

SPECIFICATIONS

FOR

SCHEDULE I: 4-BAY BOX HANGAR  
SCHEDULE II: ACCESS APRON

BATESVILLE REGIONAL AIRPORT

BATESVILLE, ARKANSAS

May 2024



**MILLER-NEWELL ENGINEERS, INC.**

P.O. Box 705

510 Third Street

M-N 22-044

Newport, AR 72112

Phone (870) 523-6531

e-mail: [milnewengr@aol.com](mailto:milnewengr@aol.com)

M-N 23-095

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TECHNICAL SPECIFICATIONS:

<u>Section No.</u>	<u>Section Title</u>	
01010	SCOPE OF WORK. . . . .	2 pages
01300	SUBMITTALS . . . . .	5 pages
01400	TESTING LABORATORY SERVICES. . . . .	3 pages
01560	TEMPORARY FACILITIES AND CONTROLS. . . . .	3 pages
02000	SUBSURFACE CONDITIONS. . . . .	1 page
02200	EARTHWORK. . . . .	6 pages
02700	STORM DRAINAGE STRUCTURES & APPURTENANCES. . . . .	9 pages
02730	ASPHALTIC CONCRETE PAVEMENT. . . . .	13 pages
02766	PAVEMENT MARKINGS. . . . .	2 pages
03300	CAST-IN-PLACE CONCRETE . . . . .	24 pages
05120	STRUCTURAL STEEL . . . . .	13 pages
07920	CAULKING AND SEALANTS. . . . .	2 pages
08350	ELECTRIC BI-FOLD DOOR. . . . .	2 pages
08360	OVERHEAD DOOR. . . . .	1 page
13121	PRE-FABRICATED METAL BUILDING T-HANGAR . . . . .	7 pages
16050	ELECTRICAL . . . . .	6 pages

INVITATION FOR BIDS

BATESVILLE AIRPORT COMMISSION

DATE: June 9, 2024

Sealed bids, subject to the conditions contained herein, will be received until 11:00 o'clock A.M., on June 25, 2024, and be read in the Conference Room of the Batesville Regional Airport Terminal, 1126 Batesville Boulevard, Batesville, Arkansas, for furnishing all labor and materials and performing all work for CONSTRUCTION OF 4-BAY BOX HANGAR AND ACCESS APRON AT BATESVILLE REGIONAL AIRPORT located in Batesville, Arkansas.

Copies of the Plans and Specifications are on file and may be inspected at:

Miller-Newell Engineers, 510 Third Street, Newport, AR  
Batesville Regional Airport, 1126 Batesville Blvd., Batesville, AR  
Dodge Plans Room, ([www.dodgeplans.construction.com](http://www.dodgeplans.construction.com))  
Construction Market Data ([www.cmdgroup.com](http://www.cmdgroup.com))  
Southern Reprographics, 901 West Seventh, Little Rock,

Plans, Specifications and wage rate decisions must be obtained from the Consulting Engineer upon payment of \$100.00; \$50.00 of which will be refunded upon return of Plans and Specifications in good condition within ten (10) days after receipt of bids.

Guarantee will be required with each bid as follows: A certified check on a solvent bank or a bid bond in the amount of five (5) percent of the total amount of bid, made payable to the Batesville Airport Commission.

In accordance with Act 150 of 1965, as amended, all bidders shall conform to the requirements of the Arkansas State Licensing Law for Contractors.

The Bidder (Proposer) must supply all the information required by the bid or proposal form.

It shall be a condition of the Contract, and shall be made a condition of such subcontract entered into pursuant to the Contract, that the Contractor and any subcontractor shall not require any laborer or mechanic employed in performance of the Contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health or safety, as determined under construction safety and health standards promulgated by the United States Secretary of Labor in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (83 Stat. 96).

Liquidated damages for delay will be provided in the Specifications.

Bids must be submitted on the specified bid form and the successful bidder will be required to execute the specified form of Contract for construction.

The right is reserved, as the the Batesville Airport Commission may require, to reject any and all bids and to waive any informality in bids received. Bidders are hereby notified that all bids may be rejected if the lowest responsive bid received exceeds the Engineer's estimate by

more than 7% and it is determined that an award of contract would cause excessive inflationary impact. No bidder may withdraw his bid within a period of 60 days from the date of the opening.

Envelopes containing bids must be sealed and addressed to the Batesville Airport Commission, Batesville, AR, and marked in the upper left corner as follows:

BID OF \_\_\_\_\_ (Contractor's Name) \_\_\_\_\_ FOR CONSTRUCTION OF 4-BAY BOX HANGAR AND ACCESS APRON AT BATESVILLE REGIONAL AIRPORT.

This Advertisement for Bids is being published by and paid for by the following:

Justin Thompson, Manager  
Batesville Regional Airport  
1126 Batesville Blvd.  
Batesville, AR 72501

The amount of this publication is \$ \_\_\_\_\_.

Kirk Warden, Chairman  
Batesville Airport Commission  
Batesville, AR

PROPOSAL FORM

TO: Chairman  
Batesville Airport Commission

1. The undersigned hereby certifies that he has examined the form of Contract, Plans and Specifications for CONSTRUCTION OF 4-BAY BOX HANGAR AND ACCESS APRON AT BATESVILLE REGIONAL AIRPORT, Batesville, Arkansas, and has examined the site of the work and is familiar with local conditions pertaining to the work.

2. The undersigned, in compliance with your Invitation for Bids dated June 9, 2024 hereby proposes to do the work called for in said Contract and Specifications and shown on said Plans, and to furnish all materials at the following rates and prices.

BID SCHEDULE

**BASE BID - SCHEDULE I - 4-BAY BOX HANGAR**

<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
Site Preparation	1	LS	\$ _____	\$ _____
Earthwork	500	CY	\$ _____	\$ _____
Foundation & Floor	1	LS	\$ _____	\$ _____
Hangar Building	1	LS	\$ _____	\$ _____
Building Erection	1	LS	\$ _____	\$ _____
Bi-Fold Doors	6	EA	\$ _____	\$ _____
Electrical/Lighting	1	LS	\$ _____	\$ _____
Miscellaneous	1	LS	\$ _____	\$ _____
Marking	1	LS	\$ _____	\$ _____
SCHEDULE I - TOTAL BASE BID			\$ _____	

**BASE BID - SCHEDULE II - ACCESS APRON & EARTHWORK**

<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
Site Preparation	1	LS	\$ _____	\$ _____
Earthwork	6,860	CY	\$ _____	\$ _____
Class 7 Base Course for Access Road & Apron	817	CY	\$ _____	\$ _____
Asphalt Surface Course	375	TON	\$ _____	\$ _____
Relay 18" Pipe	12	LF	\$ _____	\$ _____
18" RCP	230	LF	\$ _____	\$ _____

18" Flared End Section	1	EA	\$ _____	\$ _____
Grate Inlet	1	EA	\$ _____	\$ _____
B-Stone	20	CY	\$ _____	\$ _____
Marking	1	LS	\$ _____	\$ _____
Seeding & Mulching	1	LS	\$ _____	\$ _____
SCHEDULE II - TOTAL BASE BID				\$ _____

**TOTAL BASE BID - SCHEDULES I & II**

WRITTEN IN WORDS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**ALTERNATE NO. 1 TO SCHEDULE II**

Delete Asphalt on Access Dr.	95	TONS	\$ _____	\$ _____
TOTAL DEDUCT - ALTERNATE NO. 1				\$ _____
TOTAL BASE BID LESS ALTERNATE NO. 1				\$ _____

**TOTAL BASE BID LESS ALTERNATE NO. 1**

WRITTEN IN WORDS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**NOTE: Schedules I & II funded under separate grants. Invoicing shall be billed under separate invoices. Award to be made for Total Number.**

Bidder acknowledges receipt of the following addenda:  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

3. The undersigned understands that the above quantities of work to be done are approximate only and are intended principally to serve as a guide in evaluating bids.

4. The undersigned agrees, upon written notice of the acceptance of this bid within sixty (60) days after the opening of bids, that he will execute the Contract in accordance with the bid as accepted and give Contract (Performance and Payment) Bonds on the attached forms within ten (10) days after the prescribed forms are presented for signature.

5. The undersigned further agrees that if awarded the Contract, he will commence the work within ten (10) calendar days after the receipt of Notice to Proceed. Work must be completed within **one hundred-eighty (180) calendar days**. No work may be done when the temperature is below 40 degrees F., except at the discretion of the Engineer. An extension of time may be allowed when extra or additional work is ordered by the Engineer.

6. For each calendar day that any part of the work remains uncompleted after the expiration of the time allowed for completion of the work as stipulated in the Contract or as automatically increased by the additional work or materials ordered after the Contract is signed, the sum per day of **\$500.00** shall be deducted from any moneys due the Contractor, or if no money is due the Contractor, the Owner shall have the right to recover said sum or sums from the Contractor, from the Surety, or from both. The amount of these deductions are to cover liquidated damages to the Owner incurred by additional and other expenses due to the failure of the Contractor to complete the work within the time specified, and such deductions are not to be considered as penalties.

The damages stipulated are to be deducted from any moneys due the Contractor as liquidated damages for the loss to the Owner on account of the expense due to the employment of Engineers and their assistants and to any other expenses after the expiration of completion time set forth by the Engineer.

7. The bidder shall provide with the Proposal a listing of both automobile and personal liability insurance coverage currently in force, along with a copy of a Certificate of Insurance as verification of that coverage. In addition, the bidder shall provide a statement of premium cost issued by the agent or insurance carrier for that coverage.

In the event the Owner determines that the low bidder's coverage in force is inadequate, the Owner may require the low bidder to procure additional coverage in amounts specified by the Owner. The cost of premiums for such additional coverage shall be paid by the Owner in the form of a reimbursement under the Contract.

8. As evidence of good faith in submitting this proposal, the undersigned encloses a certified check or Bid Bond in the amount of five percent (5%) of bid, which, in case he refuses or fails to accept an award and to enter into a Contract and file the required Bond or Bonds within the prescribed time, shall be forfeited to the Batesville Airport Commission as liquidated damages.

9. The undersigned hereby declares that the only parties interested in this proposal are named herein, that the proposal is made without collusion with any other person, firm or corporation, that no member of the Airport Commission, officer or agent of the City of Batesville, AR is directly or indirectly financially interested in this bid.



The undersigned hereby submits this bid at the Conference Room at Batesville Regional Airport Terminal, 1126 Batesville Blvd, Batesville, Arkansas, to be opened at 11:00 A.M., June 25, 2024.

\_\_\_\_\_  
NAME OF COMPANY

By: \_\_\_\_\_

\_\_\_\_\_  
Title

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
Contractor's Arkansas License No.

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned \_\_\_\_\_  
\_\_\_\_\_, as Principal, and \_\_\_\_\_, as  
Surety, are held and firmly bound unto \_\_\_\_\_  
\_\_\_\_\_, as Owner, in the penal sum of \_\_\_\_\_  
\_\_\_\_\_ Dollars (\$\_\_\_\_\_),  
for payment of which sum well and truly to be made, we hereby jointly and  
severally bind ourselves, our successors and assigns.

SIGNED this \_\_\_\_\_ day of \_\_\_\_\_, 2024.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal has  
submitted to \_\_\_\_\_ a certain BID,  
attached hereto and made a part hereof, to enter into a contract in  
writing for the construction of:

CONSTRUCTION OF 4-BAY BOX HANGAR AND ACCESS APRON  
AT BATESVILLE REGIONAL AIRPORT

NOW, THEREFORE,

- (a) If said BID shall be rejected, or
- (b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said BID) and shall furnish a BOND for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID,

then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNER may accept such BID; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the date and year first set forth above.

\_\_\_\_\_  
Principal

\_\_\_\_\_  
Surety

By: \_\_\_\_\_

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

CONTRACT

THIS AGREEMENT, made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 2023, by and between the **BATESVILLE AIRPORT COMMISSION AND THE CITY OF BATESVILLE, ARKANSAS**, hereinafter called "Owner," and \_\_\_\_\_ of \_\_\_\_\_, **Arkansas**, hereinafter called "Contractor."

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the Owner, the Contractor hereby agrees with the Owner to commence and complete the construction described as follows:

CONSTRUCTION OF 4-BAY BOX HANGAR AND ACCESS APRON  
AT BATESVILLE REGIONAL AIRPORT

for the Batesville Airport Commission and the City of Batesville, Hereafter called the project, for the sum of \_\_\_\_\_ **Dollars & NO/100 (\$\_\_\_\_\_)** and all extra work in connection therewith, under the terms as stated in the General and Special Conditions of the Contract; and at his (its or their) own proper cost and expense to furnish all materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in the Proposal, the General Conditions, and Supplemental General Conditions of the Contract, the plans, which includes all maps, plats, blueprints, and other drawings and printed or written explanatory matter thereof, the specifications and contract documents therefore as prepared by MILLER-NEWELL ENGINEERS, INC., NEWPORT, ARKANSAS, herein entitled the Engineer, all of which are made a part hereof and collectively evidence and constitute the contract.

The Contractor hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" of the Owner and to fully complete the **Contract** within **One Hundred Eighty (180) consecutive calendar days** thereafter.

The Owner agrees to pay the Contractor in current funds for the performance of the contract, subject to additions and/or deductions, as provided in the General Conditions, and to make payments on account thereof as provided in Paragraph 33, "Payments to Contractor," of the General Conditions.

IN WITNESS WHEREOF, the parties to these presents have executed this Contract in six (6) counterparts, each of which shall be deemed an original, on the day and year first above mentioned.

CITY OF BATESVILLE  
(Owner)

By: \_\_\_\_\_  
Mayor

BATESVILLE AIRPORT COMMISSION

By: \_\_\_\_\_  
Commission Chairman

\_\_\_\_\_  
(Contractor)

BY: \_\_\_\_\_  
\_\_\_\_\_  
Title

ATTEST BY: \_\_\_\_\_  
\_\_\_\_\_  
Title

\_\_\_\_\_  
\_\_\_\_\_  
Business Address

(Seal if by a Corporation)

NOTE: Secretary of the Owner should attest. If Contractor is a corporation, Secretary should attest.

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that we \_\_\_\_\_, a \_\_\_\_\_  
\_\_\_\_\_, hereinafter called "Principal" and \_\_\_\_\_  
\_\_\_\_\_, of \_\_\_\_\_, hereinafter called the "Surety," are  
held and firmly bound unto \_\_\_\_\_,  
hereinafter called "Owner," in the penal sum of \_\_\_\_\_  
\_\_\_\_\_ Dollars (\$ \_\_\_\_\_) in  
lawful money of the United States, for payment of which sum well and truly to  
be made, said principals and surety bind themselves, their heirs, adminis-  
trators, executors, successors and assigns, jointly and severally, by these  
presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered  
into a certain contract with the Owner, dated the \_\_\_\_ day of  
\_\_\_\_\_, 2024, a copy of which is attached and made a part hereof,  
for the construction of:

CONSTRUCTION OF 4-BAY BOX HANGAR AND ACCESS APRON  
AT BATESVILLE REGIONAL AIRPORT

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its  
duties, all the undertakings, covenants, terms and conditions, and agreement  
of said contract during the original term thereof, and any extensions thereof  
which may be granted by the Owner, with or without notice to the Surety, and  
if he shall satisfy all claims and demands incurred under such contract, and  
shall fully indemnify and save harmless the Owner from all costs and damages  
which it may suffer by reason of failure to do so, and shall reimburse and  
repay the Owner all outlay and expense which the Owner may incur in making  
good any default, then this obligation shall be void, otherwise to remain in  
full force and effect.

The Surety agrees the terms of this bond shall cover the payment by the  
Principal of not less than the prevailing hourly rate of wages as found by  
the Arkansas Department of Labor or as determined by the court on appeal to  
all workmen performing work under the contract.

PROVIDED, FURTHER, THAT THE SAID surety, for value received, hereby  
stipulates and agrees that no change, extension of time, alteration or  
addition to the terms of the contract or to the work to be performed  
thereunder of the specifications accompanying the same shall in any wise  
affect its obligation on this bond, and it does hereby waive notice of any  
such change, extension of time, alteration or addition to the terms of the

contract as to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in six (6) counterparts, each of which shall be deemed an original, this \_\_\_\_\_ day of \_\_\_\_\_, 2024.

\_\_\_\_\_  
Principal

ATTEST:

By: \_\_\_\_\_

\_\_\_\_\_  
Secretary

\_\_\_\_\_  
Address

\_\_\_\_\_  
Witness as to Principal

\_\_\_\_\_

\_\_\_\_\_  
Address

\_\_\_\_\_  
Surety

ATTEST:

By: \_\_\_\_\_

Attorney-In-Fact

\_\_\_\_\_  
Secretary  
(SEAL)

\_\_\_\_\_  
Address

\_\_\_\_\_  
Witness

\_\_\_\_\_

\_\_\_\_\_  
Address

NOTE: Date of Bond must not be prior to date of Contract.

IMPORTANT: Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, that we \_\_\_\_\_, a \_\_\_\_\_, hereinafter called "Principal" and \_\_\_\_\_, of \_\_\_\_\_, hereinafter called the "Surety," are held and firmly bound unto \_\_\_\_\_, hereinafter called "Owner," in the penal sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_) in lawful money of the United States, for payment of which sum well and truly to be made, said principals and surety bind themselves, their heirs, administrators, executors, successors and assigns, jointly and severally, by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the Owner, dated the \_\_\_\_\_ day of \_\_\_\_\_, 2024, a copy of which is attached and made a part hereof, for the construction of:

CONSTRUCTION OF 4-BAY BOX HANGAR AND ACCESS APRON  
AT BATESVILLE REGIONAL AIRPORT

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, all amounts due for but not limited to, materials lubricants, oil, gasoline, coal and coke, repair on machinery, equipment and tools, consumed or used in connection with the construction of said work, fuel oil, camp equipment, food for men, feed for animals, premium for bonds and liability and worker's compensation insurance, rentals on machinery, equipment and draft animals; also for taxes or payments due the State of Arkansas or any political subdivisions thereof which shall have arisen on account of or in connection with the wages earned by workmen covered by the bond; and for all labor, performing in such work whether by subcontractor or otherwise, then this obligation shall be void, otherwise to remain in full force and effect.

The Surety agrees the terms of this bond shall cover the payment by the Principal of not less than the prevailing hourly rate of wages as found by the Arkansas Department of Labor or as determined by the court on appeal to all workmen performing work under the contract.



PROVIDED, FURTHER, THAT THE SAID surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder of the specifications accompanying the same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract as to the work or to the specifications.

PROVIDED, FURTHER, that no suit or action shall be commenced hereunder by any claimant: (a) Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: The Principal, the Owner, or the Surety above named within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered or certified mail, postage prepaid, in an envelope addressed to the Principal, Owner, or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer; (b) After the expiration of one (1) year following the date of which principal ceased work on said contract, it being understood, however, that if any limitation embodied in the bond is prohibited by any law controlling the construction hereof, such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is execution in six (6) counterparts, each of which shall be deemed an original, this \_\_\_\_\_ day of \_\_\_\_\_, 2024.

\_\_\_\_\_  
Principal

ATTEST:

By: \_\_\_\_\_

\_\_\_\_\_  
Secretary

\_\_\_\_\_  
Address

\_\_\_\_\_  
Witness as to Principal

\_\_\_\_\_  
Address

ATTEST:

\_\_\_\_\_  
Secretary  
(SEAL)

\_\_\_\_\_  
Witness

\_\_\_\_\_  
Address

\_\_\_\_\_  
Surety

By: \_\_\_\_\_  
Attorney-In-Fact

\_\_\_\_\_  
Address

NOTE: Date of Bond must not be prior to date of Contract.

IMPORTANT: Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

CERTIFICATE OF OWNER'S ATTORNEY

I, the undersigned, \_\_\_\_\_, the duly authorized and acting legal representative of the City of Batesville and the Batesville Airport Commission, do hereby certify as follows:

I have examined the attached contract(s) and surety bond(s) and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with the terms, conditions and provisions thereof.

\_\_\_\_\_  
Date: \_\_\_\_\_

**NOTICE**

**Work on the project will be restricted to Monday through Friday. No work on the weekend. No changes to the Construction Safety Phasing Plan without FAA concurrence and approval.**

## GENERAL CONDITIONS

### 1. DEFINITIONS

- A. The "Contract Documents" consist of the Advertisement for Bids, the Information for Bidders, the Proposal Form, the General Conditions, the Agreement of Contract, the Contract Bond, the Specifications and the Approved Plans, including all modifications to any of the above documents incorporated therein before their execution. All of these form the Contract.
- B. The "Owner" is understood to mean the individual for whom the work is being done.
- C. The "Engineer" is understood to mean the Registered Professional Engineer, registered in Arkansas, employed by the Owner to carry out the conditions of this contract. The Engineer is the duly authorized representative of the Owner. Where the term "Architect/Engineer" is used it is intended to mean "Engineer" and does not mean to imply the Engineer is an Architect.
- D. The "Work Order" or "Notice to Proceed" is the Contractor's authority to begin the work. It shall designate the day on which working time shall commence. The work order shall be deemed to have been delivered when mail to the Contractor at the address given in the Proposal. When a Contractor begins work before a work order is issued, his time begins on the day he commences.
- E. The term "Subcontractor," as employed herein, includes only those having direct contact with the Contractor and it includes one who furnished material worked to a special design according to the plans or specifications, but does not include one who merely furnishes material so worked.
- F. The term "Work," includes labor or material or both, equipment, or other facilities necessary to complete the work.

### 2. CONTRACTOR'S UNDERSTANDING OF CONDITIONS OF WORK

It is understood and agreed that the Contractor has, by careful examination, satisfied himself as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions, and all other matters which can in any way affect the work under this contract. No verbal agreement or conversation with any officer, agent or employee of the Owner, either before or after the execution of this Contract,

shall affect or modify any of the terms or obligations herein contained.

### 3. MATERIALS, APPLIANCES, EMPLOYEES

Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power and transportation and other facilities necessary for the execution and completion of the work.

Unless otherwise specified, all materials shall be new and both workmanship and materials shall be of good quality. The Contractor shall, if required, furnish satisfactory evidence, such as test reports, as to the kind and quality of materials.

The Contractor shall at all times enforce strict discipline and good order among his employees, and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him.

### 4. ROYALTIES AND PATENTS

The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof, except that the Owner shall be responsible when a particular process or product of a particular manufacturer is specified, but if the Contractor has information that the process or article specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Engineer in writing.

### 5. SURVEYS, PERMITS AND REGULATIONS

The Engineer will provide the Contractor with the bench mark and alignment as may be necessary for the Contractor to layout the work correctly. The finished work must conform to the bench marks furnished by the Engineer.

The Owner shall furnish all right-of-way, easements and sites for the construction.

The Contractor shall furnish all permits and licenses required by law.

The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. If the Contractor observes that the plans and specifications are at variance therewith, he shall promptly notify the Engineer in writing and proper changes or adjustments shall be made in accordance with the contract provisions for changes in the work.

### 6. PROTECTION OF WORK AND PROPERTY

The Contractor shall continuously maintain adequate protection of all his work from damages and shall protect the Owner's property from injury of loss arising in connection with the work. He shall make good any such damage, injury or loss, except such as may be due directly to errors in the Contract Documents or caused by agents or

employees of the Owner. He shall protect all private property adjacent to the work. He shall provide and maintain all passage ways, guard fences, lights and other facilities for protection required by law or local conditions.

The Contractor is hereby authorized to act in an emergency affecting loss of life or property without special authorization from the Engineer. Any compensation claimed by the Contractor on account of emergency work shall be determined by agreement or arbitration.

#### 7. INSPECTION OF WORK AND TESTING OF MATERIALS

Inspection shall be provided by a representative of Miller-Newell Engineers, Inc. The Engineer, and his representatives, shall at all times have access to the work wherever it is in preparation or progress and the Contractor shall provide proper facilities for such access and inspection.

The Contractor shall furnish to the Engineer certified laboratory testing on all material to be used on the project. To include Proctor Density and density tests on subgrade, base material and asphalt. Contractor shall acquire services of a certified laboratory to pull concrete samples and provide tests at 7 and 28 days.

No work or preparation for work shall be covered up without consent of the Engineer. If such work is covered up, without consent of the Engineer, the Contractor, if required by the Engineer, shall uncover such work for examination and replace it at his own expense.

Re-examination of approved work may be ordered by the Engineer and if so ordered, the work must be uncovered by the Contractor. If such work is found to be in accordance with the Contract Documents, the Owner shall pay the cost of the reexamination and replacement. If such work is found not to be in accordance with the Contract Documents, the Contractor shall pay such cost, unless he shall show that the defect in the work was caused by another Contractor and, in that event, the Owner shall pay such cost.

#### 8. SUPERINTENDENCE AND SUPERVISION

The Contractor shall keep on his work during its progress a competent superintendent and any necessary assistants, all satisfactory to the Engineer. The Superintendent shall not be changed without the consent of the Engineer, unless he proves to be unsatisfactory to the Contractor and ceases to be in his employ. The Superintendent shall represent the Contractor in his absence and instructions and directions given to him shall be binding on the Contractor. Important decisions shall be confirmed to the Contractor in writing.

If the Contractor, in the course of the work, finds any discrepancy between the plans and the physical conditions of the locality, or any errors or omissions in the drawings or in the layout as given by prints and instructions, it shall be his duty to immediately inform the Engineer, in writing, and the Engineer shall promptly verify the same. Any work done after such discovery, until authorized, will be

done at the Contractor's risk.

#### 9. CHANGES IN THE WORK

The Owner, without invalidating the Contract, may order extra work or make changes by altering, adding or deducting from the work, the Contract Sum being adjusted accordingly. All such work shall be executed under the conditions of the original contract, except that any claim for extension in time caused thereby shall be adjusted at the time of ordering such change.

In giving instructions, the Engineer shall have the authority to make minor changes in the work, not involving extra cost, and not inconsistent with the purpose of the work, but otherwise, except in an emergency endangering life or property, no extra work or change shall be made unless in pursuance of a written order by the Engineer, and no claim for an addition to the Contract sum shall be valid unless so ordered.

The value of any such extra work or changes shall be determined in one or more of the following ways:

- A. By estimate and acceptance in a lump sum;
- B. By unit prices named in the Contract or subsequently agreed upon;
- C. By cost and percentage or by cost and a fixed fee.

If none of the above methods is agreed upon, the Contractor, provided he receives an order as above, shall proceed with the work. He shall keep an accurate account of the cost of labor and materials, pending final determination of the value of the work.

#### 10. CLAIMS FOR EXTRA COST

If the Contractor claims that any instructions in the plans or otherwise involves any extra cost under this contract, he shall give the Engineer written notice thereof within a reasonable time after the receipt of such instructions and, in any event, before proceeding to execute the work, except in an emergency endangering life or property. No such claims shall be valid unless so made.

#### 11. DEDUCTIONS FOR UNCORRECTED WORK

If the Engineer deems it inexpedient to correct work injured or not done in accordance with the Contract, an equitable deduction from the Contract price shall be made therefore.

#### 12. DELAYS AND EXTENSION OF TIME

If the Contractor be delayed at any time in the progress of the work by an act or neglect of the Owner or of his employees or by any other contractor employed by the Owner or by changes ordered in the work or by strikes, lockouts, fire, unusual delay in transportation,



unavoidable casualties or any causes by the Engineer pending arbitration, or by any cause which the Engineer shall decide justifies the delay, then the time of completion shall be extended for such reasonable time as the Engineer may decide.

No such extension shall be made for delay occurring more than seven days before claim therefor is made in writing to the Engineer. In the case of the continuing cause of delay, only one claim is necessary.

This article does not exclude recovery of damages for delay by either party under provisions of the Contract Documents.

13. CORRECTION OF WORK BEFORE FINAL PAYMENT

The Contractor shall promptly remove from the premises all materials condemned by the Engineer as failing to conform to the Contract, whether incorporated in the work, or not, and the Contractor shall promptly replace and re-execute his own work in accordance with the Contract and without expense to the Owner and shall bear all the expense of making good all work of other Contractors destroyed or damaged by such removal or replacement.

If the Contractor does not remove such condemned work and materials within a reasonable time, fixed by written notice, the Owner may remove them and may store the materials at the expense of the Contractor.

14. SUSPENSION OF WORK

The Owner may at any time suspend work, or any part thereof, by giving five days written notice to the Contractor. The work shall be resumed by the Contractor within ten days after the date fixed by the written notice from the Owner to the Contractor to do so. The Owner shall reimburse the Contractor for expense incurred by the Contractor in connection with the work under this contract as a result of such suspension.

But, if the work or any part thereof shall be stopped by the notice in writing aforesaid, and if the Owner does not give in writing notice to the Contractor to resume the work at a date within thirty days of the date fixed in the written notice to suspend, then the Contractor may abandon that portion of the work so suspended and he will be entitled to the estimates and payment for all work done on the portions so abandoned.

15. THE OWNER'S RIGHT TO DO WORK

If the Contractor should neglect to prosecute the work or fail to perform any of the provisions of this Contract, the Owner, after three days written notice to the Contractor, may, without prejudice to any other remedy he may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor.

16. THE OWNER RIGHT TO TERMINATE THE CONTRACT

If the Contractor should be adjudged a bankrupt, or he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he should persistently or repeatedly refuse or fail to make prompt payment to his subcontractors or for material or labor, or if he should persistently or repeatedly refuse or should fail, except in cases for which time is provided, to supply enough skilled workmen or proper materials, or if he should persistently disregard laws, ordinances or the instructions of the Engineer, or otherwise be guilty of a substantial violation of any provision of the contract, then the Owner, upon the certification of the Engineer that sufficient cause exists to justify such action, may without prejudice to any other right or remedy and after giving the Contractor seven (7) days notice in writing, terminate the employment of the Contractor and take possession of the premises and all materials, tools and appliances thereon and finish the work by whatever method he may deem expedient. In such cases, the Contractor will not be entitled to any further payment until the work is finished. If the unpaid balance of the contract price shall exceed the expense of finishing the work, including compensation for additional managerial and administrative services, such excess shall be paid to the Contractor. If such expense shall exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The expense incurred by the Owner as herein provided, and the damage incurred through the Contractor's default, shall be certified by the Engineer.

17. THE CONTRACTOR'S RIGHT TO TERMINATE THE CONTRACT

If the work should be stopped under the order of any court, or other public authority, for a period of three months, through no act or fault of the Contractor or of anyone employed by him, or if the Engineer should fail to issue any estimate for payment seven days after it is due, or if the Owner should fail to pay the Contractor within seven (7) days of its maturity and presentation, any sum certified by the Engineer or awarded by arbitrators, then the Contractor may, upon seven (7) days written notice to the Owner and the Engineer, stop the work or terminate this contract and recover from the Owner payments for all work executed and any loss sustained upon any plant or materials and reasonable profit and damages.

18. PAYMENTS WITHHELD

The Owner may withhold or, on account of subsequently discovered evidence, nullify whole or a part of any certificate to such extent as may be necessary to protect himself from loss on account of:

- A. Defective work not remedied;
- B. Claims or reasonable evidence that claims will be filed;
- C. Failure of the Contractor to pay all bills properly;
- D. A reasonable doubt that the Contractor can finish work on time;

or

E. Damage to another contractor.

When the above grounds are removed, payment shall be made for the amounts withheld because of them.

#### 19. CONTRACTOR'S LIABILITY INSURANCE

The Contractor shall maintain such insurance as will protect him for claims under the Worker's Compensation Act and from other claims for damages for personal injury, including death, which may arise from operations under this Contract, whether such operations be by himself or by any subcontractor or anyone directly or indirectly employed by either of them. Certificates of insurance for liability and property damage shall be filed with the Engineer before the work is started and shall be subject to his approval for adequacy of protection.

As required above, the Contractor's Public Liability Insurance and Vehicle Liability Insurance shall be in an amount not less than \$300,000.00 or injuries, including accidental death, to any one person, and subject to the same limit for each person, and in an amount not less than \$500,000.00 on account of one accident, and Contractor's property damage insurance in an amount not less than \$300,000.00.

The insurance certificate must contain the following verbiage: "**The insurance covered by this certificate will not be canceled or materially altered except after ten (10) days prior written notice has been received by the Owner.**"

The Contractor shall either (1) require each of his subcontractors to procure and to maintain during the life of his subcontract, Subcontractor's Public Liability and Property Damage of the type and in the same amounts as specified in the preceding paragraphs, or (2) insure the activities of his subcontractors in his own policy.

#### 20. INDEMNITY

The Contractor shall indemnify and save harmless the Owner from and against all losses and all claims, demands, suits, actions, recoveries and judgments of every nature and description brought or recovered against him by reason of any act or omission of the said Contractor, his agents or employees, in the execution of the work or in the guarding of it.

The Contractor shall, and is hereby authorized to, maintain and pay for such insurance, issued in the name of the Owner, as will protect the Owner from his contingent liability under this Contract, and the Owner's right to enforce against the Contractor any provisions of this article shall be contingent upon the full compliance by the Owner with terms of such insurance or policies, a copy of which shall be deposited with the Owner.

21. FIRE INSURANCE AND BUILDERS RISK INSURANCE

The Contractor shall secure in the name of the Owner, policies for fire insurance and builders risk insurance in the amount, form and from companies satisfactory to the Engineer, upon such structures and materials as shall be specified by the latter, payable to the Owner for the benefit of the Contractor or the Owner as the Engineer shall find their interest to appear.

22. GUARANTY BONDS

The Contractor shall furnish the Owner, where stipulated in the advertisement for bids, with a performance bond covering the faithful performance on the contract and payment of all obligations arising thereunder, in such form as the Owner may prescribe and with surety company or companies as the Owner may approve.

23. DAMAGES

Any claims for damages arising under this Contract shall be made in writing to the party liable within a reasonable time of the first observance of such damage and not later than the time of final payment, except as expressly stipulated by agreement or arbitration.

24. LIENS

Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, shall deliver to the Owner a complete release of all liens arising out of this contract, or receipts in full in lieu thereof and, if required in either case, an affidavit that so far as he had knowledge or information, the releases and receipts include all the labor and material for which the lien could be filed; but the Contractor may, if any subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the Engineer, to indemnify the Owner against any lien. If any lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such lien, including all costs and a reasonable attorney's fee.

25. ASSIGNMENT

Neither party to the contract shall assign the contract or sublet it as a whole without the written consent of the other, nor shall the Contractor assign any moneys due or to become due to him hereunder without the previous written consent of the Engineer.

26. SEPARATE CONTRACTS

The Owner reserves the right to let other contracts in connection with this work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate his work with theirs.

27. SUBCONTRACTS

The Contractor shall, as soon as practicable after the signature of the contract, notify the Engineer in writing the names of the subcontractors proposed for the work and shall not employ any of the subcontractors that the Engineer may object to as incompetent or unfit.

The Contractor agrees that he is fully responsible to the Owner for all work or omissions of his subcontractors, either directly or indirectly employed by him. Nothing in this contract shall create any contractual relations between the subcontractor or the Owner.

28. POINTS AND INSTRUCTIONS

The Contractor shall carefully preserve bench marks, reference points and stakes and, in case of willful or careless destruction, he shall be charged with the resulting expense and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

29. ENGINEER'S STATUS

The Engineer shall observe the execution of the work. He has the authority to stop the work whenever such stoppage may be necessary to insure the proper execution of the Contract. He shall also have the authority to reject all work and materials which do not conform to the contract, to direct application of the forces to any part of the work, as in his judgment is required, and to order the force increased or diminished, and to decide questions which arise in the execution of the work.

30. ENGINEER'S DECISIONS

The Engineer shall, within a reasonable time after their presentation to him, make decisions in writing on all claims of the Owner or Contractor and on other matters relating to the execution and progress of the work or the interpretation of the Contract Documents.

All such decisions of the Engineer shall be final except in cases where time and/or financial considerations are involved, which, if no agreement in regard thereto is reached, shall be subject to arbitration.

31. LANDS FOR WORK

The Owner shall provide the lands upon which the work under this Contract is to be done, except that the Contractor shall provide land required for the erection of temporary construction facilities and storage of his materials, together with right of access to same.

32. CLEANING UP

The Contractor, as directed by the Engineer, shall remove from the

Owner's property and from all public and private property, at his own expense, all temporary structures and construction facilities, rubbish and waste materials resulting from his operations.

### 33. PAYMENTS TO CONTRACTOR

At least ten (10) days before each progress payment falls due (but not more often than once a month), the Contractor will submit to Engineer a partial payment estimate filled out and signed by the Contractor covering the work performed during the period covered by the partial payment estimate and supported by such data as the Engineer may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the work but delivered and suitably stored at or near the site, the partial payment estimate shall also be accompanied by such supporting data, satisfactory to the Owner, as will establish the Owner's title to the material and equipment and protect his interest therein, including applicable insurance. The Engineer will, within ten (10) days after receipt of each partial payment estimate, either indicate in writing his approval of payment and present the partial payment estimate to the Owner, or return the partial payment estimate to the Contractor indicating in writing his reasons for refusing to approve payment. In the latter case, the Contractor may make the necessary corrections and resubmit the partial payment estimate. The Owner will, within ten (10) days of presentation to him of approved partial payment estimate, pay the Contractor a progress payment on the basis of the approved partial payment estimate. The Owner shall retain five (5) percent of the amount of each payment until final completion and acceptance of all work covered by the Contract Documents. When the work is substantially complete (operational or beneficial occupancy), the retained amount may be further reduced below five (5) percent to only that amount necessary to assure completion. On completion and acceptance of a part of the work on which the price is stated separately in the Contract Documents, payment may be made in full, including retained percentages, less authorized deductions.

The request for payment may also include an allowance for the cost of such major materials and equipment which are suitably stored either at or near the site.

### 34. TIME OF COMPLETION - LIQUIDATED DAMAGES

The work shall be commenced at the time stipulated in the Notice to Proceed to the Contractor and Contract I shall be fully completed within **One Hundred Eighty (180) consecutive calendar days** thereafter.

As actual damages for any delay in completion are impossible to determine, the Contractor and his sureties shall be liable for and shall pay to the Owner the sum of \$500.00 per day as fixed and agreed liquidated damages for each calendar day of delay until the work is completed and accepted.

35. SAFETY STANDARDS AND ACCIDENT PREVENTION

With respect to all work performed under this Contract, the Contractor shall:

- A. Comply with the safety standards provisions of applicable laws, building and construction codes, and the Manual of Accident Prevention in Construction: published by the Associated General Contractors of America, the requirements of the Occupational Safety and Health Act of 1970 (Public Law 91-596 and the requirement of Title 29 of the Code of Federal Regulations, Section 1518 as published in the Federal Register, Volume 36, No. 75, Saturday, April 17, 1971), and specifically OSHA's Standard for Excavation and Trenches Safety Systems, 29 CFR Part 1926, Subpart P.
- B. Exercise every precaution at all times for the prevention of accidents and the protection of persons (including employees) and property.
- C. Maintain at his office or other well-known place at the job site, all articles necessary for giving first aid to the injured and shall make standing arrangements for the immediate removal to a hospital or doctor's care of persons (including employees) who may be injured on the job site.

## SUPPLEMENTAL GENERAL CONDITIONS

REFERENCE DOCUMENT: These Supplemental General Conditions are included as a part of the Contract Documents for this project to supplement and/or amend the standard provisions of the General Conditions.

### 1. EXECUTION, CORRELATION, INTENT AND INTERPRETATIONS

Section 2 of the General Conditions is hereby supplemented as follows: The Drawings and Specifications are intended to agree and to be mutually explanatory. Should any discrepancy exist and not be clarified by addendum prior to bid opening, it will be presumed that the Contractor has based his proposal on the more expensive of the conflicting requirements. Before proceeding with any part of the work, Contractor shall report any such discrepancy to the Engineer, who shall rule on which of the conflicting requirements is to be followed. If the least expensive is directed, the Contractor shall refund to the Owner the difference in net cost.

Explanatory notes on Drawings shall be preferred to conflicting drawn out indications, if any. Large scale details will be preferred to small scale drawings, and figured dimensions to scale measurements. Where figures are lacking, scale measurements may be followed, but in all cases the measurements are to be checked from work in place, and should variations be found, such must be referred to the Engineer for instructions. Where on any of the Drawings a portion of work is drawn out and remainder is indicated in outline, the parts drawn out shall apply also to all other like portions of the work. Where the word "similar" occurs on Drawings, it shall be interpreted in its general sense and not as meaning identical, and all details shall be worked out in relationship to their location and their connection with other parts of the work.

### 2. PROTECTION AGAINST THEFT

Contractor shall take such precautions as he deems necessary to protect himself and the Owner from loss by theft. Contractor shall be responsible for the recovery or replacement of all materials or equipment lost by reason of theft during the entire course of the work, even though payment for same may have been received.

### 3. TOILET FACILITIES

General Contractor shall furnish, install and maintain ample sanitary facilities for workmen, including those of other contractors. Toilets shall be placed where indicated on the site as soon as work begins. They shall be housed in temporary enclosures and shall be maintained in a sanitary condition. They shall be removed from the premises upon completion of the work. They shall comply with all regulations of governmental agencies having jurisdiction.



#### 4. GUARANTY

The Contractor shall guarantee all materials and equipment furnished and work performed for a period of one (1) year from the date of substantial completion. The Contractor warrants and guarantees for a period of one (1) year from the date of substantial completion of the system that the completed system is free from all defects due to faulty materials or workmanship and the Contractor shall promptly make such corrections as may be necessary by reason of such defects, including the repairs of any damage to other parts of the system resulting from such defects. The Owner will give notice of observed defects with reasonable promptness. In the event that the Contractor should fail to make such repairs, adjustments or other work that may be made necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred. The Performance Bond shall remain in full force and effect through the guarantee period.

SECTION 01010

SCOPE OF WORK

PART 1. WORK INCLUDED

- 1.1 It is intended that the contract shall include all materials, labor, equipment, services, taxes, etc. (including mechanical, plumbing, and electrical, as well as general), required for completion of Schedule I: Construction of 4-Bay Box Hangar Building; and Schedule II: Construction of Access Apron located at the Batesville Regional Airport, Batesville, Arkansas, as shown in the Drawings and described in the Specifications prepared by Miller-Newell Engineers, Inc., 510 Third Street, Newport, AR.

The project will be awarded to the lowest responsive bidder for the total of Schedules I and II. Schedules provided to separate work under various grants. Billing to be separated as Schedule I and Schedule II.

The Contractor will not be required to perform work that is not within the general character and scope of the Drawings and Specifications or not reasonably inferable therefrom; however, he must recognize and accept the fact that these documents are not intended to illustrate or describe each and every possible detail of construction or finish that will be encountered in the execution of the work, nor can they show the exact location of each mechanical line, wiring device, fixture, etc. Where conditions are encountered that have not been specifically shown or detailed, they shall be worked out and finished similar to other details of like nature, or in accordance with supplementary Drawings furnished by the Engineer.

It shall be the responsibility of the General Contractor to coordinate all of the various phases of the construction and finish materials, including mechanical and electrical lines and equipment, so that all of the many components will fit together and function properly without interference one to the other to the end that the entire job when completed will present a neat and finished appearance with all movable parts and mechanical and electrical equipment operating properly, ready for the Owner's occupancy and use.

PART 2. SCOPE OF SUBCONTRACTORS WORK

- 2.1 This shall be established by agreement between the General Contractor and his subcontractors. For convenience of reference, the Specifications are separated into titled sections; however, such separation shall not operate to make the Engineer and arbiter to establish limits of the contracts between the General Contractor and subcontractors.

### PART 3. GRADES, LINES, LEVELS AND SURVEYS

- 3.1 All grades, lines, levels and bench marks have been established and shall be maintained by the General Contractor who shall be responsible for same.

Contractor shall verify all grades, lines, levels and dimensions as shown on the Drawings, and he shall report any errors or inconsistencies in the above to the Engineer before commencing work.

Contractor shall provide and maintain well built batterboards at all corners, he shall establish bench marks in not less than two widely separated places. As the work progresses he shall establish bench marks at each floor, giving exact levels of the various floors, and shall layout on the forms (or rough flooring) the locations of all partitions, etc., as a guide to all trades and subcontractors.

### PART 4. DATA FOR "AS-BUILT" DRAWINGS

- 4.1 Contractor shall make a clearly legible record on one set of drawings of all conditions where the actual construction differs from the Contract Drawings. This includes the exact location of all mechanical lines and principal electrical conduits, referenced to convenient points with dimensions. Upon completion of the job, this set of drawings shall be delivered to the Engineer for his use.

### PART 5. PROTECTION OF EXISTING UTILITIES

- 5.1 Contractor shall exercise extreme caution during excavation and/or earthwork of all kinds to prevent damage to existing mechanical lines and/or cables which may be located in the vicinity of work under this Contract. Approximate locations of such lines, insofar as the Engineer has been able to determine, are indicated on the plot plan; however, the Engineer does not certify to the correctness of such information and does not assume any responsibility for same. In the event that such lines or cables should be disturbed by operations under this Contract, the Contractor shall immediately and at his own expense, make repairs necessary to restore them to their present condition.

### PART 6. OWNER AND LOCATION

- 6.1 The work is to be done for the Batesville Airport Commission or its duly authorized representative, referred to throughout the Contract Documents as the "Owner."

The project is to be located on the Batesville, Arkansas, Regional Airport at the point indicated on the plans.

SECTION 01300

SUBMITTALS AND SUBSTITUTIONS

PART 1. GENERAL

1.1 DESCRIPTION

A. Work included:

1. Whenever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined either by manufacturer's name and catalog number or by reference to recognized standards.
2. To ensure that the specified products are furnished and installed in accordance with design intent, procedures have been established for advance submittal of design data and for its review and approval or rejection by the Engineer.

B. Related work described elsewhere:

1. Contractual requirements for substitutions:
  - a. Instructions to Bidders
  - b. General Conditions
2. Contractual requirements for submittals:
  - a. General Conditions
3. Individual submittals required:
  - a. Pertinent sections of these Specifications
4. Sealed and stamped drawings by a Licensed Engineer licensed in the State of Arkansas for:
  - a. Foundation design of building footings meeting IBC design requirements;
  - b. Sealed and stamped drawings for the metal building structure;
  - c. Contractor to pay all costs associated with preparing the designs and drawings.

PART 2. PRODUCTS

2.1 SHOP DRAWINGS

- A. Scale Required: Unless otherwise directed by the Engineer, make Shop Drawings accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the work.

- B. Quantity and Medium of Submittals: Submit to Engineer in form of one sepia reproduction accompanied by one black or blue line reproduction. The sepia will be returned to the Contractor with appropriate action to be taken noted. When re-submittals are required, submit them in the same form. After final approval by the Engineer and Owner, the Contractor, subcontractor or supplier originating the submittal shall furnish reproductions of the approved sepia to all other parties requiring same.

## 2.2 SAMPLES

- A. Accuracy: Unless otherwise directed or permitted by the Engineer, samples shall be of the precise article proposed to be furnished.
- B. Number Required: Submit in quantity required to be returned, plus two which will be retained by the Engineer. Maintain one of each approved sample on job while work to which it pertains is in progress.

## 2.3 COLORS AND PATTERNS

- A. General: Unless the precise color and pattern is described in the Contract Documents, whenever a choice of color or pattern is available in a specified product, submit accurate color charts and pattern charts to the Engineer for his review and selection.
- B. Comparative Analysis: Unless all available colors and patterns have identical costs and identical wearing capabilities, and are identically suited for the installation, completely describe the relative costs and capabilities of each.

## 2.4 SUBSTITUTIONS

- A. Engineer's approval required:
  1. The Contract is based on the materials, equipment and methods described in the Contract Documents.
  2. The Engineer will consider proposals for substitution of materials, equipment and method only when such proposals are accompanied by full and complete technical data and all other information required by the Engineer to evaluate the proposed substitution.
  3. Do not substitute materials, equipment or methods unless substitution has been specifically approved for this work by the Engineer.
- B. Limitation of "or equal" phrase:

Where the phrase "or equal" or "or equal as approved by Engineer" occurs in the Contract Documents, do not assume that materials, equipment or methods will be approved as equal by the

Engineer unless the item has been specifically approved for this work by the Engineer. The Engineer's decision shall be final.

C. Warranty:

Should any accepted substitution prove defective or otherwise unsatisfactory within the guaranty period for which it was intended, the Contractor shall replace the defective material with materials originally specified, or with other approved substitutions that subsequently prove satisfactory in use over an equal guaranty period.

D. Availability of specified items:

1. Verify prior to bidding that all specified items will be available in time for installation during orderly and timely progress of the work.
2. In the event specified item or items will not be so available, so notify the Engineer prior to receipt of bids.
3. Costs of delays because of non-availability of specified items, when such delays could have been avoided by the Contractor, will be back charged as necessary and shall not be borne by the Owner.

## 2.5 MANUALS

A. General:

Requirements herein apply both to submittal data for approval that cannot be in shop drawing form and to operation and maintenance manuals relative to products installed. Submit each data in form of manuals with durable binders for nominal 8 1/2" x 11" sheets. Manual shall incorporate the following:

1. Submittal data for approval:
  - a. Identification on, or readable through, the front cover stating general nature of the manual.
  - b. Neatly typewritten index near the front of the manual, furnishing information as to contents. Where product is a proposed substitution, the specified product for which it is being substituted shall be named.
  - c. Complete description of product, including installation requirements and recommendations.
2. Operation and maintenance manuals: All of the above, plus
  - a. Complete instructions regarding operation and maintenance of all equipment involved.
  - b. Complete nomenclature of all replacement parts, their

part numbers, current cost and name and address of nearest vendor of parts.

- c. Copy of all guarantees and warranties issued.
- d. Copy of pertinent approved shop drawings with all data concerning changes made during construction.

B. Extraneous data:

Where contents of manuals include manufacturer's catalog pages, clearly indicate the precise items included in this installation and delete, or otherwise clearly indicate, all manufacturer's data with which this installation is not concerned.

C. Number of copies required:

- 1. Manuals for approval: Quantity required to be returned, plus one to be retained by the Engineer, plus one additional when products relate to field of consultant of the Engineer.
- 2. Operation and maintenance manuals: Unless otherwise directed by the Engineer, deliver two copies to the Engineer, who will deliver one copy to the Owner.

PART 3. EXECUTION

3.1 IDENTIFICATION OF SUBMITTALS

Identify as to whether submittal is original or resubmittal, and show at least the following:

- A. Name and address of submitter, plus name and telephone number of the individual who may be contacted for further information.
- B. Name of project, drawing number and specification section number to which the submittal applies.

3.2 COORDINATION OF SUBMITTALS

- A. General: Prior to submittal for Engineer's review, use all means necessary to fully coordinate all material, including the following procedures:
  - 1. Determine and verify all field dimensions and conditions, materials, catalog numbers and similar data.
  - 2. Coordinate as required with all trades and with all public agencies involved.
  - 3. Secure all necessary approvals from public agencies and others and signify by stamp or other means that they have been secured.

4. Clearly indicate all deviations from the Contract Documents.

- B. Groupings of submittals: Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items; the Engineer may reject partial submittals as not complying with the provisions of the Contract Documents.

### 3.3 TIMING OF SUBMITTALS

- A. General: Make all submittals far enough in advance of scheduled dates of installation to provide all required time for reviews, for securing necessary approvals, for possible revisions and re-submittal and for placing orders and securing delivery. In scheduling, allow at least seven calendar days for the Engineer's review following his receipt of the submittal.
- B. Delays: Cost of delays occasioned by tardiness of submittals may be back charged as necessary and shall not be borne by the Owner.



SECTION 01400

TESTING LABORATORY SERVICES

PART 1. GENERAL

1.1 DESCRIPTION

- A. Work included: From time to time during progress of the work, the Owner may require that testing be performed to determine that materials provided for the work meet the specified requirements. Such testing includes, but is not necessarily limited to:
  - 1. Soil compaction.
  - 2. Crushed aggregate base compaction.
  - 3. Cast-in-place concrete.
  
- B. Related work described elsewhere: Requirements for testing may be described in various sections of these specifications; where no testing requirements are described but the Owner decides that testing is required, the Owner may require testing to be performed under current pertinent standards for testing.
  
- C. Work not included:
  - 1. Selection of a testing laboratory. Owner will approve the selection of a pre-qualified independent testing laboratory selected by Contractor.
  
  - 2. Payment for testing services. Contractor will pay for all initial services of the testing laboratory as further described in Article 2.1 of this Section.

1.2 QUALITY ASSURANCE

- A. Qualifications of testing laboratory. The testing laboratory will be qualified to the Owner's approval in accordance with A.S.T.M. E-329-70, "Recommended Practice for Inspection and Testing Agencies for Concrete and Steel Used in Construction."
  
- B. Codes and Standards. Testing, when required, will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.

1.3 PRODUCT HANDLING

Promptly process and distribute all required copies of test reports and related instructions to ensure all necessary retesting and/or replacement of materials with the least possible delay in progress of the work.

## PART 2. PRODUCTS

### 2.1 PAYMENT FOR TESTING SERVICES

#### A. Initial services.

1. The Contractor will pay for all initial testing services deemed necessary.
2. When initial tests indicate non-compliance with the Contract Documents, the costs of subsequent tests associated with that non-compliance will be paid by the Contractor.

- #### B. Retesting. When initial testing indicates non-compliance with the Contract Documents, all subsequent retesting occasioned by the non-compliance shall be performed by the same testing laboratory and the costs thereof will be paid by the Contractor.

### 2.2 CODE OF COMPLIANCE TESTING

Inspections and tests required by codes or ordinances, or by a plan approval authority, and made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

### 2.3 CONTRACTOR'S CONVENIENCE TESTING

Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

## PART 3. EXECUTION

### 3.1 COOPERATION WITH TESTING LABORATORY

Representative of the testing laboratory shall have access to the work at all times; provide facilities for such access as required.

### 3.2 SCHEDULES FOR TESTING

- A. Establishing schedule. By advance discussion with the testing laboratory approved by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings. Provide all required time within the construction schedule.
- B. Revising schedule. When changes of construction schedule are necessary, coordinate all such changes of schedule with the testing laboratory.
- C. Adherence to schedule. When testing laboratory adheres to agreed schedule but is prevented from testing or taking

specimens due to incompleteness of the work, extra costs for testing attributable to the delay may be backcharged to the Contractor.

### 3.3 TAKING SPECIMENS

All specimens and samples for testing, unless otherwise provided in these Contract Documents, will be taken by the testing laboratory; all sampling equipment and personnel will be provided by the testing laboratory; and all deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

SECTION 01560

TEMPORARY FACILITIES AND CONTROLS

PART 1. GENERAL

1.1 DESCRIPTION

A. Work included. Temporary facilities and controls required for this work include, but are not necessarily limited to:

1. Temporary utilities such as gas, water, electricity and telephone;
2. Field offices and sheds (NIC);
3. Sanitary facilities; and
4. Enclosures such as tarpaulins, barricades and canopies.

B. Related work described elsewhere:

1. Compliance with safety regulations. Compliance with all requirements of pertinent regulations is described in the General Conditions of the Contract.
2. Subcontractor equipment. Except that equipment furnished by subcontractors shall comply with all requirements of pertinent safety regulations, the ladders, hoists, planks and similar items normally furnished by individual trades in execution of their own portions of the work are not part of this section of these Specifications.
3. Utility hook-up. Installation and hook-up of the various utility lines are described in the pertinent other sections of these Specifications.

1.2 PRODUCT HANDLING

A. Protection. Use all means necessary to maintain temporary facilities and controls in proper and safe condition throughout the progress of the work.

B. Replacements. In the event of loss or damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

## PART 2. - PRODUCTS

### 2.1 UTILITIES

#### A. Temporary utilities.

1. General. Provide and pay all costs for gas, water and electricity required for the performance of the work.
2. Temporary gas and water. Furnish and install all necessary temporary piping and upon completion of the work remove all such temporary piping.
3. Temporary electricity. Furnish and install all necessary temporary wiring. Furnish and install area distribution boxes so located that the individual trades may use their own construction type extension cords to obtain adequate power and artificial lighting at all points where required by inspectors and for safety.

### 2.2 FIELD OFFICE AND SHED (Not In Contract)

- A. Furnish and install a field office building adequate in size and accommodation for all Contractor's offices, superintendent's office, supply and tool room. Provide for use by the Engineer space within the field office (or in separate building, at Contractor's option) approximately 6' x 6' equipped with 3' x 5' counter with smooth top, a plan rack and one stool. Office shall be sufficiently heated and cooled to maintain 70 degrees F. in winter and 78 degrees F. in summer. Other facilities may be used upon approval of the Engineer.
- B. Insure that storage sheds are provided for all materials that could suffer damage if stored outside. For materials that can be safely stored outside, provide tarpaulins or similar suitable covers.

### 2.3 SANITARY FACILITIES

Furnish and install all required temporary toilet buildings with sanitary toilets for use of all workmen; comply with all minimum requirements of the Health Department or other public agency having jurisdiction; maintain in a sanitary condition at all times.

### 2.4 ENCLOSURES

Furnish, install and maintain for the duration of construction all required scaffolds, tarpaulins, barricades, canopies, warning signs, steps, bridges, platforms and other temporary construction

necessary for proper completion of the work in compliance with all pertinent safety and other regulations.

PART 3. - EXECUTION

3.1 REMOVAL

Maintain all temporary facilities and controls as long as needed for safe and proper completion of the work; remove all such temporary facilities and controls as rapidly as progress of the work will permit or as directed by the Engineer.

SECTION 02000

SUBSURFACE CONDITIONS

PART 1. GENERAL

1.1 INVESTIGATION

- A. Contractor should visit site and acquaint himself with site conditions.
- B. Prior to bidding, the Contractor may make his own subsurface investigations to satisfy himself with site and subsurface conditions. The Contractor shall make no deviations from the Contract Documents without specific and written approval.

## SECTION 02200

### EARTHWORK

#### PART 1.00 - GENERAL

##### 1.1 CONDITIONS

- A. Requirements of the Conditions of the Contract apply to all work under this Section. This includes all labor, materials, equipment and services necessary to complete all work indicated on the drawings and herein specified, or both.
- B. Carefully read the General Conditions of the Specifications, which shall be considered as and made a part of this section.

##### 1.2 SCOPE

- A. The work required under this section consists of all excavating, filling, grading, dewatering, and related items necessary to complete the work indicated on the Drawings and described in these Specifications, including but not necessarily limited to the following:
  - 1. **The Owner wishes to use on-site soil to the maximum extent possible. The borrow site and the fill sites shall be stripped of vegetation. Vegetation and top soil shall be stockpiled and used to cover bare areas upon completion. Contractor to process borrow materials on the building site to accomplish 95% modified density proctor under the line item Earthwork. Additional fill as required shall be hauled in from an approved borrow site.**
  - 2. Providing and installing fill materials.
  - 3. Providing and installing controlled fill materials, footings and slabs.

##### 1.3 EXAMINATION OF SITE AND DOCUMENTS

- A. It is hereby understood that the Contractor has carefully examined the site and all conditions affecting work under this section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions as indicated in the Contract Documents, or obvious from observation at the site.
- B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for himself during the bidding period as no allowance will be made for any errors or inaccuracies that may be found herein.



#### 1.4 SUBSURFACE CONDITIONS

- A. Subsurface conditions are to be assumed substantially as shown on the Drawings.

#### 1.5 REQUIREMENTS OF REGULATORY AGENCIES

- A. All work shall conform to the Drawings and Specifications and shall comply with applicable codes and regulations.
- B. Comply with rules, regulations, laws and ordinances of all authorities having jurisdiction.
- C. The Contractor shall procure and pay for all permits and licenses required for the complete work specified herein and shown on the Drawings.
- D. The Contractor shall not close or obstruct any side-walk, street, alley or passageway without permission from authorities having jurisdiction. The Contractor shall so conduct his operations as to interfere as little as possible with the use ordinarily made of roads, driveways, alleys, sidewalks, or other facilities near enough to the work to be affected thereby.

### PART 2.00 - MATERIALS AND EQUIPMENT

#### 2.1 FILL MATERIALS

- A. Ordinary Fill. Well-graded, natural, inorganic soil shall consist of sand or gravel clays approved by the Engineer and meeting the following requirements:

1. It shall be free of organic and other weak or compressive materials, of frozen materials, and of stones larger than 6 inches maximum dimension.
2. It shall be of such nature and character that it can be compacted to the specified densities in a reasonable length of time.
3. It shall be free of highly plastic clays, of all materials subject to decay, decomposition, or dissolution, and of cinders or other materials which will corrode piping or other materials.
4. It shall have a liquid limit less than 40.

- B. Controlled Fill Under Footings and Slabs.

1. The controlled fill under the floor slabs and footings shall consist of clayey sand or clayey gravel with a liquid limit less than 35. Samples of materials proposed shall be submitted for approval.

## 2.2 SOURCE QUALITY CONTROL

- A. All fill materials shall be subject to quality control testing. A qualified laboratory will be selected and paid by the Contractor to perform tests on materials. Test results and laboratory recommendations will be available to the Engineer.

## 2.3 COMPACTION EQUIPMENT

- A. Provide sufficient equipment units of suitable types to spread, level and compact fills promptly upon delivery of materials.
- B. Contractor may use any compaction equipment or device which he finds convenient and economical, but the Engineer retains the right to disapprove equipment which, in his opinion, is of inadequate capacity or unsuited to the character of materials being compacted.

## PART 3.00 - EXECUTION

### 3.1 GENERAL

#### A. Site Preparation

1. Remove all trees, grass and roots from site, excavate to grade, and compact top 8" of subgrade.

#### B. Layout and Grades

1. All lines and grade work not presently established at the site shall be laid out by the Contractor in accordance with the Contract Drawings and Specifications. The Contractor shall establish permanent bench marks determined by a Registered Land Surveyor or Professional Civil Engineer. Maintain all established bounds and bench marks and replace as directed any which are destroyed or disturbed.
2. The words "finished grades" as used herein shall mean the required final grade elevations indicated on the Drawings. Spot elevations shall govern over proposed contours. Where not otherwise indicated, project site areas outside of the buildings shall be given uniform slopes between points for which finished grades are indicated or between such points and existing established grades.
3. The word "subgrade" as used herein means the required surface of subsoil, ordinary fill or compacted fill. The surface is immediately beneath the site improvements, specially dimensioned fill, paving, loaming, or other surfacing materials.

#### C. Disposition of Existing Utilities

1. Active utilities existing on the site shall be carefully protected from damage and relocated or removed as required

by the work. When an active utility line is exposed during construction, its location and elevation shall be plotted on the record drawings and both the Engineer and the utility owner notified in writing.

2. Inactive or abandoned utilities encountered during construction operations shall be removed, plugged or capped. The location of such utilities shall be noted on the record drawings and reported in writing to the Engineer.

D. Frost Protection

1. Make no excavations to the full depth indicated when freezing temperatures may be expected unless the footings or slabs can be placed immediately after the excavation has been completed. Protect the bottom so excavated from frost if placing of concrete is delayed. Should protection fail, remove frozen materials and replace with gravel fill as directed, at no cost to the Owner.
2. The underside of in-place beams and slabs shall be protected from freezing temperatures.

E. Disposal

1. All excavated materials which are not used for fill or backfill, and all surplus excavated materials shall be placed on the site at the direction of the Engineer at no cost to the Owner.

3.2 EXCAVATION

- A. Excavate all materials as required to allow construction of the foundations for the structure as shown on the Drawings. Attention is called to "General Notes" on Structural Drawings and to the requirements contained therein which may affect the work under this section.

3.3 DEWATERING

- A. Provide, maintain and operate pumps and related equipment, including standby equipment, of sufficient capacity to keep excavation free of all water at all times and under any and all contingencies that may arise until the structures attain their full strength.

3.4 PLACING FILLS

A. General

1. Areas to be filled or backfilled shall be free of construction debris, refuse, compressible or decayable materials and standing water. Do not place when fill materials or layers below it are frozen.

2. Notify the Engineer when excavations are ready for inspection. Filling and backfilling shall not be started until conditions have been approved by the Engineer.
3. Furnish approved materials. Place fill in layers not exceeding 6 inches compacted thickness and compact as specified below for various fill conditions.

B. Placing Ordinary Fill

1. Ordinary fill as specified in Paragraph 2.1.A. hereinabove shall be provided behind all walls and for all backfill and fill where gravel fill has not been specified hereinabove or on Drawings.
2. Place ordinary fill in lifts not exceeding eight (8) inches, uncompacted thickness, and compact to 90% modified proctor density (ASTM D-1557).

C. Placing Controlled Fill

1. The controlled fill should be scarified and then processed to a moisture content between three percentage points below and two percentage points above the Standard Proctor optimum. The subgrade soils should be recompacted to a dry density of at least 95% of the standard Proctor maximum dry density for depths of at least 6 inches below the surface.
2. After subgrade preparation and inspection have been completed, fill placement may begin. Fill materials should be free of organic or other deleterious materials, have a maximum particle size of 3 inches, and have a liquid limit less than 45 and plasticity index of less than 20.
3. Fill should be placed in maximum lifts of eight inches of loose material and should be compacted within the range of two percentage points above to three percentage points below the optimum moisture content as determined by the standard Proctor test. If water must be added, it should be uniformly applied and mixed into the soil by disking or scarifying.
4. Each lift of compacted soil should be tested and approved by the soils Engineer or his representative prior to placement of subsequent lifts. As a guideline, it is recommended that field density tests be taken at a frequency of not less than one test per 2500 square feet of surface area per lift of fill in the building areas. This testing frequency may be reduced to one test per 5000 square feet of surface area per lift of fill in the pavement areas.

D. Placing Controlled Fill Under Footings

1. The clayey sand or clayey gravel placed under the footing shall be compacted to at least 95% of maximum Modified Proctor Density (ASTM D-1557) at or above optimum water

content.

2. Fill placed above the footing shall consist of the same material and shall be compacted to at least 95% of Maximum Standard Proctor Density (ASTM D-698) at or above optimum moisture.

E. Field Quality Control

1. See overlapping procedures in Source of Quality Control.
2. Cooperate with laboratory in obtaining field samples of in-place materials after compaction. Furnish identical field labor in connection with these tests.

**Note: All areas to be proof rolled prior to testing. Soft and yielding areas to be recompacted.**

F. Construction Procedures

1. Foundation excavations should be free of all loose or soft soils and water prior to placing concrete. Concrete should be placed as soon as possible after excavation, cleaning and inspection are complete to minimize possible changes in soil conditions due to the effects of wetting and drying. The Contractor shall notify the Engineer so he can be present during foundation excavation to monitor soil conditions at foundation depths.
2. Care should be taken to adequately slope or brace the sides of foundation excavations to prevent sloughing or caving. All applicable safety requirements (OSHA) regarding trench excavations should be adhered to.

3.5 CLEAN UP

- A. Move all excess earth, debris, topsoil or other materials associated with this work to the north slope of the hangar apron. Do not co-mingle material that can be used for fill and contaminated material.
- B. Keep taxiways, driveways and city streets free from mud or trash deposited by equipment used in performing work under this section.

SECTION 02700

STORM DRAINAGE STRUCTURES AND APPURTENANCES

PART 1. DESCRIPTION

1.1 This item shall consist of the construction of pipe culverts, flared end sections for pipe culverts and safety end sections for pipe culverts according to these specifications; of the type, size and dimensions shown on the plans; and in conformity with the locations, lines, and grades shown on the plans; or as directed.

PART 2. MATERIALS

2.1 Materials and design requirements for the several types of pipe culverts and flared end sections shall comply with the following:

A. All Pipe and Flared End Sections. The Contractor shall furnish the Engineer an itemized statement of the sizes and lengths of culvert pipe in each shipment. A field inspection will be made by the Engineer. This inspection will include an examination of the culvert pipe for nominal specified diameter, net length of finished culvert pipe, condition of pipe, and any evidence of poor workmanship. The inspection may include an examination for deficiencies in lengths of sheets used and a check of the brand name and heat numbers.

B. Reinforced Concrete Pipe. The pipe may be of either bell and spigot or tongue and groove unless one type is specified on the plans or is required to extend an existing culvert. Pipe shall be Class III Wall B.

(1) The manufacture and furnishing of circular pipe shall be according to the provisions of AASHTO M 170 with a minimum B wall thickness.

(2) The manufacture and furnishing of arch shaped pipe shall be according to the provisions of AASHTO M 206.

(3) The manufacture and furnishing of horizontal elliptical pipe shall be according to the provisions of AASHTO M 207.

(4) Joints shall be sealed with either preformed rubber gaskets or bitumen/butyl rubber plastic gaskets complying with AASHTO M 198 or with tubular cross-section closed cellular rubber gaskets complying with the physical requirements of ASTM D 1056 (Type 2, Class C, Grade 1) and meeting the chemical requirements of AASHTO M 198.

When Reinforced Concrete Arch Pipe is specified, Reinforced Concrete Horizontal Elliptical Pipe of equivalent size may be substituted unless Arch Pipe is required to extend an existing culvert.

- C. Flared End Sections for Pipe Culverts. The manufacture and furnishing of flared end sections for pipe culverts shall comply with Subsection 2.1 B above for concrete pipe. The flared end sections shall be of the same material as the culvert pipe for a given installation.

Reinforced concrete flared end sections for circular, arch, or elliptical pipe shall comply with the applicable requirements for Class III or higher classes of pipe. The area of reinforcing for circular pipe flared end sections shall be according to the requirements for elliptical reinforcing for Class III pipe for the appropriate wall thickness.

Concrete for curtain walls shall have a compressive strength of 3000 psi.

Reinforcing steel for curtain walls shall be grade 60.

In lieu of constructing concrete curtain walls in place, the Contractor may elect to precast the units. Precast units shall comply with all applicable requirements of Subsection 606.02(b) for concrete pipe.

Flared end sections for corrugated steel circular or arch pipe shall be fabricated from steel sheets having a thickness of 0.064" (1.63 mm) or more.

Flared end sections for corrugated aluminum circular or arch pipe shall be fabricated from aluminum sheets having a thickness of 0.060" (1.5 mm) or more.

- D. Selected pipe bedding shall consist of silty loam, loam, sand, or other similar material free from lumps, clods, and rocks.
- E. Selected pipe backfill shall comply with the requirements established by the Engineer.
- F. Structural Bedding for Reinforced Concrete Pipe Culverts shall be as shown in the plans for the specified installation type.
- G. Structural Bedding and Structural Backfill for Corrugated Metal Pipe Culverts shall meet the requirements for SM-3 material specifications for Aggregate Base Course Classes 4, 5, 6, or 7.
- H. Structural Bedding and Structural Backfill for Plastic Pipe Culverts shall meet the requirements for Class-7 material.

2.2 GRATE INLETS, CURB INLETS AND JUNCTION BOXES (POURED IN PLACE AND/OR BLOCK CONSTRUCTION)

A. Description. This item shall consist of the construction of drop inlets, curb inlets or junction boxes in accordance with these specifications and in conformity with the locations, lines and grades shown on the plans or as directed by the Engineer.

B. Materials.

(1) The concrete shall have a minimum compressive strength of 3000 psi. The reinforcing steel shall conform to the specifications listed in Table I immediately following this Section.

(2) Brick shall be clean, whole, free from cracks or warpage, and when two bricks are struck together, they shall give a ringing sound. Brick shall comply with the requirements of AASHO Designation M-114, Grade SW.

(3) Rings and covers, grates and frames, and other appurtenances shall be made from cast iron of good quality and of such character as shall make the metal of the castings strong, tough and of even grain. The castings shall be smooth, free from scale, and from cracks or other defects that might make them unfit for the use of which they were intended.

C. Construction Methods.

(1) Concrete shall be proportioned, mixed, placed, finished and cured in accordance with the requirements "Class S Concrete" as provided in Section 802 of the Arkansas State Highway Commission.

(2) Floors of drop inlets, curb inlets of junction boxes shall be poured at least 24 hours before beginning construction of the walls. The Engineer may require a longer period between the pouring of the floors and the construction of the walls if, in his judgment, weather conditions make a longer period necessary. Floors shall be constructed to full outside dimension.

(3) Walls shall be constructed upon the floor and shall form a tight joint with the floor and around the inlet and outlet. Inlet and outlet pipes shall be cut flush with the inside surface of the walls. If it is necessary to carry sanitary sewers or other utility lines through the masonry, they shall be formed about that they will not be



damaged in any way. Faces of curb inlets shall be poured as part of the curb, as shown on the plans, in order to preserve the proper alignment.

- (4) Mortar for brick masonry shall be mixed in the proportions of one part of cement to two parts of sand, in a watertight box until the mixture has a uniform color, after which water shall be added as the mixing continues until the mortar has a consistency such that it can be easily spread with a trowel. Mortar that is not used within thirty minutes after water has been added shall not be used. Retempering of mortar will not be permitted.
- (5) Brick shall be wetted thoroughly immediately before being laid. They shall be laid in full courses in full and close mortar joints. Courses shall be level and adjoining courses shall break joints as near one-half brick as possible. At least one course in every seven shall be composed of headers. No spalls or bats shall be used except for shaping around irregular openings or when unavoidable to finish out a course. All joints shall be completely filled with mortar. Walls shall be well plastered with cement mortar on the outside and inside.
- (6) All castings shall be set accurately to the finished elevations so that no subsequent adjustment will be necessary. They shall be set in full mortar bed with firm bearing on the walls or securely fastened to the forms so no movement will occur when concrete is poured around them.
- (7) All concrete and cement finish shall be placed and maintained after disposition at a temperature above 70 degrees for seventy-two hours or above 50 degrees for one hundred twenty hours. If two (2) pounds of calcium chloride is added for each sack of cement, the time for maintaining these temperatures may be reduced 50%.
- (8) No concrete shall be poured until the Engineer has inspected the forms, the placing of reinforcing steel and castings and has given his permission to proceed with the pouring.
- (9) Backfill shall be thoroughly compacted by tamping in not more than four inch layers by means of mechanical hand tamps.

### PART 3. CONSTRUCTION REQUIREMENTS

- 3.1 Depth of Excavation. Excavation shall be carried to a depth where foundation materials are satisfactory to the Engineer regardless of the elevations shown on the plans, and foundations shall be inspected and approved before placing any part of the structure. Unless otherwise provided, soft or yielding material below the bottom of the specified pipe bedding shall be removed and replaced with a suitable material.

Pipe culverts under the roadbed shall be so placed that the minimum depth of cover at the subgrade shoulder for pipe of any diameter or type shall be not less than one foot (0.3 m).

- 3.2 Forming Bed for Pipe. Where the pipe is to be laid below the ground line, a trench shall be excavated to the required depth and to the minimum width practicable for working conditions. Structural bedding shall be placed and compacted as shown in the plans. For Reinforced Concrete Pipe Culverts using bell and spigot pipe, recesses shall be excavated to receive the bells. Where unsuitable material exists at the bottom of the excavated trench, the unsuitable material will be excavated and replaced with selected pipe bedding, which shall be compacted thoroughly into place with mechanical equipment. Where rock is encountered, the trench shall be excavated to a minimum depth as shown on the plans and backfilled with suitable material, which shall be tamped thoroughly with mechanical equipment.

Where pipe is not laid in a trench, structural pipe bedding shall be placed as shown in the plans.

- 3.3 Laying Pipe. The pipe laying shall begin at the downstream end and bell or groove ends of concrete pipe and outside circumferential laps of corrugated metal pipe shall be placed facing upstream. Corrugated metal pipe shall be placed with longitudinal laps or seams at the sides. Pipe that is not in true alignment or which shows settlement after laying shall be corrected by the Contractor at no additional cost to the Owner.
- 3.4 Joining Pipe. The method of joining pipe sections shall be such that the ends are fully entered and the inner surfaces are reasonably flush and even.

Pipe protruding through structure walls shall be cut off flush with the inside face of wall.

All surfaces of the joint upon or against which joint seal gaskets may bear shall be smooth, free of spalls, cracks, fractures, and imperfections that would adversely affect the performance of the joint. A primer shall be applied if recommended by the manufacturer.

- A. When preformed rubber gasket is selected by the Contractor, the gasket shall be the sole element depended upon to make the joint flexible and watertight. The gasket shall be a continuous ring that fits snugly into the annular space between the overlapping surfaces of the assembled pipe joint to form a flexible watertight seal. The circumference of the seated gasket shall not be more than 130% of its original circumference.
- B. When bitumen/butyl plastic gasket is selected by the Contractor, the following procedure shall be used. The protective wrapping shall be removed from one side of the gasket. The gasket shall be placed and pressed firmly to the surface of the pipe joint around the entire circumference of the joint. The remaining protective wrapping shall be removed and the pipe forced into connection until material fills the joint space.
- C. When tubular cross-section closed cellular rubber gaskets are selected by the Contractor, the gaskets shall be a single, continuous part conforming to the joint shape. The outer surface of the gasket shall be completely covered with a natural skin. The cross-sectional diameters and installation practices shall be in accordance with the manufactures' recommendations for the size of pipe or culvert being placed.
- D. To ensure an even and well-filled joint, the final joining of the pipe shall be accomplished by either pushing or pulling, by approved mechanical means, each joint of the pipe as it is laid. In cold weather, when directed, the joint material shall be warmed in a hot water bath, or by other approved methods, to the extent required to keep the material pliable for placement without breaking or cracking.
- E. Field cutting of polymer precoated pipe shall be by mechanical means as approved by the Engineer. Torch cutting or other applied heat methods shall not be used. Ends of pipe that have been field cut shall be treated and/or repaired according to the manufacturer's recommendations.

Coatings damaged during manufacturing, shipping, or installation shall be repaired according to the applicable AASHTO specifications. Treatment and/or repair of damaged or cut ends shall be at no cost to the Owner.

### 3.5 Backfilling.

- A. General. Special care shall be taken to compact the fill under the haunches of the pipe. In trench excavation, the backfill above the area specified as structural backfill (or structural bedding for reinforced concrete pipe culverts) shall be placed

in 6" (150 mm) lifts and compacted with mechanical equipment to 95% of the maximum density, as determined by AASHTO T 99. In a fill section, the backfill shall be brought up evenly on each side for the full length of the pipe to avoid displacement. The berm of thoroughly compacted material on each side of the pipe shall be at least as wide as the outside diameter of the pipe. Pipe damaged during construction operations shall be replaced at no cost to the Owner.

When the existing material excavated for the pipe trench is determined by the Engineer to be unsuitable for pipe backfill, this material shall be placed at other locations on the project such as placed on the fill slopes, etc. If the Engineer determines that no suitable location exists on the project to utilize this material, the Engineer may approve the material to be wasted at an appropriate location outside the project limits. Material declared unsuitable for backfill shall be replaced with suitable material from excavation and/or borrow. If suitable material from excavation and/or borrow is not available, the Engineer may authorize the use of the Selected Pipe Backfill.

- B. Reinforced Concrete Pipe Culverts. Backfilling around the pipe shall be with material as shown on the plans. The material shall be placed along side the pipe in layers not to exceed 6 (150 mm) at near optimum moisture content and compacted with mechanical equipment to 95% of the maximum density, as determined by AASHTO T 99.
- C. Corrugated Metal Pipe Culverts and Plastic Pipe Culverts. Structural backfill material shall be placed along side the pipe in layers not to exceed 6" (150 mm) at near optimum moisture content and compacted with mechanical equipment to 95% of the maximum density, as determined by AASHTO T 99, up to an elevation of not less than 12" (300 mm) above the top of the pipe. Backfilling of the pipe trench above the structural backfill will be accomplished as described in A. above.

### 3.6 Curtain Walls for Flared End Sections

- A. The foundation for curtain walls shall be prepared to the required depth. For cast in place curtain walls, the forming, placement of reinforcing steel, and placement, finishing, and curing of concrete shall be according to the applicable requirements of the AHTD Standard Specification. Precast curtain walls shall be installed according to the applicable requirements for laying concrete pipe.

## PART 4. MEASUREMENT AND PAYMENT

### 4.1 Method of Measurement.

- A. Pipe Culverts and Side Drains will be measured by the linear foot (meter) measured parallel to the flow line of the pipe. Where inlets, catch basins, junction boxes, or other structures are included in lines of pipe, that length of pipe extending to and flush with the inside of the structure wall will be included for measurement but no other portion of the structure length or width will be so included. No allowance will be made for any pipe cut-off. Whenever possible, the lengths shown on the plans may be adjusted by the Engineer to accommodate the pipe lengths available from the supplier that most nearly match the plan lengths.

For multiple pipes, the measured length will be the sum of the lengths of the individual barrels measured as prescribed above.

- B. Flared End Sections for pipe culverts will be measured by the unit and will include the curtain wall, complete in place.
- C. When pipe culvert is used for extensions of existing culverts, the removal of any headwall, end section, or pipe joints shall be incidental to the pipe laid.
- D. Structural Bedding for Reinforced Concrete Pipe Culverts, Structural Bedding and Structural Backfill for Corrugated Metal Pipe Culverts, and Structural Bedding and Structural Backfill for Plastic Pipe Culverts will not be measured or paid for separately but full compensation therefor will be considered included in the contract unit prices bid per linear foot (meter) for the respective type of pipe culvert.
- E. Inlet will be measured by each inlet.

### 4.2 Basis of Payment.

- A. Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per linear foot (meter) for the respective type of Pipe Culverts of the several sizes, which price shall be full compensation for furnishing, hauling, and installing the pipe; for materials including joint filler for concrete pipe and connecting bands for metal pipe; for excavation and backfilling, including compacting backfill; for furnishing, placing, and compacting structural bedding and structural backfill; for removing and disposing of the existing headwall and attached end joint of concrete pipe or the flared end section on all types of pipe, in order to accomplish culvert extensions; and for all labor, equipment, tools, and

incidentals necessary to complete the work.

- B. Work completed and accepted and measured as provided above will be paid for at the contract unit price bid each for the respective type of Flared End Sections of the several sizes, which price shall be full compensation for furnishing, hauling, and installing the end sections; for materials, including joint filler for concrete end sections and connecting bands for metal end sections; for excavation and backfilling, including compacting backfill; and for all labor, equipment, tools, and incidentals necessary to complete the work.
  
- C. Work completed and accepted and measured as provided above will be paid for at the contract unit price bid each for Grate Inlet, which price shall be full compensation for furnishing, hauling, and installing; for materials; and for all labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 02730

ASPHALTIC CONCRETE PAVEMENT

PART 1.00 - GENERAL

1.1 GENERAL PROVISIONS

- A. Description. This work shall consist of constructing an access apron taxiway, access roads and POV parking (Schedule II). The area of development shall be excavated or filled to the subgrade elevation as shown on the plans. The subgrade shall be moist conditioned, scarified, thoroughly compacted and proofrolled to determine any soft areas prior to fill placement. The embankment shall be compacted to a 98% standard proctor density. An 12" thick Class 7 base course shall be constructed on the prepared subgrade and compacted to 98% standard proctor density for the apron and taxiway. A 6" thick Class 7 base course shall be constructed on the prepared subgrade and compacted to 98% standard proctor density for the access drive and vehicle parking. The base course shall be cured then receive a ACHM Type II surface course. The shoulder areas shall be graded to the elevations shown and the area seeded.
- B. Intent of Contract. The intent of the contract is to provide for the construction and completion in every detail of the work described. The bidder is expected to examine carefully the site of the work and all documents pertaining to its construction in order to verify the work conditions and requirements established by the Engineer. The Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, specifications and terms of the Contract.
- C. Authority of the Engineer. The Engineer shall decide all questions that may rise as to quality and acceptability of materials furnished, manner of performance and rate of progress of the work, interpretation of specifications or plans relating to the work, and acceptable fulfillment of the contract by the Contractor. Suspension of the work may be ordered by the Engineer if deemed to be in the public interest.
- D. Barricades and Warning Signs. The Contractor shall provide, erect, and maintain all necessary barricades, suitable and sufficient lights, danger signals, signs, and other traffic control devices. He shall take all necessary precautions to protect the work and to safeguard the public. Streets closed to traffic shall be protected by effective barricades, and obstructions shall be illuminated during hours of darkness. Suitable warning signs shall be provided to control and direct traffic properly.
- E. Protection and Restoration of Property and Landscape. The Contractor shall be responsible for preserving all public and private property. He shall protect from disturbance or damage

all land monuments and property. He shall protect from disturbance or damage all land monuments and property marks until the Engineer has witnessed or otherwise referenced their location.

During the prosecution of the work, the Contractor shall be responsible for all damage or injury to any property that results from any act, omission, neglect or misconduct in his execution of the work. He shall be responsible for all damage or injury due to defective work or materials. Repair or replacement of damaged or injured property shall be at the Contractor's expense and shall be similar or equal to that existing before such damage or injury occurred.

- F. Construction Stakes, Lines and Grades. The Engineer shall establish the centerline and furnish bench marks as may be necessary to lay out the work correctly. The Contractor shall maintain these lines, grades and bench marks and use them to lay out the work he is to perform under this contract. The finished work must conform to the bench marks furnished by the Engineer.

The Contractor shall notify the Engineer in writing not less than five (5) days before reference and bench marks are required. No claims shall be made because of delays if the Contractor fails to give such notice.

The Contractor shall carefully preserve stakes and bench marks. If such stakes and bench marks become damaged, lost, displaced or removed by the Contractor, they shall be reset at his expense.

- G. Equipment. Design, capacity and mechanical condition of equipment and tools necessary for handling materials and performing all parts of the work shall be approved by the Engineer. Equipment shall be at the job site sufficiently ahead of the start of construction operations to be examined thoroughly and approved.
- H. Special Provisions. Any work not covered in these specifications shall be detailed by special provisions or shall be accomplished in accordance with the current standards and specifications of the State Highway Department.

## PART 2.00 - EARTHWORK

### 2.1 CLEARING

All surface objects and all trees six (6) inches or less in diameter, stumps, roots and other protruding obstructions not designated to remain shall be cleared and grubbed and mowed as required. Undisturbed stumps and roots and nonperishable solid objects that will be a minimum of 18 inches below subgrade or slope



of embankments shall be accepted. Topsoil shall be excavated and stockpiled for use in backfilling behind curbs.

## 2.2 EXCAVATING

Substances encountered within the limits of the project shall be excavated to the lines and grades indicated on the drawings. All excavation shall be accomplished in such a manner as to allow adequate drainage. Unsuitable material removed from the excavation shall be used for embankments, backfilling, and such other purposes as directed. If material encountered within the limits of the work is considered unsuitable, it shall be excavated and replaced with suitable material. All unsuitable material and any excavated material not required for embankment shall be disposed of by the Contractor.

## 2.3 EMBANKMENT

Embankments shall be constructed by placing and compacting materials of acceptable quality following lines, grades and cross-sections shown on the plans. Before any embankment is placed, all trees, sod and topsoil over the entire area shall be cleared. Each layer of embankment material shall not exceed six (6) inches in compacted depth. It shall be disked sufficiently to break down oversized clods and thoroughly mix all materials. Each layer shall be uniformly compacted at optimum moisture by roller or vibrator equipment suitable for the type of material encountered. The embankment shall be proof rolled to verify density. Yielding materials shall be excavated and replaced with satisfactory material and again be proof rolled until acceptance. The required density of the embankment is 98% of the laboratory determined standard proctor (ASTM 698).

## 2.4 BORROW

Borrow shall consist of approved material required for construction of embankments or for other portions of the work, and shall be obtained from approved sources. Unless otherwise designated in the contract, the Contractor shall arrange to obtain and shall pay all cost involved.

## 2.5 SELECTED MATERIAL

This item shall consist of furnishing, excavating, hauling, placing and compacting selected material at the location and depths indicated on the plans and in these specifications and as directed by the Engineer.

The material furnished shall be free from sod, stumps, logs, roots or other perishable or deleterious matter as approved by the Engineer. Select fill shall be sandy clay material.

## 2.6 CONSTRUCTION REQUIREMENTS

The bottom of the excavation or top of the fill shall be known as

the pavement subgrade and shall conform to the lines, grades and cross section shown on the plans.

All soft and yielding materials and other portions of the subgrade that will not compact readily when rolled or tamped, shall be removed and replaced with suitable material.

The subgrade shall be brought to a firm and unyielding condition with a uniform density meeting the criteria established by the Engineer.

The selected material shall be placed on a smooth and firm roadbed completed and accepted to the lines, grades and cross sections as shown on the plans or as established by the Engineer. Selected material shall not be placed on a frozen subgrade. Selected material shall be placed in layers not to exceed eight (8) inches in depth, loose measure, and compacted by any satisfactory method that will obtain the density hereinafter specified.

The density of compacted material in each layer of selected material shall be not less than 98% of the maximum density obtained by the Standard Method of Test for the Compaction and Density of Soils, ASTM 698, with correction as may be necessary for granular material. The moisture content of the material being compacted throughout each entire layer shall be substantially that of optimum moisture for the particular soil type. It shall be the responsibility of the Contractor to bring the moisture content throughout each layer of selected material to be compacted to substantially that of optimum moisture by the addition of water or by aeration as it may be necessary to increase or decrease moisture under the conditions encountered.

The Contractor shall be responsible for the stability of all selected material placed under the Contract until final acceptance of the work and shall bear the expense of replacing any portions which may become displaced due to carelessness or negligent work on the part of the Contractor, or due to action of the elements.

It shall be compacted at or slightly above the optimum moisture content. In the absence of standard testing, moisture content may be evaluated by squeezing a ball of damp soil in the hand. If the ball crumbles easily, additional water shall be mixed into the soil. If free water comes to the surface when kneaded, the subgrade shall be dried before final compaction.

All utility trenches and structure excavations shall be backfilled to natural or finished grade with soils like those surrounding the trench as soon as conditions permit. All backfill shall be compacted with mechanical tampers in layers of not over six (6) inches in compacted thickness.

## 2.7 CONSTRUCTION METHODS

The finished subgrade shall be kept smooth and compacted until the base has been placed. Subgrades must meet the compaction requirements as shown on the plans. Construction equipment shall not operate in the paving lane when conditions of the job will permit

operation from outside the lane. If the equipment operating in the paving lane cause rutting or displacement of the subgrade material, lighter trucks or suitable runways shall be provided.

PART 3.00 - BASE COURSE

3.1 GRAVEL BASE COURSE

This material shall consist of crushed run stone or a mixture of crushed stone and natural fines uniformly mixed and so proportioned as to meet all the requirements hereinafter specified, with the further provision that a mixture of crushed stone and natural fines shall contain not less than 90 percent crusher produced material. The stone shall be hard and durable with a percent of wear by Los Angeles Test (AASHTO T 96) not greater than 45. For the purpose of this specification, shale and slate are not considered to be stone. The material furnished shall not contain more than 5 percent by weight of shale, slate and other deleterious matter.

The class or classes of crushed stone base course material that may be used on any particular job will be those called for on the proposed schedule.

GRADING REQUIREMENTS

<u>Size of Sieve</u>	<u>Percent by Weight</u>
<u>Total Retained</u>	<u>Class</u>
	<u>Class 7</u>
1 1/2"	0
1"	---
3/4"	10-50
No. 4	50-75
<u>Total Passing</u>	
No. 40	10-30
No. 200	3-10

The fraction passing the No. 200 sieve shall not be greater than two-thirds the fraction passing the No. 40 sieve. The fraction passing the No. 40 sieve shall have a liquid limit not greater than 25 and a plasticity index of not greater than 6.

When it is necessary to blend two or more materials, each material shall be proportioned separately through mechanical feeders to insure uniform production. Premixing or blending in the pit to avoid separate feeding will not be permitted. Blending materials on the roadway in order to obtain a mixture that will comply with the above requirements will not be permitted.

3.2 CRUSHED STONE BASE OR GRAVEL BASE COURSE CONSTRUCTION

The base course material shall be placed on a completed and approved subgrade or existing base that has been bladed to conform to the

grade and cross section shown on the plans.

The subgrade shall be prepared as specified and shall be free from an excess or deficiency of moisture at the time of placing the base course. The subgrade shall also comply, where applicable, with the requirements of other items that may be contained in the contract that provide for construction, reconstruction or shaping of the subgrade or the reconstruction of the existing base course.

Base course material shall not be placed on a frozen subgrade or subbase.

The crushed stone gravel shall be placed on the subgrade or other base course material and spread uniformly to such depth and lines that when compacted it will have the thickness, width and cross-section shown on the plans.

If required, the compacted depth of the base course exceeds six inches (6"), the base shall be constructed in two or more layers of approximate equal thickness. The maximum compacted thickness of any one layer shall not exceed six (6) inches. When vibrating or other approved type of special compacting equipment is used, the compacted depth of a single layer of the base course may be increased to 8 inches upon approval.

The spreading shall be done the same day that the material is hauled and it shall be performed in such manner that no segregation of coarse particles or nests or hard areas caused by dumping the gravel on the subgrade will exist. To insure proper mixing, the gravel shall be bladed entirely across the roadbed before being spread. Care must be taken to prevent mixing of subgrade or shoulder material with base course material in the blading and spreading operation.

Each course shall be compacted by any satisfactory method that will produce the density hereinafter specified. The gravel shall be substantially maintained at optimum moisture during the mixing, spreading, and compacting operations. The density of the compacted material in each course, as determined by ASTM 1557, modified proctor, shall not be less than 100 percent of the density obtained in the laboratory. The crushed stone shall be compacted across the entire width of application.

The laboratory density shall be obtained as follows. The sample is prepared by removing the aggregate retained at the 3/4 inch sieve and adding aggregate passing the 3/4 inch sieve and retained on the No. 4 sieve in an amount equal to that removed. The sample so prepared is compacted at various water contents in five equal layers in a mold 6 inches in diameter and 7 inches in height. Each layer is compacted by 55 blows of a 10 pound hammer 2 inches in diameter dropped from a height of 18 inches. The density used is the dry weight obtained at the optimum water content.

The compacted base course shall be tested for depth and any deficiencies corrected by scarifying, placing additional material, mixing, reshaping, and recompacting to specified density, as

directed.

Where neither prime coat, surfacing nor pavement are provided in the same contract with the base course, the density requirement for the base course will be waived and no compaction will be required beyond that obtained by systematic maintenance under traffic.

The Contractor shall maintain the base course in a satisfactory condition until accepted.

#### PART 4.00 - BITUMINOUS SURFACE COURSE

##### 4.1 MATERIALS

- A. Tack Coat. All materials shall conform with the requirements provided in Section 403, "Materials and Equipment for Bituminous Surface Courses" in the Standard Specifications for Highway Construction of the Arkansas State Highway Commission. In general, a rapid curing cut back or emulsified asphalt will be used for tack coat. Dependent upon the texture of the base and the season of the year that work is being performed, the Engineer will select the particular grade of the type of bituminous material designated that will be used.
- B. Surface Course. Shall be Asphaltic Concrete Hot Mix Surface Course, Type 2, as provided in the Standard Specifications for Highway Construction of the Arkansas State Highway Commission.

##### 4.2 APPLICATION OF BITUMINOUS SURFACE COURSE

- A. Asphaltic Concrete Hot-Mix Surface Course. This item shall consist of an asphaltic concrete wearing surface composed of a compacted mixture of mineral aggregate and asphalt cement constructed on the completed and accepted base course in accordance with these specifications and in conformity with the lines, grades, completed thickness and typical cross sections shown on the plans.

- (1) Preparation of Existing Base or Surface. Newly constructed base courses shall be prepared as set forth in the specification item covering such base courses.

Prior to placing the bituminous base or surface courses, all required corrections of the existing pavement or old base, such as filling pot holes, sags and depressions, or alterations of existing pavement crown, shall be made. Such corrections shall be accomplished by placing bituminous binder or surface course mixtures at the location and in a manner as directed by the Engineer. Bituminous material used for wedging or leveling course, or for filling holes, may be placed by hand, blade grader or mechanical spreader methods. The mixture shall be feather edged to a smooth and even surface around the edges of the areas. Prior to placing bituminous material, the base or existing surface shall be covered with a prime coat or

tack coat.

Unstable areas in existing pavement or bases shall be corrected by the removal of the pavement or base to the necessary depths and the repairs made as directed by the Engineer.

Joint or crack filler on any existing pavement surface shall be removed as specified by the Engineer.

Prior to the arrival of the mixture at the work, the prepared surface, primed or tack coated as specified, shall be cleaned of all loose and foreign material. The mixture shall not be placed on the surface which shows evidence of moisture.

Contact surfaces of curbs, gutters, manholes and other structures shall be painted with a thin coating of rapid curing cut-back asphalt or emulsified asphalt.

When an asphaltic course previously laid becomes coated with dirt or foreign material, or when the time elapsed between courses is of such length as to prevent proper adhesion or bond of the later course, the earlier course shall be cleaned and given a tack coat prior to placing the succeeding course.

- (2) Transporting. The mixture shall be transported from the paving plant to work in tight vehicles previously cleaned of foreign materials. Each load shall be covered with canvas or other suitable material of sufficient size to retard loss of heat and to protect it from the weather condition. The cover shall extend at least 12 inches over the sides and ends of the truck bed and shall be securely fastened. When the mixture is being hauled more than fifteen miles or when the pavement is being placed after November first or prior to April first, the sides of the vehicles shall be suitably insulated to retard loss of heat. The insulating material shall be at least 3/4 inch thick and shall cover ends, sides and bottom of the truck bed. No loads shall be sent out so late in the day as to interfere with spreading and compacting the mixture during daylight hours unless artificial light, satisfactory to the Engineer, is provided.

The mixture shall be delivered at a temperature of 275 degrees F. to 325 degrees F. It shall be placed only upon a base which shows no evidence of free moisture, and only when weather conditions are suitable. The Engineer may, however, permit work of this character to continue when overtaken by sudden rains to utilize materials which may be in transit from plant at the time, provided the finished pavement otherwise meets requirements.

- (3) Spreading and Finishing. The mixture shall be laid upon an approved surface, spread and struck off to the grade and elevation established. Bituminous pavers shall be used to distribute the mixture either over the entire width or over such partial width as may be practicable.

The longitudinal joint in one layer shall offset that in the layer immediately below by approximately six (6) inches; however, the joint in the top layer shall be at the center line of the pavement if the roadway comprises two lanes of width, or at lane lines if the roadway is more than two (2) lanes in width.

Hand spreading will be permitted only on small turn-outs or other small areas inaccessible to the spreader. On normal two-lane roads the mixture shall be spread and finished in one-half widths. Unless two machines are employed, the spreader shall alternate between the two half widths with such frequency that the second half width shall be laid the next day after the first half width is laid.

The finishing machine shall be kept in good mechanical condition and adjustment. All worn or defective parts shall be replaced immediately when indicated by improper finish of the surface. Bituminous pavers shall be self-contained, power propelled units, provided with an activated screen or strike-off assembly, heated if necessary, and capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thicknesses shown on the plans. Pavers used for shoulders and similar construction shall be capable of spreading and finishing courses of bituminous plant mix material widths shown on the plans.

The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed.

The screed or strike-off assembly shall effectively produce a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture.

When laying mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture.

The edge of the binder course shall be established by a string or chalk line for a distance of not less than five hundred feet ahead of the spreading operation.

When more than one course is called for on the plans, the succeeding course shall follow not later than 72 hours unless the preceding course is given a tack coat. If

proper bond is not obtained between the two courses, a tack coat shall be used even though the lapsed time has been less than 72 hours.

- (4) Rolling and Density Requirements. The mixture shall be compacted as soon after being spread as it will bear the weight of the rollers without undue displacement.

Rolling shall start longitudinally at the sides and proceed toward the center of the roadway, overlapping on successive trips by at least one-half the width of the roller. When paving an echelon or abutting a previously placed lane, the longitudinal joint shall be rolled first followed by the regular rolling procedure. The mixture shall be continuously rolled until all roller marks are eliminated and no further compaction is possible. The motion of the roller shall be slow enough to avoid displacement of the mixture. Displacement as a result of reversing the direction of the roller, or from any other cause, shall at once be corrected by the use of rakes and additional material where required. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened with water and/or oil.

For surface course, breakdown rolling shall be accomplished with the three-wheel or tandem steel wheeled roller as directed. The pneumatic tired roller shall follow as soon as possible and shall be operated to the end that final rolling with the tandem steel wheeled roller shall be performed before excessive loss of heat occurs in the mix.

For base and binder course, the Contractor may at his option roll as specified above for surface course or he may use a pneumatic roller for the breakdown rolling. The same roller may be used for intermediate rolling if the roller is capable of varying its tire pressure while moving to meet the contact pressure requirements for each type of rolling.

Pneumatic tired rollers, when used for breakdown rolling, shall exert an average ground contact pressure of 35 to 55 pounds per square inch. When used for intermediate rolling it shall exert an average contact pressure of 80 to 100 pounds per square inch. The Contractor shall furnish to the Engineer charts or tabulations showing the contact area pressure and tire pressure for each pneumatic roller furnished.

The contact pressure shall be considered excessive, even within the specified range, when lateral displacement of the mix occurs and shall be lowered in accordance with the stability of the mix as directed.

All jobs requiring compaction of bituminous mixtures shall



have a minimum of one tandem steel wheeled roller and one pneumatic roller. All rollers shall meet State Highway Standards. All final rolling shall be done with a tandem steel wheeled roller.

Final approval of roller and rolling sequences will be based upon satisfactory performance and the ability to compact the asphaltic mixtures to a specified density and surface requirements.

The finished bituminous courses shall be compacted to the following densities:

- |   |  |
|---|--|
| (a) Asphaltic Concrete Hot-Mix Surface Course | Not less than 92% of theoretical density.                    |
| (b) Asphaltic Concrete Hot-Mix Binder Course  | Not less than 90% of theoretical density.                    |
| (c) Dense Graded Hot-Mix Surface Course       | Not less than 90% of theoretical density.                    |
| (d) Dense Graded Hot-Mix Binder Course        | Not less than 90% of theoretical density.                    |
| (e) Sand-Asphalt Hot-Mix Surface Course       | Not less than 90% of theoretical density.                    |
| (f) Sand-Asphalt Hot-Mix Base Course          | Not less than 95% of the density obtained in the laboratory. |
| (g) Hot-Mix Asphalt Stabilized Base Course    | Not less than 97% of the density obtained in the laboratory. |

Samples for the determination of density shall be taken by sawing or coring from the finished pavement by the Contractor, at his expense, at locations and in the manner directed by the Engineer. The cuts made in taking such samples shall be repaired by the Contractor at no expense to the Owner other than for materials.

- (5) Joints. Placing of the bituminous paving shall be as continuous as possible. Roller shall not pass over the unprotected end of a freshly laid mixture unless authorized by the Engineer. Transverse joints shall be formed by cutting back on the previous run to expose the full depth of the course. When directed by the Engineer, a brush coat of bituminous material shall be used on contact surfaces on transverse joints just before additional mixture is placed against the previously rolled material.
- (6) Surface Tests. Before the completion of the rolling, the surface shall be tested for thickness and contour and

corrected as necessary while still hot by adding or removing material, restoring and re-rolling until the finished surface complies with the test requirements.

The finished surface, when checked with a ten foot straight edge placed parallel to the centerline, shall show no variation more than 1/4 inch for base or intermediate courses and not more than 1/8 inch for surface courses.

Such portions of the completed base or surface as are found defective shall be removed and replaced with suitable material by the Contractor at no expense to the Owner.

- (7) Widening Operations. When asphaltic hot-mix material is to be placed in a trench for widening an existing pavement, and the trench is inaccessible to normal rolling operations, compaction of both the subgrade and the bituminous material shall be accomplished by means of a trench roller or by other approved methods.
- (8) Temperature Limitations. Hot-mix bituminous material shall not be mixed or placed when the air temperature in the shade is below 40 degrees F., or when there is frost in the base or subgrade, or at any other time when weather conditions are unsuitable for the type of material being placed. When approved by the Engineer, bituminous material may be placed when the lifts are in excess of 20 inches compacted thickness and the air temperature in the shade is 35 degrees F., or higher.

## PART 5.00 - MEASUREMENT AND PAYMENT

### 5.1 BASE COURSE

- A. Method of Measurement and Payment. The work included in the base course as described above shall be by the cubic yard for all work completed under this item, which price shall be full compensation for hauling, placing, compacting, watering, and final grading and for all labor, tools, equipment and incidentals necessary to complete the work.

### 5.3 ASPHALTIC CONCRETE HOT MIX SURFACE COURSE

- A. Method of Measurement and Payment. The work included in asphaltic concrete hot mix surface course as described above shall be by the ton for all work completed under this item, which price shall be full compensation for furnishing all materials; for all heating, mixing, hauling, placing, rolling and finishing; and for all labor, tools, equipment, and incidentals necessary to complete the work.

PART 6.00 - DISPOSAL OF EXCESS SOIL

6.1 DISPOSAL

- A. All excess soil shall be placed on the north slope of the fill area.

PART 7.00 - STRIPING

7.1 PAVEMENT MARKING

- A. Striping is required at each hangar space and shall consist of a 4" stripe with yellow traffic marking paint equal to Sherwin-Williams Traffic Marking Paint. A 6" center line stripe will be painted where shown on the plans.
- B. Parking spaces shown on the plans shall be delineated with a 4" wide white strip using paint equal to Sherwin-Williams Traffic Marking Paint. Rate to be 115 SF/Gal of paint.

SECTION 02766

PAVEMENT MARKINGS

PART 1.00 - GENERAL

1.1 CONDITIONS

- A. Requirements of the conditions of the Contract apply to all work under this Section.

1.2 SCOPE

- A. Related work specified elsewhere includes the following:
  - 1. Pavement Marking

1.3 QUALIFICATIONS

- A. Applicator shall have a minimum of five years experience at airfield markings and layout. Applicator must be equipped with an airless sprayer.

PART 2.00 - PRODUCTS

2.1 MATERIALS

- A. Paint shall meet federal specification 1952-B for traffic marking paint.
- B. Glass beads shall be spherical in shape and meet gradation "A".

2.2 TOOLS

- A. Paint shall be applied with an airless sprayer capable of meeting the application rate.

PART 3.00 - EXECUTION

3.1 PREPARATION

- A. Pavement shall be cleans of any dust, mud, laitance, oils or grease.
- B. Pavement shall be dry.

### 3.2 APPLICATION

- A. Paint shall be applied at the rate of 115 square foot per gallon. Glass beads shall be dispensed in the wet paint at a rate of 7 pounds/gallon.
- B. Line to be straight and true to within  $\frac{1}{2}$ " in 50 feet. Edges should be true without any drift.
- C. Manufacturer's limitation for temperature shall be followed.

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1.0 - GENERAL

1.1 CONDITIONS

Requirements of the conditions of contract apply to all work under this Section.

1.2 SCOPE

A. Related work specified elsewhere includes, but is not necessarily limited to the following:

1. Excavation
2. Furnishing steel base plate and anchor bolts
3. Sleeves for piping and built-in boxes, conduits, etc., by various sections involved
4. Granular fill under slabs

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. Keep available for reference the following literature, including latest revisions, which are hereby included by reference and made a part of these specifications.

1. Southern Standard Building Code
2. ACI 306 Recommended Practice for Cold Weather Concreting
3. ACI 318 Building Code Requirements for Reinforced Concrete
4. ACI 347 Recommended Practice for Concrete Formwork
5. ACI 305 Recommended Practice for Hot Weather Concreting
6. ACI 309 Consolidation of Concrete
7. ACI 211 Recommended Practice for Selecting Properties for Concrete
8. ACI 304 Recommended Practice for Measuring, Mixing and Placing Concrete
9. ASTM Standard in Building Codes
10. CRSI Recommended Practice for Placing Reinforcing Bars
11. CRSI Recommended Practice for Placing Bar Supports
12. AWS D12.1 Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connection in Reinforced Concrete Construction
13. NRMCA Concrete Plant Standards and Truck Mixer and Agitator Standards.

B. Any material or operation specified by reference to the published specification of a manufacturer, or the above-mentioned standards, shall comply with the standard listed. In case of conflict between the referenced specifications, the one having the most stringent requirements shall govern.

In the event of conflict between the referenced specifications and the project specifications, the project specifications shall govern.

#### 1.4 INSPECTION, TESTING AND QUALITY CONTROL

- A. A testing agency will be selected by Contractor, approved by the Engineer and will be paid by the Contractor.
- B. Allow clear and safe access to the work for sampling, inspection and storage of specimens and equipment. Construct a storage box on the site of sufficient size to store 24 cylinders which will afford the protection required by ASTM C31.
- C. All samples and tests required by the Engineer to determine if materials to be used in the project comply with specification requirements shall be made by the testing agency prior to their actual use in the project. If the materials submitted do not conform to all contract requirements, the cost of subsequent sampling and testing shall be paid for by the Contractor.
- D. Whenever the source, quality or characteristics of the approved material changes or indicates lack of compliance with contract requirements, (1) resubmit additional materials for sampling, and (2) test these materials until they meet specification requirements. Cost of additional sampling, testing and inspection of materials and workmanship not conforming to contract requirements shall be paid for by the Contractor.
- E. Notify the Engineer and testing agency not less than 24 hours in advance of commencement of any project concrete operations.
- F. When tests of control specimens fall below the required strength, or when freshly poured concrete is suspected of being frozen or damaged by frost, the Engineer may require core specimens taken from the concrete in question and tested in accordance with ASTM C42. If these specimens do not meet the strength requirements, the Engineer will have the right to require additional curing, load tests, strengthening and removal and replacement of those parts of the structure which are unacceptable and, in addition, removal of such sound portions of the structure as necessary to insure the safety and durability of the structure. Control specimens shall not be used for evaluating compressive strength of concrete suspected of being frozen. All additional testing, strengthening or removal and replacement of parts of the structure shall be at the Contractor's expense.
- G. Those portions of the structure that do not meet the contract requirements shall be corrected and removed and replaced as directed by the Engineer and all costs of operations, removal and replacement shall be at the Contractor's expense.
- H. Testing and approvals are required to aid the Contractor in adhering to the specification requirements and in no way are

meant to be construed as relieving the Contractor of his responsibility to fulfill all the requirements of the Contract Documents.

- I. Any items referred to above relative to payments by the Contractor to the Owner will be determined by the Engineer. In addition, the Contractor shall reimburse the Owner for inspection, sampling or testing services ordered but not used due to the Contractor's improper coordination.

## 1.5 SUBMITTALS

### A. Shop Drawings.

1. Submit reinforcement shop drawings showing detailed layouts including materials, dimensions, spacing, bend details, accessories, if any, and similar items required for the proper construction of the work.
2. Submit formwork drawings for all exposed concrete work showing location of form face materials, location of strap anchors, ties and other items in contact with or embedded in the concrete. Indicate material to be used, methods of sealing joints and surfaces and leveling joints.
3. Submit mill reports for all reinforcement.
4. Submit proposed mix for concrete.
5. Submit the methods proposed for cold weather or hot weather curing and protection of concrete prior to commencement of concrete work.
6. Unless otherwise noted, when compliance with the referenced specifications or this specification is required, furnish an affidavit from the manufacturer or fabricator certifying that the material or product delivered to the project meets all the requirements of the Contract Documents.

### B. Samples. Submit the following in duplicate for approval prior to the actual use in the project:

1. Concrete constituents, including admixtures.
2. Form ties and spreaders.
3. Accessories for reinforcement.
4. Reglets.
5. Form release agent.
6. Control joint filler material.
7. Vapor barrier.

### C. Schedules. Submit to Engineer a schedule of concrete placement indicating areas to be poured and showing in detail the methods to be used at construction joints not indicated on the Contract Drawings.



## 1.6 PRODUCT HANDLING

### A. Delivery of Materials.

1. All central plant and rolling stock equipment and methods shall conform with Truck Mixer and Agitator Standard of the Truck Mixer Manufacturer's Bureau of the National Ready-Mixed Concrete Association, as well as ACI 614, "Recommended Practice for Measuring, Mixing and Placing Concrete" and ASTM C94, "Specifications for Ready Mixed Concrete."
2. Transit mixed concrete shall be mixed at mixing speed for at least ten (10) minutes immediately after charging the truck followed by agitation without interruption until discharged.
3. Ready-mixed concrete shall be transported to the site in water-tight agitator or mixer trucks loaded not in excess of rated capacities. Discharge at the site shall be within 1.5 hours after water was first introduced into the mix and within 1 hour when ambient air temperature exceeds 80 degrees F.
4. Schedule and dispatch trucks from the batching point so that they shall arrive at the site just before the concrete is required. Avoid excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.
5. All light weight concrete shall be delivered to the site in trucks loaded to 50% of their rated capacity unless the Control Engineer approves loading to a higher percentage. This requirement is to prevent segregation of constituents.

B. Storage of Materials. No materials frozen or containing ice shall be used. All improper and rejected materials shall be immediately removed from the point of use. Materials, including steel reinforcement and accessories, shall be covered during the construction period. Concrete constituents shall be handled and stored separately in such a manner as to prevent intrusion of foreign matter, segregation or deterioration, and shall be properly stockpiled as necessary to assure uniformity throughout the project.

## PART 2.00 - MATERIALS

### 2.1 MATERIALS

#### A. Concrete.

1. Cement shall be American made Portland Cement, free from water soluble salts or alkalies which will cause efflor-

escence on exposed surfaces. Portland cement shall conform to all chemical and physical requirements of ASTM C150 for Types I or II.

2. Fine aggregate (normal weight) shall consist of washed, inert, natural sand conforming to ASTM C33 and the following additional requirements:

<u>Sieve</u>	<u>Retained (5)</u>
#4	0 - 5
#16	25 - 40
#50	70 - 87
#100	93 - 97
F.M. . . . .	2.80 (+0.20)
Organic . . . . .	Plate 2 maximum
Silt . . . . .	2.0% maximum
Mortar Strength. . . . .	100% minimum compression ratio

3. Coarse aggregate (normal weight) shall consist of well graded crushed stone or washed gravel conforming to ASTM C33 and the following additional requirements:

<u>Designated Size</u>	<u>2"</u>	<u>1 1/2"</u>	<u>1"</u>	<u>3/4"</u>	<u>1/2"</u>	<u>3/8"</u>
F.M. (+/-0.20)	7.45	7.20	6.95	6.70	6.10	
Organic		Plate 1 maximum				
Silt		1% maximum				

4. Pea gravel shall be washed, clean, hard, rounded gravel conforming to ASTM C33, except that it shall be graded to 90% passing the 3/8" screen and 90% retained on the 1/2" screen.
5. Light weight fine and coarse aggregates shall conform to ASTM C330 and as specified herein. Aggregate sizes shall include fine aggregate designated as "sand size," and coarse aggregate designated as graded 3/4" size. The splitting ratio (Fsp) shall not be less than 5.5.
6. Maximum designated sizes of natural aggregate shall be used as follows:

<u>Dimension of section</u> <u>inches</u>	<u>Maximum size aggregate</u> <u>inches</u>
10 and over	2
8 - 10	1
3 - 8	3/4
1 1/4 - 3	1/2
less than 1/2	3/8 (pea gravel)

7. Water shall be potable and from a domestic supply.
8. Admixtures:
  - a. A water reducing agent conforming to ASTM C494 shall be used in all concrete as determined by the Engineer.
  - b. Air Entraining Agent shall conform to ASTM C-260 and be fully compatible with the water reducing agent to be used. Air entraining agent shall be used in all concrete exposed to the weather or subject to freezing and thawing, as a supplement to the water reducing agent to produce air entrainment of 4.5 to 5.5% total air (entrapped plus entrained) in normal weight concrete. It shall also be used in controlling density of light weight concrete, but in no case in such quantity as to produce air entrainment greater than 6.0% total air.
  - c. Admixtures retarding setting of cement in concrete shall be used if ordered by the Engineer.
  - d. Calcium chloride may be used only with express permission of the Engineer in writing.
  - e. Admixtures shall be pre-mixed in solution form and dispensed as recommended by the manufacturer. The water in the solution shall be included in computation of water-cement ratio.
  - f. "Fly-Ash" is an allowable admixture provided it is not used in such proportions and quantities that will alter the strength, performance and durability of the concrete. As specified elsewhere in these specifications, the Contractor shall obtain written permission from the Engineer before the use of fly-ash is allowed.

B. Form Materials.

1. Concrete surfaces not exposed to view shall be made of wood, metal or other material as approved by the Engineer.
2. Forms for exposed concrete surfaces shall be Class I B-B High Density Overlay Plyform, exterior grade not less than 5 ply nor less than 5/8 inch thick and conforming to U.S. Product Standard PSI-66.
3. Form ties and spreaders shall be commercial brands such as Richmond Tyscrus - Richmond Screw Anchor Co., 500 East 132nd Street, Bronx, New York 10454; or Superior Ties - Superior Concrete Accessories, Inc., 9301 King Street, Franklin Park, Illinois 60131; or Sure-Grip Ties - Dayton Sure-Grip and Shor Co., 721 Richard Street, Miamisburg, Ohio, or equal. Ties shall have a removable tapered plas-

tic or wood cone 1/2 inch outside diameter and set back 1 inch deep. Wire ties shall not be used.

4. Ties for walls below grade and at unexposed areas shall be snap-on ties or the type specified above with removable cones and shall incorporate water-seal washer.

C. Reinforcing.

1. Reinforcing steel bars shall be newly rolled billet steel conforming to ASTM A615. All reinforcement is to be Grade 60 except column ties, beam stirrups, and temperature reinforcement, which shall be Grade 40.
2. Welded wire fabric shall conform to ASTM A185, sizes as shown on the Drawings.
3. Tie wire shall be annealed wire of sufficient strength for the intended purpose, but not less than No. 18 gauge.
4. Metal supports shall be of such a type as not to penetrate the surface of the formwork and show through the surface of the concrete. Individual and continuous slab bolsters and chairs shall be of a type to suit the various conditions encountered and must be capable of supporting a 300 pound load without crushing.
5. The Contractor shall provide the Engineer with an affidavit or Mill Certificate for the reinforcing steel utilized.

D. Other Materials.

1. Form release agent shall be an approved, non-staining, non-emulsifiable type for all concrete to be left exposed, painted or plastered, or to receive any adhesive applied finish. It shall be compatible with architectural finishes applied later.
2. Pre-molded joint filler shall be cork type, non-extruding self-expanding filler strips conforming to ASTM D1752 Type III and AASHTO M153 Type III. They shall be as manufactured by Celotex Corp.; W.R. Meadows, Inc.; or W.R. Grace & Co., or equal. Use where shown on Drawings or specified, in thickness shown, but not less than 1/2 inch. Joint filler shall be compatible with any joint sealer to be used.
3. Non-shrink cement grout under steel base plates and bearing plates and required to fill in pockets left in concrete walls or slabs shall be "Embeco Pre-Mixed Grout" by Master Builders; "Vibro-Foil Ready-Mixed" by W.R. Grace; or "Ferrolith G" by Sonneborn Building Products, Inc., or equal. The material shall be a ready-to-use metallic aggregate product requiring only the addition of water at the job site, and shall have the following qualities:

- a. Capable of producing a flowable grouting material having no drying shrinkage or settlement at any age.
  - b. Compressive strength of grout (2" x 2" cubes) shall be not less than 4000 psi at 7 days, and 6000 psi at 28 days.
4. Vapor barrier shall be 6 mil polyethylene used in the widest possible widths. Joints shall be lapped a minimum of 6 inches. Laps and all penetrations shall be sealed with a compatible trowel mastic or pressure sensitive tape. Seal along wall intersections and other penetrations.

## 2.2 MIXES

### A. Concrete Mix Designs.

1. The concrete mix design shall be carried out in accordance with Chapter 3 - Proportioning "Suggested Specifications for Structural Concrete for Buildings," and ACI Recommended Practices for Selecting Proportions for Concrete (ACI 613 and 613A), except as otherwise specified herein.
2. It is the intent of this specification to secure, for every part of the work, concrete of homogenous structure which, when hardened, will have the required strength, appearance and resistance to weathering. The actual proportions of constituents necessary to produce concrete conforming to the specification requirements shall be determined by means of prior laboratory tests made with the constituents to be used in the work.
3. All testing and control of concrete will be carried out by an organization selected by the Engineer, except that at his option the Contractor may use a different laboratory for design of the concrete mixes. All concrete shall be subject to control, at the Engineer's discretion. The Contractor agrees to accept as final the results of tests secured by the Testing Engineer.
4. Under special circumstances, the Engineer may at his discretion allow minor deviations from the material requirements specified below, provided the resulting quality is not adversely affected thereby. If an increase in cement content is made to compensate for such deviations, such increase shall be made without cost to the Owner.
5. The Contractor shall make available to the Testing Engineer all materials and mixtures for acceptance testing of the proposed concrete mixes as well as sufficient samples of fine and coarse aggregate for qualitative acceptance test. All samples shall be available at least five (5) weeks before the Contractor proposes to use them

in the work. Duplicate small samples shall be plainly and neatly labeled with the source, where proposed to be used, date and name of collector, and presented to the Engineer for permanent reference. All costs in connection with furnishing and delivery of samples shall be at the Contractor's expense.

6. The conformity of aggregates to the specifications herein before given, and the actual proportions of cement, aggregates and water necessary to produce concrete conforming to the requirements set forth in Table "A" below shall be demonstrated and determined by tests made with representative samples of the materials to be used on the work. All such tests shall be made by the approved laboratory.
7. The materials acceptance test results, trial mix data, and recommended job mixtures shall be presented to the Engineer for approval as soon as possible and at least five (5) working days prior to the proposed beginning of concreting. Materials shall not be delivered to the site or used until the samples shall have been approved and as used they shall in all respects be equal to the approved samples.
8. All concrete shall have a minimum compressive strength as indicated on the Drawings. Concrete not so designated shall have a minimum compressive strength of 4000 psi at 28 days of age.
9. The following limiting strengths, water-cement ratios, cement factors, etc. as shown in Table A below, shall apply for the specific strengths of concrete:

TABLE A

Minimum Allowable Comp.Str. (psi @28 days)	Max. Allowable Net Water Content (Gal/Sack*)	Cement Factor Est. Probable Average***		Sacks Per C.Y. Min Permissible**
		Gravel	Cr.Stone	
N.Wt. 6000	4.75	7.75	8.0	7.5
N.Wt. 5000	5.00	7.0	7.4	6.7
N.Wt. 4000	5.75	6.2	6.6	6.0
N.Wt. 3000 (Cl.A)	6.50	5.3	5.7	5.0
N.Wt. 2000 (Cl.B)	7.75	4.8	5.2	4.65
L.Wt. 4000	5.75		7.0*)	7.0
L.Wt. 3000	6.50		6.25*)	6.0

\*Maximum: Decrease if possible; this represents total water in mix at time of mixing, including free water on aggregate.

\*\*Minimum: Increase as necessary to meet other requirements.

\*\*\*For purpose of estimating only with high quality aggregates medium consistencies, Type II cement under average conditions. Type I cement concrete will generally require approximately an additional 0.25 sacks per cubic yard. Architectural "Type II" cement will generally require 0.5 additional sacks per cubic yard depending on brand and strength. Actual cement factors to be established to meet all other stated requirements.

\*)Light weight aggregate.

10. The approved water reducing agent shall be added to all concrete. Concrete exposed to the weather shall contain entrained air. Retarders in hot weather shall be used, subject to approval of brand and method of use.
11. The water content and cement content of the concrete to be used in the work shall be based on a curve showing the relation between water content, cement content, and 7 and 28 day compressive strengths of concrete made using the proposed materials. The curves shall be determined by four (4) test specimens at each age, and shall have a range of values sufficient to yield the desired data, including all the compressive strengths called for on the plans, without extrapolation. The design mix of the concrete to be used in the structure, as determined from the curve, shall correspond to the test strengths in Table "B" obtained in the laboratory trial mixtures, but in no case shall the resulting mix conflict with the limiting values as specified in Table "A".

TABLE B  
Minimum Strength of Lab Trial Mixes

Design Strength	Working Stress		Ult. Strength	
	7-days*	28-days**	7-days*	28-days**
5000	4500	5800	5000	6250
4000	3500	4600	3800	5000
3000	2500	3500	2700	3750
2200	1500	2400		

\*May be employed for preliminary design.

\*\*To be used for final design.

12. The set density of the concrete shall be determined in accordance with ASTM C138.

B. Controlled Concrete.

1. All material to be used in the work shall be subject to testing to determine that it conforms to the requirements of the specifications. The methods of testing shall conform to the appropriate ASTM specification, but the place, time, frequency, and method of sampling will be determined by the Engineer in accordance with the particular conditions of this project.

2. If, during the progress of the work, the Contractor desires to use materials other than those approved originally or if the materials from the source originally approved change in characteristics, additional tests shall be made with new materials which will produce concrete meeting with the stated requirements and not cause objectionable change in the color or appearance of the structure. These additional tests shall be made by the selected Testing Engineer, at the expense of the Contractor. No concrete made from such different materials shall be used in the work until the Engineer has given his approval.
3. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being used, the Engineer may order such changes in the proportions or materials, or both as may be necessary to secure the desired properties, subject to the limiting requirements in Table A above. Any changes so ordered shall be made at the Contractor's expense, and no extra compensation will be allowed by reason of such changes.
4. All concrete shall be ready-mixed produced by a plant acceptable to the Engineer. Hand or site mixing shall not be done. All constituents, including admixtures, shall be batched at the central batch plant.
5. Materials shall be measured by weighing. The apparatus provided for weighing the aggregates and cements shall be certified by the testing agency. Each size of aggregate and the cement shall be weighed separately. The accuracy of all weighing devices shall be such that successive quantities can be measured to within one (1) percent of the indicated amount. Cement in standard packages (sacks) need not be weighed. The mixing water shall be measured by volume or by weight. The water measuring device shall be accurate to 1/2%. All measuring devices shall be subject to approval. Admixtures shall be mixed, dispensed and used in accordance with the specific manufacturer's detailed specifications. Dispensing may be done either manually with the use of calibrated containers or measuring tanks, or by means of an approved impulse dispenser by the manufacturer of the specified admixture.
6. Use cooled or heated water in accordance with ACI 305 and 306.
7. Central mixed concrete shall be plant mixed a minimum of five (5) minutes. Agitation shall begin immediately after the pre-mixed concrete is placed in the truck and shall continue without interruption until discharged.
8. The consistency of the concrete at time of deposit as measured by the ASTM Standard Slump Test, Designation



C143, shall be as follows:

<u>Portion of Structure</u>	<u>Recommended</u>	<u>Max. Range</u>
Pavements, Slabs on Ground & Stair Fill	2 inches	1 inch - 3 inches
Footings, Massive Sections	2 inches	1 inch - 3 inches
Reinforced Slabs, Beams	3 inches-4inches	2 inches- 4 inches
Reinforced Walls & Columns	4 inches	3 inches- 5 inches

9. In general, when mechanical vibration is used for compacting concrete, the above "Recommended" consistencies shall not be exceeded. The limiting consistencies may be modified subject to the approval of the Engineer, provided the requirements for placability shall be satisfied.
10. In all cases, the concrete shall be of such consistency and mix composition that it can be worked readily into the corners and angles of the forms and around the reinforcement, concrete inserts and wall castings without permitting the materials to segregate or free water to collect on the surface, due consideration being given to the methods of placing and compacting.

### 2.3 FABRICATION

- A. Fabrication of Reinforcing Steel. Reinforcing bars shall be detailed in accordance with requirements of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315). Bars shall be bent cold.

## PART 3.00 - EXECUTION

### 3.1 CONDITION OF SURFACES

- A. Examine all surfaces on which or against which the work of this Section is to be applied to insure that the surfaces, and the original general conditions at the site are satisfactory for the installation of the work.
- B. All soil supporting slabs and footings and all reinforcing, inserts, and forms shall be inspected by the Engineer before concrete is placed.
- C. Remove water and foreign matter from forms and excavations. Place no concrete on frozen soil and provide adequate protection against frost action during freezing weather. Calcium chloride shall not be sprinkled into forms to remove ice or thaw frozen soil, or on any concrete surface to remove ice.

### 3.2 PREPARATION

- A. Slabs to receive cement waterproofing, monolithic topping or concrete fill shall be roughened and freed of all laitance and

foreign material.

- B. Forms shall be treated with release agent applied in accordance with the manufacturer's instructions.
- C. Before concrete is placed, the surfaces of the concrete already placed, including vertical and inclined surfaces, shall be thoroughly cleaned of foreign materials and laitance, roughened with suitable tools, such as chipping hammers, wire brushes, etc., and re-cleaned by a stream of water or compressed air. Well before the new concrete is deposited, joints shall be saturated with water. After free or glistening water disappears, joints shall be given a thorough coating of neat cement grout mixed to the consistency of very heavy paste. The surfaces shall receive a coating of at least 1/8 inch thick; wherever possible, this shall be scrubbed in by means of stiff bristle brushes. New concrete shall be deposited before the neat cement grout dries.

### 3.3 INSTALLATION

#### A. Erection of Formwork and Shoring:

1. Forms shall be constructed to withstand all dead and live loads, including construction live loads, both vertical and lateral, imposed upon them during construction, concreting and curing periods. Bracing shall be such that forms do not move out of specified tolerances for line and elevation. Conform to ACI 318 and 347.
2. The Contractor shall provide sufficient form materials so work can proceed without delay. Forms shall be built mortar-tight and edges glued or otherwise sealed to prevent loss of concrete matrix. Edges of formed panels, in contact with previously cast concrete, shall be flush within 1/16 of an inch. Forms shall be continuously adjusted for line and elevations during concrete placement as required.
3. Forms and form accessories shall be so designed and installed so that removal will in no way damage concrete surfaces.
4. Before form materials can be re-used, surfaces that will be in contact with freshly cast concrete shall be thoroughly cleaned, damaged areas repaired, and all projecting nails withdrawn.
5. Before reinforcement is placed on or against formwork, surfaces of forms coming in contact with fresh concrete shall be cleaned and then treated with the approved form release agent.
6. Provide chamfers at all external corners of forms abutting masonry or other vertical building materials, nailed 6" o.c.

7. Provide feature and drip strips as located and shown on the drawings, nailed 6" o.c.

B. Placing Reinforcement:

1. Reinforcement shall be accurately placed in accordance with Contract Documents and shall be firmly secured and positioned by templates, wire ties of adequate gauge and reinforcement accessories.
2. At the time concrete is placed, reinforcement shall be free of excessive rust scale, or other coatings that will destroy or reduce bond requirements. Reinforcement expected to be exposed to the weather for a considerable length of time shall be painted with a heavy coat of cement grout.
3. Splicing of reinforcement at points of maximum stress shall be avoided. Splices of bar #11 size and smaller shall be lapped as shown on the Drawings or a minimum of 30 bar diameters, placed in contact and wired securely together. Welded wire fabric shall be lapped six (6) inches and one wire space plus two (2) inches, whichever is larger and shall be securely wired together at 18" intervals.
4. Reinforcement shall be continuous through construction joints unless otherwise indicated on the Drawings. Provide additional reinforcement at construction joints in walls, except at control joints, as follows:  
  
Provide additional reinforcement 80 bar diameters long, one-half length of bar, ear side of joint in sufficient quantity so that the total area of bars through the joint is equal to .003 of the gross cross-sectional area of the wall. Bars are to be placed at each face of wall alternately spaced with the main reinforcement.
5. All splices shall be made so that the bars being joined are parallel and not offset more than 1/8 inch nor out of straight alignment more than 1/4 inch in ten (10) feet. The elevation of the top of vertical bars shall be within plus or minus 1 inch (+/-1 inch) of specified elevation as shown on the Contract Drawings.
6. Arc welded splices shall conform to all requirements of the American Welding Society D12.1.
7. Bars to be welded to structural members shall be welded to conform to A.W.S. D12.1, Section 406, with proper welding procedures to be employed for carbon and manganese contents of the reinforcing bars to be welded. The Contractor shall provide the Engineer with certified copies of the ladle analysis for each lot of reinforcing steel bars to be welded. The ladle analysis shall state the percentage of carbon, phosphorous, manganese and

sulfur present in the steel. Bars that are to be welded shall be clearly identified with the heat from which they are rolled. Welding will not be permitted on reinforcing steel without such identification.

8. Bending, tack welding, cutting or substituting reinforcement in the field, other than shown on the Contract Drawings, in any manner is prohibited, unless specific approval for each case is given by the Engineer or his designate.
9. All splices shall be made so that the bars being joined are parallel and not offset more than 1/8 inch nor out of straight alignment more than 1/4 inch in ten (10) feet. The elevation of the top of vertical bars shall be within plus or minus 1 inch (+/-1 inch) of specified elevation as shown on the Contract Drawings.

C. Embedded Items and Coordinations:

1. Insure that installation of all embedded items conform to requirements of ACI 318-71, Chapter 6, Paragraph 6-3, "Conduits and Pipes Embedded in Concrete," and as specified below.
  - a. The installation of all inserts required by other trades shall be coordinated with, or shall be installed prior to, the placing of reinforcing steel.
  - b. Place anchor bolts, adjustable anchor slots, etc., furnished by other Sections.
  - c. Embed no pipes other than electrical conduit in any structural concrete. Apply for permission from Engineer for any variation from the following requirements unless shown on the Structural Drawings. Make request in writing, accompanied by suitable sketch.
    - (1) No conduit coating, except galvanized or equivalent, shall be used.
    - (2) Do not cut or displace any reinforcement.
    - (3) Do not place conduit between concrete surfaces and reinforcement.
    - (4) Slabs - restrict L.D. of conduit to 1/4 of slab thickness. Keep within middle half of that thickness.
    - (5) Run conduit larger than 1/6 slab thickness approximately parallel and at right angles to slab reinforcing, not diagonally.

- (6) Place nearly parallel conduits apart at least 6 times L.D. of conduit being used.
- (7) Do not embed conduit over 4% of the gross concrete area lengthwise in beams or columns.

D. Joints:

1. Construction and control joints indicated on the Drawings are mandatory and shall not be omitted. If joint location is not specifically shown, Contractor shall submit a sketch to the Engineer for approval showing proposed joint location before slab is poured.
2. Construction joints shall be continuously bevel keyed, 2" x 4" minimum, except at noted.
3. Joints not indicated or specified shall be placed to least impair the strength of the structure and shall be subject to the approval of the Engineer or his designate.

E. Placing Concrete:

1. The consistency of the concrete at the time of deposit as measured by ASTM C143, "Standard Method of Test for Slump of Portland Cement-Concrete," shall be in conformance with ACI 211. Slump for light weight concrete shall be from 2" to 3". The concrete shall be of such consistency and mix composition that it can be worked readily into the corners and angles of the forms and around the reinforcement and concrete inserts, without permitting the materials to segregate or free water to collect on the surface.
2. The retempering of concrete which has partially hardened will not be permitted.
3. Transport concrete from mixer to place of final deposit as rapidly as practical by methods which prevent separation of the ingredients and displacement of reinforcement, and avoid rehandling. Deposit not partially hardened concrete. When concrete is conveyed by chutes, the equipment shall be of such size and U-shaped design as to insure a continuous flow in the chute. The slope shall not be less than 25 nor more than 45 degrees from horizontal. The discharge end of the chute shall be provided with a baffle plate or spout to prevent segregation. If the discharge end of the chute is more than 5 feet above the surface of the concrete in forms, a spout shall be used, and the lower end maintained as near the surface of deposit as practicable. When the operation is intermittent, the chute shall discharge into a hopper. Concrete shall not be allowed to flow horizontally over a distance exceeding 5 feet.

4. Work shall be so executed that a section begun on any one day shall be completed in daylight on the same day.
5. If a section cannot be placed continuously between planned construction joints, a field joint and additional reinforcement shall be introduced. The Engineer shall be notified immediately in such case.
6. In order to secure full bond at construction joints, the surfaces of the concrete already placed shall be thoroughly cleaned of foreign materials and laitance, roughened with suitable tools and recleaned by a stream of water or compressed air. Well before the new concrete is deposited, the joints shall be saturated with water. After free or glistening water disappears, the joints shall be given a thorough coating of neat cement grout mixed to the consistency of very heavy paste. The surfaces shall receive a coating of at least 1/8 inch thick; whenever possible, this shall be scrubbed by means of stiff bristle brushes. New concrete shall be deposited before the neat cement grout dries.
7. Concrete shall be thoroughly compacted by means of internal type mechanical vibrators. Vibration shall be done by experienced operators and shall be thorough enough to produce homogeneity and optimum consolidation without permitting segregation of the constituents or "pumping of air." All vibrators used for light weight concrete shall operate at a speed of not more than 5000 rpm, with large amplitude motion. All vibration shall be supplemented by proper wooden spade puddling to remove included bubbles and honeycombs. At least one vibrator shall be on hand for every 10 cubic yards of concrete placed per hour, plus one spare. All vibrators shall be operable and on the site prior to starting placement.
8. Cold joints are to be avoided, but if any occur, the Engineer may require removal of all or part of the concrete at which cold joint occurs, using any method he deems necessary. Minimum requirement will be that a cold joint shall be treated as a bonded construction joint.
9. When placing exposed concrete on vertical surfaces, strike corners of forms rapidly and repeatedly from the outside along the full height while depositing concrete and vibrating.
10. After depositing concrete in columns or walls, at least 2 hours must elapse before depositing in beams, girders or slabs supported thereon.
11. Chutes, hoppers, spouts, adjacent work, etc., shall be thoroughly cleaned before and after each run and the water and debris shall be discharged outside the form.

12. After concrete has been placed, provide protection against rapid drying, from direct sun or wind, or cold temperature, during and after finishing operations.

F. Finishing:

1. Float Finish.

- a. Provide floated finish on the following surfaces:
  - (1) Slabs to receive metallic waterproofing.
  - (2) Slabs to receive built-up roofing.
  - (3) Slabs to receive terrazzo.
  - (4) Top surfaces of walls, curbs, and parapets to receive metal flashing, or other finish material not requiring a steel troweled surface.
- b. Surfaces to receive floated finish shall be finished in conformance with ACI 301, Section 1104(b).

2. Steel Troweled Finish.

- a. Provide steel troweled finish on the following surfaces:
  - (1) Slabs to receive carpeting.
  - (2) Slabs to receive resilient tile.
  - (3) Slabs to be left exposed
  - (4) Top surfaces of equipment pads.
- b. Surfaces to receive steel troweled finish shall be finished in conformance with ACI 301, Section 1104 (b) and (c), and additional requirements as follow:
  - (1) Floated Finish - After the concrete has been placed, struck off, consolidated, and leveled, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared, and/or when mix has stiffened sufficiently to permit the proper operation of a power-driven float. The surface shall then be consolidated with power-driven floats. Hand floating with wood or cork-faced floats shall be used in locations inaccessible to the power-driven machine. Trueness of surface shall be re-checked at this stage with a 10 foot straightedge applied at not less than two different angles. All high spots shall be cut down and all low spots filled during the procedure to a Class B tolerance. The slab shall then be re-floated immediately to a uniform, smooth, granular texture.
  - (2) Troweled Finish - Where a troweled finish is specified, the surface shall be finished first with power floats, as specified above, where

applicable, then with power trowels, and finally with hand trowels. The first troweling after power floating shall be done by a power trowel and shall produce a smooth surface which is relatively free of defects but which may still contain some trowel marks. Additional trowelings shall be done by hand after the surface has hardened sufficiently. The final troweling shall be done when a ringing sound is produced as the trowel is moved over the surface. The surface shall be thoroughly consolidated by the hand troweling operations. The finished surface shall be free of any trowel marks, uniform in texture and appearance, and shall be planed to Class A tolerance. On surfaces intended to support floor coverings, any defects of sufficient magnitude to show through the floor covering shall be removed by grinding.

- (3) Apply 2 coats of floor hardener to all concrete floor slabs not receiving another finish material as called for on the drawings. Apply hardener over broom clean dry concrete (minimum of 28 days after concrete placement). Rate of application for each coat shall not exceed 100 square feet per gallon.
- (4) Level and grind depressed and high spots in concrete surfaces in excess of the tolerances. In areas where leveling materials are required to provide the proper surface, such materials shall be of a type approved by the Engineer.

G. Curing, Protection, Form Removal and Reshoring:

1. Curing shall conform to ACI 301, Chapter 12, except as herein amended.
2. Sand and sawdust shall not be used for the curing of floor slabs. The slabs shall, in all cases, be kept continuously wet for at least six (6) days.
3. Sufficient and adequate equipment for protecting the concrete from any damage by the elements, including equipment for enclosing and heating the work, shall be kept on the site.
4. A permanent temperature record shall be kept by the Contractor showing the date and outside temperature for all concreting operations. Thermometer readings shall be taken at the start of work in the morning, at noon and again late in the afternoon, and the locations of all concrete placed during such periods shall likewise be recorded, all in such a manner as to show any effect the temperature may have had on the construction. Concrete temperatures shall



be taken one inch below the surface using mercury-filled thermometers. Locations of temperature readings shall be such as to give a true indication of the concrete temperature of the entire unit being monitored.

5. Forms shall be removed only after concrete has attained sufficient strength to support its own weight, construction live loads placed thereon, and lateral loads, all without excessive deflection or damage to the structure. See ACI 347.
  - a. The Contractor shall be fully responsible for the proper removal of forms, installing all shoring and re-shoring, and removal of shores and re-shores. Replace any work damaged due to improper or too early removal of forms, shores or re-shores.
  - b. Do not place construction or building materials on concreted members for a period of at least 24 hours after pouring, at which time adequate shores shall be employed to prevent damage to "green" concrete. Workmen shall not walk on freshly poured concrete members for a minimum of 12 hours after finishing.

#### 3.4 FIELD QUALITY CONTROL

- A. Slump tests, air tests, fabrication of cylinders and all other recognized tests which are deemed applicable shall be carried out in the field by the Testing Agency as required by the Engineer.

#### 3.5 REPAIRING AND FINISHING OF FORMED SURFACES

- A. As soon as the forms have been stripped and the concrete surfaces exposed, fins and other projections shall be removed plane with parent concrete surfaces. Recesses left by the removal of form ties shall be filled and minor surface defects repaired.
- B. Immediately after removal of forms, remove cones or cut off metal ties at least 1 1/2 inches back from surfaces exposed to view or which are to be finished. Fill holes upon stripping as follows: Moisten the hole with water, followed by a 1/16 inch brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug hole with a 1:1 1/2 mixture of cement and concrete sand mixed slightly damp to the touch (just short of "balling"). Hammer the grout into the hole until dense and an excess of paste appears on the surface. Trowel smooth with heavy pressure. Employ same source of cement and sand as used in the parent concrete. Rub lightly with a 60 grit carborundrum stone at an age of two to five days if necessary to bring the surface plane with the parent concrete. Exercise care to avoid damaging the virgin skin of the surrounding parent concrete. Wash thoroughly to remove all rubbed matter.

- C. Defective concrete and honeycombed areas shall not be patched unless examined and approval is given by the Engineer. If such approval is received by the Contractor, areas involved shall be chipped from square and at least 1 inch deep to sound concrete by means of cold chisels or pneumatic chipping hammers. If honeycomb exists around reinforcement, chip to provide a clear space at least 3/4 inch wide all around the steel to afford proper ultimate bond thereto. For areas less than 1 1/2 inch deep, the patch may be made in the same manner as described above for filling form tie holes, care being exercised to use adequately dry (nontrowelable) mixtures and to avoid sagging. Thicker repairs shall require build-up in successive days, each layer being applied (with slurry, etc.) as described above. The air strength and bonding of the multiple layer repairs, a non-shrink metallic aggregate shall be used as an additive as follows:

<u>Materials</u>	<u>Volumes</u>	<u>Weights</u>
Cement	1.0	1.0
Metallic Aggregate	0.15	0.25
Sand	1.5	1.5

For very heavy (generally, formed) patches, pea gravel may be added to the mixture and the proportions modified as follows:

<u>Materials</u>	<u>Volumes</u>	<u>Weights</u>
Cement	1.0	1.0
Metallic Aggregate	0.2	0.33
Sand	1.0	1.0
Pea Gravel	1.5	1.55

In cases where the metallic aggregate is employed in multiple patches and a rusty finish is not desired on the surface, the final layer (of at least the fine 1/2 inch) shall be composed of the 1:1.5 mix (see above) without metallic aggregate. After hardening, rub lightly as described above, for form tie holes. Patches which become grazed, cracked or sound hollow upon tapping shall be removed and replaced with new material at no expense to the Owner.

### 3.6 REPAIR AND FINISH OF UNFORMED SURFACES

- A. Tops of slabs, walls, stairs, etc., shall be repaired by using either the same material as originally cast or by use of a dry-pack material. Areas affected shall be chipped back square and to a depth of one inch minimum. Hole shall then be moistened with water for a minimum of two hours, followed by a brush coat of 1/16 inch thick cement slurry. Immediately plug the hole with concrete, or with a dry pack material consisting of 1:1 1/2 mixture of cement and concrete sand mixed slightly damp to the touch. Hammer the dry-pack into the hole, until dense, and excess of paste appears on the surface. Finish the patch level and to the same extent as surrounding concrete.

### 3.7 GROUTING OF COLUMN BASE PLATES AND BEAM BEARING PLATES

#### A. Mixtures.

1. Where clearances are less than 2 inches or where placement is difficult, grout shall consist of only grouting material and water.
2. Where clearances are over 2 inches and free passage will not be obstructed by coarse aggregate, 50 lbs. of pea gravel shall be added for each 100 lbs. of the grouted material.
3. Use minimum amount of water required to produce flowable grout.

#### B. Mixing.

1. Mix materials in accordance with manufacturer's requirements, using paddle type mortar mixer.
2. Mixing shall be done close to the area to be grouted. Provide adequate means for transporting the mixed grout as quickly as possible in order to prevent segregation.
3. No more grout shall be mixed at one time than can be placed in a period of 15 minutes. After the grout has been mixed, it shall not be retempered by additional water.

#### C. Preparation.

1. All defective concrete, laitance, dirt, oil, grease and loose material shall be removed from the concrete foundation leaving a reasonably rough surface. Surface of concrete shall be treated with two brush coats of cement waterproofing consisting of 1 part metallic aggregate to 1 part Portland cement mixed with sufficient water to produce a grout of brushable consistency. Not less than 24 hours shall elapse between coats, and after second coat prior to grouting. Cover the area with waterproof paper to prevent contamination prior to grouting.
2. The bottom of the plate shall be cleaned of all dirt, oil, grease and loose material. The plate shall be aligned and levelled in its final position and maintained in that position during grouting.
3. Special care shall be taken in hot or cold weather to insure proper setting and gain the strength, in accordance with instructions of the manufacturer of the ready-to-use grouting material.
4. Prior to grouting, all loose dirt and matter shall be cleaned away by compressed air and other means. The surface of the concrete shall be thoroughly saturated with

clean water. Free water shall be removed from the surface just prior to placing the grout.

5. Take care that nearby equipment or machinery does not transmit vibrations to the plate being grouted whereby settlement, the normal set, strength and bond of the grouting may be affected.

D. Grouting.

1. The grout shall be placed quickly and continuously to avoid undesirable effects of overworking which might result in segregation, bleeding, or breaking down of initial set.
2. The grout shall be placed by the most practical means. The grout may be poured in place, pressure-grouted by gravity, or pumped. The use of pneumatic pressure or dry-packed grouting required approval of the Engineer.
3. Grout shall completely occupy the space to be filled and be thoroughly compacted and free of air pockets. Pour grout from one side only to avoid air entrapment. Chain, if necessary.

- E. Finishing Unconfined Grout. After the grout has acquired its initial set, all exposed edges shall be cut off, leaving sloping "shoulders." The entire exposed area shall then be painted within 24 hours with a vapor-proof paint or plastered with a Portland cement-sand mortar.

3.8 CONCRETE FOUNDATIONS FOR EQUIPMENT

- A. The concrete pads required under items of mechanical, electrical and other equipment shall be included under this Section of the Specifications. See mechanical and electrical drawings for size and design of pads and location of equipment requiring concrete pads and foundations. Concrete shall be normal weight concrete of same strength as specified for floor slabs and shall have a smooth integral finish. Set bolts, anchors, piping, etc., in concrete as required by manufacturer of equipment used. Templates or setting diagrams as necessary shall be furnished by the various trades. Provide steel reinforcing in equipment foundations as indicated, but in no case less than required for slabs of the same thickness.

3.9 CLEANING

- A. Concrete surfaces shall be cleaned of objectionable stains as determined by the Engineer. Materials containing acid in any form, or methods which will damage the "skin" of concrete surfaces shall not be employed.

SECTION 05120

STRUCTURAL STEEL

PART 1.00 - GENERAL

1.1 CONDITIONS

- A. Requirements of the conditions of the Contract apply to all work under this Section.

1.2 SCOPE

- A. Extent. The work required under this section consist of furnishing and installation of all structural steel and related items as necessary to make the work complete in every respect and related items necessary to complete the work indicated on the drawings and described in this specification, including, but not necessarily limited to the following:
1. Base plates, beams, girders, columns, trusses, open web steel joists, struts, hangers, bracing, brackets, angles, channels, stiffeners, separators, plates, clips, supports for steel deck at column beams and connections, bolts, connections, welding filler metal and electrodes.
  2. Anchor bolts levelling plates, bearing plates and other items of structural steel required to be built into concrete or masonry, as indicated or specified, shall be furnished to the respective trades at the proper time with instructions, or templates, or both, for installation.
  3. All structural steel members shall have assigned positions and identification mark or symbol, plainly indicated thereon near one end, which marks shall agree with those given on the shop drawings relating to or calling for the members.
- B. Related Work. The following items of related work are specified and included in other sections of these specifications:
1. Prefabricated Metal Buildings & Components
  2. Reinforcing Steel for Concrete
  3. Miscellaneous Metal
  4. Metal Doors, Frames and Thresholds
  5. Grout Under Base Plates and Bearing Plates.
  6. Touch-Up and Finish Painting

### 1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. The Contractor shall, at all times, keep available at the site for reference the following codes, standards and specifications which are hereby made a part of this section, subject to the qualifications therein.

1. Southern Standard Building Code.
2. American Institute of Steel Construction, "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings."
3. American Institute of Steel Construction, "Code of Standard Practice for Steel Bridges and Buildings."
4. American Welding Society, "Code for Welding in Building Construction."
5. Industrial Fasteners Institute, "Handbook on Bolt, Nut and Riven Standards."
6. American Institute of Steel Construction, "Specifications for Structural Joints Using ASTM A325 or A490 Bolts."
7. Steel Structures Painting Council, "Painting Manual, Vol. 1, Good Painting Practice," and Painting Manual, Vol. 2, Systems and Specifications."
8. Steel Joist Institute, "Standard Specifications."

NOTE: Substitute the words "Architect/Engineer or his authorized representative" for "Building Official" or similar title of person charged with enforcement in all referenced specifications, etc.

- B. All referenced codes, standards and specifications shall be of the latest issue in effect on date of invitation to submit proposal.
- C. Any material or operation specified by reference to the published specifications of a manufacturer, The American Society for Testing Materials (ASTM), The American Institute of Steel Construction (AISC), or other published standard, shall comply with the standard listed. In case of conflict between the referenced specifications, etc., the one having the most stringent requirement shall govern. In case of conflict between any of the referenced specifications, etc., the project specifications, or the drawings, the most stringent requirement shall govern.
- D. Unless otherwise noted, when compliance with the referenced specifications, etc., is specified for materials or a manufacturer or fabricated product, the Contractor shall furnish the Engineer with an affidavit from the manufacturer or fabricator certifying that the material or product delivered to the project meets the requirements of the Contract Documents.

#### 1.4 INSPECTION, TESTING AND CONTROL

- A. An independent inspection service, hereafter called the Inspector, approved by and under the supervision of the Engineer, will be selected and paid by the Contractor.
- B. The materials and workmanship to be furnished under this section shall be subject to inspection in the mill, shop, and field by the Engineer or the Inspector. Such inspection shall not relieve the Contractor of his responsibility to furnish materials and workmanship in accordance with the requirements of the Contract Documents.
- C. Certified copies in triplicate, of mill test reports, including names and locations of mills and shops and analysis of chemical and physical properties, of steel to be used on this project shall be submitted to the Engineer before delivery to the job site.
- D. Manufacturer's certification in triplicate, of bolts, nuts, and filler metal for welding shall be submitted to the Engineer when requested by the Engineer.
- E. Qualifications of high strength bolting procedures and operations shall be as specified under "Erection" in this section, and the following:
  - 1. Each bolting crew working on the project shall be assigned an identification symbol or mark. Each bolting crew shall mark this identification on each joint worked.
  - 2. The Inspector shall supervise, and keep appropriate records thereof, daily on-site calibration of all impact wrenches to be used in the actual installations.
  - 3. Calibration of each impact wrench shall consist of tightening, in a hydraulic tension-measuring device, furnished by the Contractor, three bolts of the same size to be used, with a hardened washer under either the bolt head or nut, whichever is turned in tightening.
  - 4. The Inspector shall use a manual torque-indicator wrench, furnished by the Contractor, to determine the torque-tension relationship for every combination of impact wrench and bolt size to be used in the work for the day. These torque values shall be used as the inspection standard in testing the actual installations.
  - 5. The Inspector may require additional calibration whenever deficiencies occur.

- F. Qualifications of welders and welding procedures and operations shall be as prescribed in "Standard Qualification Procedure" of the American Welding Society.
1. All welding operators shall be qualified to perform the type of work required, except that this provision need not apply to tack welds not later incorporated into finished welds carrying calculated stress. Shop welding operators continuously employed as welders may be accepted on the basis of satisfactory reports dated not more than two years prior to award of this contract. All others must be requalified. Welding operators qualified on the job shall use equipment that will be used during construction, under the direct supervision of the Inspector.
  2. All welding operators working on the project shall be assigned an identification symbol or mark. Each welder shall mark or stamp his identification symbol on each weldment completed.
  3. The Contractor shall maintain records of test results of welding procedures and records of welders employed, date of qualification, and identification symbol or mark. Such records shall be available for examination by the Engineer or Inspector, or certified copies submitted upon request, to the Engineer or Inspector.
- G. The Inspector shall inspect and test (as required by the Engineer) all welded and bolted work.
- H. Weldments and bolted connections that are required by the Inspector to be corrected, shall be corrected or redone as directed, at the Contractor's expense and to the satisfaction of the Inspector.
- I. The Contractor shall notify the Engineer and Inspector five (5) days prior to the shipment of any structural steel so that a paint inspection can be made. At these inspections the dry mil thickness of the paint film will be checked. Also, all steel containing mill scale that can easily be removed with the blade of a pocket knife will be subject to recleaning and repainting at the expense of the Contractor.
- J. Any material or workmanship which is rejected by the Engineer or Inspector, either in the mill, shop or field, shall be replaced promptly by the Contractor, at the Contractor's expense, to the satisfaction of the Engineer or the Inspector.
- K. The fact that steel work has been accepted at the shop shall not prevent its final rejection at the job site, or even after it has been erected, if it is found to be defective in any



way.

## 1.5 SUBMITTALS

- A. Shop Drawings. Submit six copies of shop drawings of all items specified herein to the Engineer for approval in accordance with requirements described in the General Conditions. Obtain Engineer's approval of shop drawings in writing prior to proceeding with manufacturing.
1. To receive consideration by the Engineer, all drawings shall be accompanied by a letter of transmittal and each drawing shall contain the following information in the title block:
    - (a) Project identification
    - (b) Engineer's name
    - (c) Date of preparation or submission, and of revision if applicable
    - (d) Drawing number
    - (e) Contractor and subcontractor's names
    - (f) Names of person or firm preparing drawings
    - (g) Statement or stamp of approval by the Contractor which shall be deemed to certify that he has seen and examined it and that all requirements of the General Conditions have been complied with. The wording of this stamp shall be subject to the Engineer's approval.
  2. Shop drawings shall be numbered consecutively and drawings relating to various units comprising a proposed assembly shall be submitted simultaneously so that said units may be checked individually and as an assembly.
  3. Shop drawings shall clearly indicate all details, sectional views, arrangements, working and erection dimensions, kinds and quality of materials and their finishes, and other information necessary for the proper checking and for fabrication and installation of the items, and shall include all information required for making connections to other work.
  4. If any information on previously submitted shop drawings, besides the notations made by the Engineer, is revised in any way, such revisions must be circled or otherwise brought to the Engineer's attention. If approved drawings are subsequently revised, they must be resubmitted to the Engineer with all revisions clearly brought to the Engineer's attention. Whenever drawings are revised, the latest revisions shall be rung up in a manner to distinguish them clearly from all previous revisions (and

from the information on the original drawing).

5. If a shop drawing as submitted indicates a departure from the contract requirements which the Engineer deems to be in the Owner's interest, and to be so minor as not to involve a change in the contract price, or time for completion of the work, he may approve such drawing.
6. The Contractor shall be responsible for obtaining and distributing copies of approved shop drawings to his subcontractors and material suppliers needing the information, at no additional cost to the Owner.
7. Contractor shall keep on the site, in good order, a complete up to date set of all approved shop drawings.
8. Prepare erection drawings, detailed shop drawings and schedules, properly cross-referenced, checked and coordinated with other parts of the construction. Submit shop drawings in reasonable sequences and quantities allowing not less than two weeks for checking by the Engineer.
9. These drawings shall include all information necessary for the fabrication and erection of the component parts of the structure. They shall indicate distinguishing marks; type of steel; dimensions; size and weight of members; location and size of slots and holes; type and location of shop and field connections; type, size and extent of all welds; joint welding procedures; welding sequence; and painting requirements. The welding symbols used shall be as adopted by the American Welding Society.
10. Except as otherwise noted, the approval of shop drawings will be for size and arrangement of principal and auxiliary members and strength of connections. Any error in dimensions shown on the shop drawings shall be the responsibility of the Contractor.
11. Fabrication of any material or performance of any work shall not proceed until the shop drawings have been approved by the Engineer.

## PART 2.00 - PRODUCTS

### 2.1 MATERIALS

- A. Structural steel shall conform to ASTM A36, unless otherwise noted. Steel plates and bars shall conform to ASTM A284.
- B. High strength steel bolts shall conform to ASTM A325 and ASTM

A490.

- C. Anchor bolts shall conform to ASTM A307.
- D. Shear connectors and concrete stud anchors shall be headed 3/4" diameter studs or anchors, formed from cold finished low carbon steel conforming to ASTM A108, grade 1015 and 1020, containing a non-corroding flux, or approved equal.
- E. Filler Metal for Welding.
  - 1. Shielded metal-arc welding. Welding electrodes shall conform to the E60 or #70 series of ASTM A233.
  - 2. Submerged arc welding in Gradw SAW-1 or Grade SAW-2.
  - 3. In all cases, the welding electrodes and the filler metal shall be compatible with the steel to be welded.
- F. Paint.
  - 1. "Tnemec No. 99-G Green Metal Primer" by Tnemec Company, North Kansas City, Missouri.
  - 2. "DuPont 7771 Red Lead Primer" by DuPont DeNemours & Co., of Wilmington, Delaware.
  - 3. "Rust-Oleum, 769 Damp-Proof Red Primer" by Rust-Oleum Corp., of Evanston, Illinois.
  - 4. Approved equal.

## 2.2 FABRICATION

- A. Applicable standards.
  - 1. Except as otherwise indicated on the drawings or specified, the fabrication of structural steel shall be in accordance with AISC specifications.
  - 2. Fabrication of open-web steel joist, H-Series and LH-Series, shall be in accordance with the AISC and Steel Joist Institute Specifications.
- B. Provisions for attachment of other materials. Punch and drill steel for attachment of wood nailers and other materials indicated on the drawings or noted in the specifications to be attached to the steel.
- C. Connections. End connections for beams, seated or framed, shall have a minimum capacity equal to the greater of the end

reactions produced by either the total live and dead loads carried by the beam or a full uniform load stressing the beam to 24 ksi. In no case shall framed connections be less than those shown in Table I, Framed Beam Connections, of the current AISC manual. Connections for channels shall be the same as for beams of equal strength. Minimum size of bolts shall be 3/4" diameter high strength bolts, unless shown otherwise. Provide 3/4" web stiffeners for beams wherever they frame over columns or other supports. End moment and shear connections for end girders and trusses shall be designed for the moments and shears given on the structural drawings. The design details where shown on the structural drawings shall be strictly followed. All work shall conform to the applicable requirements of the specifications.

D. Shop Connections. Shop connections shall be welded or friction-type high strength bolted, installed by the turn-of-nut method, unless otherwise indicated. Filler beams shall have framed or seated beam connections using 3/4 inch diameter bolts, except as otherwise approved by the Engineer, fasteners in accordance with the requirements of the AISC "Manual of Steel Construction." Field connections for filler beams may be made with 3/4 inch diameter A-307 bolts.

E. Welding.

1. Quality control and qualification of welding procedures and operations shall be as specified under "Inspection, Testing and Control" in this section.
2. Shop welding shall be done by either shielded metal-arc welding or submerged arc welding.
3. All groove welds shall be complete penetration welds unless otherwise noted on the drawings.
4. Where structural joints are required to be welded, the details of all joints, the technique of welding employed, the appearance and quality of welds made, and the methods used in correcting defective work shall conform to the applicable requirements of the specifications.
5. The Contractor shall prepare joint welding procedures for all welded joints which shall be approved by the Engineer before any welding is done. After approval, these welding procedures shall be followed without deviation unless specific approval for change is obtained from the Engineer.
6. The Contractor shall submit to the Engineer for approval

a complete program of sequence of welding for each component and for welding joining components to each other. After approval, the welding sequence shall be followed without deviation unless approval for change is obtained from the Engineer.

- F. Oxygen Cutting. Manual oxygen cutting shall be done only with a mechanically guided torch. Alternatively, an unguided torch may be used provided the cut is not within 1/2 inch of the finished dimension and the final removal is completed by chipping or grinding to produce a surface quality equal to that of the base metal edges. The use of oxygen cut holes for bolted connections will not be permitted. Components prepared in this manner will be rejected.
- G. Openings in Structural Steel:
  - 1. Additional openings required shall be provided at unit prices to be quoted by the Contractor.
  - 2. No cutting of openings differing from or in addition to that shown on the drawings will be permitted without the written approval of the Engineer.
  - 3. All openings shall be cut and reinforced by the structural steel contractor only.

### PART 3.00 - EXECUTION

#### 3.1 UNLOADING AND HANDLING

- A. Handle and stack all materials carefully to prevent deformation or damage. Store all structural steel members carefully on substantial timbers and blocking so arranged that the steel will be free from the earth and properly drained, preventing any spattering with dirt or accumulation of water in or about the steel. Take care to prevent damage to the shop coat of paint and to prevent the accumulation of mud, dirt, or other foreign matter on the steel. Such accumulation shall be completely removed prior to erection.

#### 3.2 ERECTION

- A. Applicable Standards:
  - 1. Except as otherwise indicated on the drawings or specified, the erection of structural steel shall be in accordance with the AISC specifications.

2. Erection of open web steel joists, H-Series and LH-Series shall be in accordance with AISC and Steel Joist Institute Specifications.
- B. Method of Erection. Prior to starting work, the Contractor shall submit to the Engineer a description of the methods, sequence of erection, and type of equipment he proposes to use for erecting the structural steel work. This submission or approval shall not relieve the Contractor of his responsibility for providing the proper methods, equipment, workmanship, or safety precautions.
  - C. Temporary Floors. All temporary flooring, planking, and scaffolding necessary in connection with the erection of the structural steel, or the support of erection machinery, shall be provided as a part of the erection work. The temporary floors shall be as required by Arkansas laws and governing safety regulations.
  - D. Field Connections. All field connections shall be welded or friction-type high strength bolted installed by the "modified turn-of-nut" method unless otherwise noted. Filler beams shall have framed or seated beam connections using 3/4 inch diameter, except as otherwise approved by the Engineer, high strength bolts in accordance with the requirements of the AISC "Manual of Steel Construction." Field connections for filler beams may be made with 3/4 inch diameter A-307 bolts.
  - E. High Strength Steel Bolts.
    1. Installation shall be performed by using pneumatic powered impact wrenches with sufficient capacity and an adequate supply of compressed air.
    2. Installation shall be performed in accordance with the turn-of-nut method outlined in the AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts," with the following modifications:
      - (a) Use a hardened washer under either the bolt head or nut, whichever is turned in tightening.
      - (b) Qualification of high strength bolting procedures and operation shall be as specified under "Inspection, Testing, and Control" in this section.
    3. Joints shall be made without the use of erection bolts, the high strength bolts required for the joint serving that purpose themselves.

- F. Welding.
1. Field welding shall be executed in accordance with all the requirements under "Fabrication" in this section, excepting those requirements which manifestly apply to shop conditions only.
  2. All field welding shall be done by manual shielded metal-arc welding only.
- G. Oxygen Cutting. Oxygen cutting of steel in the field shall be executed in accordance with the requirements under "Fabrication" in this section.
- H. Openings in Structural Steel. Openings through structural steel required in the field shall be executed in accordance with the requirements under "Fabrication" in this section.
- I. Setting Plates. Column base plates, beam bearing plates, and leveling plates shall be set level to correct elevations and temporarily supported on steel wedges, shims, or as indicated by the drawings, until the supported members have been positioned, plumbed, anchor-bolted and grouted. The entire area under the plates shall be packed solidly with a non-shrink grout as specified in the "Concrete" section. Leveling devices shall be left in place until after the grout has attained the required strength, and then cut off flush with the top or edge of the base plate, or both.
- J. Templates. Furnish templates for all anchor bolts. The Contractor shall furnish instructions for the setting of anchors and bearing plates and shall ascertain that the items are properly set during the progress of the work.
- K. Framing. The framing shall be carried up true and plumb and temporary bracing shall be introduced whenever necessary to take care of all loads to which the structure may be subjected, including erection equipment and its operation. Such bracing shall be left in place as long as may be required for safety. It shall finally be removed by the Contractor as part of his equipment. As erection progresses, the work shall be securely connected to take care of all dead load, wind, and erection stresses. Temporary bracing as required by OSHA shall be furnished and installed.
- L. Cleaning Up. As erection progresses, remove all unneeded materials, rubbish, etc, and leave all surfaces in a condition as required by following or adjacent trades.

### 3.3 PAINTING

- A. Applicable Standards. Except as otherwise indicated on the drawings or specified herein, the painting of structural steel shall be in accordance with the AISC specifications.
- B. Steel to be Painted.
  - 1. Unless specifically excluded, all structural steel shall receive one shop coat of primer paint.
  - 2. Surfaces inaccessible after fabrication or erection shall receive two coats of primer paint. Second coat to be tinted a different color.
  - 3. Thoroughly clean all steel to be painted of all loose mill scale, dirt and foreign matter.
- C. Steel to be Left Unpainted.
  - 1. Steel members and portions of members to be encased in concrete.
  - 2. Surfaces to receive welded shear connectors and metal subfloor fastened by welding.
  - 3. Contact surfaces (e.g. high strength bolted connections).
  - 4. Surfaces requiring paint shall be painted only to within two inches of any field weld. If, for any reason, the surface to be field welded is painted, such paint shall be completely removed in the shop to within the stated limits before field welding.
  - 5. After fabrication, the steel work referred to above shall be cleaned of oil or grease by solvent cleaners and be cleaned of dirt and other foreign material with a stiff fiber brush.
  - 6. Finished surfaces. Machine finished surfaces (e.g. bearing surfaces of columns) shall be protected against corrosion by a rust-inhibiting coating that can be easily removed prior to erection or which has characteristics that make removal unnecessary prior to erection.
- D. Shop Painting.
  - 1. After steel has been properly prepared as specified above, apply primer paint to dry steel surfaces in accordance with manufacturer's instructions by brush, spray or roller, assuring no running or sagging.



2. The coverage rate per coat shall not be more than 400 square feet per gallon, shall result in a wet film thickness of four (4) mils and shall provide a dry film thickness of two (2) mils.
  3. Inspection of shop painting shall be as specified under "Inspection, Testing and Control" in this section.
- E. Certification. The Contractor shall furnish the Engineer with certification that the requirements pertaining to shop painting have been performed as specified.
- F. Touch-up.
1. After erection, clean and touch up field connections, bare spots, abrasions, and other surfaces required to be painted. Field connections shall not be painted until after inspection and approval by the Engineer.
  2. Use the same type of paint as used for the shop coat, but tinted to a different color.
  3. Paint for touch up painting shall be supplied to the painting contractor under this section.

SECTION 07920

CAULKING AND SEALANTS

PART 1.00 - GENERAL

1.1 CONDITIONS

- A. Requirements of the conditions of the Contract apply to all work under this Section.

1.2 SCOPE

- A. Related work specified elsewhere includes the following:
  - 1. Glazing sealants.
  - 2. Aluminum to aluminum sealants.

1.3 QUALIFICATIONS

- a. Applicator shall be franchised or otherwise formally approved by manufacturer of caulking and sealant materials.

1.4 SUBMITTALS

- A. Submit manufacturer's complete descriptive literature for approval and color selection.

1.5 PROTECTION

- A. Mask surrounding surfaces.

PART 2.00 - PRODUCTS

2.1 MATERIALS

- A. Sealants for joints in concrete work and precast concrete panels, except expansion joints, shall be Dow Silicone, Mono made by Tremco, DAP acrylic terpolymer, or G.E. Silicone Construction Sealant, standard color as selected by Engineer.
- B. Backing shall be polyethylene foam rods, shaped as recommended by sealant manufacturer for type of joint involved.
- C. Sealant for vertical expansion joints shall be Tremco Dymeric, color as selected by Engineer.

D. Interior caulking shall be non-staining butyl latex.

## 2.2 TOOLS

A. Mixing equipment, application guns and nozzles, and joint tools shall be clean and non-staining and suitable for intended use.

## PART 3.00 - EXECUTION

### 3.1 PREPARATION

- A. Remove all contaminant materials and clean joints in order to provide sound, clean surfaces to receive materials.
- B. Apply masking tape where required to protect adjoining surfaces. Align tape with joint edges. Do not allow tape to touch surfaces to which caulking or sealant is to be applied.
- C. Apply solvents, if required by sealant manufacturer, as directed by sealant manufacturer.

### 3.2 MIXING

- A. Mix two-part sealants according to manufacturer's instructions.

### 3.3 APPLICATION

- A. Install back up material. Material shall be sized to require 20% to 50% compression in width. Insert back up to depth recommended by sealant manufacturer for type and width of joint involved. In joints too shallow for rod, install polyethylene foam bond-breaking tape.
- B. Apply caulking and sealant according to manufacturer's printed instructions. Fill joints carefully and completely, compressing material into joint. Smooth and tool joints slightly concave or smooth as indicated to leave a neat, tightly sealed joint.
- C. Remove masking tape immediately after tooling of sealant is accomplished and before surface skin has started to form.

SECTION 08350

ELECTRIC BI-FOLD DOOR

PART 1.00 - GENERAL

1.1 CONDITIONS

- A. Requirements of the conditions of the Contract apply to all work under this Section.

1.2 SCOPE

- A. Related work specified elsewhere includes the following:
  - 1. Structural Steel
  - 2. Box Hangar Building Section

1.3 SUBMITTALS

- A. Submit duplicate submittals.

PART 2.00 - PRODUCTS

2.1 ELECTRIC BI-FOLD DOORS

- A. Hangar doors shall be of the electric bi-fold canopy type, made in two sections, hinged at the top to building truss and hinged at the horizontal center line. Doors to be factory primed with red oxide and assembled into a welded frame of hi-tensile light gauge steel tubing. Each electric bi-fold door shall be equipped with one 2860 Dittco Steel pre-finished walk door with a cylindrical lock and master keyed. Door shall be equal to Schweiss. Doors shall provide a 14' clear opening.
- B. Lifting device is a 1 H.P., 230 volt, single phase moto. All doors to be provided with up/down/off switch, lift straps and sheave wheels. Bi-fold doors shall be fitted with weather seal at the top and bottom and lap columns for weather tight seal.
- C. Motor shall be General Electric, Leland-Faraday, or Dayton and gear boxes shall be Durst or Abart. Door operator shall be mounted centrally on supporting tube truss.
- D. Operator is mounted rear center of door truss. Manual cam locking devices are required on doors and shall be provided with hurricane pins.
- E. Door shall be provided with disconnect switch located near push button operator. Push button switch shall be hold down button for door to operate. Door to stop when pressure released. Provide two hurricane pins. Provide latching mechanism on each side of door.

## 2.2 DOOR COVER

- A. The door frame shall be covered with 26 ga. Sheet metal to match that used on the metal frame for the building, with color matching. The top section of the door shall be provided with three (3) translucent panels. The door shall be insulated and provided with 3" wide metal strips at the insulation joints to prevent the insulation from becoming loose in the frame.

SECTION 13121

PRE-FABRICATED METAL BUILDING BOX HANGAR

PART 1.00 - GENERAL

1.1 CONDITIONS

- A. Requirements of the conditions of the Contract apply to all work under this Section.

1.2 SCOPE

- A. Work under this section consists of furnishing all labor, materials, tools and equipment necessary for the construction of the building and shall include structural framing, metal roofing, metal siding, bracing, rough hardware, fasteners, sealants, and any other component part necessary for the complete erection of a metal building box hangar as specified or as shown on the Drawings.
- B. The intent of these specifications and drawings is to establish a quality and performance level for structural design, material, durability and workmanship.
- C. All bidders must conform to these specifications in their bid. Note that the box hangar with bi-fold hangar door is detailed around the Erect-A-Tube building.
- D. All buildings shall be A&S, Butler Manufacturing Company, Star, Erect-A-Tube, Ruffin or equal.
- E. All other manufacturers shall submit design data and other pertinent information for review and written approval to the Engineer at least seven (7) days prior to bid date.

PART 2.00 - BUILDING DESIGN

2.1 GENERAL

- A. The design of the structural system shall be a clear span rigid frame for wind load with straight or tapered columns and parallel roof beams; and a single slope roof. The roof beam shall be designated as a simple beam for live load.
- B. Actual building length shall be structural line to structural line and shall be the same as nominal, i.e. the number of bays times length of bays.
- C. Actual building width shall be structural line to structural line and shall be the nominal building width.
- D. The roof shall have a 1" in 12" slope.

- E. All components and parts of the structural system shall be as indicated on the drawings and/or specifications.
  - 1. All components and parts shall be clearly marked and erection drawings shall be supplied for identification and assembly of the parts.
  - 2. All drawings shall carry the seal and signature of a registered professional engineer.
- F. Field modification of parts shall be in accordance with the best standard procedures and shall be the responsibility of the building erector.
- G. Foundations.
  - 1. Foundations shall be adequately designed by a competent engineer, licensed in the State of Arkansas, in accordance with the best recommended practices for specific soil conditions of the building site. All reactions for the proper design of foundations shall be supplied by the building manufacturing company. A sealed and signed set of drawings shall be provided by the contractor fully detailing the reinforcing steel and footing size to meet current IBC codes.
  - 2. Anchor bolts shall be as specified by the building manufacturing company's standard anchor bolt layout drawings. Anchor bolts shall be supplied by the Contractor, not the building manufacturer.

## 2.2 STRUCTURAL STEEL DESIGN

- A. All structural mill sections of welded-up plate sections shall be designed in accordance with the 1969 edition of AISI "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings," and all cold-formed steel structural members shall be designed in accordance with the current edition of AISI "Specification for the Design of Cold-Formed Steel Structural Members."
- B. The following design criteria shall be followed in the design of Type WBF Structural Systems:
  - 1. Live Load, Wind Load and Earthquake Load - Designed to meet the International Building Code (current edition) for enclosed buildings only.

Roof Live Load - 20 pounds per square foot on horizontal projection, in accordance with Table 1203.C.

Wind Load - 80 mph wind in accordance with Section 1205, Wind Loads, as specified in the International Building Code (current edition).

Earthquake Load - Zone 2 in accordance with International Building Code.

Collateral Loading - 1 pound per square foot.

## 2.3 PRIMARY FRAMING

### A. Rigid Frames.

1. Frames shall consist of welded up plate section columns and roof beams complete with necessary splice plates for bolted field assembly.
  - (a) Welding shall be done in accordance with the American Welding Society Code for Building Construction.
    - (1) Certification of welder qualification shall be supplied when required and specified.
  - (b) All base plates, cap plates, compression plates and stiffener plates shall be factory welded into place and have the connection holes shop fabricated.
  - (c) All splice plates shall be shop fabricated complete with bolt connection plates.
  - (d) Columns and roof beams shall be fabricated complete with holes in webs and flanges for the attachment of secondary structural members and bracing.
2. All bolts for field assembly of frame members shall be high strength bolts as indicated on erection drawings.

## 2.4 SECONDARY STRUCTURAL MEMBERS

### A. Purlins and Girts

1. Purlins and girts shall be "Z" shaped, precision roll formed.
2. Girts shall be 9 1/2" deep "Z" sections.
3. Purlins shall be 8" or 9 1/2" deep "Z" sections.
4. Girts and purlins shall have metal panels attached with self tapping screws with Neaprene metal backed washers.

B. Eave struts shall be 8" or 9 1.2" deep "C" sections.

### C. Bracing

1. Bracing shall be located as indicated on drawings.
2. Diagonal bracing shall be of size indicated on drawings, and attached to columns and roof beams where indicated on the drawings.



3. Optional fixed base endwall wind posts may be substituted for sidewall rod bracing on buildings as indicated on drawings.
  4. Flange braces, sag angles, etc., when required, shall be cold formed and installed as indicated on drawings.
- D. Hangar framework shall be provided with a truss spanning across the hangar door opening, designed to support a 14'x41'-6" bi-fold hangar door, to provide a 12' high clear opening.

## 2.5 STRUCTURAL PAINTING

- A. All structural steel components shall be factory cleaned to remove all loose dirt, grease and mill scale and chemically treated with phosphoric type cleaner and then painted with one coat of zinc chromate alkyd formulated to equal or exceed the performance requirements of Federal Specifications TT-P-636c.

## PART 3.00 - ROOF PANEL

### 3.1 GENERAL

- A. The roof shall be covered with precision roll formed panels, as manufactured by Erect-A-Tube.
- B. Details shall be in accordance with the manufacturer's drawings.
- C. Installation shall be in accordance with the manufacturer's drawings.

### 3.2 PANEL DESCRIPTION

- A. Panels shall be roll formed, 3' wide with four major corrugations, 1 1/2" (2 7/8" wide tapering to 1 9/32" wide at the top) high, 12" on center.
- B. Panels of maximum possible lengths shall be used to minimize end gaps. Standard lengths shall be limited to a nominal 38'-9".
- C. Ridge assembly shall be designed to allow roof panels to move with expansion and contraction.
- D. Eave panels shall extend beyond the structural line of the wall.

### 3.3 PANEL DESIGN

- A. Panels shall be designed in accordance with AISI "Specifications for the Design of Light Gage Cold Formed Steel Structural Members" and in accordance with sound engineering methods and practices.

- B. Panels shall be designed to support design live loads and roof traffic during construction.

### 3.4 PROVISIONS FOR EXPANSION/CONTRACTION

- A. The roof shall provide for expansion/contraction without detrimental effect on the roof panel when ambient air temperature varies +/- 100 degrees F. from the temperature at which the roof was installed.

### 3.5 PANEL MATERIAL

- A. Panel material as specified shall be:
  - 1. 26 gauge aluminum-zinc alloy coated steel, coated both sides with a layer of aluminum-zinc alloy (approximately 55% aluminum, 45% zinc) applied by the continuous hot-dip method. Nominal aim is 0.5 ounce of aluminum-zinc alloy per square foot of coated sheet (total both sides). Triple-spot minimum - 0.36 ounce per square foot as determined by the triple spot test per ASTM Specification A-428.

### 3.6 PANEL FINISH

- A. The panel finish as specified shall be the following:
  - 1. Galvalume finish.

### 3.7 PANEL APPLICATION

- A. All panels shall be factory cut to length according to erection drawings. All panels to be positioned and aligned to hold the 3' module throughout the building length.
- B. Panel laps shall be at least 6", sealed with building manufacturer's sealants and fastened together with standard fasteners.

### 3.8 FASTENERS

- A. All connections of roof panels to structural members shall be made with clips with 1/4 - 14 x 7/8" Type AB self-taping, 3/8" hex-head screws with a 5/8" O.D. metal backed neoprene washer.
- B. Panel-to-panel connections shall be made with 1/4 - 14 x 7/8" Type AB self-taping, 3/8" hex-head screws with a 5/8" O.D. metal backed neoprene washer.

### 3.9 ACCESSORIES

- A. Accessories, i.e. ventilators, sky lights, gutter, fascia, rake, shall be as standard with the building manufacturer, unless otherwise noted, and furnished as specified.
- B. Location of standard accessories shall be as shown on erection drawings as furnished by the building manufacturer.

- C. Material used in flashing and transition parts shall be as standard with the building manufacturer and may or may not match the roof panel material as specified.
- D. Provide and install foam rubber bird strings in the corrugation on top of the eave strutt.
- E. Wall panels to fit sufficiently tight against roof panel to prevent birds/rodents from moving between bays.

#### PART 4.00 - WALL PANELS

##### 4.1 GENERAL

- A. Exterior walls shall be covered with precision roll formed colored 26 gauge panels installed in accordance with manufacturer's instructions. Panels shall be provided with foam rubber corrugation strip to be placed between the wall panel and the eave strutt.

##### 4.2 PANEL DESCRIPTION

- A. Panels shall be 3' wide consisting of 12" modules with a panel depth of 1 1/4".
- B. Panels shall be one piece from base to building eave.
- C. Maximum panel length is 32'.
- D. Panels above and below certain accessories shall be factory pre-cut to correct length.

##### 4.3 PANEL DESIGN

- A. Panel design shall be in accordance with AISI "Specification for the Design of Light Gage Cold Formed Steel Structural Members," and in accordance with MBMA Recommended Design Practice Manual.

##### 4.4 PANEL MATERIAL

- A. Panel material, as specified, shall be 26 gauge galvanized steel, ASTM Galvanized Specification A525, latest issue, 1.25 ounce coating (G90).
- B. Color is selected from manufacturer's standard color selection. Submit metal color tabs for approval by Engineer.

##### 4.5 PANEL APPLICATION

- A. Wall panels shall be positioned and aligned for plumbness and fastened with self-tapping fasteners with neoprene washers.
- B. All side laps will be at least one full corrugation.

C. Wall panels shall rest in 1-1/2" x 2" ledge to bird and bug proof exterior walls.

D. Wall panel material to be used to cover bi-fold door.

#### 4.6 FASTENERS

A. All connections of 26 gauge colored wall panels (panel to structural and panel to panel) shall be made with self-tapping or self-drilling. Fasteners to be provided with a metal backed Neoprene washer.

### PART 5.00 - FULL PARTITIONS

5.1 Partition sheets shall extend downward from the bottom roof deck to a point sufficiently close to the floor that access from one hangar unit to the next is restricted and bird proof. Partition panels shall not be less than 29 gauge galvanized in pressed or rib form. Application and fasteners shall be as specified in Part 4.00. Partition sheets on one side of girts only.

### PART 6.00 - SAFETY

6.1 Provide two (2) 20 pound Class ABC fire extinguishers equal to Kidd Pro Plus and two (2) Cato 12051-H surface mounted fire extinguisher cabinets. Mount in location indicated on plans.

### PART 7.00 - DESIGN

7.1 As previously stated the contractor shall provide a shop drawing set that are sealed and stamped by an architect registered in the State of Arkansas.

7.2 Contractor shall provide a set of plans providing the design of the footing to include footing size and thickness and reinforcing steel size and spacing. The plans shall be signed and sealed by a professional engineer licensed in the State of Arkansas. Design shall comply with the latest IBC edition and seismic codes.

SECTION 16050

ELECTRICAL

PART 1.00 - GENERAL

1.1 CONDITIONS

Furnish all labor, materials, equipment and services to complete the electrical work as shown on the drawings or as specified. Refer to the General Conditions, Supplemental General Conditions and other sections below, as they apply.

1.2 SCOPE

- A. Furnish and install all electrical systems complete in every respect and ready to operate. Furnish all miscellaneous items and accessories required for such installation, whether or not each such item or accessory is shown on the drawings or mentioned in these specifications.
- B. The work shall consist of, but is not limited to the following general items:
  - 1. Service Entrances and Grounding Facilities
  - 2. Lighting Fixtures and Lamps
  - 3. Raceways
  - 4. Wiring Devices and Plates
  - 5. Panelboards and Branch Circuits
  - 6. Control Wiring
  - 7. Bi-Fold Electric Operated Door
- C. Submit shop drawings for:
  - 1. Lighting Fixtures and Lamps
  - 2. Wiring Devices and Plates
  - 3. Panelboards
  - 4. Safety Disconnect Switches
  - 5. Control Wiring
  - 6. Bi-Fold Electric Operated Door

PART 2.00 - PRODUCTS

2.1 MATERIALS

Submit material lists for all raceways and connectors, conductors and their connectors, boxes and grounding facilities.

## PART 3.00 - EXECUTION

### 3.1 RACEWAYS

- A. GENERAL: Provide raceways for all wiring systems, minimum 3/4 inch. Raceways shall include rigid galvanized steel, conduit, rigid aluminum conduit, (EMT) electrical metallic tubing, flexible metallic conduit, surface metal raceways, wire ways and troughs. Raceways shall be mechanically and electrically continuous from service entrance to final outlet. Raceways shall be run perpendicular and parallel to building construction. Except in Mechanical Rooms or as otherwise noted, all raceways shall be concealed. All breaks and turns with exposed raceways shall be made with malleable iron cadmium or hot dipped galvanized conduit fittings and covers. Raceways shall be rigidly supported with malleable iron conduit clamps or trapeze supports and clamps at intervals not exceeding 7 feet with 12 inches of all outlet boxes, elbows, and changes or direction. Concealed raceways shall be supported from structural members and not furring. All raceway systems shall be completely installed and secured and swabbed out, and all work in the area shall have progressed sufficiently to prevent injury to cables, before any conductors are installed. Provide caps and plugs on ends of raceways and openings in boxes to prevent foreign material from entering during construction. Provide double locknuts where 1 1/2 inch and larger conduits terminate, where No. 4 and larger conductors are installed, and where required by NEC. Do not use running threads. Leave No. 12 pull wire (identified at both ends) in all empty raceways. Provide plastic insulating busing on all conduit connections and fiber inserts on all tubing connections. Surface metal raceways, surface wiremold and surface metal troughs shall be installed only where shown on the drawings.
- B. RIGID CONDUIT: Provide rigid galvanized steel conduits for service entrance, panel feeders and all motor feeders. Threadless fittings, all thread and running threads shall not be used. Rigid conduits shall be provided for all raceway systems run underground or embedded in concrete or solid masonry. Rigid conduit shall be as manufactured by Youngstown, Allied, Triangle, or equal. Conduits located on ground or underground or exposed to the elements shall have an additional coat or polyvinylchloride and shall be manufactured by Robroy, or equal.
- C. ELECTRICAL METALLIC TUBING (EMT): Electrical metallic tubing (EMT) may be used for conduits concealed in furred ceilings or walls, run exposed in the building, or embedded in hollow masonry construction above grade. EMT shall be as manufactured by Triangle, Allied, Republic, or equal. EMT fittings shall be ferrous metal galvanized or plated to resist corrosion and shall be of the compression-ring type, rain-tight and concrete-tight. Set screw, indenter or friction type fittings will not be allowed. All fittings shall be wrench tight and shall have insulated throats. Fittings shall be as manufactured by Steel City, Raco, Appleton, or equal.

- D. FLEXIBLE CONDUIT: Provide flexible conduit for all connections to motors and other equipment subject to vibration or motion with a maximum length of 18 inches. Flexible conduit may be used for final connection to lighting fixtures in lay-in ceilings. Conduit shall be rigidly supported where connection to flexible conduit is made. Conduit and fittings shall be self-grounding and, in addition, copper bonding jumpers shall be used. Flexible conduit shall be as manufactured by Republic, Anaconda, Pittsburgh, or equal. Connectors shall be ferrous metal, galvanized or plated to resist corrosion, of the two (2) screw clamp type, or the squeeze type, as manufactured by Raco, Appleton, Steel City, or equal. Flexible conduit and fittings used outdoors or in other areas subject to moisture shall be of the liquid-tight type with connectors having an O-ring assembly. Liquid tight connectors shall be Raco type 3500, Appleton STB, or equal.
- E. CONDUIT HANGERS AND SUPPORTS: All conduits shall be rigidly supported and securely fastened to structural members. Perforated iron straps or wire shall not be used for support. Maximum support spacing shall be five (5) foot for one (1) inch and smaller conduits, and seven (7) foot for conduits larger than one (1) inch. All conduits shall be installed to permit expansion and contraction, and type hanger, method of support, location of support, etc. shall be governed in part by this consideration.

### 3.2 OUTLET, JUNCTION AND PULL BOXES

- A. Provide outlet and junction boxes where shown on the drawings or as required by Code. Boxes shall be independently rigidly supported and accessible. All outlet boxes shall be minimum of two (2) inches deep. Provide a four (4) inch square box with plaster ring and cover at each switch and receptacle location. Wiring device boxes located in brick, block or concrete walls shall be approved for the type of installation being at mortar joints. Multi-gang boxes shall be installed for more than two (2) adjacent devices; sectional boxes will not be allowed. All exposed cover plates as manufactured by Crouse Hinds, or equal. Outlets exposed to the weather shall be type FD with weather-proof gaskets and covers. Pull boxes shall be constructed of code gauge galvanized steel and shall be sized not less than 1 1/2 times all dimensions as recommended by the NEC. All conductors in pull boxes shall be identified with tags.

### 3.3 CONDUCTORS

- A. All conductors shall be rated 600 volts, and shall be copper with type THHN insulation. Minimum size shall be No. 12 and No. 8, and larger shall be stranded. All conductors shall be color coded, with sizes through No. 10 being of the solid compound coating. Stripes, bands or hash marks with respective color coding may be used for conductors No. 8 and larger. Color coding shall be phase A - black, phase B - red, phase C - blue, neutral - white, and ground - green. All conductors shall be by the same manufacturer and shall be Triangle, Simplex, Anaconda, General,

Okonite, or equal.

- B. Mains and feeders shall be run continuous without joints or splices. Branch circuit splices shall be made with 3M "Scotchlocks," or equal. In panelboards and boxes, conductors shall be neatly placed in phase groups and supported away from all enclosure sides. Lacing shall be done at intervals not greater than six (6) inches and shall be done with linen cord or T & B self-locking "Ty-Raps," or equal.

### 3.4 PANELBOARDS

- A. Provide panelboards in accordance with the schematic drawings and schedules indicated on the drawings. Main bus bars, connecting straps and stub projections shall be silver plated copper. Panelboards shall be mounted with top six (6) feet above floor unless indicated otherwise. At all surface mounted 120 volt panels, provide a duplex receptacle surface mounted extending six (6) inches below panel and connected to a spare breaker. Provide a typewritten directory card in each panel indicating the location and equipment served by each circuit. Panelboard shall be as manufactured by Square D, General Electric, Cutler-Hammer, Westinghouse, ITE, or equal.
- B. Panelboards shall contain quick-make, quick-break circuit breakers for manual and automatic operation. Circuit breakers shall be of the combination thermal-magnetic type with bolt-on attachment and with minimum interrupting capacities of 10,000 amperes. Single pole breakers shall be of nominal one (1) inch width. All multi-pole breakers shall be of the common trip so that an overload on one phase will trip all poles simultaneously. Tie handles are not acceptable.

### 3.5 LIGHTING FIXTURES

- A. Provide all lighting fixtures as noted on the drawings. Fixtures shall be suspended from structural members or from ceiling structural members, by standard bar hangers, or other approved means. Structural steel necessary to support fixtures shall be furnished and installed under this Section. Provide plaster frames as required. All fixtures shall be grounded. Fixtures shall be completely wired and lamped and shall be in perfect condition and operating at the time of completion. New building fixtures shall not be used for construction lighting.
- B. Fixtures shall be LED with maximum light spread at floor level.
- C. Fixture locations shall be coordinated with ceiling patterns or other details or notes as shown on the drawings.
- D. If a lighting fixture for a specific location is not clearly noted, the Contractor shall bring it to the attention of the Engineer prior to bidding, or the Contractor shall furnish and install a fixture similar and comparable in cost to that specified for other like location.



### 3.6 WIRING DEVICES AND PLATES

- A. Furnish and install all wiring devices and plates where shown on the drawings and herein specified. All devices shall be NEMA rated specification grade, with all parts except terminals totally enclosed, and with each device separately packaged upon arrival at job site. Height of wiring device shall work with brick joints and concrete block joints, but in general, lighting switches shall be mounted 4'-0" above floor, and receptacles and telephone outlets shall be mounted 12" above floor. Adjacent wiring devices shall be mounted as close to each other as possible. All wiring devices shall be side wired.
- B. In general, wiring devices and plated located in finished unpaneled areas shall be ivory. Wiring devices and plates located in finished paneled areas shall be brown. In unfinished areas, plates shall be 302 stainless steel.

### 3.7 SAFETY DISCONNECT SWITCHES

- A. Furnish and install safety disconnect switches where shown on the Drawings or as required by NEC. Switches shall be NEMA heavy duty, horsepower rated, with padlocking provisions and with a nameplate identifying equipment served. In wet or exterior locations, switches shall be in NEMA 3R enclosures. Switches shall be as manufactured by Square "D", General Electric, Westinghouse, ITE, or equal.

### 3.8 GROUNDING

- A. The entire electrical system and the building structure shall be grounded, or as indicated on the drawings. The electric service, equipment and enclosures, conduits and raceways, switches, breakers and panels, motors, controllers, lighting fixtures and receptacles shall be grounded. Each branch or power circuit shall have an independent grounding conductor whether shown or not, with the exception of lighting switches.
- B. Bonding jumpers shall be installed to maintain continuity at water meters, connections shall be made with approved clamps as manufactured by Burndy. Provide building ground.

### 3.9 HANGAR BI-FOLD DOOR OPERATOR

- A. See section on bi-fold door for push button requirements and safety switches.