to any other obligation which the Contractor might have under the Contract Documents, including Paragraph 4.5 hereof. The establishment of the time period of one year after the Date of ~~Substantial~~ Completion or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which his obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to his obligations other than specifically to correct the Work.

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13.3 ACCEPTANCE OF DEFECTIVE OR NON-CONFORMING WORK

13.3.1 If the Owner prefers to accept defective or non-conforming Work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect a reduction in the Contract Sum where appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made. However such adjustments shall not exceed the amount necessary to correct such work.

ARTICLE 14

TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of thirty consecutive days through no act or fault of the contractor or a Subcontractor or a Sub-contractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor, for any of the following reasons:

1. issuance of an order of a court or other public authority having jurisdiction;

2. an act of government, such as a declaration of national emergency making material unavailable;

3. because the Architect has not issued a Certificate for Payment or because the Owner has not made payment thereon; or

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4. if suspension, delay or interruption by the Owner as described in Paragraph 14.4 constitutes in the aggregate more than 100 percent of the total number of days scheduled for completion, or six months, whichever is less.

14.1.2 If one of above reasons has existed for thirty consecutive days, the Contractor may, upon seven additional days' written notice to the Owner and Architect and Construction Manager, terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, construction equipment and machinery, including ~~reasonable~~ overhead and profit at five percent 5% of the loss.

14.1.3 If the Work is stopped for a period of sixty consecutive days through no act or fault of the Contractor or a Subcontractor or a Sub-subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has persistently failed to fulfill the Owner's obligations including performance by the Architect under the Contract Documents with respect to matters material to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the contract and recover from the Owner as provided in Subparagraph 14.1.2.

14.2 TERMINATION BY THE OWNER

14.2.1 The Owner may terminate the Contract if the Contractor:

1. persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

2. fails to make prompt payment to Subcontractors for materials or labor;

3. persistently or repeatedly disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction; or

4. otherwise is guilty of violation of a material provision of the Contract Documents.

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and fails to cure such deficiencies within ten days after notice in writing by Owner. If such deficiency cannot be cured within 10 days, Contractor shall satisfy its obligations hereunder by commencing such cure within the 10 day period and by continuing correction of such default with diligence and promptness.

14.2.2 Except as provided above, when any of the above reasons exists, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may without prejudice to any rights or remedies and after giving the Contractor and the Contractor's surety, if any, seven days' written notice:

1. terminate employment of the Contractor;

2. take possession of the site and of all materials, equipment to be incorporated in the construction thereon owned by the Contractor;

3. finish the Work by whatever method the Owner may deem expedient; and

4. take further appropriate action as described in Subparagraph 14.2.2.

14.2.3 When the Owner terminates the Contract for one of the above reasons, the Contractor shall not be entitled to receive further payment until the Work is finished.

14.2.4 If the unpaid balance of the Contract Price and Contractors fee exceeds costs and damages of finishing the Work, including, but not limited to, compensation for the Architect's additional services and expenses and attorneys' fees and expenses made necessary thereby, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner.

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14.3 OWNER'S TERMINATION FOR CONVENIENCE.

14.3.1 The Owner may, at any time, terminate the Contract in whole or in part for the Owner's convenience and without cause. Termination by the Owner under this Paragraph shall be by a notice of termination delivered to the Contractor, specifying the extent of termination and the

Overhead and profit at five percent (5%) of the cost

3. ~~A percentage of the Contractor's Fee based on the percentage~~ of the actual work performed.

14.3.4 Allowance shall be made for payments previously made to the Contractor for the terminated portion of the Work, and claims which the Owner has against the Contractor under the Contract, and for the value of materials, supplies, equipment or other items that are part of the cost of the Work to be disposed of by the Contractor.

14.3.5 Owner may not exercise its rights under this Section 14.3 to take over performance of the remainder of the Work.

14.4 OWNER'S SUSPENSION FOR CONVENIENCE

14.4.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine. This provision allows the Owner to suspend the Contract without having to provide the Contractor with any reason.

14.4.2 In the event of suspension, delay or interruption by the Owner an adjustment by Change Order shall be made ~~for Contractor's fee and~~ for increases in the cost of performance of the Owner-Contractor Agreement, caused by suspension, delay or interruption and to extend the time of performance by the period of suspension, delay or interruption plus the time necessary to remobilize and for any additional delays resulting therefrom. No adjustment shall be made to the extent:

and overhead and profit at ~~five~~ ~~00~~ rcent (5%) such creases.

1. That performance is, was or would have been so suspended, delayed or interrupted by another cause, including the fault or negligence of the Contractor; or

2. That an equitable adjustment is made or denied under another provision of this Contract.

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14.4.3 Adjustments made in the cost of performance shall include both increases in direct costs and increases in overhead resulting therefrom and interest at one percent over the prime rate charged by the Continental Illinois National Bank during such period on any outstanding retainer.

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effective date. This provision allows the Owner to terminate the Contract without having to provide the Contractor with any reason.

14.3.2 Upon receipt of a notice of termination, the Contractor shall immediately, in accordance with instructions from the Owner, proceed with performance of the following duties regardless of delay in determining or adjusting amounts due under this Paragraph:

1. cease operation as specified in the notice;

2. place no further orders and enter into no further subcontracts for materials, labor, services or facilities except as necessary to complete continued portions of the Contract;

3. terminate all sub-contracts and orders to the extent they relate to the Work terminated;

4. Proceed to complete the performance of Work not terminated, and

5. take actions that may be necessary, or that the Owner may direct, for the protection and preservation of the terminated Work.

14.3.3 The amount to be paid to the Contractor by the Owner because of the termination shall consist of:

1. For Work performed on the terminated portion of the Work before the effective date, the cost of that Work and the cost of settling and paying termination costs under the terminated subcontracts and for materials that are properly chargeable to the terminated portion of the Work;

2. The reasonable costs of settlement of the Work terminated, including accounting, legal, clerical and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data; additional costs of termination and settlement of subcontracts and purchase orders and storage, transportation, and other costs incurred which are reasonably necessary for the preservation, protection or disposition of the terminated Work; and

SECTION 3A

CONCRETE

3A.01 GENERAL CONDITIONS:

A. The GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION and the OWNER'S SPECIAL CONDITIONS form a part of these Specifications and must be examined by Contractors prior to signing Contract.

3A.02 SCOPE:

A. The work covered by this Section includes the furnishing and the installation and/or use of all materials, labor, equipment, apparatus, services and tools and related items necessary to completely and properly erect all plain and reinforced concrete for the building and adjacent structures as shown on the Drawings or specified herein, including the concrete work which is specified in Sections, HEATING, PLUMBING, and ELECTRICAL WORK. Continuous footings, grade beams and foundations in geneal, pads and bases for equipment are included.

B. This Section does not include furnishing concrete work specified in the following Sections: PAVING AND SIDEWALKS, LANDSCAPING and CAISSONS.

C. The garage structure is to be post-tensioned concrete.

3A.03 MATERIALS:

A. All materials shall comply with the applicable Specifications as hereinafter listed.

B. Portland Cement: Portland Cement shall comply with the "Standard Specifications for Portland Cement", (SS-C-192 or ASTM Designation C150), or the "Standard Specifications for Air-Entraining Portland Cement", (ASTM Designation C175), and shall be Type I, IA, III or IIIA. All Portland Cement used for exposed, unpainted concrete shall be of the same manufacturer's cement and uniform color.

C. Aggregates:

1. Concrete Aggregates: Concrete aggregates shall conform to "Specifications for Concrete Aggregates", ASTM C33.

2. Fine Aggregate shall consist of natural sand having clean, hard durable, uncoated grains, free from deleterious substances, or sand prepared from inert materials having similar characteristics when given prior approval by the Architect. Sand shall range in size from course, from #100 to #4.

3. Coarse Aggregate shall consist of crushed stone or gravel, or other inert materials of similar characterisitics, or a combination thereof, having clean, hard, strong, durable pieces free from shale or other soft deleterious matter, uncoated. Size range for footings shall be designated size No. 4 to 2 inches and for all other work designated size 3/4 inches to No. 4.

D. Deleterious Substances: Deleterious substances shall not be present in the fine and coarse aggregate in excess of the amounts permitted by ASTM C33 for severe weather exposure.

E. Mixing Waters: Mixing water shall be clean and free from injurious amount of oils, acids, vegetable matter, alkalies, organic material, salts, or deleterious substances.

F. Metal Reinforcement:

1. All reinforcing bars shall be deformed bars, hard grade A615 steel with a yield point of 60,000 psi. All bars shall markings indicating size of bar, type of steel and grade mark. Cold drawn wire for spiral reinforcement shall conform to ASTM A82. See Structural Engineers General Notes for detailed information.

2. Wire for concrete reinforcement shall conform to the requirements of the "Standard Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement", (Serial Designation A82), and "Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement", ASTM A185.

G. Admixtures:

1. Admixture for producing Air-Entrained Concrete shall be Darex, AEA, Dewey & Almy Chemical Co., as described in ASTM Standard Specification C260.

2. Hydraulic Lime: Federal Specifications SS-L-361.

H. Fly Ash: Shall be Chicago Fly Ash conforming to the requirements of ASTM 350, except that under "Chemical Requirements" the maximum SO_2 content shall be 4.0% and the maximum loss on ignition shall be 5.0%.

I. Admixtures for increasing density, workability and strength shall be "Placewell" as manufactured by the Johns-Manville Company or Pozzolith, as manufactured by Master Builders.

J. Concrete Floor Sealer shall be equal to West Chemical Co's. Product.

K. Waterproof kraft paper shall conform with Federal Specifications Symbol UU-P-147, Type IV, Class A.

L. Hydraulic Hydrated Lime: ASTM Designation C-141.

M. Expansion Joint Material: A preformed expansion joint filler Type 1 or ASTM Specifications D544, "Korkpak" made by Servicised Products Company, Chicago, Illinois. Expansion joint shall be 1/2" thick unless otherwise shown on Drawings.

N. Metal Accessories:

1. All metal accessories, including chairs, spacers, ties and other devices necessary for proper assembly, spacing, placing and supporting of metal reinforcing for concrete work shall be of shape, design, and size approved by the Architect. Unless otherwise specified, type, arrangement and spacing of bar supports shall conform to ACI, 315, Manual of Standard

Practice for Detailing Reinforced Concrete Structures. Tie wire shall be annealed iron of not less than No. 18 gauge. To prevent rusting of the metal surfaces or rust bleeding through to exposed concrete surface, all accessories which support or brace reinforcing bars and rest on or against forms, such as chairs or other metal accessory items, shall have plastic tipped legs.

2. Metal anchors, slots, inserts and ties shall be of shape, size and design as shown, specified and/or approved by the Architect. All such anchors which will be partially or fully exposed after forms are stripped shall be galvanized or shall be of non-corroding metal.

3. Inserts required to support shelf angles or other angles shall be Peerless Wedge.

O. Vapor-barrier to be 6 mil polyethylene (visqueen).

3A.04 TESTING AND INSPECTION:

A. Mill and laboratory test reports and affidavits shall be furnished for all materials in this Section in accordance with the GENERAL CONDITIONS.

B. For concrete at the site, the Portland Cement shall be mill tested and shipments shall be identified by the mill testing laboratory. Reports of tests shall be furnished to the Architect before the cement is shipped. If ready-mixed concrete is used, the Contractor shall take whatever precautions may be necessary to insure that the cement used conforms to the proper specification and furnish the Architect a statement that it does conform to the proper specifications.

C. The Contractor shall furnish the Architect the name of the testing laboratory with certified mill reports covering the chemical and physical tests for each melt of steel from which the reinforcing bars are rolled. If such reports are not available, tests shall be made by the testing laboratory as directed by the Architect, at the Contractor's expense.

D. Tests: The Owner* shall employ an accredited testing laboratory approved by the Architect, to inspect and test representative samples of material and concrete as specified hereinafter.

*(Owner's Construction Manager)

E. Materials:

1. Reinforcing Steel: Certified mill reports covering the chemical and physical tests for each will be accepted as certification that the reinforcing steel conforms to the specifications. In the event mill reports aren't available, physical and chemical tests shall be made by the testing laboratory to determine the quality of the reinforcing steel.

2. Cement: The Contractor shall furnish a statement that all cement used in ready-mixed concrete conforms to the Specifications. Cement for use in job mix concrete shall be tested by the Testing Laboratory in accordance with ASTM C183.

3. Aggregate: All aggregates shall be sampled and tested in accordance with ASTM C33. Aggregates for use in concrete which shall be exposed to the weather shall be tested for soundness in accordance with ASTM Specification C88.

4. Test Cylinders:

a. For the first pour, six (6) test cylinders shall be made and six (6) cylinders for every 50 cu. yd. until 250 cu. yd. have been poured if pour is continuous. Three (3) cylinders of each series to be tested at 7 days, and three (3) cylinders of each series at 28 days. For strengths above 6000 psi, two (2) cylinders of each series to be tested at 7 days, two (2) cylinders of each series at 28 days, and two (2) cylinders of each series at 56 days. If all cylinders meet strength specifications, the number of test cylinders may be reduced as outlined paragraph b. of this section. Test cylinders shall be accompanied by slump tests made in accordance with ASTM Specification Designation C143, and air content tests in accordance with ASTM C231.

b. Representative of testing laboratory shall take and test three (3) cylinders for approximately 150 cubic yards of concrete or fraction thereof for each eight hour pour. Samples shall be taken so that foundations, walls, columns, footings, and individual floor and roof slabs are each represented by at least one set of test cylinders. Samples shall be taken from the forms by a representative of the approved testing laboratory and cylinders shall be molded and cured in accordance with ASTM Specification C31, "Standard Methods of Making and Curing Concrete Compression and Flexure Test Specimens."

c. Twenty-four hours after casting, the first three cylinders shall be sent to the laboratory for curing.

d. When normal Portland cement is used, one laboratory cured cylinder shall be tested at 7 days and two laboratory cured cylinders shall be tested at 28 days. When high early strength cement is used, one laboratory cured cylinder shall be tested at three (3) days, and two laboratory cured cylinders shall be tested at seven (7) days. For strengths above 6000 psi, one cylinder shall be tested at 7 days, one cylinder shall be tested at 28 days, and one cylinder shall be tested at 56 days.

e. All test cylinders shall be tested for compressive strength in accordance with ASTM Specification C39. The minimum strength of cylinders and corrective measures to be taken, if necessary, are specified below in Paragraph G., "Minimum Strength of Concrete".

f. Load Tests: All tests of concrete in place, which may be required by the City Authorities or by the Project Engineer, if cylindrical strength of concrete or workmanship are unsatisfactory, shall also be done by the Contractor at his expense, in accordance with the Chicago Building Code requirements.

F. Reports: The testing laboratory shall make reports of all materials inspected and tested. The reports shall be submitted promptly after tests are made and shall be identified by the name and address of the project. Copies of all reports shall be distributed as follows:

1. Two (2) copies to the Architect.

2. One (1) copy to the Structural Engineer.

3. One (1) copy to the Contractor.

4. One (1) copy to the Owner's Construction Manager.

5. One (1) copy of all reports required by the City Building Department to be forwarded to the Commissioner of Buildings.

6. The Laboratory shall issue to the Architect a report with full explanation of any materials or difficulties encountered.

G. Minimum Strength of Concrete:

1. The compressive strength of the concrete, as indicated by the test cylinders, shall be not less than the values shown on the Structural Drawings. Minimum field cured cylinder strength shall be (except the Structural Engineer shall make the determinations where asterisks (*) occur):

Age of Cylinder	Normal Cement Strength (PSI)					
7 days	2000	2666	3333	4000	*	*
28 days	3000	4000	5000	6000	*	*
56 days	---	---	---	---	7500	9000

2. If the average strengths of laboratory cured cylinders at 7 days for concrete with normal cement, fall below the minimum strengths indicated above, the Project Engineer shall have the right to order a change in mixture, or in the water content for the remaining portion of the structure.

3. If the average strengths of the field cured cylinders for any portion of the structure, aged 7 days for normal cement, falls below the minimum strengths indicated above, the Project Engineer shall have the right to require conditions of temperature and moisture necessary to secure the required strengths.

4. In cases where the average compressive strength of the entire set of test cylinders is below the specified minimum compressive strength, the concrete in the structure represented by these results shall be considered defective. Such portions of the structure shall be subject to further tests at the Contractor's expense, as directed by the Architect. Such tests may be compression of cores and/or load tests. Where load tests are impractical, tests shall be made on concrete in accordance with ASTM Standards C42 and C39. In case these tests are not satisfactory to the Architect, the defective concrete shall be removed and replaced at the Contractor's expense.

5. Air Entrainment: Tests for volume of air entrainment of fresh concrete at the mixer shall be made twice daily by the pressure (Airmeter) method in accordance with ASTM Standard Specifications C231-62. The tests shall be made at least four (4) hours apart. The latter test may be made by the Contractor.

6. Slump Tests: Contractor shall maintain a standard slump cone constantly available for the use of his Superintendent, as may be required by the Project Engineer, at the site of concreting operations.

7. General: The basis of rejection of material shall be determined according to the minimum requirements of this Specification and the applicable Standard Specifications of the American Society for Testing Materials; local or state requirements; or their suitability for use, as determined by the Architect.

3A.05 STORAGE OF MATERIALS:

A. No site mixing of concrete allowed.

B. All reinforcing steel, including dowels, shall be stored in neat piles at the site, clear of the ground in such a manner so that all bars can be readily identified when required. Cover with tarpaulins for protection against weather.

C. Any materials which are rejected shall be removed from the premises immediately.

3A.06 SHOP DRAWINGS:

A. Prepare detailed Drawings showing size, number, arrangement, location and bending details for all reinforcing bars, bar supports and other accessories.

B. Shop Drawings shall include setting diagrams, bar lists and bending details.

C. The approval of Shop Drawings will be for size, spacing, arrangement and type of bars. Any errors in dimensions shown on Shop Drawings shall be the responsibility of the Contractor.

D. Before starting operations, complete Shop Drawings and setting diagrams for the reinforcing steel shall be submitted and approved. They shall cover all reinforced concrete portions of the building and shall be submitted to the Architect for approval in accordance with GENERAL CONDITIONS. Submit one sepia and four prints for approval. Sepia only will be returned to Contractor.

E. The metal reinforcement shall be protected by the thickness of the concrete indicated on the Drawings. Where not otherwise shown, the thickness of concrete protection over the reinforcement shall be not less than the following:

1. Concrete deposited against ground without the use of forms, 3 inches.

2. Concrete exposed to the ground but cast in forms, 2 inches.

3. All concrete exposed to the weather, 2 inches.

4. Slabsnot exposed to ground or weather, 1" highrise 3/4 inch otherwise.

5. Beam tops and bottoms, columns and exposed slab edges 1-1/2 inches.

6. Beam sides, 2 inches (exposed after completion) or 1-1/2 inch, (not exposed after completion).

7. Walls not exposed to ground or weather, 3/4 inch.

F. Typical bending, placing and bar support diagrams are shown on the Drawings. For parts not shown, bending details and lengths shall conform to the requirements of the latest, issues of the ACI Building Code 318 and of the Manual of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315).

3A.07 SPECIAL AND MINIMUM REINFORCING STEEL REQUIREMENTS:

A. Where walls or other items are shown as built integrally with other sections, but are placed as separate pours, dowels must be provided. Dowels shall be same size and spacing as reinforcing, but in no case less than the #4 bars at 12" on centers each face, with not less than 36 bar diameters embedment at each end.

B. Main reinforcing bars shall not be spliced unless noted on the Drawings or approved by the Project Engineer. Such splices shall have a minimum lap of 36 bar diameters. Continuous reinforcing shall be lapped 36 bar diameters, but not less than 12 inches. Welded wire fabric shall be lapped one space between parallel rolls and two spaces at the ends of rolls.

C. The minimum requirements for flexural and shrinkage and temperature reinforcement shall be in accordance with ACI 318, unless otherwise noted on the Drawings.

D. Grade beams shall have a minimum of 2 #6 bars continuous top and bottom, unless noted otherwise on the Drawings.

3A.08 PROPORTIONING AND MIXING CONCRETE.

A. Concrete Mix Design: (Method 1 or 2) The Contractor shall employ an accredited testing laboratory and at least thirty-five (35) days prior to placing of concrete work, the Contractor shall submit to the laboratory samples of the materials to be used in the work, in order that the laboratory may determine the proper proportions for concrete mixes that will be plastic and workable during placement, that will avoid honeycomb and segregation, and that will attain the required strength.

1. The proportions of cement, admixture, aggregates and water shall be such as will produce a mixture that will work readily into the corners and angles of the forms and around the reinforcement without excessive puddling or spading and without permitting the materials to segregate or excess free water to collect on the surface. Entrained air shall be not less than 3% nor more than 5%.

2. Concrete shall be mixed in the proportions proposed for the work and laboratory shall submit to the Architect a detailed report of the 7-day and 28-day test strengths of the concrete thus obtained. The strength determinations shall be made on the basis of not less than 5 concrete test specimens for each age and each class of concrete specified. The test specimens shall be made with the admixtures or densifiers the Contractor proposes to use. Strength of concrete shall be determined by American Concrete Institute Building Code ACI 318, Chap.4.4.

3. The laboratory tests shall indicate strength at least 15% higher than required for each concrete classification.

4. The laboratory shall make proper adjustments for mechanical vibrations and any special handling or compacting devices or equipment to be used on the job.

5. All concrete shall have a 28-day compressive strength of not less than 3,000, 4,000, 5,000, 6000, 7500 or 9000 pounds per square inch as noted on the Drawings. Except as otherwise noted the water content, including the surface moisture of the aggregate, shall not exceed the amount indicated by the laboratory design mixes.

6. All exposed concrete and all concrete below grade shall have an admixture of Pozzolith or Placewell. The amount of each admixture shall be:

Pozzolith - 1/4 lb. per bag of cement

Placewell - 1 lb. per bag of cement

7. With the use of admixtures the amount of mixing water shall be reduced not less than 10% and the minimum cement factor shall be 5 bags per cu. yd. of concrete.

8. The methods of measuring concrete materials shall be by weight and shall be such that the proportions can be accurately controlled and easily checked at any time during this work.

9. The combined aggregate shall be of such composition of sizes that when they are separated on a No. 4 standard sieve, the weight passing sieve (fine aggregate) shall not be less than 30% nor greater than 50% of the total.

10. Uniformity of color and texture shall be maintained on all exposed interior and exterior walls.

11. The Contractor shall be responsible for attaining the design strength of the concrete. A change in the source of cement or aggregates will require new design mixes as indicated before hand.

12. Mixing of Concrete: Unless otherwise authorized by the Architect, the concrete shall be delivered to the site in ready-mixed equipment.

a. Ready-mixed concrete may be used provided the plant, equipment and method of operation are approved by the Architect, and conform to ASTM Specification C94. All ready-mixed concrete shall be placed in the forms within one hour after the addition of the mixing water. Equipment for transporting the concrete from the mixing plant to the building site shall be of the agitating type.

b. For ready dry-batched mixes, certificates shall be furnished for concrete strength and prior testing similar to those above specified for ready-mixed concrete. Ready dry-batched mixes shall be transported to the site in trucks having batch compartments of adequate size for the rated capacity of the mixer. Protect cement with tarpaulin while in transit. Add water to batch after discharge into the mixer, which must be within two (2) hours after the cement was added to the batch.

c. Strength requirements for ready-mixed concrete shall be the same as for job mixed concrete and procedures shall be such that the concrete has minimum 28-day compressive strengths of 15% higher than those specified, established in advance by tests made in accordance with methods described in ASTM Standards C39 and C192. No change shall be made in the materials of the established mix without prior approval from the Architect.

d. If ready-mixed concrete is used, each load shall have a ticket accompanying delivery upon which is listed the amount of all materials in the batch, including water. Tickets shall be kept on file by the Contractor. Unauthorized adding of water to the mix by the field forces, i.e., water beyond the quantities specified by the concrete suppliers, will be regarded a "breach of contract" and the contractor will be held liable for all remedial work.

e. Retempering or remixing of partially hardened concrete either with or without water, aggregates or cement will not be permitted. Any concrete that has become partly hardened shall immediately be removed from the site or disposed of as directed by the Project Engineer.

f. All equipment used for mixing or transporting concrete shall be kept clean and free from hardened concrete, dirt and other foreign materials at all times. All equipment shall be cleaned at the end of each period of operation, or oftener if so directed by the Project Engineer.

g. One brand of cement only shall be used unless written permission is given by the Architect to do otherwise.

h. All concrete produced under these Specifications shall contain a densifier as specified in this Seciton, used in accordance with manufacturer's recommendations and for the purpose of increasing strength, workability and density of the concrete to meet specified requirements.

i. All concrete above grade shall have purposeful air entrainment of 3% to 5%. Frequent measurement of the air content, as directed by Project Engineer and adjustment if necessary, shall be made to keep the air content within the limits specified.

j. Admixtures specified for air-entrainment shall be added to the mixture, at the mixer, by automatic mechanical means to assure uniformity in dosage, using the material in its delivered form or mixed with water as recommended by the producer.

k. If the densifying admixture does not contain air, the addition of an air-entraining agent will be required; this shall be Neutralized Vinsol Resin or Darex.

l. The Contractor shall furnish the Project Engineer with a continuous cumulative report of the volume of concrete and the numer of bags of cement in each pour.

B. Maximum Size of Coarse Aggregate and Slump: The maximum size of coarse aggregates and range of slump for the various parts of the structure shall be as set forth in the following table:

	Aggregate	Slump Range
Caissons, Caisson Caps, Retaining Walls, Footings	1" - 2"	3"* to 4"*
Slabs, Beams, Walls and other similar parts	3/4"	3" to 5-1/2"
Slabs on ground (including walks and curbs)	3/4"	5" maximum

*Note: Caissons can be 5 to 6 inches.

1. Where several classifications (as listed above) occur in the same placing operation, the smallest aggregate required for any portion shall be used for all portions.

2. The maximum size of coarse aggregate shall be, in any case, not larger than one-fifth of the narrowest dimension between forms of the member nor larger than three-fourths of the clear distance between the reinforcing bars.

3A.09 FORMWORK:

A. Forms shall be designed and built in accordance with the prepared "Recommended Practice for Concrete Formwork" ACI Committee #622, latest edition, of the American Concrete Institute. Provide camber for forms to compensate for deflection due to weight of concrete.

B. Forms, and all bracing and supports for same, shall be designed and constructed to withstand the pressure of freshly placed concrete. Temperature of the concrete at time of placing, effect of vibration, speed of placement the height of plastic concrete, and similar factors shall be considered in the design. Concrete surfaces that are to be exposed shall be free of misalignments or unsightly bulges.

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C. Forms shall conform to the shape, lines and dimensions of the members as shown on the plans. Provide for forming such shapes of concrete as shown on plans, such as drips, bevels, etc. Shapes shall be sharp, accurate and in alignment for purpose and design intended. They shall be properly braced or tied together to maintain position and shape an insure safety to workmen and passers-by. Forms shall be made sufficiently tight to prevent leakage of mortar. Typical panels for walls, columns, beams and slab forms shall be detailed and drawings submitted to the Architect for approval before forms are fabricated or erected. Removable sections shall be provided at sufficient intervals at the base of wall or column forms to allow cleaning and inspection before concrete is placed. Forms for exterior columns shall be one-piece in height. Construction joints occur only at floor lines, unless otherwise shown on plans. Exposed horizontal joints shall be straight and level.

D. The edges of form panels in contact, both horizontal and vertical must be located so as to coincide with horizontal and/or vertical grooves and/or score lines of exposed concrete shear walls, columns and beams as shown on Drawings. No exception will be permitted except by written permission of the Architect.

1. Forms shall be constructed of the following materials.

2. For concrete surfaces which will be left exposed after completion of all other work shown: Five Ply Waterproof treated plywood or other approved material to produce surface finish specified.

3. It shall be at the Contractor's option to use plastic surfaced plywood, masonite surface forms or to use new unsurfaced plywood for 2 or 3 re-uses. It shall be the Contractor's responsibility to produce smooth, even concrete surfaces which do not show form marks or wood grain marks.

4. For all other concrete: Metal or lumber of any variety which is free from knot holes and large dead knots and which is surfaced on at least one side and two edges, or approved equal materials.

E. On wall forms, when the outside form is erected and reinforcement is in place and before the inside form is erected, the Project Engineer shall be notified and the inside form shall not be placed until work already done is approved. Open joists which would permit leakage of grout shall be sufficient cause for rejection of forms. If, in the opinion of the Project Engineer, pointing an ocassional slightly open joint will prevent leakage, then such pointing shall be done with a mixture of equal parts of beef tallow and Portland Cement, or wood putty as manufactured by the Sanogran Co. Pointing shall be carefully done and there shall be no trace of the pointing mixture on the surface of the sheathing.

F. Formwork surfaces shall be coated with non-staining form oil before reinforcing is placed. Forms shall be checked just prior to placing concrete and tightened to produce flush surfaces.

G. Provision shall be made for chases, offsets, openings, depressions, curbs and bulkheads. Slot and chamfer strips shall be placed in the forms when and where specified, shown on Drawings, or when directed by the Project Engineer.

H. The shores and supports for the formwork shall have ample strength to support all applied loads without settlement. The sills shall rest on solid ground free from frost.

I. Forms shall produce concrete surface finishes that are reasonably smooth, level and in place. The edges of form panels in contact shall be in the same plane within a reasonable tolerance. There shall be no bulges or depressions higher or deeper than 3/16" in 4 feet. Where forms for permanently exposed surfaces of ceilings, beams and columns are lined with plywood, masonite or other material producing a smooth concrete surface, such surface need not be rubbed after the forms are stripped, except as required to eliminate joint marks, fins, rough spots or similar blemishes which impair an otherwise smooth unmarked surface. Such rubbing as may be required to produce the required finish shall be done with dry carborundum stones immediately after the forms are stripped.

J. Particular care shall be taken in the construction of the forms and in the depositing and vibrating of the concrete to produce a uniformly smooth finish of consistent color that shall be equal, in the opinion of the Project Engineer, to what should be obtained by skilled and careful workmanship and strict adherence to these Specifications.

K. The Project Engineer reserves the right to require the Contractor to remove and reconstruct such work or to resurface such areas as are not acceptable. Forms shall be constructed so as to prevent leakage and to permit their removal without damage to the finished surfaces.

L. Lumber and plywood once used in forms shall have nails withdrawn and surfaces to be in contact with concrete shall be fully cleaned before being used again.

M. Construct forms for beams and girders so that sides may be removed without disturbing bottom of form or its supports.

N. Footings, pads, curbs and bases for equipment requiring same in the Mechanical and Electrical Divisions of these Technical Specifications, are to be provided under this Section of work.

O. Form ties approved by the Architect shall be used. They shall have a minimum working strength when fully assembled of at least 3,000 lbs. Ties shall be so adjustable in lengths as to permit tightening of forms and of such type as to leave no metal closer than 3/4" of the surface and they shall not be fitted with any lugs, cones, washers or other device to act as a spreader within the form or for any other purpose which will leave a hole larger than 7/8" in diameter or a depression back of the exposed surface of the concrete. Wire ties will not be permitted.

P. Ties that are to be pulled from the wall shall be coated with cup grease or other approved material to facilitate removal. Fill and rub down tie holes in exposed concrete or precast concrete plugs.

Q. The elevator hatchway requires plumbness of walls from elevator pit to penthouse. The maximum tolerance for variance for the entire height is 1" from top to bottom, and any excess out of plumbness shall be corrected in a manner approved by the Project Engineer.

R. Provide slots in concrete slabs as required to receive cast iron elevator door sills.

S. Sleeves, Anchors, Inserts and Conduits: After forms are erected and before reinforcement is placed, all inserts for mechanical, electrical ,and such other trades, shall be set in place by the trade involved. Other sleeves, anchors, inserts, anchor bolts, specialties, and similar items embedded in the concrete shall be furnished, accurately located, and set by the Contractor. In general, electrical conduits shall be placed between the upper and lower reinforcement. No conduit shall exceed in outside diamter 1/3 of the thickness of the concrete in which it is embedded.

3A.10 BUILT-IN WORK:

A. Conduits in concrete shall not be placed closer together than three (3) diameters on centers, except at points of crossing and at cabinet boxes. All conduits shall have a minimum clear distance of 1" from the finished concrete surface.

B. Reinforcement shall be adjusted to fit the sleeves, inserts, and openings, using additional bars where required around openings.

C. Furnish and install No. 16 gauge dovetail type anchor slots in concrete columns, beams walls or other concrete work vertically to receive anchors for anchoring masonry wall construction. The Contractor has the option to shoot anchors into the concrete in lieu of using dovetail slots.

D. Furnish and install reglets to receive flashings or gravel stops.

3A.11 CHASES, OPENINGS:

(1) A. All chases, bulkheads, or slots required, whether indicated on plans or not, shall be installed before any pouring is done. Notify the Contractor for other Sections of work in due time, so they may make the necessary installations, on schedule and prior to pouring.

B. Contractor shall check the sizes and locations of all openings and other work which is to be "Built-In".

C. Before pouring any floor, Contractor shall check to determine that, where required, the trades have provided proper information or installations as to the location of any openings through concrete, and be responsible for their placement and accuracy of location even though provided, where specified, by other Sections of work.

D. Lay out on all floor forming the principal partitions to establish the locations of openings in surrounding partitions in order to permit the mechanical trades to properly locate their respective installations.

E. Openings for mechanical trades shall be provided by their respective Sections; all other openings are to be installed under this Section.

(1) Add. "The contractor may core for vertical sprinkler lines with prior approval of architect/structural engineer".

F. Pipe sleeves for pipes through walls or beams or columns, or slabs, shall be of galvanized steel pipe furnished and installed by the respective Sections requiring them, and shall require the approval of the Project Engineer. Under no circumstances shall sleeves passing through principal structural members be installed if their location is such that proper spacing of reinforcement is not possible.

G. Sleeves for passing of pipes through slabs shall be of steel pipe, 1-1/4" above floor in stairs, penthouse levels and elsewhere where code requires projection above the slabs for electrical and communication risers. In other locations they can be plastic.

3A.12 CONCRETE FLOOR CONSTRUCTION:

A. Reinforced concrete floor slab construction shall be placed over wood or metal forms, properly braced, tied and supported.

B. Forms shall be removed in accordance with Section titled "Stripping of Forms". The Project Engineer reserves the right to prohibit the removal of formwork when deemed unsafe, but his permission for their removal shall not relieve the Contractor from responsibility for the safety of the construction with forms removed.

C. The Contractor shall leave for a longer period at least one line of shores in center of floor slab panels and two supports under all beams and girder spans. When required for carrying on other work or when directed by the Project Engineer the Contractor shall, without endangering the work, request the change of any shoring in place. A competent and experienced foreman shall be in charge of the removal of forms. Forms removed shall not be allowed to accumulate.

D. Contractor shall submit detail Drawings to the Architect for approval showing the method of formwork he proposes to use, and showing the sizes of materials, spacing, bracing, etc., complete. The formwork for floor slabs shall be so designed and formed of such panels as will provide a smooth even plane ceiling free of honeycombs and ridges.

E. All slabs shall be made of thickness noted on Drawings or Schedule. Bars shall be set up from bottom of concrete as shown or directed.

F. Provide additional bars around all openings in concrete slabs as shown or as directed.

G. Properly provide for sleeves, inserts, etc., set in place by PLUMBING, HEATING, VENTILATING, ELECTRICAL WORK and other Sections of Work, building in all slots, anchors, elevator beams, pipe rail standard inserts, stair and curb nosing fastening device, "Job Built" stair forms and reinforcing, hangers, inserts, etc., as furnished by others and as directed by them.

H. Properly frame for stairways, stairway beams, elevator shaft beams, pipe shafts, and other openings, as shown or directed.

I. Slabs shall be finished to true and even plane, smooth and at proper heights for reception of finished floors and suitable to receive same.

J. Provide and frame all openings in floors as shown on Drawings or as directed by the Project Engineer. If not shown, the framing shall be built of strength equal to that of adjacent construction.

3A.13 REINFORCEMENT PLACING:

A. Cleaning and Bending:

1. Metal reinforcement before being placed shall be thoroughly cleaned of mill and rust scale and of coatings that will destroy or reduce the bond. Reinforcement appreciably reduced in section shall be rejected. Where there is delay in depositing concrete, reinforcement shall be reinspected and when necessary, cleaned.

2. Bends for stirrups, ties and other bars shall be made around a pin having a diameter not less than recommended by the Manual of Standard Practice for Detailing Reinforcing Concrete Structures, ACI 315. All bars shall be bent cold, in accordance with the requirements of the ACI 315.

B. Bending and Straightening:

1. Reinforcement shall be carefully formed to the dimensions indicated on the plans.

2. Metal reinforcement shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the plans shall not be used. Heating of reinforcement will be permitted only when the entire operation is approved by the Project Engineer.

C. Placing:

1. Metal reinforcement shall be accurately positioned and secured against displacement by using annealed wire of not less than No. 18 gauge or suitable clips at intersections and shall be supported in a manner that will keep all metal away from the exposed surface of the wall. Nails shall not be driven into the outside forms to support reinforcement nor shall any other device for this purpose come in contact with the outside wall form except that wood strips shall be inserted between the reinforcement and the forms at intervals to maintain the required clear distance between the reinforcement and the inside and outside surfaces of the concrete. The strips shall be pulled up and removed from the walls as the level of the concrete rises. All reinforcing steel shall be rigidly supported and accurately located and held in position by the use of proper reinforcing steel supports, spacers and accessories in accordance with the Drawings and "Manual of Standard Practice for Detailing Reinforced Concrete Structure" (ACI 315) and "Recommended Practice for Use of Metal Supports for Reinforcement" (ACI-319), except as otherwise noted.

2. Slab and beam reinforcing supports shall be of the spacer type. All legs of all reinforcing supports shall be such that the end of the leg rod does not mar the form. Supports shall have legs connected to prevent spreading under load of reinforcing.

3. Typical samples of all types of accessories shall be submitted to the Architect for approval before installation.

D. Splicing:

1. Wherever it is necessary to splice reinforcement otherwise than as shown on the plans, the character of the splice shall be decided by the Project Engineer on the basis of allowable bond stress and the stress in the reinforcement at the splice.

2. All bars shall be lapped at least 36 diameters at all corners and at abrupt changes in directions of walls.

E. Splices and Offsets in Reinforcement:

1. In slabs, beams and girders, splices of reinforcement at point of maximum stress shall generally be avoided. Splices shall provide sufficient lap to transfer the stress between bars by bond and shear.

2. Where changes in the cross-section of a column occur, the longitudinal bars shall be offset in a region where lateral support is afforded. Where offset, the slope of the inclined portion shall not be more than 1 in 6, and in the case of tied columns, the ties shall be placed not over 3 inches on centers for a distance of 1 foot below the actual point of offset.

3A.14 PREPARATIONS PRIOR TO DEPOSITING CONCRETE:

A. Cleaning Equipment: Before beginning a run of concrete, hardened concrete and foreign materials shall be removed from the inner surfaces of the mixing and conveying equipment. All conveyance, buggies or barrows shall be kept clean during the placing of the concrete.

B. Preparation of Place of Deposit:

1. Before beginning the placement of concrete, all water, ice, snow and other foreign materials shall be removed from the spaces to be occupied by the concrete. Use of chemicals for melting snow or ice is prohibited.

2. All sleeves, anchors, anchor slots, keys, inserts, and other items must be in proper position and securly anchored. Bulkheads limiting the operation shall be set in a manner satisfactory to the Project Engineer.

3. Any flow of water into an excavation where concrete is to be placed shall be diverted through proper side drains to a pump or be removed by other approved methods which will avoid washing the freshly deposited concrete. If directed by the Project Engineer, water vent pipes and drains shall be filled by grouting or otherwise after the concrete has hardened.

4. Concrete shall not be placed until all reinforcement is securely and properly fastened in its correct position, nor until the forms have been inspected and approved by the Project Engineer and form ties at construction joints have been retightened, nor until all bucks, sleeves, hangers, pipes, conduits, bolts, wires and any other fixtures required to be embeddded therein have been placed and anchored by the Contractor, nor until the forms and reinforcement have been cleaned and the forms oiled or lacquered as specified. Concrete shall not be placed at any time except under the direct supervision of the Project Engineer, nor outside of regular working hours unless the Project Engineer is notified at least 4 hours in advance and the Project Engineer is on the job.

5. All reinforcement within the limits of a day's pour shall be in place and secured in sufficient time to complete inspection before concreting begins.

6. Top surface of walls or columns or walls below shall be cleaned of all laitance, dirt or any loose materials.

C. Depositing Concrete: Concrete shall be taken from the mixer, or in the case of ready-mixed concrete, from the transporting vehicle, to the place of final deposit as rapidly as practicable in carts, buggies, conveyors, or by methods which shall prevent the separation or loss of ingredients. Under no circumstances shall concrete that has partially hardened be placed. Concrete shall be deposited in the forms as near as practicable to its final position, to avoid rehandling. The free drop in walls shall not exceed 10 feet, and greater free drops shall be prevented, where necessary, by the use of sectional chutes. Every possible precaution shall be taken to prevent separation or loss of the ingredients while transporting the concrete. Delivery carts or buggies shall be kept on temporary runways built over the floor system and runway supports shall not bear upon reinforcing steel or fresh concrete. The concrete shall be so deposited as to maintain, until completion of the unit, a plastic surface approximately horizontal.

D. Placing:

1. Special care must be exercised to prevent segregation of the concrete and to prevent splashing the forms or reinforcement with concrete and any such splashes or accumulations of hardened or partially harened concrete on the forms or reinforcement above the general level of the concrete already in place must be removed before the work proceeds. Concrete shall be placed through canvas (elephant trunks) or galvanized iron chutes equipped with suitable hopper heads. Sufficient illumination shall be provided in the interior of the forms so that the concrete at places of deposit is visible from the deck and runways.

2. Concrete shall be placed at a rate to avoid bleeding water to top surface and to allow for settlement. Space to thoroughly embed all reinforcement and fixtures. Spading shall be supplemented by tapping the forms with rubber hammers or wooden mallets or by light pneumatic or electric hammers (chipping guns) applied to the studs and walls at the level of the concrete being placed. When forms are removed, surfaces shall be even and dense, free from aggregate pockets or honeycomb.

E. Placing With Vibration:

1. Concrete will be placed with the aid of mechanical vibrating equipment. Where vibration is used, it shall be applied directly to the concrete unless otherwise approved by the Project Engineer. The intensity of vibration shall be sufficient to cause flow or settlement of the concrete into place. Vibration shall be applied at the point of deposit and in the area of freshly placed concrete. It shall be of sufficient duration to accomplish thorough compaction and complete embedment of reinforcement and fixtures, but shall not be long enough to cause segregation of the mix. To secure even and dense surfaces, free from aggregate pockets or honeycomb, vibration shall be supplemented by hand spading in the corners and angles of forms and along form surfaces while the concrete is plastic under the vibratory action. Transporting concrete in forms by vibratory equipment is prohibited.

3660 Delete and sustitute "All steel at exposed slab edges to CONCRETE be properly spaced and supported with slab bolsters. Structural engineer to provide detail".

2. Concrete in wall section shall be placed in layers not to exceed 24 inches in depth and each layer shall be puddled into place by methods which will not cause segregation of the ingredients. Mechanical vibrators shall be equipped with rubber tips and shall be operated under experienced supervision. Forms shall be constructed to withstand the pressure created by their action. Surfaces shall be smooth and free from voids and honeycomb caused by stone pockets.

3. Concrete within any one section of the building shall be deposited continuously, or in frequent layers so that no concrete will be placed on older concrete which has hardened sufficiently to result in seams and planes of weakness within the section. If a section cannot be placed continuously construction joints may be located at points provided for in the Drawings or approved by the Project Engineer. Such joints shall be made as hereinafter specified.

4. It is the Contractor's responsibility to see that the concrete, however mixed or transported, has the required quality at the time it is deposited in the forms. When difficult placing conditions are encountered, he may, with prior approval from the Project Engineer, use a limited amount of mortar from which the coarse aggregate has been omitted.

5. Accumulations of water on the surfaces of the concrete during placing and compaction shall be prevented as far as possible by adjustments in the mixture. Provision shall be made for the removal of any water that may accumulate so that under no circumstances will concrete be placed in such an accumulation.

F. Construction Joints and Stoppages:

1. The placing of concrete shall be carried on continuously between construction joints shown on the Drawings. If for any reason it shall become necessary to stop the placing of concrete at places other than those indicated such places shall have the approval of the Project Engineer.

2. For Continuous Reinforced Concrete Footings and Grade Beams: Joints shall be located at or near the middle of the clear distance between the bearing walls or columns. Keys shall be provided as required for shear and as directed by the Project Engineer.

3. Immediately after concrete placement is completed, the reinforcement projecting above the concrete shall be thoroughly cleaned. The surface of the concrete shall be level where ever a run of concrete is stopped. To insure a level, straight joint on the exposed surface of the walls, one of the following methods shall be used:

a. METHOD 1 - A strip of 1 inch square-edged dressed board shall be set level and tacked to the forms at the outside surface of the wall. The concrete shall be carried about one-half inch above the underside of the strip. About one hour after the concrete is placed the strip shall be removed and any irregularities in the joint line shall be leveled off with a screed. The following day all laitance shall be removed with a stiff wire brush, leaving the aggregate exposed.

b. METHOD 2 - The form sheathing shall be stopped exactly at the elevation of the construction joint and shall be brought to a true level line. The concrete shall be heaped up above the joint and the excess concrete shall be struck off to the level of the top of the sheathing. Surface of the concrete between outside form and reinforcement shall be screeded and the concrete back of reinforcement shall be wire brushed, the following day to expose the aggregate.

4. Vertical stops shall be placed at interior corners only, unless otherwise shown on the Drawings or approved by the Project Engineer.

5. Joints not indicated on the plans shall be made and located as to least impair the strength of the structure. Where a joint is to be made the surface of the concrete shall be thoroughly cleaned and all laitance removed. In addition to the foregoing, vertical joints shall be thoroughly wetted and slushed with a coat of cement grout, as hereinafter specified, immediately before the placing of new concrete.

6. At least 2 hours must elapse after depositing concrete in the columns or walls before depositing in beams, girders or slabs supported thereon. Beams and girders shall be considered as part of the floor system and shall be placed integrally therewith.

7. Construction joints in floors shall be located near the middle of the spans of slabs, beams, or girders, unless a beam intersects a girder at this point, in which case the joints in the girders shall be offset a distance equal to twice the width of the beam. Provide suitable approved dowels for construction joints.

G. Bonding: Before depositing freshly mixed concrete on or against hardened concrete, the forms shall be retightened. The surfaces of the hardened concrete shall be roughened as required by the Project Engineer and cleaned of all loose particles, damaged concrete, foreign matter, and laitance. They shall then be saturated with water.

H. Samples: Two samples of each type of concrete to be used where left exposed shall be submitted to Architect for approval of color and finish. If concrete from more than one manufacturer is proposed, samples of each must be submitted. (Attention is called to Paragraph 9, page 4-10, and Paragraph B, page 4-1 regarding the use of concrete by only one manufacturer.)

I. These samples must be 1'-0" x 2'-0" x 3" thick, identified as to name of manufacturer of concrete, and designation of building where to be used. After approval by the Architect, they will be kept at the job office.

3A.15 COLD WEATHER REQUIREMENTS:

A. Protection - When Required: When placing concrete at or below a temperature of 40°F., or whenever in the opinion of the Project Engineer, atmospheric temperatures will probably fall below this limit within the next 24 hour period after placing concrete, the mixing water and aggregates shall be heated and the freshly placed concrete protected by adequate housing or covering and heating.

B. Equipment: Contractor shall have on the job, ready to install, adequate equipment for heating the materials and for maintaining the proper temperature for the freshly placed concrete and for enclosing the work in accordance with the requirements specified herein.

C. Temperature of the Concrete: When the temperature of the surrounding air is below 40°F., the concrete when placed in the forms, shall have a temperature of not less than 50°F., nor more than 80°F. Freshly placed concrete shall be maintained at a temperature of not less than 70°F., for 3 days or 50°F., for 3 days for high early strength concretes. The methods of protection and curing shall be such as to prevent evaporation of moisture from the concrete and injury to the surface. If Type II Portland Cement is used, consult the Project Engineer for supplementary heating instructions.

D. Temperature Records: A permanent temperature record shall be kept, showing the date, hour, outside temperature, and temperatures at several points within the enclosure to show the most favorable and unfavorable conditions to which the concrete is subjected. Thermometer readings shall be taken at the start of the work in the morning and again in the late afternoon and the data so obtained shall be recorded in such manner that it will show the location of each reading and any conditions which might have an effect on the temperature. A copy of the temperature record shall be sent to the Project Engineer at the close of each day's work.

E. Methods of Heating and Protection:

1. Before depositing any concrete, the Contractor shall submit for the approval of the Project Engineer, the proposed method to be used for protecting the concrete against low temperature.

2. The Contractor shall provide adequate fire protection accessible at the times of each floor where heating is in progress and shall maintain watchmen or other attendants to keep the heating units in continuous operation.

3. Heating appliances shall not be placed in such a manner as to endanger formwork or centering or expose any area of concrete by drying out or other injury due to excessive temperatures.

F. Heating of Materials: Either aggregates or water, or both as may be necesary, shall be heated with steam coils or other devices so that the average temperature of the concrete as it is deposited in a form shall fall within the limits specified above. Aggregates containing frozen lumps, ice or snow shall not be allowed to enter the mixer.

G. Anti-Freeze Compound: The use of salts, chemical or other foreign materials such as $CaCl_2$ in the mix to lower the freezing point of the concrete is prohibited without prior approval of Structural Engineer.

H. Preparation of Forms:

1. Before placing the concrete in any form or on any surface, or around reinforcement, heat shall be applied in such a manner that ice or snow shall be completely removed. The use of $CaCl_2$ or other chemicals to melt snow or ice in forms is prohibited.

2. No concrete shall be placed on a subgrade that is frozen or on one that contains frozen materials, and precautions shall be taken to prevent the soil that supports the concrete from freezing and heaving after placement.

I. Removal of Forms During Cold Weather Operations:

1. Forms shall remain undisturbed until the concrete has attained sufficient strength to sustain its own weight and a live load of 20 lb. per sq. ft. in addition to any temporary or permanent load that may be placed upon it during the building of the structure. Beam sides, column forms, or forms for walls may be removed as soon as the concrete has attained sufficient strength to sustain its own weight, provided that such action does not endanager any part of the structure.

2. In the opinion of the Structural Engineer, based on the records and the conditions of the concrete, the removal of the forms is likely to endanger the whole or any part of the structure, forms shall remain in place for such an additional period of time as may be necessary to insure safety; provided, however, that no slab and beam form shall be wholly or partly removed in less than 3 days and no slab or beam support in less than 21 days unless reshored to the satisfaction of the Structural Engineer.

3A.16 CURING AND PROTECTION:

A. All exposed surfaces of concrete shall be protected from premature drying, and freshly placed concrete shall be protected against wash by rain.

B. All concrete shall be protected immediately after placement to keep the temperature from dropping below 50°F., at any time during the first 5 days.

C. Before depositing any concrete, the Contractor shall submit for the approval of the Project Engineer, the proposed methods to be used for protecting the concrete against low temperatures.

3A.17 STRIPPING OF FORMS:

A. The time of removal of forms shall be approved by the Project Engineer. Forms shall not be distributed until the concrete has adequately hardened. Shoring shall not be removed until the member supported has acquired sufficient strength to safely support its own weight and the load imposed on the shored member. Care shall be taken to avoid spalling the concrete surface. Wood forms shall be completely removed from under dead spaces, steps and similar space through temporary openings if necessary, in order that no material will be left for termite infestation. Slabs and beams shall be reshored as required for the safety of the structure.

B. Clamps: Ties that are designed to be wholly withdrawn from the wall shall be pulled toward the inside face. The cutting of such form ties back from the face of the wall will not be permitted.

C. Timing: Under normal conditions, after placing concrete, the minimum waiting period before the forms may be stripped shall be governed by the 3/4 strength requirement. The use of this requirement shall not operate to relieve the Contractor of responsibility for the safety of the structure. Test cylinders or Schmidt Hammer Test shall be made for the purpose of determining stripping time. Test cylinders shall be cured under conditions for the portions of the concrete which the test specimens represent.

3A.18 PATCHING:

A. Concrete work in permanently exposed beams, walls, slabs, etc., consitutes the finished surface. As set forth in these Specifications, it is particularly desired that special care be given to the construction of forms, mixing and placing of concrete, and removal of forms in order that the finished surfaces obtained are of the highest quality obtainable within the scope of these Specifications and first-class workmanship.

B. Any concrete which is not formed as shown on the plans or for any reason is out of alignment or level or shows a defective surface, shall be considered as not conforming with the intent of these Specifications and shall be removed from the job by the Contractor at his expense unless the Project Engineer grants permission to patch the defective area, which shall be done in accordance with the following procedure. Permission to patch any such area shall not be considered a waiver of right to require complete removal of the defective work if the patching does not satisfactorily restore the quality and appearance of the surface.

C. After removing forms all concrete surfaces shall be inspected, and any poor joints, voids, stone pockets or other defective areas permitted by the Project Engineer to be patched and all tie holes shall be patched. Where necessary, defective areas shall be chipped away to a depth of not less than one inch with the edges perpendicular to the surface. The area to be patched and a space at least six inches wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar. A grout of equal parts of Portland Cement and sand, with sufficient water to produce a brushing consistency, shall then be well brushed into the surface, followed immediately by the patching mortar. The patch shall be made of the same material and of approximately the same proportions as used for the concrete except that the coarse aggregate shall be omitted. The mortar shall not be richer than one part cement to 3 parts sand. White Portland Cement shall be substituted for a part of the grey Portland cement to match the color of the surrounding concrete. The proportion of white and grey cements shall be determined by making a trial patch. The amount of mixing water shall be as little as consistent with the requirements of handling and placing. The mortar shall be retempered without the addition of water by allowing it to stand for a period of one hour during which time it shall be mixed with a trowel to prevent setting.

D. The mortar shall be thoroughly compacted into place and screeded off so as to leave the patch slightly higher than the surrounding surface. It shall then be left undisturbed for a period of one or two hours to permit initial shrinkage before being finally finished. The patch shall be finished in such a manner as to match the adjoining surface. On exposed surfaces where unlined forms have been used, the final finish shall be obtained by striking off the surface with a straight edge spanning the patch and held parallel to the direction of form marks. All patches shall be cured in a protected and moist condition.

E. Tie holes left by withdrawal of rods or the holes left by removal of ends of ties shall be filled solid with mortar after first being thoroughly wetted. For holes passing entirely through the wall a plunger type grout gun shall be used to force the mortar through the wall starting at the back face. A piece of burlap or canvas shall be held over the hole on the outside and when the hole is completely filled, the excess mortar shall be struck off with the cloth flush with the surface. Holes not passing entirely through the wall shall be filled with a small tool that will permit packing the hole solid with mortar. Any excess mortar at the surface of wall shall be struck off flush with a cloth.

F. Grout under and around all cast elevator door sills after sills and door frames are set and built in and the elevator hatchway is checked and approved for plumbness.

3A.19 CLEANING EXPOSED CONCRETE WORK AND CLEANUP:

A. No cleaning operations shall be undertaken until the walls of the building are entirely completed, including all patching and filling of tie holes. Cleaning portions of the concrete work as the work progresses will not be accepted as final cleaning.

5. Cleaning:

1. If, in the opinion of the Architect, the surface of the concrete shows a film of oil left from an excess of oil on the forms, or the concrete is oil stained, or is otherwise not of uniform color, he may require the following cleaning method to be used, in accordance with the final paragraph of this Section.

2. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistence of thick paint. White Portland Cement shall be used for all or part of the cement in the grout, as directed by the Project Engineer, to give the color desired. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout and apply the grout with a trowel or a spray gun uniformly, completely filling air bubbles and holes. Immediately after applying the grout, float the surface with a cork or other suitable float, scouring the wall vigorously. While the grout is still plastic, the surface shall be finished with a sponge rubber float removing all excess grout. This finishing shall be done at the time when grout will not be pulled from holes or depressions.

3. Next allow surface to dry thoroughly, then rub it vigorously with dry burlap to completely remove any dried grout. There shall be no visible film or grout remaining after this rubbing. The entire cleaning operation for any area must be completed the day it is started. No grout shall be left on the wall overnight.

4. After the entire concrete work has been grout cleaned, if any slightly dark spots or streaks remain, they shall be wiped off lightly with a fine abrasive hone without using water but the rubbing with the hone shall not be sufficient to change the texture of the concrete. This final operation shall be included as part of the grout cleaning.

C. Clean-Up:

1. Scrape all floors, walls, and other surfaces clean of concrete grout, drippings or other cementious materials used under this Section. Remove all forms, rubbish, material used in connection with this Section of the work, leaving floors broom clean for acceptance for partition layout and masonry operations.

2. All inserts imbedded in concrete to receive bolt installation for fastening shall be cleaned out of all concrete ready for bolt instalation by others.

3. Upon substantial completion of concrete operations, glazing and rubbish removal from interiors, and when so ordered by the Project Engineer, remove all rubbish waste concrete, broken concrete from site, cut anchor bolts in floors slabs for "tying" back towers, and patch floor to a smooth finish.

3A.20 CEMENT FINISHES - FLOORS AND CONSTRUCTION JOINTS:

A. General: All slabs on ground, structural concrete floors, roof and gallery slabs shall be one course construction unless otherwise shown.

1. To insure proper grades, levels and plans of the finished surfaces, screeds (of wood or metal with true and straight top edges) shall be set with proper elevations and at proper intervals (approximately 8 feet apart) and same shall be approved by the Project Engineer before concrete is poured.

2. Strike off concrete surfaces with "straight edges" at true line of surfaces between screeds.

3. After surface has been struck off, the entire surface shall be machine floated. Excessive floating shall be avoided.

4. After machine floating, and when sufficiently hard and dry, bring surface to a smooth, dense finish by troweling with steel trowel.

5. Steel troweling shall be continued until the surface has been finished to a smooth dense surface and level with a tolerance of 1/4 inch in ten (10) feet.

6. No dry materials, such as cement or cement and sand mixture, shall be permitted for use to fill depressions. Where low spots occur, concrete shall be used and "worked into" and bonded with the slab.

7. Construction joints in the typical floors shall be located at or near the middle of the span. Contractor shall indicate on Shop Drawings location of construction joints subject to approval of the Architect.

8. For Concrete Floors, Slabs and Aprons on Fill: All large area floors, slabs, and aprons on fill shall be divided into panels by full depth joints without keys or fillers, but with the reinforcing continuous across the joint. The concrete in the panels shall be placed in alternate sequence to permit the panels placed first to harden and develop their initial shrinkage before the alternate ones are placed. The joints shall be vertical and in straight lines, with all top edges finished with a 1/8" radius. Caulk joints with control joint sealer.

B. Watertight Concrete: All pits, walls and floors below grade and exposed portions of first floor to be absolutely waterproof and free from leakage for a period of 12 months after completion of the work. Work is considered complete upon issuance of the final certificate. Should leakage develop in any of these items, the region near the leak shall be waterproofed by the Contractor with ironite. This shall be repeated, if necessary until all leakage has been stopped.

C. Slab Finishes, Miscellaneous:

1. Outside area stair treads and slabs shall be floated to a surface which shall be level or pitched as shown on Drawings, with a tolerance not exceeding 1/4" per 10'-0".

D. Concrete Floors on Soil or Fills:

1. The subgrade under floors must be leveled off and uniformly compacted. Soft or spongy pockets shall be removed and backfilled with sand and compacted until the area is firm and unyielding.

2. The 5" immediately below the slab shall consist of a layer of clean crushed stone or gravel, compacted in place. The concrete slab laid over this shall have the same composition and finish as is specified for typical concrete floors. The slab shall be placed in panels in alternate sequence, as specified under "Cement Finishes - Floors" and as shown on the Drawings.

3. For areas where additional fill is required, the fill shall be installed as specified in Section 2A..

4. Chairs and supports for reinforcing shall rest on cement brick, pads of grout, or other similar non-organic material to prevent displacement or settlement of reinforcing steel during the placing of the concrete.

E. Joint Filler: Where shown or required, in sidewalks, curbs, etc., the Contractor shall install non-extruding premolded expansion joint material 1/2 inch thick, conforming to ASTM Specification D544, Type I or V.

F. Cold Joint Water Stops

1. Shall be Waterstop-RX as manufactured by American Colloid Company or approved equal. Waterstops shall be installed in all concrete joint locations below the Basement Floor (elevator pits, Mechanical, Switch Gear and Commonwealth Edison vaults) including where the foundation wall meets the footing and/or slab, at the pour joint of walls and/or slabs, where pipes, conduits etc. pass thru walls and elsewhere as shown on the drawings.

a. Use 1" x 3/4" size unless the smaller 3/4" x 3/8" size is recommended by the manufacturer.

b. Surface Preparation: Joint surfaces to be clean and dry.

c. Application: Butt ends of preformed sealant together (never overlap). Leave protective release paper on Waterstop-RX during application. Nail in place 2'-0" with concrete cut nails to prevent displacement of Waterstop-RX during the pour, or Volclay's adhesive primer.

d. The Contractor shall install these waterstops in accordance with manufacturer's instructions.

e. These cold joint water stops are not designed as expansion joint sealers.

G. Floor Sealers:

1. Parking Structure, Garage and Loading Dock Slabs:

a. See Addendum 1.

2. All Other Exposed Concrete:

a. See Addendum 1.

3. The surfaces to receive the sealer is to be free of mortar debris, dirt and/or dust

Stair Forms:

1. Scope: Furnish and install for the stairs as shown on the Architect's Drawings.

2. Materials: Stair forms shall consist of job-built and formed concrete risers, reinforcing bars and 1/2" temperature rods, ASTM A15, and A305, together with reinforcing steel through the landings where indicated on the Drawings, of size and spacing necessary to provide a minimum of 100 lb. live load per square foot.

3. Fabrication: Stairs shall have uniform riser and tread spacing, all according to dimensions on Drawings. Reinforcing rods shall not sag or shift.

4. Shop Drawings: Before any fabrication is begun Shop Drawings shall be submitted for approval. In addition, the Contractor shall verify job conditions for all dimensions.

5. Erection: Stair units shall be erected plumb, square and in proper alignment. Contractor to anchor forms securely and check dimensions before pouring concrete. Care shall be taken to obtain a clean and smooth finish on all exposed concrete surfaces of the finish stair through the use of plastic faced plywood or masonite.

6. Cleaning: Stairs shall be cleaned of excess mortar.

I. Concrete Work for Other Trades: The Contractor shall install all concrete foundations for mechanical equipment, such as fans, coils, pumps, oil tank, pad for fire control panel; and concrete bases for light standards, meter vault, etc., and electrical transformer vault, as directed, and be responsible fo the proper location and installation. The templates, details, sleeves and bolts will be furnished as specified under the respective trade sections.

3A.21 POST TENSIONING:

A. General:

1. This Section includes the furnishing and installation of all post tensioning work in connection with the parking facility/garage.

2. Provide all of the articles, materials, operations or methods mentioned to/or as indicated and subject to all of the qualifications noted herein.

3. Perform each operation prescribed; and provide therefore all necessary labor, equipment and incidentals.

4. Contractor shall furnish and be responsible for materials, labor and experienced supervision to install post tensioning system on this project.

5. Supplier shall have had adequate previous experience in post tensioning or shall provide full time technical supervision from the post tensioning system manufacturer.

6. System used shall be the Cona Single Strand System as manufactured by Inryco, Inc., or approved equal.

7. Approval for other post tensioning manufacturers must be received prior to bid openings.

8. Post tensioning is to be used in combination with mild steel reinforcing. Refer to the drawings for limits of each system.

B. Stresses:

1. Final effective stress on tendons shall be .6 times ultimate stress.

C. Inryco Single Strand System:

1. Materials:

a. Strand: 7 wire strand shall conform to ASTM Spec. A-416 with a minimum ultimate strength of 270,000 psi.

b. Anchorage: All anchorage components as supplied by Inryco, Inc., Post Tensioning Division, shall meet the minimum requirements as set forth in the "Guide Specification for Post Tensioning Materials," as prepared by the Pre-Stressed Concrete Institute.

c. Strand Coating: Shall be the rust preventative and lubricant compound as formulated for Inryco, Inc.

d. Sheathing: The sheathing shall be impervious to cement past allowing slippage of the strand. The sheathing must not rupture due to normal temperature changes, coiling or normal field handling.

2. Tests:

a. The Contractor shall provide, upon request, test data confirming that the anchorage will develop the minimum guaranteed ultimate strength of the strand and an elongation at rupture of not less than 2.5%. Certified mill reports of the strand used shall be supplied showing ultimate strength, percent of elongation at rupture and modules of elasticity.

3. Systems:

a. The post tensioning system shown on the drawings is the Cona, unbonded single strand system as furnished by Inryco, Inc., Post Tensioning Division. Other systems will be allowed, if equal. The engineer will be the sole judge as to whether another system is acceptable.

4. Manufacturing Procedure:

a. Tendons shall be manufactured in such sequence and quality as to avoid lengthy storage at the job site.

b. Broken strands and strand showing severe fabricating defects shall be removed and replaced or the member may be rejected.

c. All prestressing steel shall be satisfactorily protected from excessive rust or other corrosion prior to placement. Sufficient protection shall also be provided for exposed prestressing at the ends of members to prevent deterioration by rust or corrosion.

d. Tendons shall be clearly identified as called for on the placing drawings for easy placement.

5. Placing:

a. Post tensioning shop drawings showing complete details of pre-stressed members including the arrangement of prestressing steel and numbers, methods of maintaining strand alignment, type of post tensioning enclosures, detailing anchorage devices, calculations of friction and anchorage stresses, and other incidental features shall be submitted to the engineer for approval. When approved, shop drawings and data shall not be changed nor shall construction operations be deviated from unless resubmitted and reapproved. The engineer's approval of details and construction operations will not relieve the contractor of his responsibility for completing the work successfully in accordance with these specifications and within the contract time.

b. Tendons shall clear openings and drains by 3".

c. Slight deviation in spacing of the slab tendons is permitted where required to avoid openings and inserts which are specifically located.

d. Suitable horizontal and vertical spacers or chairs shall be provided as required to hold the tendons in true position. Chairs shall be placed so as to properly support the tendon. All strands in a given pour shall be full length without splices of couplers unless called for on the supplier's approved drawings.

e. Post tensioning tendons shall have convex and concave parabolic profiles and shall conform to the control points shown on the drawings. Dimensions located at this profile apply to the center of gravity of the tendon.

f. The post tensioned work shall be performed by an organization that has successfully performed previous installations of a major nature similar to the one involved in this contract.

g. No material shall be stored on prestressed slabs before final prestressing of slabs is accomplished. At no time shall the weights of the storage material placed on the slabs after prestressing is completed exceed the total design load of the slab.

6. Stressing:

a. All post tensioning shall be under the immediate control of a person experienced in this type of work. He shall exercise close check and a rigid control of all operations as necessary for full compliance with all requirements.

b. All prestressing steel shall be stressed by means of hydraulic jacks, equipped with accurate reading, calibrated hydraulic pressure gauges, to permit the stress in the prestressing steel to be computed at any time. A certified calibration curve shall accompany each jack. If inconsistencies between the measured elongation the the jack gauge reading occur, the jack gauge shall immediately be recalibrated. An agreement of withing 5% shall be satisfactory.

c. Stressing shall not be started until the concrete of the member has attained the designed strength and approved by the structural engineer.

d. The average working stress of the prestressing steel shall not exceed 60% of the ultimate strength of the steel.

e. The loss in stress in post tensioning prestressing steel due to creep and shrinkage shall be assumed to 15% of the guaranteed ultimate tensile strength unless there is data to warrant a change in this figure.

f. In no case shall the steel be tensioned above 80% of the ultimate tensile strength of the strand.

g. Inspection of the post tensioning field operation and records, if required, will be performed by the General Contractor.

h. Records shall be kept by the General Contractor of the elongation and tension applied to each strand and this shall be submitted to the structural engineer promptly upon completion of each member or slab. At the time of stressing the first member of each type, the individual tendon shall be checked to establish a procedure for insuring uniform results. At any time a recheck may be ordered by the structural engineer, if it appears that the designed stresses are not being attained.

i. Safety precautions shall be taken to prevent workers from standing above, in front or behind the jacks when tendons are being tensioned. These safety precautions are the sole responsibility of the Contractor.

j. A nominal tension in the tendons shall be maintained during concreting operations for slabs to maintain alignment of prestressing steel. If tendons move out of their designed positions they shall be adjusted to their correct position when necessary.

k. Slab forms may be removed immediately after the slab is tensioned.

7. Stressing Pocket Grouting:

a. Exposed post tensioning shall be coated with an approved bonding agent such as WELD-CRETE by Larson Products Corporation and then filled flush with a mix of cement, sand, pea-gravel and water. White cement shall be added as required for the filler to match adjacent concrete color when finished. This work shall be performed as soon as practical after stressing by the General Contractor.

b. Care shall be exercised in filling recesses to obtain flush clean surfaces to match the color character of the surrounding surfaces.

* * *

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(1) 1st line. Insert between words "be" and "Type" the words "and be of a color and texture equal to".
2nd line. Correct spelling of "Richter" to "Richtex".
3rd line. After work "Manganese" add "smooth TX. The allowance shall be $550 FOB job site, tax included."

4A-1 & 2 4A.03A. 7 and 13a.

(2) 7. 4th line. Add "Further the brick manufacturer shall certify, in writing, that the brick he supplies for this project is appropriate for use on this specific building."

CONC

3660

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JAMES MCHUGH CONSTRUCTION CO
COMMERCIAL BUILDING - 3660 N. LAKE SHORE DRIVE

88109720

CONTRACT		SIGNED BY MOSES CORDOVI FOR TECH PLAN	DELIVERED TO MCHUGH	SIGNED BY DICK MANN FOR MOE & F	DELIVERED TO WAVELAND ASSOC.
ORIGINAL CONTRACT VALUE..............	$363,500.00				
CHANGE ORDER #183A..................	$8,308.00	1/8/88	1/20/88	1/28/88	1/28/88
CHANGE ORDER #184A..................	$897.00	1/8/88	1/20/88	1/28/88	1/28/88
CHANGE ORDER #185A..................	$14,179.00	1/8/88	1/20/88	1/28/88	1/28/88
TECH PLAN PURCHASE ORDER TP 001098..	$1,934.84	1/4/88	1/4/88	NOT REQUIRED	NOT REQUIRED
TECH PLAN PURCHASE ORDER TP 001099..	$2,052.34	1/5/88	1/5/88	NOT REQUIRED	NOT REQUIRED
TOTAL CONTRACT VALUE................	$390,871.18				

PAYMENTS	AMOUNT REQUESTED	DATE REQUESTED	AMOUNT PAID	DATE PAID	AMOUNT DUE
MCHUGH APPLICATION # 1	$205,758.00	11/2/87	$205,758.00	11/13/87	$0.00
MCHUGH APPLICATION # 2	$142,440.00	12/11/87	$121,392.00	1/12/88	$21,048.00
MCHUGH APPLICATION # 3	$59,734.00	1/22/88	-	-	$59,734.00
MCHUGH INVOICE # 0800	$1,934.84	11/ /87	-	-	$1,934.84
MCHUGH INVOICE # 0808	$2,052.34	12/ /87	-	-	$2,052.34
	$411,919.18		$327,150.00		$84,769.18
DIFFERENCE OF AMOUNT REQUESTED AND PAID FOR PAY APPLIV\CATION # 2 IS $ 21,048. THIS AMOUNT WAS REREQUESTED IN PAY APPLICATION # 3.	$21,048.00		$0.00		($21,048.00)
NET AMOUNT REQUESTED............................	$390,871.18		$327,150.00		$63,721.18

105.00 Mail
1.00

EXHIBIT "C"

86109720

Joan Gress Stevens
c/o
Rekersen & Houpt
180 N. LaSalle
Suite 3400
Chicago IL 60601