on other buildings we have done, at your request.

Following is a list of persons you may contact regarding our work -

Client	Person to Contact	Telephone
Manufacturers Hanover Trust Co.	Mr. Walter Thomas, Vice President - Operations	350-5252
First National City Bank of NY	Mr. Richard S. Perkins Chairman of the Exec. Comm.	559-3322
New York Life Insurance Co.	Mr. R. Manning Brown, Executive Vice President	576-5017
Morgan Guaranty Trust Co.	Mr. H.M. Sherman, Jr. Senior Vice President	Re 2-6400
Westchester County	Mr. James C. Harding Commissioner of Public Works	Wh 9-1300

As to the manner in which we would handle a job of this scope, let me say that we would handle it exactly as we do all jobs in our office. All three partners of the firm would be thoroughly acquainted with the general problem, and the various phases would be under the direction of one particular partner. Directly responsible for every detail, under the partners, would be a Senior Associate of the firm who would devote his entire time to the project with a staff under him, of the size required. We have purposely limited the size of our office force so that we, the Partners and Associates, working under one roof, are not spread too thin. In this way the client is assured of securing the personal attention of the "first team", thus eliminating a great deal of unnecessary work.

We understand that this phase of the work entails arriving at an architectural solution by July 1, 1963 and that development of the working drawings is a later phase. The architectural solution would take advantage of the research work done by your organization and consultants.

To - Mr. Richard C. Sullivan
6/29/62

5.

With reference to financial arrangements - we are flexible in this matter and would be agreeable, within A.I.A. bounds, as to payments on the agreed upon contract, but would request that compensation be made for out-of-pocket expenses from month to month. Work comparable to yours has been done on a "time card" basis as we feel that is the most equitable compensation.

We trust that we have not burdened you with too much detail, but hope that we have answered the questions you raised. If any points require clarification, please contact us.

Yours very truly,

Earl H. Lundin

EHL/ck
Enclosure

PARTIAL LIST OF OTHER IMPORTANT WORK BY THE OFFICE OF CARSON, LUNDIN & SHAW (OTHER THAN MENTIONED IN ATTACHED LETTER)

	Approximate Cost $
OFFICE BUILDINGS	
38 story office building for Tishman Realty & Construction Company 666 Fifth Avenue, New York City	30,000,000.
37 story Sinclair Oil Building, 600 Fifth Avenue, New York City (Winner, Second Award, Fifth Avenue Association, 1954)	12,000,000.
31 story Esso Building, Rockefeller Center, New York (Winner, First Award, Fifth Avenue Association, 1950)	11,000,000.
27 story General Telephone Building, 730 Third Avenue, New York City	12,000,000.
22 story Illuminating Building, Cleveland, Ohio	11,000,000.
21 story First National Building, Tulsa, Oklahoma	5,500,000.
10 story office building for Associated Hospital Service of New York	3,000,000.
8 story office building for Deering, Milliken & Co. Inc., New York City	6,000,000.
BANKS	
Brooklyn Savings Bank, Brooklyn, N.Y.	5,000,000.
First National Bank & Trust Company, Tulsa, Oklahoma	1,250,000.
First National City Bank of New York (Branch Bank)	2,500,000.
Irving Trust Company, West 51st Street (Winner, First Award, Fifth Avenue Association, 1952)	1,500,000.
Manufacturers HanoverTrust Company, 350 Park Avenue, New York City	7,000,000.
Morgan Guaranty Trust Company - modernization program, 140 Broadway	22,000,000.
Union Dime Savings Bank, 6th Avenue at 40th Street, New York City	1,500,000.
INFORMATION AND EXHIBITION	
RCA Exhibition Hall, Rockefeller Center, New York	450,000.
Esso Information Lounge, Esso Building, Rockefeller Center, New York	150,000.
Guided Tour Lounge, Rockefeller Center, New York	75,000.

In addition to the above we have done radio and television studios for National Broadcasting and American Broadcasting and Radio Corporation of America. We have done a number of shops and restaurants as well as industrial work consisting of mills and plants.

6/29/62

BUILDING: 666 FIFTH AVENUE
NEW YORK, NEW YORK

Report on 666 Fifth Ave.

Interview with: T. Tishman

1. He chose Carson and Lundin by personal evaluation of their work.

2. Mr. Tishman has worked with a great many other architects, (Skidmore Owings & Merrill, Kahn & Jacobs, Victor Cruin, Welton Becket, Emery Roth, Kelly & Gruzen, and many others).

3. In comparing these architects with others he found them of high caliber in reference to office buildings.

4. He is completely satisfied with the building.

5. The building was built by the Tishman Construction Co., and drawings were prepared as the construction progressed. All completion dates were met by the architect for the various phases of the project.

6. There were no problems between architect and consultants.

7. Since Tishman was the contractor-owner, there were no problems between architect and contractor.

8. There were no unusual delays due to unusual specifications, as the owner seemed to control this end of the job.

9. The contract between architect and owner was a lump sum.

10. The architect did not supply any estimates, nor is he aware of final cost of building.

11. The building as designed functions correctly.

12. The owner wholeheartedly recommended the architect for any <u>office building complex</u>.

Based on this interview I got the feeling that Tishman would only use Carson & Lundin on a middle rate, hi-rise office building. I was asked a few times during the interview whether this architect would associate with others on the various aspects of our over-all complex. He seemed to be trying to warn us that we might have problems. A building of the type of 666 cannot be compared with the project we have in mind as the owner completely dictated by spacing, mechanical layouts, skin treatment etc., and never really completed a set of contract drawings that went out for public bid. He also was not responsible for the cost control of the project. I also got the impression that it was fairly easy to bend the architects, which might be an advantage or disadvantage depending upon how you look at the over-all picture.

In weighing all of the above, this architectural firm can probably do us a very fine machine. However, I believe they would have some trouble coming up with something that we could consider outstanding. They might work out as a secondary part of a team, provided it was headed by a much stronger designer.

BUILDING: ESSO BUILDING
ROCKEFELLER CENTER
NEW YORK, NEW YORK

P. A. TEAM RATING

Architecture dictated by the existing concepts of Rockefeller Center. The building adheres to the overall theme and, as such, has achieved its architectural goal. No outstanding interior features. Little co-ordination of the electrical and mechanical installations in the tenant areas; however, this may be a result of post-construction tenant changes. It is difficult to evaluate the architects capabilities on the basis of this building, considering the esthetic requirements and the fact that Carson (who was responsible for its design) is now deceased.

A. C. system uses conventional zoning, and is adequate considering building age and limited glazing, but substandard today. Other services patterned after existing buildings: High quality but not distinguished by today's standards.

Electrical system patterned after existing buildings. Adequately designed considering minimal complaints but not distinguished. Lighting fixtures are unattractive. Power distribution is below presentday standards. Control board arrangements are good.

The building design and layout presents no problems for maintenance or operations. Maintenance cost figures were not available.

ESSO BUILDING - ROCKEFELLER CENTER

DATA SHEET

Interview date	July 17, 1962
Completion	1948
Owner	Rockefeller Center Inc.
Owner's representative	Mr. Eyssell, President Rockefeller Center Inc.
Architect	Carson, Lundin & Shaw
Mech. Elect. Consultant	Pollak & Grieve
Structural Consultant	Edwards & Yorth

OWNERS RATING OF ARCHITECT

Selection basis	Carson & Lundin were members of the staff of Rockefeller Center. The management set up Carson & Lundin in business to handle the Esso Building. A. Shaw became principal of the firm at a later date.
Contract agreement	percentage
Other architects used by owner:	Harrison & Abramowitz, Rienhard & Hofmeister, Wiggins
Relative rating	Carson & Lundin more satisfactory than other architects
Availability	Excellent
Meets deadlines	Yes
Contractor relationship	Excellent
Overall coordination	Excellent
Consulting engineers	Excellent

OWNERS RATING OF BUILDING

Function	Good
Appearance	In conformance with established Rockefeller Center treatment
Elevator performance	Good (elevators converted to automatic self service)
A.C. Performance - regular hrs.	Good
A.C. Performance - off hrs.	Fair - zoning somewhat incompatible
Steam consumption	Normal
Power consumption	Normal

BUILDING DATA

Height	33 stories
Areas gross	approx. 500,000 sq. ft.
typical tower floor gross	11,500 sq. ft.
typical tower floor net	9000 sq. ft.
Elevators	12 passenger and 2 service elevators, later converted to automatic operation (speed-800'/min., and 100'/min.
Construction	Steel frame-fireproof
Floor to floor height	12'0"
Column spacing	25' 8" x 27' 6"
Exterior - Materials	Vertical limestone bands and cast aluminum
Module	Spandrels alternating 4'5" (limestone) and 4'9" (window)
Interior	Upper elevator lobbies: terrazzo floors & walls, plaster ceilings. Main lobby: terrazzo floor, travertine marble bronze walls, lighting coves on ceilings.

P. A. TEAM RATING: Architecture dictated by the existing concepts of Rockefeller Center. The building adheres to the overall theme and, as such, has achieved its architectural goal. No outstanding interior features. Little coordination of the electrical and mechanical installations in the tenant areas; however, this may be a result of post-construction tenant changes. It is difficult to evaluate the architects capabilities on the basis of this building, considering the esthetic requirements and the fact that Carson (who was responsible for its design) is now deceased.

MECHANICAL DATA

A. C. Ducts -	Supply	Ceiling ducts & diffusers
	Return	Ceiling ducts & grilles
	Fan Room	Every 3 floors serving exposure zones
	Controls	Zone, non-segregated interior/exterior area
A.C. Machines -	Location	Bsmt.
	Capacity	200,700,900 tons
	Drive	Electric Motor
	Gross SF/ton	286
Cooling Tower		Roof
Heating -	System Type	High Vacuum Steam
	Radiators	Under Windows
	Service	Con Ed 125#, reduced to 90#
	Condensate	To Economizers, then wasted
Domestic H.W. Tanks		18th
Fire Tanks		10th, Roof
Sump Tank/Suction Tank		Bsmt.

Bsmt. Equipment - Other	Sewage Ejectors, 750 GPM fire pump

P.A. TEAM RATING: A.C. system uses conventional zoning, and is adequate considering building age and limited glazing, but substandard today. Other services patterned after existing buildings: High quality but not distinguished by today's standards.

ELECTRICAL DATA

Service - Watts/SF	5
Space capacity	25 per cent
Transformers	Con Ed vault in Bsmt.
Metering	Submetering by Rock. Ctr. Inc.
Lighting - Typical Fixtures	4' with 2 - 40w lamps
Foot candles	45/50 maintained
Telephone - Terminal	23rd floor R.C.A. Building
Closet	every floor
Underfloor Duct - Type	Telephone only
Arrangement	3' 6" from wall all around with ties to columns
Operating Control Board	Bsmt.
Fire Alarm/Security Control Board	Local in Bsmt./Remote control
Large Loads	Fan Rooms, Machine Rooms

P.A. TEAM RATING: Electrical system patterned after existing buildings. Adequately designed considering minimal complaints but not distinguished. Lighting fixtures are unattractive. Power distribution is below presentday standards. Control board arrangements are good.

OPERATIONS & MAINTENANCE

Janitorial -	Exterior	Lime stone wall
	Interior	Asphalt flooring, painted walls and partitions, vinyl covered corridor. Bronze wall-main lobby. Main lobby-fluted ceiling.
	Window	Double hung windows
	Toilets	Floor mounted fixtures
Mechanical -	HVAC	Equipment accessible
Electrical -	Lighting	45 F.C. maintained
	Relamping	Tenant responsibility
	Equipment	Open front switch board
Operations -	Security	Fire Alarm Board in Building monitored from central security office--one watchman in off hours patrol building.
	Circulation	Main lobby layout very good
	Elevators	Two service elevators used to handle peak hour demand

P.A. TEAM RATING: The building design and layout presents no problem for maintenance or operations. Maintenance cost figures were not available.

ARCHITECT: PHILIP JOHNSON

375 PARK AVENUE
NEW YORK 22, NEW YORK

375 Park Avenue New York 22 N Y PLaza 1 7440 Philip Johnson Associates

July 3, 1962

Mr. Richard C. Sullivan
World Trade Department
The Port of New York Authority
111 Eighth Avenue at 15th Street
New York 11, New York

Dear Mr. Sullivan:

Thank you for your courteous reception on Monday. Our firm does indeed wish to be considered further as the architect for the World Trade Center.

First, you wished to know if our firm was capable of carrying such a large project. It is our intention for this purpose to form a joint venture with C.F. Murphy Associates of Chicago, as we think that only in that way would maximum efficiency be achieved. We are a comparatively small office, of about 35 men, whereas our associate firm is one of the largest in the country and is well equipped to handle jobs of over $100,000,000, such as the O'Hare Airport, which they finished this year.

You asked me specifically about the relation of engineers in our office. The answer is that the engineers are incorporated in the office of our associates.

You also asked me how competent our firm is in meeting budgets and satisfying later maintenance requirements. The best method of proof on any claims in this field is to talk to the clients of our three largest projects: the Seagram Building, the Kline Science Center at Yale University, and the New York State Theater at Lincoln Center. In the Seagram firm it would be best to get in touch with Mr. Murry Cohen, Comptroller of Jos. E. Seagram and Sons, Inc., 375 Park Avenue, New York 22, (PL 1-7000). In the case of Lincoln Center, the President of Lincoln Center, Mr. Edgar Young, 10 Columbus Circle, New York 19, (JU 2-7171). At Yale University, the Chairman of the Buildings and Grounds Committee, Dean Norman S. Buck, 92 York Square, New Haven, Conn., (ST 7-3131, ext. 2736).

You ask specifically how we would charge for preliminary work in the first eleven months: we would propose to work on a system of time card times a factor. The size of the factor can be negotiated and of course the work audited.

Most of our other work is of a smaller scale, encompassing in the last few years five museums, a nuclear reactor in Israel and a church in Indiana. I enclose photographs of some of these projects.

Also, you asked me what our commitments were in the next twelve months. Fortunately, we have recently refused some large commissions such as a forty story skyscraper in Boston and a $20,000,000 plant for IBM in Poughkeepsie.

We have on hand only the completion of the New York State Theater at Lincoln Center which is now completely let out with the exception of some interior finishes, and the $5,000,000 New York State Pavilion at the World's Fair, for which piles are now being driven.

Other work which we may have to work on during the next twelve months is a small addition to Montefiore Hospital and one further unit in the Kline Science Center at Yale. This leaves us comparatively free for larger work.

The second part of your request concerned my "philosophy" of building. Very briefly:

1) The scale. Because of the vastness of the project, it would seem better to make a lower building so that the bulk would not entirely spoil the view of lower Manhattan. This consideration leads to a second.

2) Stages of Construction. Since it is not known in what stages the project will actually be built, it would seem better to build a single building of lower bulk than the present building group in order that additions could be made horizontally rather than vertically, rather in the manner of radiator units.

3) Clarity. In a project as vast as this, the sense of being lost is the greatest danger. The overall plan must be so extremely simple that no one can possibly get the sense of confusion or the sense of walking down five hundred foot corridors. This is a

matter of clear level distinctions and leaving enough public malls and direct relations to the streets around the big mass. In other words, the malls should be at the street level. I would avoid roof terraces since they are really roofs and not terraces. Any courtyard should go to the existing grade and be pleasantly connected with the building as well as the streets.

If there is anything further you wish to know about our firm, or the Murphy firm, I will be pleased to furnish it.

Yours sincerely,

Philip Johnson

enclosures: photographs

BUILDING: HOUSE OF SEAGRAM
375 PARK AVENUE
NEW YORK, NEW YORK

BRIEF SUMMATION

ARCHITECT: Philip Johnson

BUILDING: 375 Park Avenue, N.Y.C. (House of Seagram)

The design of the building is the culmination of all the glass skin construction that has been produced in New York City since the end of World War II. The architectural team has refined the curtain wall to its simplest form and this, plus the over-all bulk of the building, represents a very fine structure. The owner emphasized that Mr. Johnson was not the architect of the Seagram Building, but was merely an associate to Mies van der Rohe. Accordingly, a more detailed investigation should be made of buildings on which Mr. Johnson was the designer and architect.

The mechanical and electrical systems are very well designed, with excellent space utilization and equipment arrangements. The power controls and signal systems are centralized for ease of operation. The peripheral air conditioning units are well designed and take little space. The inobtrusive fixtures provide effective light intensities with low brightness ratios. The peripheral three modules on every floor are provided with a luminous ceiling which complements the prestige office areas and gives the building a pleasing soft glow at night. Access to the freight elevator and the mechanical systems outside of equipment areas is poor. The exterior bronze presented a difficult maintenance problem initially and still requires attention. The grading of platforms for storm drainage is poor.

SEAGRAM BUILDING - 375 PARK AVE. N. Y. C.

DATA SHEET

Interview Date	7/13/62
Person Interviewed	Mr. Ralph Ardolina, Building Manager
Interview Team	J. Milano

SPACE DATA

Rentable Space: 38 Stories (750,000 sq. ft.) The 7 lower floors are occupied by Seagram's Distillers Co.

Service Space: 39th floor, 40th floor, and C-basement

Basements: There are three basement levels (A, B, C)

- A- Basement has the medical Dep't, mail room, and the building management and operating offices.
- B- Basement has a 250 car garage.
- C- Basement has mechanical equipment and tenant storage rooms.

MECHANICAL DATA

All rented spaces are fully air-conditioned and heated with Carrier Corp. equipment. There are two 1600 ton steam driven compressors (40th floor)

Interior Zone:	Low pressure, dual duct, 4 mixing boxes per floor. The 39th floor fan rooms serve the 21st through the 38th floor, and the C-basement fan rooms serve the lower floors. There are 6 shafts for air ducts to the 10th floor and 5 shafts above the 10th floor.
Diffusers:	A 54" module is used throughout the building and the square, flush mounted diffusers are generally spaced 2 modules in one direction and 3 modules in the other axis.
Exterior Zone:	High pressure Weathermaster, with exhaust in ceiling slot.
Controls:	Johnson Service Co. pneumatic. The window units have 1 thermostat per room, and in large offices there are no more than 4 units per thermostat.
Filters:	The electrostatic filters required excessive cleaning maintenance until pre-filters and after filters were added after the building was in operation.
Operation:	The A.C. is operated from 8 a.m. to 6 p.m. on weekdays and until 1 p.m. on Saturdays. If a tenant requires A.C. outside of these periods he is charged at a rate of $50/hr. The Brasserie Restaurant and a 2nd floor computer room require 24 hour A.C.

Cooling Tower	On roof
Fire pumps	Two electric 750 G.P.M., 260 P.S.I. pumps are located in C basement
Water tanks	2 tanks (7,500 gals. & 4,000 gals.) are on 14th floor
Sprinklers	Basement levels only
Drinking water	Central system in building, with chilled water piped in Seagram areas only
Elevators	18 automatic Westinghouse 20 pass. units in 3 banks 1 manned 2 ton freight service car 1 manned 10 pass. garage car
Waste removal	Refrigerated garbage room for the restaurants and a bailing machine for carted waste.
PORT AUTHORITY TEAM RATING	The space utilization and equipment arrangement in the mechanical equipment rooms is excellent and the peripheral A.C. Units are well designed and take little space. Access to mechanical systems outside of equipment areas is poor. Corridor acess to the freight elevator is poor.

ELECTRICAL DATA

Metering	Master meter in basement with tenant meters in floor service room. Local transformers in each service room.
Incoming voltage	480
Use voltage	480, 277, 120
Switchgear	The main switchgear room is A-basement and a motor control center is located on the 40th floor
Feeders	3 - 3500 Amp. power and lighting feeders 1 - 4000 Amp. mech. equip. feeder
Emergency power & lighting	none.
Telephone	Both Centrex and PBX Telephone terminal room is in A-basement
Television	Master antenna system. Connection available at floor outlets
Underfloor ducts	Power & telephone connections are available on 6'-0" center. Ducts are 4" Orangeburg.
Lightning protection	none
Security	Watchman key system with local alarm board
Fire alarm	Waterflow is supervised by Central Station while pull boxes create local signals and are registered on a local alarm board.
Lighting	60 FT-C maintained lighting intensity with 4 ft. warm white rapid starts throughout building. A special 52" troffer was used in the Seagram spaces and a standard 48" troffer in other areas. The peripheral 3 modules are provided with a luminous ceiling on every floor. Incandescent pool and canopy lighting is provided for exterior effect.
Lighting Control	Both relay and line switching with clock control for peripheral night lighting.

PORT AUTHORITY TEAM RATING	The quality of lighting is generally excellent and the fixtures are as inobtrusive as possible. The brightness ratios are generally good except for areas with highly contrasting partition colors and materials. Power controls are highly centralized and a minimum of equipment types and sizes was used.
OPERATION AND MAINTENANCE	
Maintenance	All done by Seagram except for window cleaning and waxing of tenant areas.
Costs	$1.83/net S.F. for complete maintenance and energy costs. Average elec. cost per month is $14,000 and the steam cost is approx. same.
Window cleaning	A power driven rig on rubber tires is located on the roof.
Lighting maintenance	Lamps and plastic are group cleaned by areas on a 1 year to 18 months basis. Lamps are group replaced every 18 months to 2 years.
Exterior Bronze	Wiped with a solution of parafin and lemon oil as required.
Partitions	8'-10½" Hauserman wood or steel partitions are used throughout.
PORT AUTHORITY TEAM RATING	Partitions are difficult to move from one floor to the next. Electrical & mechanical equipment is easy to maintain except for the access difficulty mentioned. The exterior bronze presented a difficult maintenance problem initially and still requires attention. The sloping of the lobby platform is poor and causes flooding of the lobby during heavy rainstorms.

ARCHITECT: THE ARCHITECTS COLLABORATIVE

63 BRATTLE STREET
CAMBRIDGE 38, MASSACHUSETTS

JEAN B. FLETCHER
NORMAN FLETCHER
WALTER GROPIUS
JOHN C. HARKNESS
SARAH P. HARKNESS
ROBERT S. McMILLAN
LOUIS A. McMILLEN
BENJAMIN THOMPSON

RICHARD BROOKER
ALEX CVIJANOVIĆ
HERBERT GALLAGHER
WILLIAM J. GEDDIS
PETER W. MORTON
H. MORSE PAYNE, JR

AC

THE ARCHITECTS COLLABORATIVE

ERNEST L. BIRDSALL
COMPTROLLER

July 2, 1962

Mr. Richard C. Sullivan, Deputy Director
World Trade Department
The Port of New York Authority
111 Eighth Avenue
New York 11, New York

Dear Sir:

We are pleased to submit our qualifications as architects for the World Trade Center in lower Manhattan.

The Architects Collaborative (TAC) with eight partners and six associates was founded in 1946 and is presently working in the United States with a staff of approximately 100 people and in Europe with a staff in Rome of eighty. Construction in the United States ranges from the Pan American, Grand Central Building, $100,000,000, in New York City, (design consultants), and IBM's $10,000,000 projected office building outside Washington to the new Federal Office Building, $25,000,000, in Boston's Government Center. Educational and hospital buildings of approximately $41,000,000 construction cost are also under construction in the United States.

European work is presently composed of the Baghdad University, $90,000,000, a new government-owned university which will be approximately the enrollment and physical size of Harvard University. Because of the comprehensive scope of this Baghdad job and the desire to keep working drawing production and supervision close to construction and materials of local availability, TAC moved two partners to Rome in 1959 to organize a European office. Working drawings on Baghdad University are now 90% complete and will be finished by September 1, 1962. Actual construction on site work, utilities, and the 20 story Faculty Tower began March, 1962.

TAC European work, besides a developing program in Africa and the Middle-East for AID (see separate enclosure) includes a new city-block development for Piccadilly Circus in London: stores, exhibitions, and offices; $9,800,000. TAC is also designing the National Parliament Buildings for the Government of Nigeria in Lagos to include both Houses of Parliament and various administrative organizations, $10,000,000, and the projected Islamic Center for the Aga Kahn in Geneva, Switzerland, composed of three large office blocks plus Mosque, Islamic Club and various reception facilities; $19,000,000.

[illegible] STREET, CAMBRIDGE 38, MASSACHUSETTS

PHASE I (DESIGN)

If TAC were to receive the commission for the World Trade Center, it is expected that the Phase I stage would be handled between offices in New York and Cambridge. The space studies, organizational research and engineering work would be principally handled in New York while the design work would be located in Cambridge to utilize the full facilities of our partnership and principal staff.

PHASE II (WORKING DRAWINGS)

Phase II, working drawings, would be handled in New York either in a special TAC job-office or in association with a selected architectural firm mutally acceptable to the Port Authority and TAC. We would prefer to delay a decision concerning the recommended arrangement for working drawings until further details are discussed in the event we are selected for this work. We are confident that our organization could handle the necessary work under at least several alternative arrangements. It is also possible that the phasing-out of the Baghdad section of our Rome work in September 1962 may coincide with the World Trade Center schedule. Thus certain European-based personnel might return to work on this project.

ENGINEERS

Engineers would be selected from the New York area and would be mutually acceptable to the Port Authority and TAC. We have worked with many engineering consultants and generally choose engineering firms for specific jobs based on the particular requirements of the project. A close collaboration of engineering services with the Port Authority Engineering Department should be arranged, and joint facilities for testing and estimating should be coordinated services. We recognize that structure, form and the mechanics of contemporary structures are absolutely interrelated. Therefore, it is essential that engineers participate fully in the project at the earliest conception of the building in Stage I.

TEAMWORK

TAC has pioneered in the concepts of collaboration and teamwork for sixteen years. Architecture and building have become so complex in this century that only a group or company can effeciently carry through large commissions. Thus the collaboration and/or teamwork of the group becomes vital in molding the inter-dependent components of design - aesthetic, technical and economic into a harmonious balance. The present casual method of collaboration is to solve large building

projects by throwing a few prominent architects together with the hope that five people will automatically produce more beauty than one. The result becomes an unrelated assemblage of individual architectural ideas, not an integrated whole of new and enriched value. The necessary preconditions of collaboration emphasizes voluntariness based on mutual respect and liking, and exercise of individual leadership and responsibility within the group. Without the first, it is mere expediency. Without the last, it loses artistic integrity. TAC, since 1946, has worked successfully with these principals synchronizing individual efforts by a continuous give-and-take of its members. Thus we have a history of successful team collaboration behind us and would not have to organize anew to accomplish this work.

FEES STAGE I

We would expect that fees for Stage I should be based on cost plus a percentage factor of payroll, plus reimbursables at cost.

FEES STAGE II

Further discussion with the Port Authority is necessary prior to determination of Stage II fee arrangement.

The World Trade Center will command the ocean entrance to New York. Architecturally speaking, the main task for the designers is to give this vast building group a significant and expressive form which will stir the imagination. From far away the silhouettes must be simple to be grasped at a glance and remembered as the unequivocal image of the World Trade Center.

John Stuart Mills felt that if people trade, they would end wars. We know, of course, that trade is cooperative and complimentary to people and governments, that it is dynamic in terms of economics; thus by its very nature trade is cosmopolitan and liberating to society...it is a positive force. The World Trade Center "idea" is less abstract than the United Nations or UNESCO idea. Architecture resulting from those buildings in New York and Paris are large office blocks (secretariats) complimented by assemblies, meeting rooms and services.

The World Trade Center will house very dynamic but specific activities that will produce different character to the project if integrated imaginatively with the architecture. The "market" was the hub of man's earliest town plans. The Agora was classically the natural center-of-life of the ancient town and the architectural-social resultant of early capitalism. The new World Trade Center will be, in actuality, a market with permanent exhibitions by United States and foreign countries of goods, participation of consulates, the actual flow of trading documents and goods, customs transactions and the exchange of world contact - these are at the center of world trade. The complimentary services, the hotel, the international restaurants, the various offices give a necessary and variated interest.

Mr. Richard C. Sullivan

July 2, 1962

A method must be found to bring this huge building complex into the range and scale of human perception. The normal flat curtain walls cannot fulfill this requirement for their flush surfaces without any depth are shadowless and dull particularly when they are large. Varying uses of space for the various functions would be characterized by different fenestrations relieving the potential deadly monotony through change of window size. Depth of reveals and contrasting value of surface materials would also provide a human scale and relief for the eye.

Important to be mentioned also is the acceptance of art as part of man's environment. Artwork cannot be added as an after thought when all architectural drawings have been finished. An integral use of art will add a whole new dimension to the design. The artist, as the engineer, should be called in at the beginning of work as a participant in the creative process.

The World Trade Center in operation day and night should have a bold new architectural form to symbolize this positive world cooperation. It is a totally new architectural problem with a new scale and demanding new techniques and conceptions of space and movement. The architectural statement of the World Trade Center should be one of great power consistant with the pioneering spirit of our age.

Very sincerely,

THE ARCHITECTS COLLABORATIVE

Walter Gropius

WG:sdw

Walter Gropius

Enclosures:
(1) References
(2) Histories - Partners, Associates, and Staff
(3) Budget Comparison
(4) Statement of Current Work
(5) Statement of Completed Work
(6) Awards

BUILDING: HARVARD GRADUATE CENTER
HARVARD UNIVERSITY
CAMBRIDGE, MASSACHUSETTS

BRIEF SUMMATION

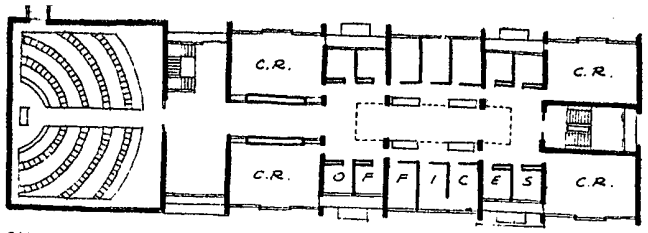
ARCHITECT: THE ARCHITECTS COLLABORATIVE

BUILDING: THE HARVARD GRADUATE CENTER

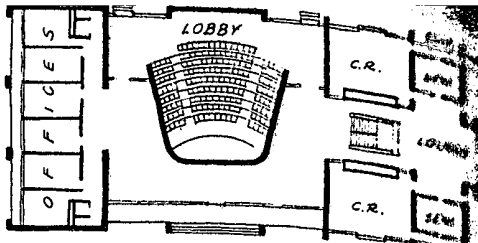
The buildings while not outstanding, are above average. The extremely low budget restrictions are reflected in the selection of building finishes, thus affecting architectural quality. The simplicity of the planned concept creates a very pleasing spatial relationship of buildings. The architect effectively met the problem of population flow and the imaginative space arrangements have fulfilled their planned functions very well.

The mechanical and electrical equipment is well designed and well integrated with the surroundings. At the same time, maintenance problems are minimized by functional simplicity and well planned accessibility. The illumination levels are well suited to the work spaces and are achieved with low brightness ratios.

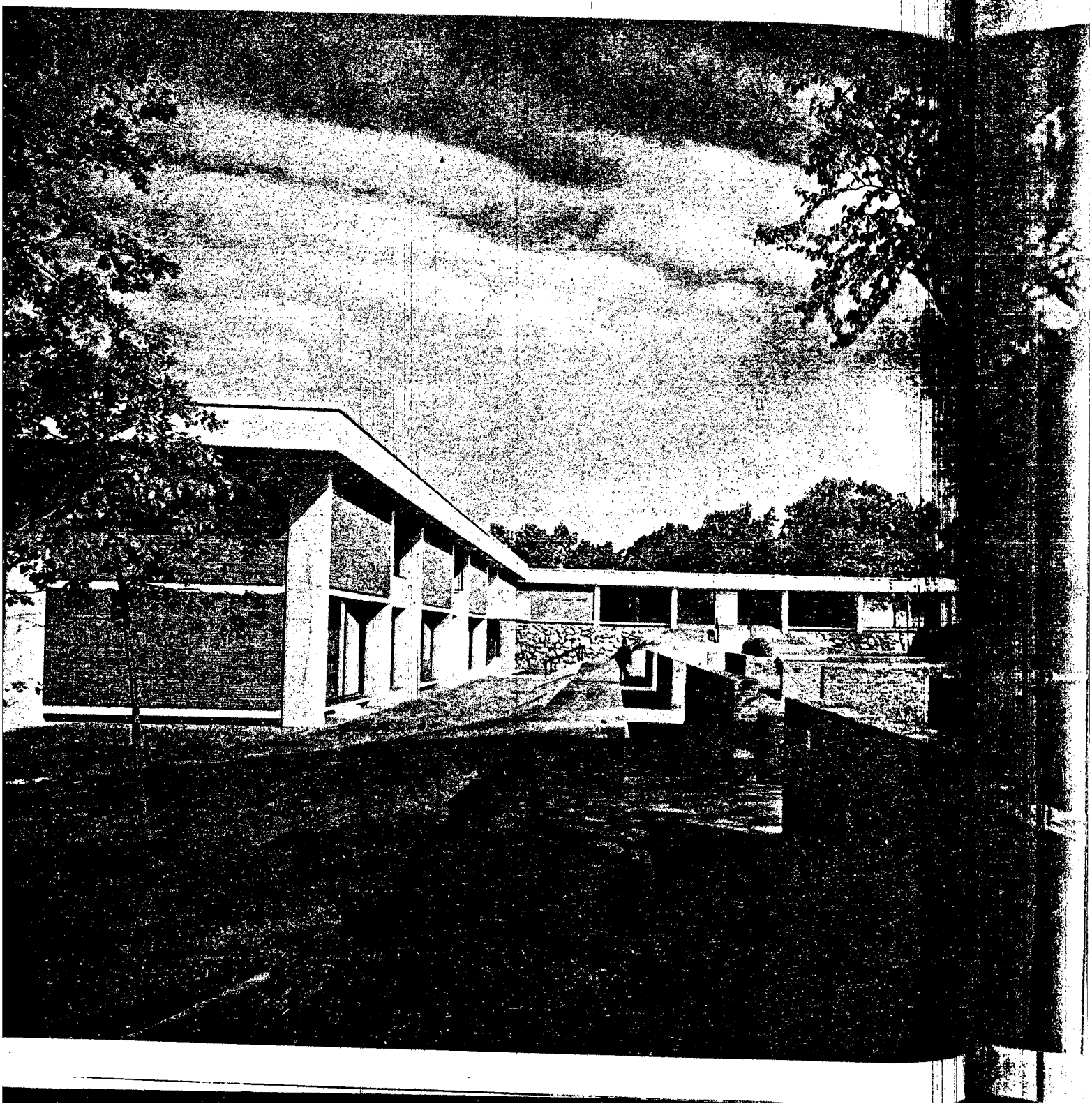
BUILDING: SIX EDUCATIONAL BUILDINGS
BRANDEIS UNIVERSITY
WALTHAM, MASSACHUSETTS

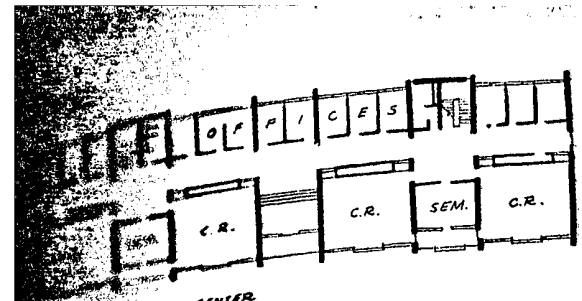


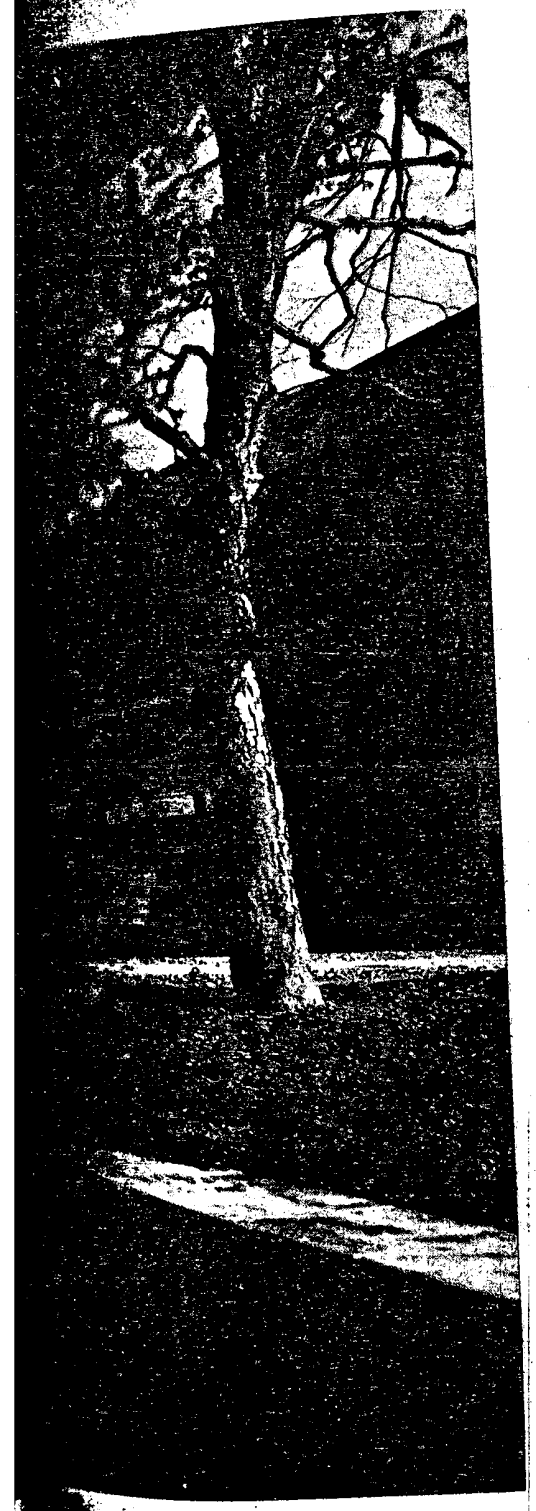
OLIN-SANG AMERICAN CIVILIZATION CENTER

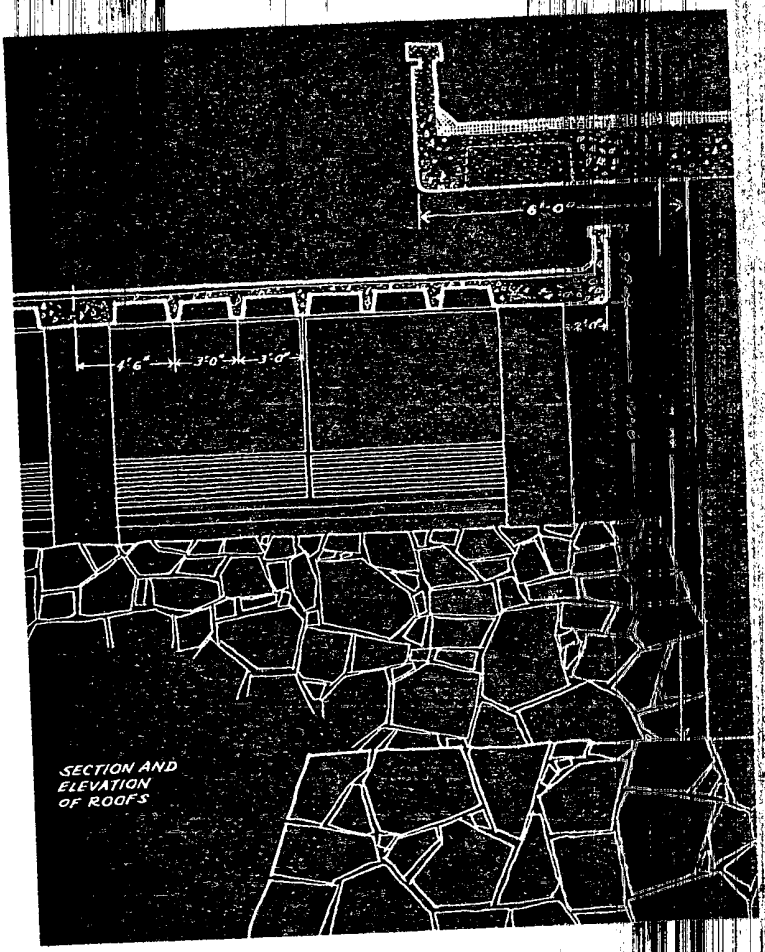


GOLDING JUDAIC CENTER









Roof relationships *of the one-story Golding Judaic Center and the two-story Olin-Sang American Civilization Center are shown in sketch and photo above. The roof structures, as shown in the section through the overhang of the Judaic Center, are concrete coffers, cantilevered and terminated in a parapet. The panoramic courtyard view (left) shows the Shiffman Humanities Center completing the group at the right, behind brick terrace walls built for future gardens. Floor plans are placed above their corresponding buildings.*

BRIEF SUMMATION

ARCHITECT: THE ARCHITECTS COLLABORATIVE

BUILDING: SIX EDUCATION BUILDINGS AT BRANDEIS

The six buildings are outstanding. The architects have developed simple yet bold architectural forms with a creative use of masonry materials which flow into the interior space. An inviting warmth has been created by the excellent use of daylight and of wood placed in contrast to the masonry. The imaginative space arrangements have fulfilled their planned functions very well.

The mechanical and electrical equipment is well designed and carefully integrated with the surroundings. At the same time, maintenance problems are minimized by functional simplicity and well planned accessibility. The illumination levels are well suited to the work spaces and are achieved with low brightness ratios.

ARCHITECT: KAHN & JACOBS

TWO PARK AVENUE
NEW YORK 16, NEW YORK

...N AND JACOBS, Architects

...JACQUES KAHN, FAIA
...ALAN JACOBS, FAIA
...S NEWMAN, AIA, ASCE

TWO PARK AVENUE, NEW YORK 16, N.Y.
TELEPHONE OREGON 9-3932

ASSOCIATES: LLOYD A. DOUGHTY
SHELDON FOX, AIA
ELSA GIDONI, AIA
JOHN N. LINN, AIA
EMANUEL MANHEIMER, CSI

June 29, 1962

Mr. Richard C. Sullivan, Director
World Trade Center
The Port of New York Authority
111 Eighth Avenue
New York 11, N. Y.

Dear Mr. Sullivan:

We are transmitting herewith the information you requested at our meeting of Monday, June 18, 1962.

This material consists of:

A. Written information relating to our qualifications and responding to the questions which you asked.

B. A brochure which contains specific buildings referred to under item A above and which visually demonstrates other samples of our work.

C. Three separate brochures which show 3 of our buildings in greater detail.

The design of the World Trade Center presents to us an opportunity which does not come very often, perhaps no more than once in a life-time. As such it is an enormous challenge.

We believe that we are in a position to meet this challenge, that our personnel is second to none in ability and experience. We feel that we can fulfill to your satisfaction the requirements of design and function, and within the time and budget limitations indicated by you.

We submit that we are particularly well qualified for this project for in our varied practice, office buildings have been our specialty for over 40 years. We also have a large Space Planning Department so that we completely understand, down to the last detail, the needs of people working in office structures.

Our experience has been very broad since we have designed many office buildings for owner-builders, as well as large corporations and we are fully aware of the importance of achieving outstanding design within budget limitations.

Mr. Bent and I would personally direct this job. As in the American Airlines Terminal he will be in charge of administration and I will direct design.

We would free ourselves to a very large degree from the work load in our office and devote ourselves to this project, in order to insure that the requirements of the job will be met.

Again, we wish to express our thanks for the opportunity to present our qualifications.

If there is any further information which you require, please do not hesitate to call us.

Kind regards.

Very truly yours,

Robert Allan Jacobs

BUILDING: TRAVELERS INSURANCE BUILDING
BOSTON, MASSACHUSETTS


THE TRAVELERS
INSURANCE COMPANY

BRIEF SUMMATION

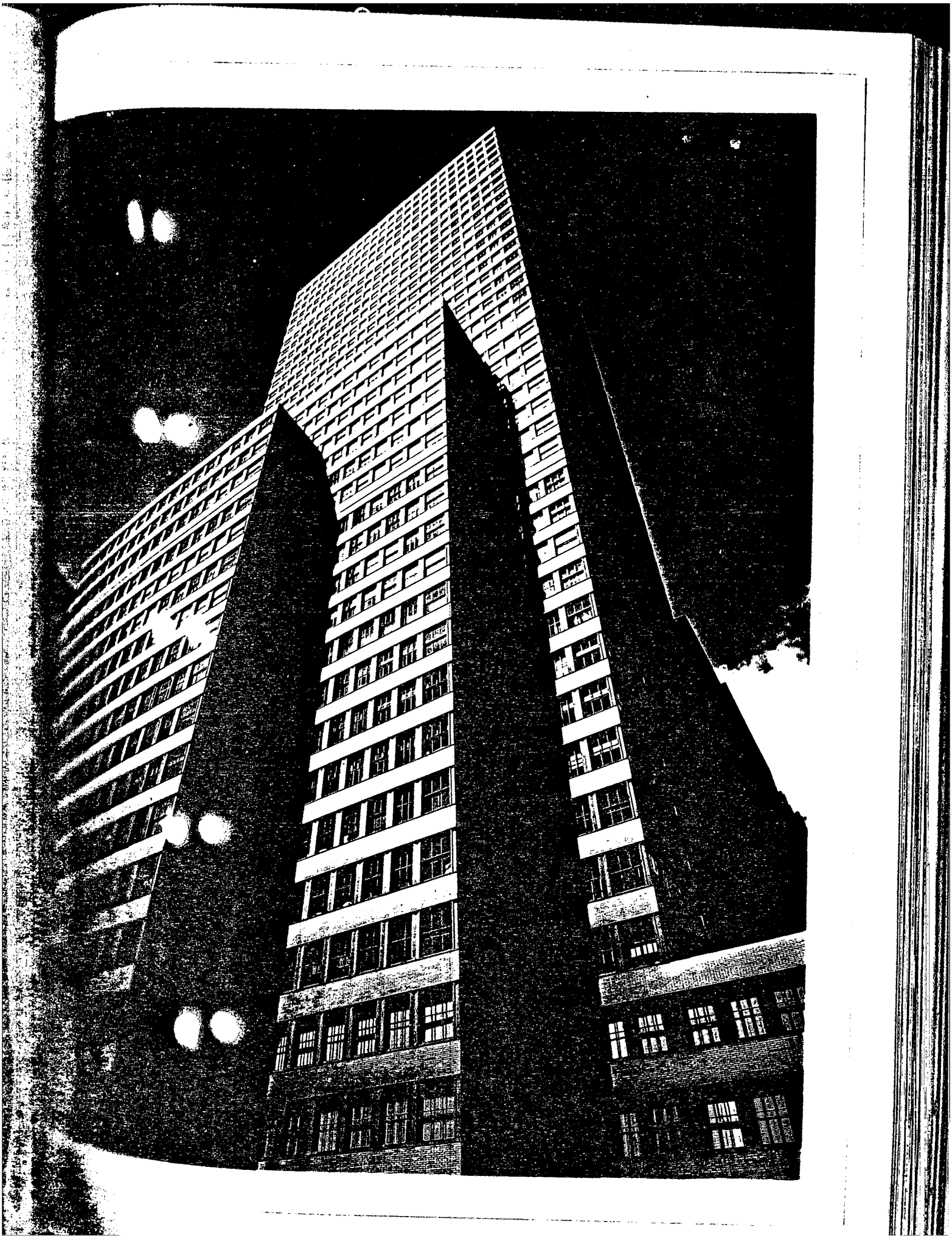
ARCHITECT: Kahn & Jacobs

BUILDING: Travelers Insurance Building, Boston

The building is average, with a typical glazed masonry facade and an ordinary interior treatment of an interesting architectural form. The architect made excellent use of available space and projects the utility core from the facade allowing a full floor tenant to divide his space as he desires. The lobby has efficiently utilized spaces with a pleasing main entrance projecting to a reflecting pool and mural.

The mechanical and electrical systems are well designed except for the inefficient peripheral air-conditioning. The distribution and space allocation of the equipment within the single service core is excellent. The lighting is well designed and coordinated with the spaces. The operation and maintenance costs are reasonable although above original estimates.

BUILDING: 1407 BROADWAY
NEW YORK, NEW YORK



BRIEF SUMMATION

ARCHITECT: Kahn & Jacobs

BUILDING: 1407 Broadway, New York City

For the time it was built (1948) it could be considered average. There was an attempt to develop a pleasing tower form, but, the need for maximum rentable space broke the facade badly. The interior was designed for maximum flexibility, with tenants buying raw space and doing their own partitioning and decorating. The architect successfully met the planned combined factory and office function of the building.

The mechanical and electrical services are well designed and the equipment areas are very well utilized. The owner supplies the tenants with heating, cooling and electrical capacity only. Consequently, there are extreme variations in air-conditioning and lighting terminal installations. Maintenance costs are low due to equipment accessibility and strict adherence to schedules.

BUILDING: 425 PARK AVENUE
NEW YORK, NEW YORK

BRIEF SUMMATION

ARCHITECT: KAHN & JACOBS

BUILDING: 425 Park Avenue, New York City

The building is below average. It is a typical "wedding cake" with maximum utilization of rentable area on the site. All aspects of the design were done in a typical way with a complete absence of imagination. This building was constructed with the owner acting as a general contractor in a joint venture with the builder. The owner meticulously supervised the design and told the architect exactly what he wanted. Consequently the building was completed quickly and at lower than estimated costs.

The mechanical and electrical equipment and systems are very well designed, except for a need for more elevators. Steam utilization and arrangement of mechanical equipment rooms is excellent. The lighting fixtures, while well coordinated with the treatment of the spaces, provide illumination intensities which are generally too low for a modern office building. The types and sizes of equipment have been carefully selected to reduce maintenance costs.

ARCHITECT: MINORU YAMASAKI ASSOCIATES

1025 EAST MAPLE ROAD
BIRMINGHAM, MICHIGAN

(F)

MINORU YAMASAKI AND ASSOCIATES
ARCHITECTS & ENGINEERS 1025 EAST MAPLE ROAD BIRMINGHAM, MICHIGAN MIDWEST 6-8400

June 29, 1962

Mr. Richard C. Sullivan
Director
World Trade Center
The Port of New York Authority
111 Eighth Avenue at 15th Street
New York 11, New York

Dear Mr. Sullivan:

Thank you very much for your consideration of our firm for architectural services for your great project. I enjoyed meeting with you and Mr. Levy, and am thrilled by the possibilities inherent in the project because of your wonderful aspirations for it, the symbolic challenge, and its great scope.

You asked me for a list of items. I am including with this letter a brochure of photographs similar to the one which I showed you in your office. I am also attaching a pamphlet which lists our key personnel, including personal histories of these people, honors, exhibits, bibliography, references, and a list of projects both in planning and under construction and, also, a philosophical article which I wrote recently which may help give you a better insight as to our beliefs.

As I told you in our meeting, we would be unable to handle the total architectural work including working drawings, engineering and supervision, since we do not have the staff for a project of this scope. However, we are confident that, with our staff, we are able to handle all the architectural design and design detailing. We would be pleased to associate with a large New York or other office acceptable to you, though we would request that the structural engineering be done by Worthington, Skilling, Helle and Jackson, whose chief partner, John Skilling, has collaborated with us on all of our projects in the last few years. He has shown great imagination in being able to solve our design considerations with sound structure and sound economics. He has made analyses of several systems on every job so that we could have

a clear picture of the integration of the structure into the building, the cost factor, and the general desirability of the structure, both functionally and aesthetically.

Our office has at present a staff of sixty-one employees. We have maintained this size, more or less (55-70), for the past four or five years, primarily because we feel that we operate at our peak efficiency and can do a very thorough job in all areas with this size staff. The key people, as you can see from the personnel statements have been together for a considerable amount of time. We have confidence that we have excellent background in our organization in architectural and engineering know-how. Of the forty architects whom we have, twenty-five, including myself, are working in design or in model making. Fifteen are in working drawings and supervision. I think you can see from our personnel history that we have a fine background of practical know-how in construction, both architectural and engineering. I am very proud of the capabilities of our staff in regard to the complete design and production of our work. I am sure that our clients will testify as to their satisfaction with our organization in all areas.

Of the forty architects, twenty are registered. We have seven mechanical engineers and four electrical engineers, of whom two are registered. One of the men permanently on our staff is a representative of Worthington, Skilling, Helle and Jackson, a structural engineer, so that we will always be in a position to be able to coordinate easily with his office. The remainder are staff (secretaries, bookkeepers, stenographers).

The reason for the high number of people working in design and model making in relation to our total group is that we are doing a fair amount of joint venture work in which we do the design and complete architectural details, and our collaborators handle the working drawings, specifications, and supervision. Moreover, since we work almost completely by model, we find that it takes a great many people to accomplish the degree of care which we wish to exercise on a particular project.

We make models of almost all parts of the building, not only of the exterior, but of the interior, as well as full-size and large-scale models of such details as railings and copings, window sections, etc. In order to do this, we maintain a staff of four permanent professional model makers, and we have complete equipment in our shop for them to build any kind of architectural model. Beyond this, of the remaining twenty-one in the design section, at least fifteen or sixteen are making models almost constantly. I would enjoy very much having you go through our office to see how we operate.

You asked me about whether I believed it would be possible at this time for us to handle this project of yours. Since we have concepts and, in most cases, preliminary packages which include details and mechanical, structural and electrical systems on all of our commitments except one, we would be free to concentrate almost our entire design staff on your project by September first. Prior to that, if we should be so fortunate as to receive the commission, we would build a large-scale model of the entire neighborhood surrounding your complex in sufficient detail to enable you and us to understand exactly how various schemes would relate to the surrounding area. We do this for every job which we undertake. Then, using this model, we would try various solutions in block form, working out rough plans considering aesthetics, utility, and over-all economy. We would expect to meet with you several times during this stage.

Upon agreement that the basic concept of the scheme is acceptable, achieving the kind of excitement and glory which you wish for this project, giving you a completely useful structure and within the bounds of the economic framework, then we would proceed to detail the kind of structure and over-all appearance. We are very interested, as I have told you, beyond finding beautiful, functional and economic design, in solving the problems of sun control, of the relationship of glass to wall, and of flexibility architecturally, mechanically, and electrically, which is gained without placing in the building items which will never be used. We would expect to be working with you constantly during this stage.

Since we are very concerned with the total coordination, we would wish to work with structural, mechanical, and electrical engineers from the incept of the job. We would go into great detail to find a syetem for your building or buildings in which the structural, mechanical, electrical and architectural aspects not only fit together easily and naturally during the construction stage, but one in which you would have the lowest possible operational and maintenance costs.

As I think I told you, we are a very busy office. We have several jobs, small in comparison with yours, but of the several-million-dollar category. Most of them are well in working drawings, with the phase which I have mentioned above completed. We have a $17,000,000 hotel, our largest active project, on which we will have the preliminary phase, as stated above, completed and be well in working drawings by September first.

For your project, to me, the basic problem beyond the solving of the functional relationships of space is to find a beautiful solution of form and silhouette which fits well into Lower Manhattan and gives the World Trade Center the symbolic importance which it deserves and must have. In my opinion, this should not be an over-all form which melts into the multi-towered landscape of Lower Manhattan, but it should be unique, have excitement of its own, and yet be respectful

to the general area. The great scope of your project demands finding a way to scale it to the human being so that, rather than be an overpowering group of buildings, it will be inviting, friendly, and humane. Its great spaces need the excitement and delight of change of pace, of surprise, of interest, to avoid the danger of an overwhelming multiplicity of repeated modules. To be symbolic of its great purpose, of the working together in trade of the Nations of the World, it should have a sense of dignity and pride, and still stand for the humanity and democratic purposes in which we in the United States believe.

I am personally responsible for every project which is designed in this office and since, obviously, this would be the most exciting thing we or anyone else in the architectural profession would have the opportunity to work on for a long time to come, I would be totally dedicated to your project.

Finally, you asked me to indicate in this proposal the type of fee which we would request from you. We would be pleased to negotiate either a percentage fee or one which is based on payroll.

I appreciate your interest in our organization, and would like very much to work with you in putting together this most important Center.

Sincerely yours,

MINORU YAMASAKI AND ASSOCIATES

Minoru Yamasaki

jg

enclosures

BUILDING: REYNOLDS METAL COMPANY
DETROIT, MICHIGAN

lfnes:

Yes

REYNOLDS METALS COMPANY
REGIONAL SALES OFFICE

Interview Date:	July 19, 1962
Building Construction Started:	1957
Building Completed:	1959
Building Type:	Regional Sales Office for Reynolds Aluminum Sales Company
Owner:	Reynolds Metals Company
Owner's Representative:	J. E. Blomquist, Vice President and Regional General Manager
Architect:	Minoru Yamasaki
Associate Architect:	None
Structural Consultant:	Ammann & Whitney, Milwaukee
Mechanical-Electrical Consultant:	Yamasaki Associates
Interior Decorator:	W. B. Ford Design Associates
Landscape Architect:	Eichstedt-Johnson Assoc., Grosse Pointe,Mich.
Program:	

OWNER'S RATING OF ARCHITECT

Selection Basis:	Since this was a sales office, Reynolds Co. wanted to capitalize on wonderful publicity Mr. Yamasaki has received. They believe their choice was correct and accomplished their intent. Would consider architect for other work.
Contract Agreement:	Fixed fee included construction and supervision. About 10% reduced by building changes - net 7 or 8%
Other Architects used by Owner:	Skidmore, Owings & Merrill - dissatisfied - $9 million project ended up at $14 million
Comparative Rating:	Highly stylized, strong electrical and mechanical group, architect very devoted, imaginative
Reliability:	Always
Meets Deadlines:	Yes

Accepts Criticism:	Yes - feels very strongly re interior design
Contractor Relationship:	Good, made contractor adhere to specifications
Over-all Coordination:	Excellent
Architect Cost Conscious:	Extras caused by owner, $20,000-$30,000 in extras. No extras of importance caused by architect. Architect wanted element in building. Company did not agree so architect paid for it out of his own money.

OWNER'S RATING OF BUILDING

Function:	Very happy with building
Appearance:	Has received a great deal of attention, well pleased with results, have had many visitors
Outstanding Characteristics:	Unique as sales office. Use company products in building. Unique aluminum screen facade. Space frame pyramid skylight. Radiant snow melting system for outside pedestrian area. Office partitions changes flexible due to integration with coffer slab.

BUILDING DATA

Height:	Basement plus 3 stories
Type of Occupancy:	Sales office building, affairs held in center area
Typical Floor Areas:	Small
Gross Area:	45,500 sq. ft.
Net Area:	No information obtained
Efficiency:	"
Occupancy:	110 people, handles 300-400 people in affairs given in center area. Acoustics always good.

Cost - Building Excluding Land:	$1,600,000
Cost - With furnishings:	$2,200,000
Cost/Sq. Ft. Building:	No information obtained
Elevators:	Hydraulic
Construction:	Reinforced concrete frame with curtain wall on upper stories. Roof reinforced concrete waffle system. Aluminum space frame skylight. Aluminum decorative screen facade 4' in front of curtain wall.
Column Spacing:	30' x 30'
Ceiling:	Aluminum grille 4 panels in 5' x 5' waffle
Ceiling Height:	--
Curtain Wall:	Heat absorbent glass - aluminum frame
Expansion:	Built 25% greater than present need so as to provide expansion
Parking:	Minor, about building grounds
Special Occupancy:	Paint spray room, incinerator
Screen:	Hosed once, rain does job of cleaning. Screen operates wonderfully well for A.C.
Skylight:	Company initially concerned about design and construction of skylight. Has worked very well, no leaks.

AUTHORITY TEAM RATING:

The Reynolds Building is delightful and exciting to see. It is set in an environment of its own and glitters handsomely in the sun with its of gold anodized aluminum creating a lightness to the building's appearance. screen proves to be no visual obstruction from the interior and combined with wall of heat absorbent glass 4' to its rear, greatly cuts the air conditioning load. The reflecting pools in front of the building undoubtedly a maintenance problem although they pleasingly set the building apart

from the parking area and grounds. Terrazzo used as an outside finishing material is undesirable, becoming slippery during inclement weather. The details in every case develop warmth and maintain human scale rarely found in modern architecture.

BUILDING: MC GREGOR MEMORIAL BUILDING
COMMUNITY CONFERENCE CENTER
WAYNE UNIVERSITY
DETROIT, MICHIGAN

lines: No major problems

dlines:

No major problems

MC GREGOR MEMORIAL BUILDING
WAYNE STATE UNIVERSITY, MICHIGAN

Interview Date:	July 20, 1962
Building Construction Started:	1956 - construction approx. 18 months
Building Completed:	1958
Building Type	Community Conference Center
Owner:	Wayne State University (presently 80 acres, approx. 20,000 students)
Owner's Representative:	Dr. Kneef, Provost, Wayne State University
Architect:	Minoru Yamasaki
Associate Architect:	None
Structural Consultant:	Ammann & Whitney, Milwaukee
Mechanical-Electrical Consultant:	Yamasaki Associates
Interior Decorator:	--
Program:	Provided by McGregor Foundation - Building to be memorial to Mr. & Mrs. T.W. McGregor. Used in conjunction with facilities of nearby auditorium and exhibit hall, provide conference rooms, provide for food service

OWNER'S RATING OF ARCHITECT

Selection Basis:	Dr. Kneef's interest aroused by Architect's presentation to design small school in area. Architect spoke of relationship of students to school. He recommended him for the job.
Contract Agreement:	6% of contract cost
Other Architects used by Owner:	Albert Kahn; Ralph Calder; Ed Barnes; Harley, Ellington and Day; Pilafian
Relative Rating:	Architect completely involved in work - provided personal attention, personally participated in garden pool directing location of stones
Availability:	Satisfactory - other project took Architect out of area from time to time
Meets deadlines:	No major problems
[illegible]	Yes, but objectively

Contractor Relationship:	No information obtained
Over-all Coordination:	No information obtained
Architect Cost Conscious:	Did a good sales job in persuading McGregor Fund to provide double cost in original budget thinking - complied with established budget.

OWNER'S RATING OF BUILDING

Function:	Generally successful within context of a memorial building
Appearance:	Excellent (According to Dr. Kneef, inspired by Venetian Gothic)
Outstanding Characteristics:	Public impact great - semi-religious. Being a community conference center seems to call for a "dignified approach to problems".

BUILDING DATA

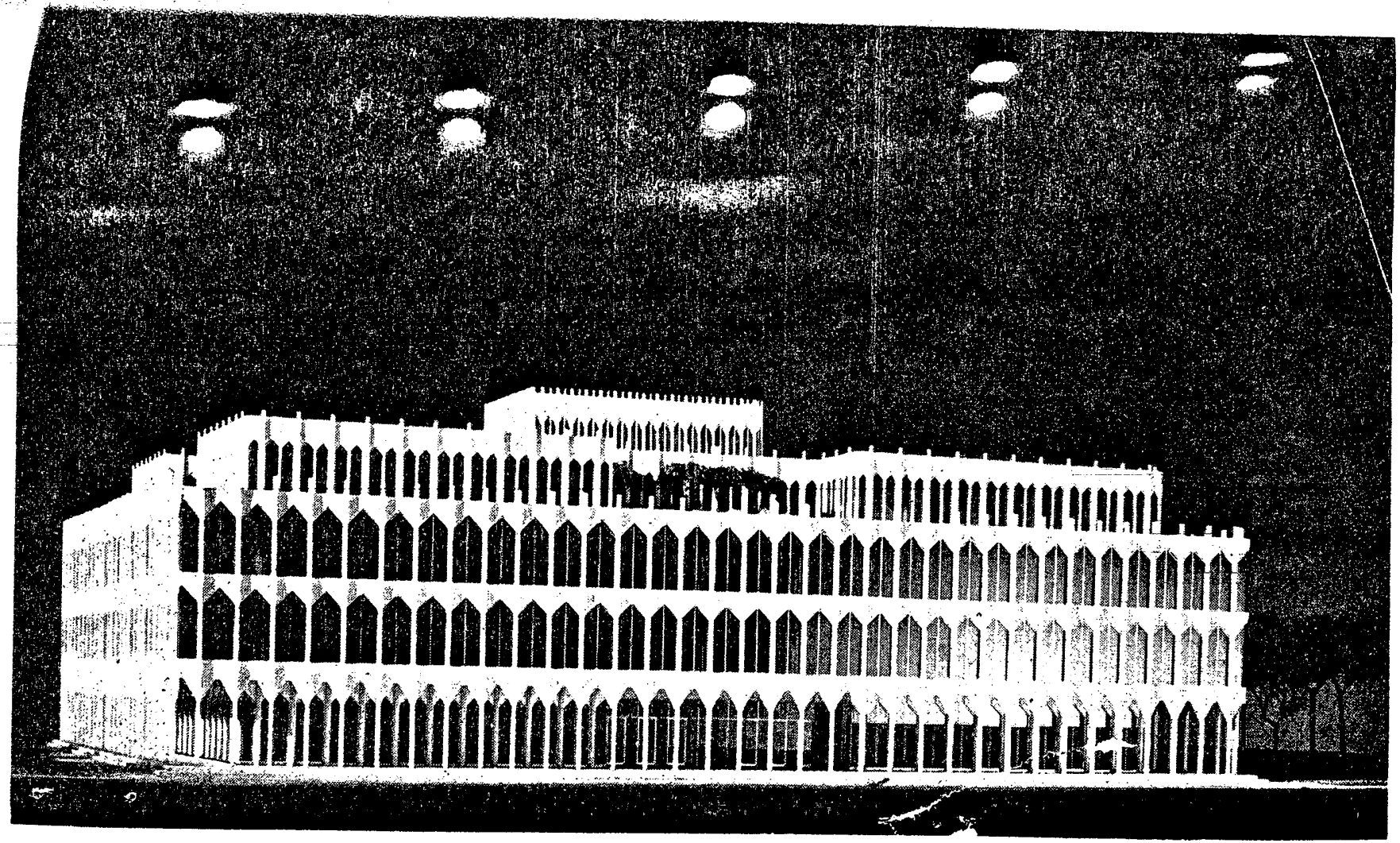
Height:	Basement 12'-0", 1st floor 15'-0", 2nd floor 15'-0"
Type of Occupancy:	Community conference center
Typical Floor Areas:	--
Gross Area:	29,000 sq. ft.
Net Area:	--
Ratio:	--
Population:	Possible to accommodate 600 at one time, 4,000 in one day, 20,000 in a week - building does not show wear
Cost - Building Excluding Land:	Approx. $1,000,000 - incl. outside developed area (court) $1,250,000
Cost - with finishes and furnishings:	No information obtained
Cost/Sq. Ft. Building:	Approx. $33 sq. ft. including site work $40.35 sq. ft.
Elevators:	1 hydraulic
Construction:	Two buildings joined together by cantilevered skylight - reinforced concrete - floor straight concrete pan construction - floor slab center depth 14", side depth varies

Column Spacing:	18' center, side 41'
Hung Ceiling:	--
Ceiling Height:	varies
Spandrel Panels:	None
Expansion:	None
Parking:	None
Special Occupancy:	Conference rooms, cafeteria - originally designed for 150 as program required
Windows:	Gray smoked glass on east and west facades

PORT AUTHORITY TEAM RATING

Architectural - Beautifully designed. Proportions and materials well chosen in context of a memorial building. Building actually two elements on podium (as per Roman and Greek Temples) joined creatively by cantilevered structural aluminum members forming multiple pyramid skylight. No pictures in area. Although white is predominant color, feeling is warm and inviting. Though center area is small, largeness effect is obtained by marble floor which results in resounding clicking of women's heels.

BUILDING: COLLEGE OF EDUCATION
WAYNE UNIVERSITY
DETROIT, MICHIGAN



COLLEGE OF EDUCATION - WAYNE U.

P. A. TEAM RATING

ARCHITECTURE

The College of Education is very functional and simply done. The facade is highly stylized and would not appeal to some people. The interior of the arcade about the lower floor is simple but effective with color in portions of the geometric shaped coffer ceiling providing interest. The $20/square foot of the building is very low considering the precast facade and completely air conditioned building.

ENGINEERING

System design appears excellent in view of unreserved owner satisfaction, high quality equipment in low cost project, integrated lighting, extensive services for electronic teaching aids, convenient underfloor ducts.

Systems are well designed considering complete owner satisfaction, clean uncluttered equipment areas, effective controls and modern equipment. Notable success in concealment and integration of appurtenances in occupied areas. Exposed appurtenances pleasing in appearance. A. C. system provides flexibility and low cost.

OPERATION AND MAINTENANCE

Building design minimizes maintenance and janitorial cost. Building layout has facilitated the operation of this school.

COLLEGE OF EDUCATION
WAYNE STATE UNIVERSITY, MICHIGAN

Interview Date:	July 20, 1962
Building Construction Started:	
Building Completed:	
Building Type:	Class rooms and facility offices
Owner:	Wayne State University
Owner's Representative:	Dr. Kneef
Architect:	Minoru Yamasaki
Associate Architect:	None
Structural Consultant:	Ammann & Whitney
Mechanical-Electrical Consultant:	Yamasaki Associates
Interior Decorator:	--
Program:	Provided by University

OWNER'S RATING OF ARCHITECT

Selection Basis:	Pleased with McGregor Memorial Building, requested him to design College of Education for low budget
Contract Agreement:	Percentage fee - 7%
Other Architects used by Owner:	See data on McGregor Memorial Building
Relative Rating:	"
Availability:	"
Meets Deadlines:	"
Accepts Criticism:	"
Contractor Relationship:	"
Over-all Coordination:	"
Architect Cost Conscious:	"

OWNER'S RATING OF BUILDING

Function:	Good
Appearance:	Highly stylized (Dr. Kneef told Architect he hoped in doing facade of Education Building he had gotten the highly stylize approach out of his system.)
Outstanding Characteristics:	Interior class room with no windows, office areas about perimeter of building

BUILDING DATA

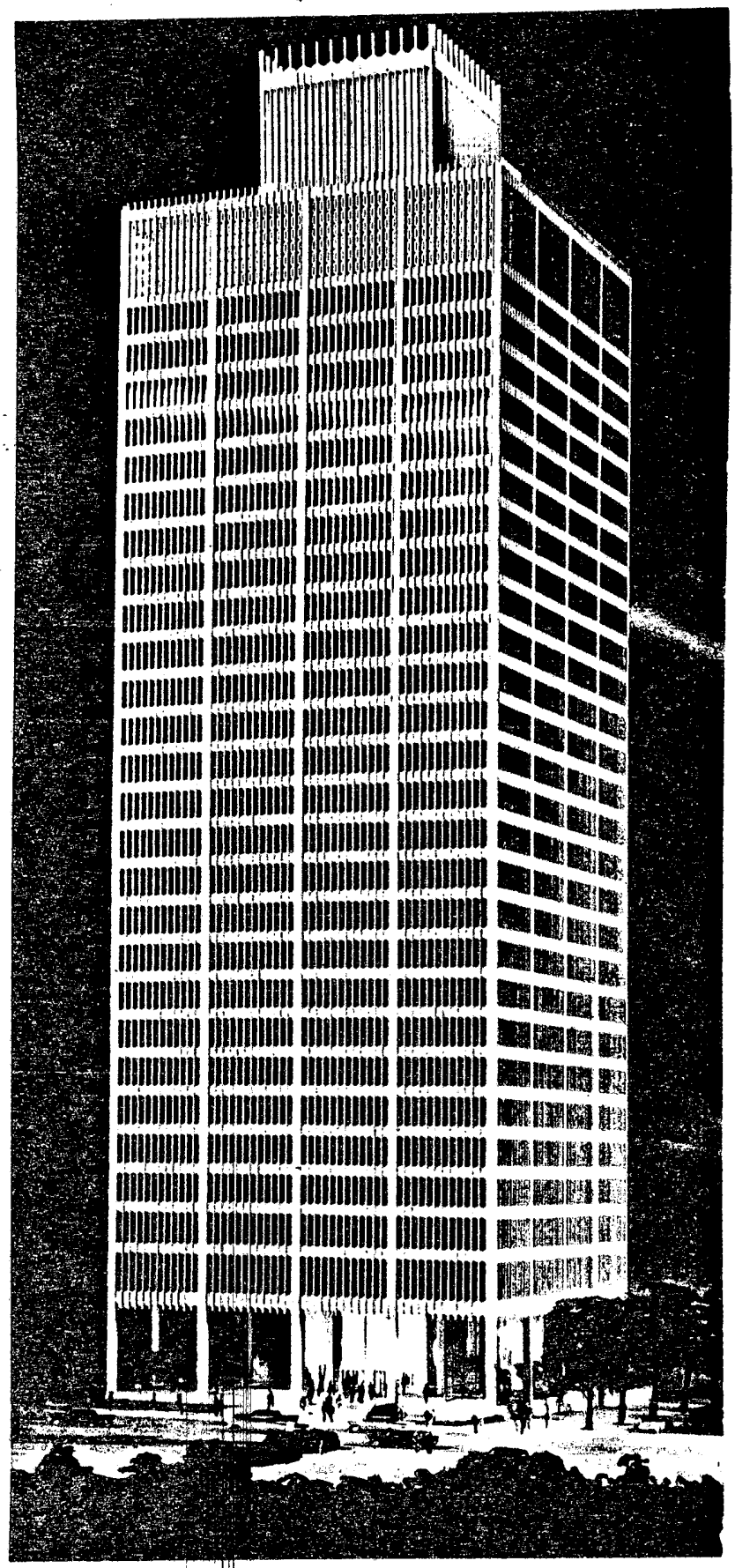
Height:	4 floors plus basement
Type of Occupancy:	Interior, class rooms (no windows) - exterior, facility and administrative offices. Interior core contains stairway toilet rooms, elevators
Typical Floor Areas:	--
Gross Area:	100,000 sq. ft.
Net Area:	--
Ratio:	--
Population:	--
Cost - Building excluding Land:	--
Cost - with finishes and furnishings:	--
Cost/Sq. Ft. Building:	Approx. $20 sq. ft.
Elevators:	--
Construction:	Exterior walls structural precast quartz aggregate surfaced reinforced concrete trees 40' high and 5' wide. Between trees fixed anodized aluminum sash. The building is set on a platform approx. 24" above grade with first floor set back 10' forming a continuous protective arcade. Interior structure combination poured in place, precast and prestressed concrete. Core area uses conventional poured in pla concrete system of beams, columns and slab The core extending throughout the height provides a rigid anchor and bracing for th rest of the precast structure.

olumn Spacing:	Portions of all floors are framed with precast prestressed double tees which span 52'.
mg Ceiling:	--
eiling Height:	--
pandrel Panels:	--
xpansion:	--
arking:	--
pecial Occupancy:	--
indow Washing:	--

ORT AUTHORITY TEAM RATING

The College of Education is very functional and simply done. The facade is highly stylized and would not appeal to some people. The interior of the arcade about the lower floor is simple but effective with color in portions of the geometric shaped coffer ceiling providing interest. The $20 sq. ft. of the building is very low considering the precast facade and completely air-conditioned building.

BUILDING: MICHIGAN CONSOLIDATED GAS COMPANY
DETROIT, MICHIGAN



MICHIGAN CONSOLIDATED GAS CO.
OFFICE BUILDING - DETROIT

Interview Date:	July 19, 1962
Building Construction Started:	1960
Building Completion Expected:	December 1962-January 1963
Building Type:	Mainly office building, one tenant occupancy
Owner:	Mr. Ralph T. McElvenny, President Michigan Consolidated Gas Co. Detroit, Michigan
Owner's Representative:	None
Architect:	Minoru Yamasaki
Associate Architect:	Harold Tsochiya, Cass Wadowski conducted tour of building
Structural Consultant:	
Mechanical-Electrical Consultant:	Smith, Hynchman & Grilles Detroit, Michigan
Interior Decorator:	W.B. Ford
Program:	Esthetics and concept handled by architect completely. Owner told architect to build 450,000 square feet and provide functional requirements at meetings with architect as planning progressed.

OWNER'S RATING OF ARCHITECT

Selection Basis:	Planned to build only one building, to be distinctive, practical yet beautiful. Looked at several other buildings before making selection of architect. Saw General Motors Test Center - commented project used best brains of G.M. and Saarinen. Did not consider results to be distinctive. Saw Air Force Academy - did not feel it was well done.
Contract Agreement:	Based on percentage - slightly more than stipulated by Michigan A.I.A.
Other Architects used by Owner:	None mentioned
Relative Rating:	Brilliant, extremely creative ability impressed owner
Availability:	Architect always gave personal attention to the project

Meets Deadlines:	Yes, no delays due to architect
Accepts Criticism:	Yes, if it does not violate his positive fundamental requirements
Contractor Relationship:	Good
Over all Coordination:	Good, felt organization of the firm was good
Difficulty with Material Specs.:	No major problem
Consulting Engineers:	No remarks
Extra Work:	Extra work due to owner
Architect Cost Conscious:	Yes, cost less than estimated in budget planning
Recommend Architect for W.T.C.:	Yes
NOTE:	Owner heads Art Institute of Detroit

OWNER'S RATING OF BUILDING

Function:	Excellent
Appearance:	Excellent
Outstanding Characteristics:	Distinct building

BUILDING DATA

Height:	430', 32 stories, building 124' x 124'
Type of Occupancy:	Office building, single tenant
Typical Floor Areas:	15,400 sq. ft.
Gross Area:	454,000 sq. ft.
Net Area:	No data obtained
Ratio:	70%
Population:	800 to 900 people
Cost - Building Excluding Land:	(38 x 450,000) $17 million approx. Owner stated $20 million including land.
Cost - with finishes and furnishings:	No data obtained
Cost/Sq. Ft. Building	$38 sq. ft. (Later conversation with architect put cost at approx. $40

Elevators:	2 bank of 6 electric elevators plus 1 hydraulic (selectomatic)
Construction:	Precast stone facade (aggregate-Utah quartz - approx. 15 different forms used) reinforced concrete waffle slab and steel frame
Column Spacing:	30' x 30'
Hung Ceiling:	Steel louver grating - 4' - 8" module
Ceiling Height:	8' - 11" normal, 11' - " " public area (ceiling construction 3' - 1")
Spandrel panels:	Precast stone panels, mullions of precast stone 28" o.c.
Expansion:	Intend to rent 3-1/2 floors for interim period - use for expansion as required
Parking:	Forty cars in basement
Special Occupancy:	IBM Data Processing - entire floor, Restaurant on top floor
Window Washing:	Accomplished by stage - 35' wide using roof track and specially designed metal mullions 35' o.c.

PORT AUTHORITY TEAM RATING

Precase stone facade well done. Many details within building show original thinking. Treatment of entrance well designed with separation from street by reflecting pools with steps rising to the building. Pattern of precast interesting, not overdone, different. Use of modules for windows good, different. Proportion of building elements well studies, excellent. Lightness achieved by small spandrel area of precast stone. Human scale maintained throughout. Interior on upper floors provides good feeling of security on higher floors effected by module of 28" o.c. for windows but view is not impaired.

GENERAL DESIGN INFORMATION

1. Demonstrates original thinking. A 25' mullion 2" x 4-1/2" solid steel bar spaced 4' - 8" o.c. was stiffened, placed in tension by spring in floor.

2. Finished ceiling set in aluminum channel consisting of steel louver grill.
3. Fiberglass insulated between aluminum channel and underside of coffer soffit to prevent A.C. leaks.
4. Demonstrates original thinking - coffer rib used as module for office partitioning with partitioning extending to soffit of rib.
5. Cast stone fascia sections doweled and grouted in place. Depth of vertical precast mullion 11".
6. Neoprene extrusion used at seam of precast elements used as a back-up for caulking.
7. A perimeter track used for support of washing stage.
8. Precast sections not porous, silicon not applied to finished precast. Architect felt there was no way other materials could be protected in the application of the silicon such as sash, etc.
9. Concrete molds made in Salt Lake City - approx. 15 different types of molds used.
10. Elevator lobbies 8' wide.
11. Architect Associate stated early use of precast 32 years ago in Roselin, Virginia; Bali Temple (specific name unknown). Claims is standing up extremely well.

ARCHITECT: WELTON BECKET ASSOCIATES

1000 SANTA MONICA BOULEVARD
LOS ANGELES 25, CALIFORNIA

June 29, 1962

Mr. Richard C. Sullivan
Director, World Trade Center
Port of New York Authority
111 Eighth Avenue
New York 11, New York

Dear Mr. Sullivan:

We appreciate very much this opportunity to submit our qualifications and would like to thank the Port of New York Authority for their consideration of our firm.

We believe we have assembled the finest possible team in order to provide professional services for the World Trade Center which will truly be the gateway to the United States. This team provides you with over 700 technical people who can complete your project without the necessity of hiring any additional staff.

The basic team consists of Welton Becket and Associates, Architects; Severud-Elstad-Krueger Associates, Structural Engineers; and Cosentini Associates, Mechanical and Electrical Engineers. Also, exclusively at our disposal, as a part of the team, will be some of the finest consultants available: Wilbur Smith, Traffic Engineer; Zion & Breen, Site Planners and Landscape Architects; H.V. Munchhausen, Acoustical Engineer; and Joseph S. Ward Associates, Soil Engineers.

Because of the magnitude and complexities of this project and the relatively short time element for plan development, it is imperative that a large competent team be selected. Virtually all of this team has worked together previously. We have the manpower available and are ready to go to work to create an outstanding design incorporating advanced technology and planning. Our firm has consistently striven to create new techniques, methods and means of construction within economic limitations and certainly hope that we have the opportunity to do so on this challenging project.

I would personally like to discuss with you in more detail the program and how we can best work with your outstanding organization.

Sincerely,

Welton Becket

At our meeting of Friday, June 22, 1962 with Messrs. R. C. Sullivan and Malcolm Levy of the Port of New York Authority and MacDonald Becket, C. B. McReynolds and Vinton P. Frost of Welton Becket and Associates, we were asked to submit information indicating our desire and qualifications to provide professional services for the World Trade Center.

Key answers to the questions asked are on subsequent pages.

You will note that as a part of our exclusive team we have Severud-Elstad-Krueger-Associates and Cosentini Associates as our basic engineers.

* * * * * *

UNDERSTANDING OF THE PROJECT AND PHILOSOPHY

We are fully aware of the importance, magnitude and complexity of this World Trade Center, and the flexibility in planning necessary to create the varied structures. The design concept must be one resulting in physical installations worthy of the ambitious intent of the greatest trade center in the world, and one to express the dynamic nature of the function and processes carried out within the structures. We must consider the beauty, efficiency of operation, and internal workings of many government agencies, commercial enterprises, international exhibits, transportation organizations and supporting service facilities along with the external influences of surface and sub-surface transportation and other links to the City of New York.

We must, at the same time, through design and planning, create buildings and their surroundings in such a manner that a pleasant environment is attained for people.

Our philosophy applied to this project can best be described by Mr. Becket's own words after receiving the VII Pan American Congress of Architects' Award:

> "As architects and engineers our professional goal is to design buildings of distinctive beauty and maximum efficiency.
>
> "However, if the buildings we plan do not directly or indirectly produce income for our clients - either through increased sales, cost-reducing operations or highly-saleable space - we have no cause for pride no matter how many awards we may win.
>
> "We must produce attractive, functional buildings. But above all, we must produce sound investments for our clients."

* * * * * *

ABILITY TO PROVIDE SERVICES

We are pleased to submit the following indication of our intense interest in, and professional qualifications for, performing complete architectural and engineering services to develop the World Trade Center of the Port of New York Authority.

With over 700 technical personnel available, Welton Becket and Associates, Severud-Elstad-Krueger-Associates and Cosentini Associates are ready to commit the necessary technical personnel to the World Trade Center without need of hiring any inexperienced personnel. We are prepared to meet your time schedule as well as project budget.

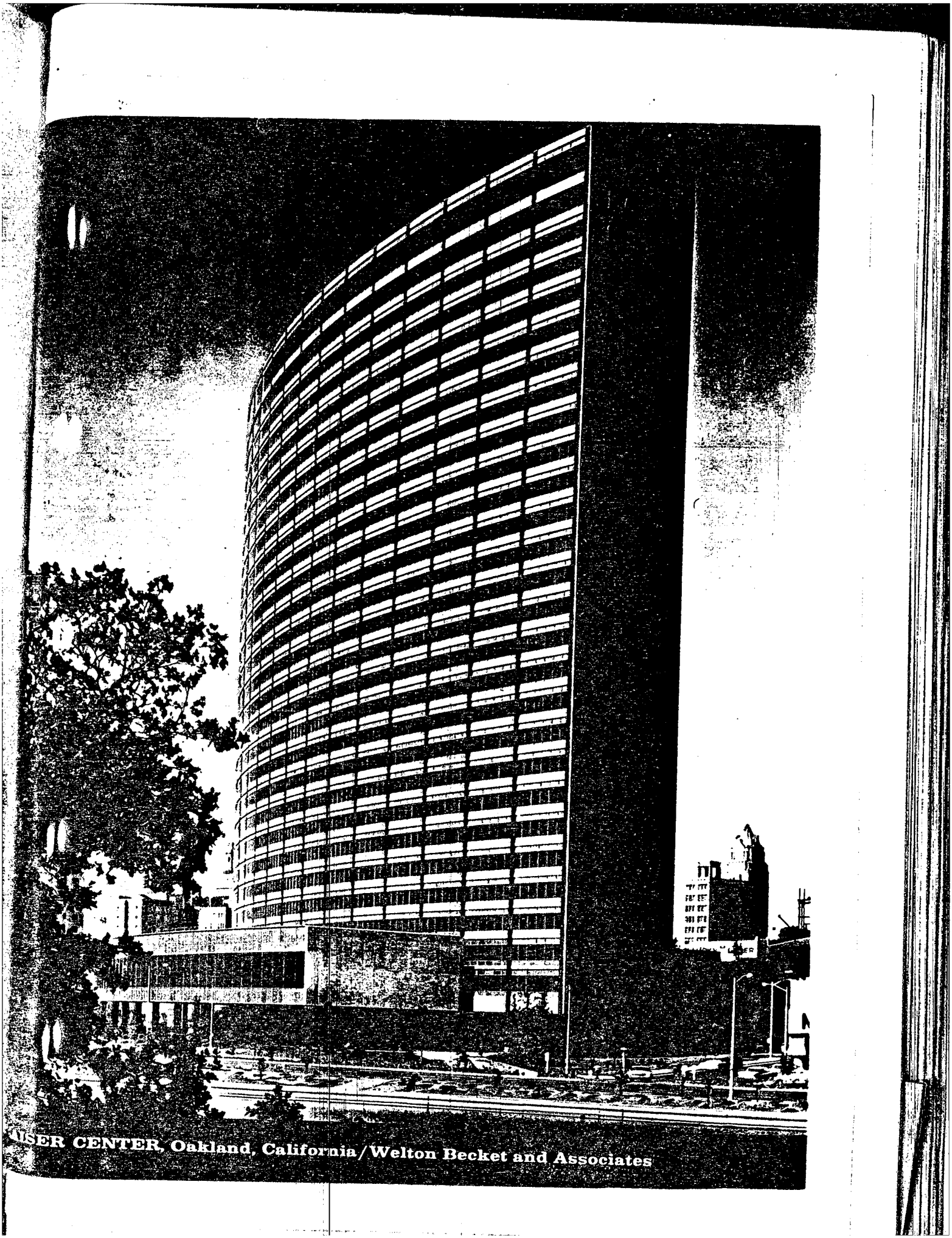
We have designed major projects of similar intent and concept. These projects of related experience include the $100 million Cullen Center in Houston, Texas; the $35 million Southland Center in Dallas, Texas; Century City, under construction, in Los Angeles, which on completion will have an aggregate construction cost of $500 million; the Schine Ambassador Center in Los Angeles, and the University of California at Los Angeles. All of these projects represent complex planning projects. The manner with which these problems were solved is indicative of our qualifications for the Port of New York Authority's World Trade Center.

The professional team that we propose for this project is made up of key personnel whose experience was gained in great part as a team on the aforementioned projects and are indicated in the organization chart.

* * * * * *

BUILDING: BETHLEHEM BUILDING
SAN FRANCISCO, CALIFORNIA

BUILDING: KAISER CENTER
OAKLAND, CALIFORNIA



ISER CENTER, Oakland, California/Welton Becket and Associates

ARCHITECT: KELLY AND GRUZEN

10 COLUMBUS CIRCLE
NEW YORK 19, NEW YORK

KELLY & GRUZEN
ARCHITECTS · ENGINEERS

PROPOSAL AND REPORT

Reference: WORLD TRADE CENTER

Submitted to:

Mr. Richard C. Sullivan
Director
World Trade Center
The Port of New York Authority
New York, New York

June 29, 1962

Please reply to:
☒ 10 COLUMBUS CIRCLE, NEW YORK 19, N.Y., JUdson 2-7040
☐ 44 OAKLAND ROAD, MAPLEWOOD, N. J., Mitchell 3-1944

KELLY & GRUZEN
ARCHITECTS · ENGINEERS

June 29, 1962

Mr. Richard C. Sullivan, Director
World Trade Center
The Port of New York Authority
111 Eighth Avenue at 15th Street
New York 11, N.Y.

Dear Mr. Sullivan:

We wish to express our appreciation to the Port of New York Authority for being afforded an opportunity to be considered for the proposed World Trade Center.

In accordance with your request, we are submitting herewith an outline description of our qualifications and background of experience--and our statement embodying an attitude and philosophy which we feel should permeate the planning of the Center.

Also submitted is an exhibit of photographs reflecting the general character, diversity and scope of our work.

Fully recognizing the magnitude and significance of such a project--and being fully aware of the enormous responsibilities to be placed upon those charged with its planning--we are presenting our qualifications with confidence in the knowledge that we are equipped and staffed to provide the Port Authority with the calibre of imaginative and comprehensive services essential to the ultimate success of the program.

Since KELLY & GRUZEN is in a position, after more than thirty-five years of practice, to carry on successfully with its commitments in many areas of planning--the organization is prepared

Please reply to:
☒ 10 COLUMBUS CIRCLE, NEW YORK 19, N.Y., JUdson 2-7040
☐ 44 OAKLAND ROAD, MAPLEWOOD, N. J., Mitchell 3-1944

KELLY & GRUZEN
ARCHITECTS-ENGINEERS

Mr. Richard C. Sullivan, Director
World Trade Center

June 29, 1962

to place at the disposal of the Port Authority, for this project, the FULL TIME services of the writer to direct and administer the execution of master planning and design.

Also to be made available would be the FULL TIME assistance of Mr. John St. Germain, R.A., an Associate of the firm, to serve as my Executive Assistant; and of Mr. Joseph Pniewski, A.I.A., Chief of Production, to serve as Project Manager. In addition, the complete reservoir of technical skills contained in the firm will be available at all times, and, of course, accessible for assembling the group which will be required for final development.

In the material we are presenting for your consideration, we have endeavored to provide evidence of our extensive experience and capabilities in the areas of large scale planning and public works--and to substantiate our continuous efforts to produce valid and distinctive architectural expressions for our clients.

We stand ready to meet with you and your colleagues again to discuss further this project and the manner in which we can place our organization at the disposal of the Port Authority.

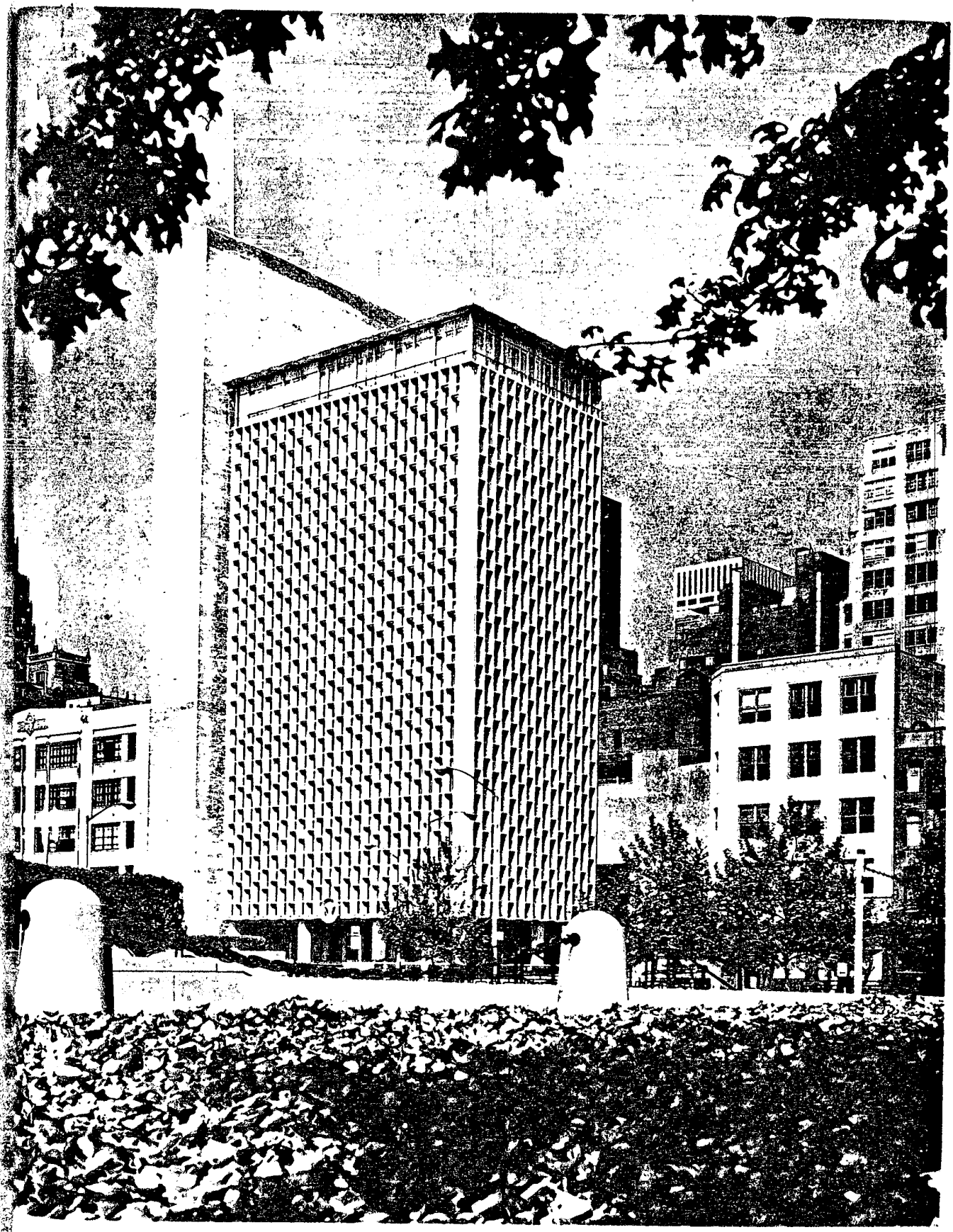
Sincerely yours,

KELLY & GRUZEN

B. S. Gruzen, F.A.I.A.

BSG:srk.

BUILDING: UNITED STATES MISSION TO THE UNITED NATIONS
NEW YORK, NEW YORK



BUILDING: NEW YORK SCHOOL OF PRINTING
NEW YORK, NEW YORK

N. Y. SCHOOL OF PRINTING

P. A. TEAM RATING

The New York School of Printing provided a good solution , functionally and structurally, to a new approach in vocational high schools use of printing machines for vocational training. Lobby areas and corridors seemed excessive. Circulation not sufficiently studied. The building is located in a builtup area of the city extending in the nor th perimeter to the city sidewalk, on the south it is set back by the playground and auditorium. The years of subjecting the building to the city air pollution problem were evident. The glass block retained the dirt of the city streets giving the building a shabby appearance. However, a few clever thoughts were demonstrated in its construction such as the sunken playground taking advantage of the grade after demolition. Use of escalators for verticle circulation in a high school . The intent of the glass block to provide better light in the interior did not appear successful, probably did prevent glare.

Mechanical services are adequate but not distinguished. Heating is by L. P. steam system. Only two boilers used on coldest days. Noteworthy is central vacuum cleaning system, and economy and efficiency of escalators during peak circulation.

Electrical systems very well designed. Building contains a complex scatter of electrical loads from the printing machines in the classrooms besides the normal complement of lighting and mechanical requirements. Floor area allottments to the electrical service equipments are generous and well arranged.

The architect did not pay sufficient attention to design, detail, which in the opinion of the team has resulted in high maintenance and operation cost.

BUILDING: ALBERT EINSTEIN COLLEGE OF MEDICINE
YESHIVA UNIVERSITY
NEW YORK, NEW YORK