



# Oxford - USD 358

# Relocation of Arches

# 2022



HANNEY & ASSOCIATES ARCHITECTS
1726 S. HILLSIDE • WICHITA, KANSAS 67211 • (316) 683-8965 •



#### <u>INDEX TO SPECIFICATIONS</u> <u>USD # 358 OXFORD SCHOOLS – ARCH RELOCATION</u>

#### ARCHITECTURAL

#### **DIVISION 1 – GENERAL REQUIREMENTS**

Section 00100	Invitation to Bid & Instructions to Bidders	3 pages
Section 00150	Bid Form	2 pages
Section 00300	Special Conditions	4 pages
Section 00400	Insurance Requirements	2 pages
Section 01020	Allowances	1 page
Section 01300	Submittals	3 pages
Section 01400	Project Coordination	6 pages
Section 01700	Contract Close-out	4 pages

#### **DIVISION 2 – SITEWORK**

Section 02050	Preparation of Site	2	pages
Section 02200	Excavation and/or Fill and Geotechnical Report	2	pages
	Geotechnical Report	36	pages

#### **DIVISION 3 – CONCRETE**

Section 03200	Segmental Unit Retaining Wall Systems (SRW)	5	pages
Section 03300	Concrete	14	pages

#### **DIVISION 4 – MASONRY**

Section 04100	Mortars	2 pages
Section 04200	Masonry	6 pages
Section 04531	Masonry Tuck Pointing	3 pages

#### **DIVISION 5 – METALS**

Section 05100	Structural	Steel	3	page	2S
---------------	------------	-------	---	------	----

#### **INVITATION TO BID & INSTRUCTIONS TO BIDDERS**

#### **1. SCOPE OF PROJECT**

The Specifications and the accompanying drawings are intended to provide for all materials and labor necessary to complete the **Relocation of Arches for Oxford USD # 358, Oxford, Kansas**, in **Oxford, Kansas**.

1.1 The bid shall include all labor and materials necessary for a complete and operational system. Including work necessary to restore the site, removing debris, after the project is complete.

#### 2. CONTRACT DOCUMENTS

- 2.1 The General Contractor may obtain electronic plans and specifications from the office of the Architects, **HANNEY & ASSOCIATES ARCHITECTS**, 1726 South Hillside, Wichita, Kansas 67211; Phone: (316) 683-8965. Plans will be available in a drop box folder. Addenda information will be posted on our website.
- 2.3 Contract Documents are on file and may be viewed at the office of the Architect, and;
  - 2.3.1 Kansas Construction News, 230 Laura, Wichita, Kansas
  - 2.3.2 <u>www.haarchitects.com</u>

#### 3. PROPOSAL PROCEDURE

#### 3.1 <u>BID DATE</u>

- 3.1.1 Sealed proposal for this project will be received by the Owner, Oxford Unified School District # 358, 319 E. College, Oxford, Kansas, 67119, on Friday, July 8, 2022, up to and until 2:00 p.m.
- 3.1.2 At which time proposals received will be opened **public**. Any proposals received after closing time will be returned unopened.
- 3.2 Should a proposer find discrepancies in, or omissions from the drawings or documents, or should he be in doubt as to their meaning, he shall at once notify the Architect, who will send written instructions to all proposers. Neither Owner nor Architect will be responsible for any oral instructions.
- 3.3 Proposals shall be made upon the <u>PROPOSAL FORM</u> or exact copy thereof bound into the specifications.
- 3.4 Fill in all blanks on the <u>PROPOSAL FORM</u> clearly with ink. Erasures or other changes in a proposal must be explained or noted over the signature of the proposer. Signatures shall be in longhand by a principal duly authorized to sign contracts, and if proposal is by a corporation, the signature shall be accompanied by the corporate seal impression. Proposals shall contain neither alterations nor recapitulation of work to be done.
- 3.5 Should the Contractor fail to complete all of the work required by the Contract Documents on or before the date bid by this contractor for substantial completion, the Contractor shall pay as liquidated damages, the sum **of two hundred dollars (\$200.00)** for each consecutive calendar day thereafter, Sundays and holidays excluded.

#### Arch Relocation Oxford USD # 358

- 3.6 Each proposer is required to bid all alternates included in the Proposal Form except that should he desire not to bid an alternate he may insert the words "no bid" in the space provided for prices for such alternate. In such case, if it is determined to use such alternate, the fact that the cost of the type or method bid in the proposal may be lower than that chosen shall not constitute the basis of a claim by the proposer that the contract shall be awarded to him. If an alternate price called for involves no change in price, proposer shall so indicate by writing the words "no change" in the space provided.
- 3.7 No oral or telephonic proposals or modifications will be considered. No telegraphic proposals will be considered, but modification by telegraph of proposals already submitted will be considered if received prior to time set for proposal opening.
- 3.8 Before submitting his proposal, each proposer shall carefully examine all documents pertaining to the work, visit the site of work, and fully inform themselves as to all existing conditions under which the work will be performed. Submission of a proposal will be considered presumptive evidence that the proposer is fully aware of the Contract Documents, pertinent state and markets, and has made allowances in his proposal for all work and all contingencies.
- 3.9 Any addenda issued during the time of preparation of proposals are to be acknowledged in the Proposal Form and in closing a contract, they will become a part thereof.
- 3.10 Enclose the proposal along with the required Proposal Security, in an opaque envelope: Proposal For: (State category of the work)

Arch Relocation Project Oxford Unified School District # 358 319 E. College Oxford, Kansas 67119 Name of Bidder

#### 4. **PROPOSAL SECURITY**

- 4.1 Proposal Security, consisting of a bid bond, certified check or cashier's check on a solvent bank, must be enclosed with each proposal for at least five percent (5%) of the Base Proposal.
- 4.2 Proposal Security shall be made payable, without condition to Oxford Unified School District # 358 as a guarantee that the bidder, if awarded the contract, will promptly execute the formal contract in accordance with the proposal and as required by the other Contract Documents, and that he will furnish good and sufficient bonds for the faithful performance in each category of work will be retained until the contract is awarded or other disposition is made thereof. Deposit checks shall be refunded if bidding documents are returned to the Architect in satisfactory condition within sixty (60) days after awarding the contract. If bidding documents are not returned, applicable deposit checks shall be returned to the Owner and deposited into the/his account. The successful contractor's deposit shall be returned after the award of the contract.
- 4.3 Performance Bond and Statutory Bond will be required in an amount of 100% of the contract amount. Such bonds shall be in such form as indicated in the Revisions in the General Conditions and registered at the **Sumner County District Court**.

#### 5. **PROPOSAL WITHDRAWAL**

A Proposal may be withdrawn on written or telegraphic request received from proposer prior to time for proposal opening. No proposal may be altered or withdrawn for a period of at least thirty (30) days after opening of proposals.

#### 6. SUBSTITUTIONS

- 6.1.1 The materials, products and equipment described in the bidding documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.
- 6.1.2 No substitution will be considered unless written request for approval has been submitted by the bidder and has been received by the architect at least ten (10) days prior to the date for receipt of bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a completed description of the proposed substitute including drawings, cuts, performance and test data and any other information necessary for an evaluation. A statement setting forth any changed in other materials, equipment or work which incorporation of the substitute would require shall be included. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval disapproval of a proposed substitute shall be final.
- 6.1.3 If the Architect approves any proposed substitute, such approval will be set forth in an addendum. Bidders shall not rely upon approvals made in any other manner.

#### 7. AWARD OF CONTRACT

Contract will be awarded to the responsible proposer submitting the lowest responsible proposal (i.e. combination of Base Proposal and accepted alternates, with due consideration to unit prices), provided:

- 7.1.1 Evidence of the experience, qualifications and financial responsibility of the bidder and his subcontractors, and the time of completion are all-acceptable to the Owner.
- 7.1.2 Manufacturer's Guarantee, Service Warranty and financial responsibility of manufacturer.
- 7.1.3 The total of acceptable proposals is within the financial budget for the project.
- 7.1.4 The Owner reserves the right to reject any or all proposals, to accept or reject alternate proposals and unit prices, and to waive all technicalities concerning the proposals received when it may be in his best interest to do so.

#### **GENERAL PROPOSAL**

#### FOR

#### **RELOCATION OF ARCHES**

#### **OXFORD UNIFIED SCHOOL DISTRICT # 358**

Relocation of Arches Oxford Unified School District # 358 Date: June 11, 2022

The undersigned, in compliance with your invitation for bids for the **Relocation of Arches for Oxford USD # 358, Oxford, Kansas,** having examined the site of the work, and being familiar with all the conditions surrounding the work, hereby propose to furnish all labor, materials and supplies and do all work necessary for the project in accordance with the contract documents at the price stated below. These prices are to cover all expenses incurred in performing the required work under the Contract Documents, of which this Proposal is a part.

#### **BASE PROPOSAL – Relocation of Arches:**

For all the work described in the specifications and shown on the plans for **Relocation of Arches for Oxford USD # 358, Oxford, Kansas;** I or (we) agree to perform all the work and furnish all materials including the Supervision and Coordination of the Owners sub-contractors, complete for the sum of:

Dollars (\$).

#### TIME OF COMPLETION

The undersigned agrees, if awarded the Contract; to Complete all work by **the date agreed upon by Oxford Unified School District # 358 and the General Contractor**.

The undersigned further agrees that, from the compensation otherwise to be paid; the Owner may retain the sum of Two Hundred Dollars (\$200.00) for each consecutive calendar day thereafter, Sundays and Holidays excluded, that the Contract remains incomplete, which sum is agreed upon as the proper measure of liquidated damages which the Owner will sustain per diem by the failure of the undersigned to complete the work at the time stipulated. This amount is not to be construed as in any sense of penalty.

#### **DECLARATION**

The undersigned declares that he has carefully examined and understands all Bid Documents, including Invitation to Bid, instructions to Bidders, Drawings, Specifications, and Addenda, that he has visited the location of the work and familiarized himself with all conditions under which the work is to be performed, including all pertinent codes and the conditions of labor and material markets, that he has checked quantities and prices, that he has made allowance in his bid for all work and all contingencies, and understands that in signing this bid he waives all right to plead any misunderstanding regarding the same.

The undersigned acknowledges receipt of the following Addenda to the Drawings and/or Specifications.

(Give number and date of each.)

Respectfully Submitted,

(Title)

(Signed by authorized officer)

(legal name of bidder)

(Address of bidder)

Seal (If bid is by a corporation)

#### SPECIAL CONDITIONS

#### 1. EXISTING CONDITIONS

- 1.1 This project is the Relocation of Arches for Oxford USD # 358, Oxford, Kansas.
- 1.2 During the school year the contractor is to coordinate with Oxford USD # 358, to minimize interference.
- 1.3 This Contractor shall review proposed the locations for trash, material storage, and staging with the USD #463 grounds manager prior to utilization.
- 1.5 The Contractor shall provide their own trash and waste receptacles.

#### 2. WORK INCLUDED

These Specifications and the accompanying Drawings are intended to provide for all materials and labor necessary for the **Relocation of Arches for Oxford USD # 358, Oxford, Kansas.** 

#### **3. CONTRACT DOCUMENTS**

The Contract Documents consist of: The Agreement, the conditions of the Contract (General Conditions, Revisions in General Conditions and Supplementary General Conditions), the Drawings, the Specifications, all Addenda issued prior to the execution of the Agreement, and Change Orders thereafter.

#### 4. CHANGES

It is understood that the Owner shall have the right during the progress of construction to make any alterations, additions, or omissions that he may desire to work, or material herein specified or shown on the Drawings. The same shall be carried into effect by the Contractor without in any way violating the Contract, but if such changes are made, the value of same must be agreed upon in writing between Owner, Architect, and Contractor. No omissions will be allowed, or extra work paid for unless ordered in writing by the Architect.

#### 5. **PERMITS**

The Contractor shall obtain and pay for all permits, surveys, and inspector's fees required by **Sumner County and the City of Oxford, Kansas.** 

#### 6. SPECIAL TESTING

- 6.1 The Contractor is responsible for testing on all lifts, and backfill during placement; testing shall be performed by a licensed and certified geotechnical engineer to verify compliance.
- 6.2 The Contractor is responsible for all required special testing.

#### 7. SPECIAL WORK NOT INCLUDED

The Owner reserves the right to have special work, not included in the Contract, done during the course of the work herein included.

#### 8. **RESPONSIBILITY FOR ACCIDENTS**

The Contractor must bear all loss of damage from accident which may occur to any person or persons, by or on account of the execution of the work, until possession is taken by the Owner. The Contractor must provide all legal and necessary guard railing, lights, warning signs, etc., during the progress of the work.

#### Arch Relocation Oxford USD # 358

#### 9. DETAIL AND WORKING DRAWINGS

Additional detail and working drawings will be furnished in amplification of the Contract Drawings as they may be required; all such additional drawings are to be considered of equal force with those which accompany these specifications. A complete set of the drawings and specifications must be kept at the jobsite, at all times during the progress of the work.

#### 10. **DIMENSIONS**

This is an existing facility. Field verify any and all required dimensions.

#### 11. FOREMAN

The Contractor must have at the jobsite from start to finish one responsible foreman throughout the entire job; in addition, the Contractor must give the work his personal supervision; the foreman must be on duty during all working hours. Any instructions for notices given to him shall have the same force as if given to the Contractor in person.

#### 12. MATERIALS AND WORKMANSHIP

All materials and workmanship are to be the best of their several kinds, unless specified to the contrary. The Contractor is to furnish all accessories needed, such as scaffolding, forms, protection, and all other temporary work, unless otherwise specified distinctly.

#### **13. DEFECTIVE OR IMPROPER WORK**

Any work or materials not conforming to the specifications must be removed by the Contractor and replaced by approved materials or work without extra compensation. All condemned material must be removed from the premises immediately.

#### **14. PROTECTION**

All materials in or designed for the work shall be at all times suitably housed or protected, particular care being taken of all finished parts.

#### **15. PRIVY** (Not Applicable)

#### 16. DISRUPTION OF SERVICES

Before digging or trenching commences, each Contractor shall verify with Public Service Companies all known plumbing, gas, and underground electrical lines.

#### **17. GUARANTEE**

The Contractor shall be responsible for and shall make good any defects due to faults in labor and materials, which may arise or be discovered within one (1) year after the completion of the work and its acceptance by the Architect.

#### **18. WRITTEN WORDS IN PROPOSAL**

In case of a difference between words and figures in a proposal, the amount stated in written words shall govern.

#### **19. TRASH AND DEBRIS**

The Contractor shall coordinate with School District.

#### 20. TEMPORARY LIGHTING & POWER

The Contractor shall coordinate with School District to access power from the school building.

#### 21. CONSTRUCTION FENCE

The General Contractor shall provide and maintain a 6' high construction fence to secure the construction area for the duration of the project. Access gates (number and location shall be determined by the General Contractor.

#### 22. TEMPORARY ROADS AND PAVED AREAS (Not Applicable)

#### **23. TEMPORARY WATER and SEWER**

23.1 The General Contractor is responsible for all costs of water to bring water to the site during construction for use by all trades.

#### 24. SALES TAX EXEMPTION

- 24.1 Materials and equipment incorporated into this project are exempt from payment of Kansas Sales Tax and such Sales Tax shall be excluded from bidder's proposal.
- 24.2 The Owner will provide the Contractor with a proper exemption certificate number within ten (10) days of Contract date. Upon issuance of a proper exemption certificate number to the Contractor, the Contractor shall assume full responsibility for his own proper use of the certificate number and shall pay all costs of any legally assessed penalties relating to the Contractor's improper use of the exemption certificate number.
- 24.3 Should the Owner fail to provide a proper exemption certificate number, the amount of the Sales Tax for the project shall be allowed as an extra to the Contract amount.

#### 25. TAXES

The Contractor shall make all necessary forms for and shall pay for all taxes on labor and materials, such as Sales Tax, Social Security Tax, Withholding Tax, etc., without additional cost to the Owner, where such taxes are required by the State and Federal Laws.

#### 26. OMISSIONS

- 26.1 The Drawings and Specifications are intended to cooperate anything shown on the Drawings but not mentioned in the Specifications or vice versa, or anything not expressly set forth in either, but which is reasonable implied, shall be furnished as though specifically shown and mentioned in both, without any charge.
- 26.2 Should anything be omitted from the Drawings, necessary to the proper construction of the work herein described, it shall be the duty of the Contractor to so notify the Architect before signing the Contract and in the event of the Contractor failing to give such notice, he shall make good any damages of defects in his work caused thereby without extra charge.

#### 27. PROTECTION OF WORK AND PROPERTY

The General Contractor shall take charge of and assume general responsibility for proper protection of the building during construction. He shall further provide substantial enclosures at all openings as necessary for protection, including doors and locks. Each Contractor shall assume responsibility for his materials stored on the premises.

#### 28. EQUAL EMPLOYMENT OPPORTUNITY

Sections 1 through 5 of K.S.A. 44-1030 (as follows) shall be included in this Contract except those subcontractors, vendors, or suppliers whose cumulative dollar total in any fiscal year is \$5,000 or less, or who have fewer than four (4) employees:

- 28.1 The contractor shall observe the provisions of the Kansas Act against discrimination and shall not discriminate against any person in the performance of work under the present Contract because of race, religion, color, sex, physical handicap unrelated to such person's ability to engage in the particular work, national origin or ancestry;
- 28.2 In all solicitations or advertisements for employees, the contractor shall include the phrase, "equal opportunity employer," or a similar phrase to be approved by the commission;

- 28.3 If the contractor fails to comply with the manner in which the contractor reports to the commission in accordance with the provisions of K.S.A. 1976 Supp. 44-1030, as amended, he shall be deemed to have breached the present Contract and it may be cancelled, terminated or suspended, in whole or in part, by the contracting agency;
- 28.4 If the contractor is found guilty of a violation of the Kansas Act against discrimination under a decision or order of the commission which has become final, the contractor shall be deemed to have breached the present Contract and it may be cancelled, terminated or suspended, in whole or in part, by the contracting agency;
- 28.5 The contractor shall include the provisions of Paragraphs (1) through (4) inclusively of this Subsection (a) in every subcontract or purchase order so that such provisions will be binding upon such subcontractor or vendor.

#### 29. LAWS AND ORDINANCES

The Contractor is required to familiarize himself with and observe all laws, ordinances and regulations relating to the work, and such laws, ordinances and regulations are hereby incorporated in and made a part of these specifications and the Contract for this work. All work shall comply with the Americans with Disabilities Act.

#### **30.** COMMENCE WORK

Work may commence with Owner's approval.

**31.** Company's approved equals to the original specified suppliers are required to meet all requirements of the plans, specifications, and standards of performance and construction as established by the first named originally specified manufacturers product.

#### 32. CLAIMS FOR ADDITIONAL TIME DUE TO ADVERSE WEATHER CONDITIONS

- 32.1 Bad weather day means a day that a contractor is unable to proceed with the stage or stages of the Work that is scheduled for that day due to weather conditions.
- 32.2 If adverse weather conditions are the basis for a claim for additional time, such claim shall be documented by data substantiating that weather conditions were abnormal for a period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.
- 32.3 The average number of bad weather days reasonably anticipated for each month are as follows: January (10), February (5), March (4), April (5), May (8), June (8), July (6), August (5), September (6), October (5), November (3), December (8).
- 32.4 The contractor will provide the Architect with a monthly bad weather day report within 5 days of the end of a month. If the contractor fails to report bad weather days 5 days from the end of the month, then it will be assumed that there were no bad weather days for the month.

#### **INSURANCE REQUIREMENTS**

#### 1. GENERAL

- 1.1 The General Conditions of the Contract for Construction as issued by the American Institute of Architects, A.I.A. Document A201, 2017 Edition, shall be considered as a part of these specifications, as if included herein, subject to the following additions:
- 1.2 The Contractor shall not commence work under this contract until he has obtained all Surety Bonds and Insurance Certificates submitted as required under these specifications and the General Conditions of the Contract, and such Bonds, insurance and coverage has been approved by the Owner, and his Attorney, and his insurance carrier.

#### 2. INSURANCE COVERAGE AND LIMITS

The Contractor shall purchase and maintain coverages required by the General Conditions of the Contract, Paragraph 11.1 and these Specifications in the following minimum amounts, and provide the Owner, through the Architect, three copies of a Certificate of Insurance on A.I.A. form G705.

	KIND OF INSURANCE	LIMITS OF LIABILITY
2.1	(1) Workmen's Compensation	Statutory Workmen's Comp.
	Bodily injury by Accident	\$100,000.00 each occurrence
	Bodily Injury by Disease	\$500,000.00 each employee
	Bodily Injury by Disease	\$500,000.00 policy limit
	Aggregate Disease	

#### 2.2 <u>Commercial General Liability</u>

Include premises and operations, independent contractors, products/completed operations (maintain completed operations coverage for two years after substantial completion), broad form property damage, blanket contractual liability and explosion, collapse, and underground (XCU) coverage:

Bodily Injury and Property Damage	\$1,000,000 Each Occurrence
Personal and Advertising Injury	\$1,000,000 Each Occurrence
General Aggregate (other than products/completed operations)	\$2,000,000 Aggregate
Products/Completed Operations	\$2,000,000 Aggregate
Automotive Liability Bodily Injury and Property Damage	\$750,000 Combined single limit
\$500,000 Each Occurrence \$500,000 Each Occurrence	Independent Contractors Completed Operations

2.3

\$500,000 Each Occurrence	Contractual
\$500,000 Aggregate	Operations, Independent Contractor Products &
	Contractual

2.4 Umbrella Liability

\$2,000,000 over primary limits; \$10,000 retention

#### 3. CONTRACT PROPERTY INSURANCE

- 3.1 Builders Risk Insurance shall be carried and paid for by the Contractor. Builders Risk will carry special extended coverage's endorsement (All-Risks Builders Risk including transit and storage) in addition to the normal fire, vandalism and extended coverage. The Contractor shall be responsible for any deductible.
- 3.2 Builders Risk to be carried for the completed value of the work for the insurable value of the work completed in the names of the Owner, the Contractor and all Sub-contractors as their interest may appear.
- 3.3 Completed products coverage to extend at least one year after final completion of the job.
- 3.4 The Contractor will provide his own Liability Insurance.
- 3.5 All rights of subrogation of the Insurance Company must be waived on all insurance's coverages involved under this contract to all parties including Owner.
- 3.6 Contractors' and Sub-contractors' equipment will not be covered by any insurance provided by the Owner.

#### **ALLOWANCES**

#### 1. GENERAL

- 1.1 All work included under this heading shall be subject to the General Conditions of the entire operation. The Contractor for this portion of the work is required to refer especially thereto.
- 1.2 Allowances shall include (unless otherwise noted) the cost of material, labor, transportation and delivery to the Job Site.

#### 2. ALLOWANCES

- 2.1 <u>General Construction Contingency</u>
  - The General Contractor shall have a contingency balance in the amount of ten thousand and no/100 dollars (\$10,000.00) set aside to cover the miscellaneous changes during the course of the project.
- 2.2 Bidders are instructed to not include this contingency amount in their base bid. This amount will be included in the final Agreement.
- 2.3 The portion of the contingency sum not used during construction shall be removed from the Agreement by AIA Change Order prepared by the Project Architect at the end of the contract period.

#### **SUBMITTALS**

#### 1. CONSTRUCTION SCHEDULES

See General Conditions of the Contract, Article 4, Paragraph 4.10 for contractual requirements governing progress schedule. The schedule shall indicate the starting and completion dates for the various stages of construction.

#### 2. SHOP DRAWINGS AND SAMPLES (SUBMITTALS AND DISTRIBUTION)

2.1 See General Conditions, Article 4, Paragraph 4.12 of the Contract for contractual requirements governing shop drawings and samples.

#### 2.2 <u>PROCEDURES</u>

- 2.2.1 Submit architectural and structural items as follows:
  - 2.2.1.1 One reproducible transparency and <u>two</u> prints of Shop Drawings with transmittal form to the Architect.
  - 2.2.1.2 Three (3) Samples with transmittal form to the Architect.
  - 2.2.1.3 Six (6) copies of brochures with transmittal form to the Architect.

#### 2.2.2 Submit mechanical and electrical items to the Architect as follows:

- 2.2.2.1 One reproducible transparency and one print of Shop drawings with copy of transmittal for the Mechanical/Electrical engineers.
- 2.2.2.2 Three (3) Samples with copy of transmittal for the Mechanical/Electrical Engineers.
- 2.2.2.3 Six (6) copies of brochures with copy of transmittal for the Mechanical/Electrical Engineers.

#### 2.3 <u>REVIEW</u>

- 2.3.1 The Architect or Engineers will process the submission and indicate the appropriate action on the submission.
- 2.3.2 The Architect or Engineers will print Shop Drawings for his own use. The Architect will return sepias of Shop Drawings, one sample or three brochures to the Contractor.

#### 3. PRODUCT DATA

- 3.1 Collect required data into one submittal for each unit or work or system. Mark each copy to indicate products, models, options applicable to the Project. Include manufacturer's standard printed recommendations for application and use, application of labels and seals, notation of field measurements, which have been checked, and special coordination requirements.
- 3.2 Maintain one set of product data, for each submittal, at the Project Site, available for reference at all times.
- 3.3 Do not submit product data, or allow its use on the Project, until compliance with requirements of the Contract Documents has been confirmed by the Contractor. Submittal is for information and record, unless otherwise indicated. Initial submittal is final submittal unless returned promptly by the Architect/Engineer; marked with an "Action" which indicates an observed non-compliance.

Submit 2 copies, plus 2 additional copies (which will be returned where required for maintenance manuals).

#### 4. SHOP DRAWINGS

- 4.1 Information required on shop drawings includes, dimensions, identification of specific products and materials which are included in the work, compliance with specified standards and notations of coordination requirements with other work. Provide special notation of dimensions that have been established by field measurement. Highlight, encircle, or otherwise indicate deviations from the contract documents on the shop drawings.
- 4.2 Contractor shall be responsible for any modifications affecting all other trades due to requested deviations of the contract documents.

#### 5. SAMPLES

- 5.1 Submit samples for the Architect's visual review of general generic kind, color, pattern, and texture, and for a final check of the coordination of these characteristics with other related elements of the work. Samples are also submitted for quality control comparison of these characteristics between the final sample submittal and actual work as it is delivered and installed.
- 5.2 Refer to individual work sections of these specifications for additional sample requirements, which may be intended for examination or testing of additional characteristics. Compliance with other required characteristics is the exclusive responsibility of the Contractor; such compliance is not considered in the Architect's review and "Action" indication on sample submittals.

#### 5.3 <u>PREPARATION</u>

- 5.3.1 Where possible provide samples that are physically identical with the proposed material or product to be incorporated in the work; provide full scale, fully fabricated samples cured and finished in the manner specified. Where variations in color, pattern, or texture are inherent in the material or product represented by the sample, submit multiple units of the sample (not less than 3 units), which show the approximate limits of variations. Where samples are specified for the Architect's selection of color, texture or pattern, submit a full set of available choices for the material or product. Mount, display, or package samples in the manner specified to facilitate the review of indicated qualities. Prepare samples to match the Architect's sample where so indicated.
- 5.3.2 Refer to individual sections of these specifications for samples which, because of their relatively high cost or other special considerations are intended to be returned to the Contractor for incorporation in the work. Such samples must be in an undamaged condition at the time of use. On the transmittal form to the Architect, indicate such special requests regarding the disposition of sample submittals.

#### 5.4 **DISTRIBUTION OF SAMPLES**

Maintain the final submittal sets of samples, as returned by the Architect, at the project site, available for quality control comparisons throughout the course of performing the work. In addition, final submittal sets may be used to obtain final acceptance of the work associated with each set. Prepare and distribute additional sets of samples to subcontractors, suppliers, fabricators, manufacturers, installers, governing authorities, and others as required for proper performance of the work. Show final distribution on transmittal forms.

Arch Relocation Oxford USD # 358

#### 6. CLOSEOUT SUBMITTALS

Refer to sections of these specifications for specific submittal requirements of project closeout information, materials, tools, and similar items.
6.1 RECORD DOCUMENTS

<u>RECORD DOCUMENTS</u> Furnish set of original documents as maintained on the project site. Along with original marked-up record drawings, provide photographic copies of marked-up drawings, which, at the Contractor's option, may be reduced to not less than half size.

#### 6.2 OPERATING AND MAINTENANCE DATA

Furnish bound copies of operating data and maintenance manuals.

#### 6.3 MATERIALS AND TOOLS

Refer to individual sections of these specifications for required quantities of spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units to be submitted.

6.4 For all interior finishes, submit two copies of care and maintenance information to the Architect for distribution to the Owner.

#### PROJECT COORDINATION

#### 1. GENERAL REQUIREMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

#### 2. DESCRIPTION OF WORK

- 2.1 Minimum administrative and supervisory requirements necessary for coordination of work on the project include but are not necessarily limited to the following:
  - 2.1.1 Coordination and meetings
  - 2.1.2 Administrative and supervisory personnel
  - 2.1.3 Surveys and records or reports
  - 2.1.4 Limitations for use of site
  - 2.1.5 Special reports
  - 2.1.6 General installation provisions
  - 2.1.7 Cleaning and protection
  - 2.1.8 Conservation and salvage

#### 3. COORDINATION AND MEETINGS

#### 3.1 <u>GENERAL</u>

Prepare a written memorandum on required coordination activities. Include such items as required notices, reports, and attendance at meetings. Distribute this memorandum to each entity performing work at the project site. Prepare similar memorandum for separate contractors where interfacing of their work is required.

#### 3.2 <u>MONTHLY COORDINATION MEETINGS</u>

Hold monthly general project meetings at regularly scheduled times convenient for all parties involved. These meetings are in addition to specific meetings held for other purposes, such as regular project meetings and special pre-installation meetings. Request representation at each meeting by every party currently involved in coordination or planning for the work of the entire project. Conduct meetings in a manner, which will resolve coordination problems. Record results of the meeting and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting. At the Contractor's option, monthly coordination meetings can be held integrally with monthly progress meetings as specified in section "Schedules, Reports, Payments".

#### 4. ADMINISTRATIVE/SUPERVISORY PERSONNEL

#### 4.1 <u>GENERAL</u>

In addition to a General Superintendent and other administrative and supervisory personnel required for performance of the work, provide specific coordinating personnel as specified herein.

#### 4.2 <u>MECHANICAL/ELECTRICAL COORDINATOR</u>

Provide a person or entity technically qualified and experienced in this type of mechanical and electrical work. Experience shall include both mechanical/electrical work coordination and the relationships between mechanical/electrical work and the work of all other trades involved in the project. A minimum of five-(5) years' experience will be required.

- 4.2.1 Coordinator shall participate in progress meetings and forward a written report of M/E coordination items discussed and their resolution to the Architect and Engineers.
- 4.2.2 Space Conflicts involving M/E work shall be brought to the coordinator's attention. He shall assist in the solution to the problem, record the event in either letter or drawing form, and distribute it to the interested trades and the Architect and Engineers.
- 4.2.3 Work with other trades involving cutting and patching, tolerances, compatibility as a basis for selection, M/E coordination drawings, etc., shall be resolved through the coordinator.
- 4.2.4 <u>Documentation</u>: Observe and maintain a record of tests; record:
  - A. Specifications section number, product or equipment and the name of subcontractor
  - B. Testing agency and name of inspector
  - C. Name of manufacturer's representative present
  - D. Date, time, and duration of tests
  - E. Type of test, and results
  - F. Re-testing required
- 4.2.5 <u>Equipment Start-up</u>: Verify utilities, connections, and controls are complete and equipment is in operable condition as specified in Section 01650. Observe start-up and adjustments; record time and date of start-up and results. Observe equipment demonstrations to Owner, record times, and record additional information required in Operation and Maintenance Manuals.
- 4.2.6 <u>Inspection and Acceptance of Equipment and Installation</u>: Prior to inspection, verify that equipment is tested and operational, clean and in specified condition. Assist Architect/Engineer inspection; prepare list of items to be completed or connected. Verify completion or corrections and certify that they are properly done prior to subcontractor leaving job.
- 4.2.7 <u>Submittal of Staff Names, Duties</u>: Within 15 days of Notice to Proceed, submit a listing of Contractor's principle staff assignments and consultants, naming persons and listing their addresses and telephone numbers, and brief history of experience.

#### 5. SURVEYS AND RECORDS/REPORTS

#### 5.1. <u>GENERAL</u>

Working from lines and levels established by the property survey, establish and maintain benchmarks and other dependable markers. Establish benchmarks and markers to set lines and levels for work at each story of construction and elsewhere as needed to properly locate each element of the project. Calculate and measure required dimensions as shown within recognized tolerances. Drawings shall not be scaled to determine dimensions. Advise entities performing work, of marked lines and levels provided for their use.

#### 5.2. <u>SURVEY PROCEDURES</u>

Before proceeding with the layout of actual work, verify the layout information shown on the drawings, in relation to the property survey and existing benchmarks. As work proceeds, check every major element for line, level and plumb. Maintain a surveyor's log or record book of such checks; make this log or record both available for the Architect's reference. Record deviations from required lines and levels and advise the Architect promptly upon detection of deviations that exceed indicated or recognized tolerances. Record deviations, which are accepted, and not corrected on drawing records.

#### 6. LIMITATIONS ON USE OF THE SITE

#### GENERAL

Limitations on site usage as well as specific requirements that impact site utilization are indicated on the drawings and by other contract documents. In addition to these limitations and requirements administer allocation of available space equitably amount entities needing both access and space, so as to produce the best overall efficiency in performance of the total work of the project.

Schedule deliveries, so as to minimize space and time requirements for storage of materials and equipment on site.

#### 7. SPECIAL REPORTS

#### 7.1 <u>GENERAL</u>

Submit special reports directly to the Owner within one day of an occurrence. Submit a copy of the report to the Architect and other entities that are affected by the occurrence.

#### 7.2 <u>REPORTING UNUSUAL EVENTS</u>

When an event of an unusual and significant nature occurs at the site, prepare and submit a special report. List chain of events, persons participating, response by the Contractor's personnel, an evaluation of the results or effects and similar pertinent information. Advise the Owner in advance when such events are known or predictable.

#### 7.3 <u>REPORTING ACCIDENTS</u>

Prepare and submit reports of significant accidents, at site and anywhere else work is in progress. Record and document data and actions. For this purpose, a significant accident is defined to include events where personal injury is sustained, or property loss of substance is sustained, or where the event posed a significant threat of loss or personal injury.

#### 8. GENERAL INSTALLATION PROVISIONS

#### 8.1 P<u>RE-INSTALLATION CONFERENCES</u>

Hold a pre-installation meeting of each unit of work, which requires coordination with other work. Installer and representatives of the manufacturers and fabricators who are involved in or affected by that unit of work, and with its coordination or integration with other work that has preceded or will follow shall attend this meeting. Advise the Architect of scheduled meeting dates.

- 8.2 Record significant discussions of each conference, and record agreements and disagreements, along with the final plan of action. Distribute the record of meeting promptly to everyone concerned, including the Owner and Architect.
- 8.3 Do not proceed with the work if the pre-installation conference cannot be successfully be concluded. Initiate whatever actions are necessary to resolve impediments to performance of the work and reconvene pre-installation conference at the earliest feasible date.

#### 8.4 INSTALLER'S INSPECTION OF CONDITIONS

Require the Installer of each major unit of work to inspect the substrate to receive work and conditions under which the work is to be performed. The Installer shall report all unsatisfactory conditions in writing to the Contractor. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

- 8.5 At each meeting review progress of other work and preparations for the particular work under consideration including specific requirements for the following:
  - 8.5.1 Contract documents
  - 8.5.2 Options
  - 8.5.3 Related change orders
  - 8.5.4 Purchases
  - 8.5.5 Deliveries
  - 8.5.6 Shop drawings, product data and quality control samples
  - 8.5.7 Possible conflicts
  - 8.5.8 Time schedules
  - 8.5.9 Weather limitations
  - 8.5.10 Manufacturer's recommendations
  - 8.5.11 Compatibility of materials
  - 8.5.12 Acceptability of substrates
  - 8.5.13 Temporary facilities
  - 8.5.14 Space and access limitations
  - 8.5.15 Governing regulations
  - 8.5.16 Safety
  - 8.5.17 Inspection and testing requirements
  - 8.5.18 Required performance results
  - 8.5.19 Recording requirements
  - 8.5.20 Protection

#### 8.6 <u>MANUFACTURER'S INSTRUCTIONS</u>

Where installations include manufactured products, comply with the manufacturer's applicable instructions and recommendations for installation, to the extent that these instructions and recommendations are more explicit or more stringent than requirements indicated in the contract documents.

- 8.6.1 Inspect each item of material or equipment immediately prior to installation. Reject damaged and defective items.
- 8.6.2 Provide attachment and connection devices and methods for securing work. Secure work true to line and level, and within recognized industry tolerances. Allow expansion and building movement. Provide uniform joint width in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable visual-effect choices to the Architect for final decision.
- 8.6.3 Recheck measurements and dimensions of the work, as an integral step of starting each installation.
- 8.6.4 Install each unit of work during weather conditions and project status which will ensure the best possible results in coordination with the entire work. Isolate each unit of work from incompatible work as necessary to prevent deterioration.
- 8.6.5 Coordinate enclosure of the work with required inspections and tests, so as to minimize the necessity of uncovering work for that purpose.

#### 8.7 MOUNTING HEIGHTS

Where mounting heights are not indicated, mount individual units of work at industry recognized standard-mounting heights for the particular application indicated. Refer questionable mounting height choices to the Architect for final decision.

#### 9. CLEANING AND PROTECTION

#### 9.1 <u>GENERAL</u>

During handling and installation of work at the project site, clean and protect work in progress and adjoining work on the basis of continuous maintenance. Apply protective covering on installed work where it is required to ensure freedom from damage or deterioration at time of substantial completion.

9.2 Clean and perform maintenance on installed work as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

#### 9.3 <u>LIMITING EXPOSURES OF WORK</u>

To the extent possible through reasonable control and protection methods, supervise performance of the work in such a manner and by such means which will ensure that none of the work, whether completed or in progress, will be subjected to harmful, dangerous, damaging or otherwise deleterious exposure during the construction period. Such exposures include, where applicable, but not by way of limitation the following:

- 9.3.1 Excessive static or dynamic loading
- 9.3.2 Excessive internal or external pressures
- 9.3.3 Excessively high or low temperatures
- 9.3.4 Thermal shock
- 9.3.5 Excessively high or low humidity
- 9.3.6 Air contamination or pollution
- 9.3.7 Water or ice
- 9.3.8 Solvents
- 9.3.9 Chemicals
- 9.3.10 Light
- 9.3.11 Radiation
- 9.3.12 Puncture
- 9.3.13 Abrasion
- 9.3.14 Heavy traffic
- 9.3.15 Soiling
- 9.3.16 Bacteria
- 9.3.17 Insect infestation
- 9.3.18 Combustion
- 9.3.19 Electrical current
- 9.3.20 High speed operation, improper lubrication, unusual wear or other misuse
- 9.3.21 Incompatible interface
- 9.3.22 Destructive testing
- 9.3.23 Misalignment
- 9.3.24 Excessive weathering
- 9.3.25 Unprotected storage
- 9.3.26 Improper shipping or handling
- 9.3.27 Theft
- 9.3.28 Vandalism

Arch Relocation Oxford USD #358

#### 10. CONSERVATION AND SALVAGE

It is a requirement for supervision and administration of the work that construction operations be carried out with the maximum possible consideration given to conservation of energy, water, and materials.

#### **CONTRACT CLOSEOUT**

#### PART 1 - GENERAL

#### 1. **RELATED DOCUMENTS**

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

#### 2. DESCRIPTION OR REQUIREMENTS

#### 2.1 <u>DEFINITIONS</u>

Closeout is hereby defined to include general requirements near end of Contract Time, in preparation for final acceptance, final payment, normal termination of contract, occupancy by Owner and similar actions evidencing completion of the work. Specific requirements for individual units of work are specified in sections of Division 2 through 16. Time of closeout is directly related to "Substantial Completion", and therefore may be either a single time-period for entire work or a series of time periods for individual parts of the work which have been certified as substantially complete at different dates. That time variation (if any) shall be applicable to other provisions of this section.

#### 3. PREREQUISITES TO SUBSTANTIAL COMPLETION

#### 3.1 <u>GENERAL</u>

- 3.1.1 Prior to requesting Architect's inspection for certification of substantial completion (for either entire work or portions thereof), complete the following and list known exceptions in request:
- 3.1.2 In progress payment request, coincident with or first following date claimed, show either 100 percent completion for portion of work claimed as "substantially complete", or list incomplete items, value of incompletion, and reasons for being incomplete.
- 3.1.3 Include supporting documentation for completion as indicated in these contract documents.
- 3.1.4 Submit statement showing accounting of changes to Contract Sum.
- 3.1.5 Advise Owner of pending insurance change-over requirements.
- 3.1.6 Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.
- 3.1.7 Obtain and submit releases enabling Owner's full and unrestricted use of the work and access to services and utilities, including (where required) occupancy permits, operating certificates, and similar releases.
- 3.1.8 Submit record drawings, maintenance manuals, final project photographs, and similar final record information.
- 3.1.9 Deliver tools, spare parts, extra stocks of materials, and similar physical items to Owner.
- 3.1.10 Make final change-over of locks and transmit keys to Owner and advise Owner's personnel of change-over in security provisions.

- 3.1.11 Complete start-up testing of systems, and instructions of Owner's operating/maintenance personnel. Discontinue (or change over) and remove from project site temporary facilities and services, along with construction tools and facilities, mock-ups, and similar elements.
- 3.1.12 Complete final cleaning up requirements, including touch-up painting of marred surfaces.
- 3.1.13 Touch-up and otherwise repair and restore marred exposed finishes.

#### 3.2 INSPECTION PROCEDURES

Upon receipt of Contractor's request, Architect will either proceed with inspection or advise Contractor of prerequisites not fulfilled. Following initial inspection, Architect will either prepare certificate of substantial completion, or advise Contractor of work which must be performed prior to issuance of certificate; and repeat inspection when requested and assured that work has been substantially completed. Results of completed inspection will form initial "punch-list" for final acceptance.

#### 4. **PREREQUISITES TO FINAL ACCEPTANCE**

4.1 <u>GENERAL</u>

Prior to requesting Architect's final inspection for certification of final acceptance and final payment, as required by General Conditions, complete the following and list known exceptions (if any) in request:

- 4.1.1 Submit final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
- 4.1.2 Submit updated final statement, accounting for additional (final) changes to Contract Sum.
- 4.1.3 Submit certified copy of Architect's final punch list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, endorsed, and dated by Architect.
- 4.1.4 Submit final meter readings for utilities, measured record of stored fuel, and similar data as of time of substantial completion or when Owner took possession of and responsibility for corresponding elements of the work.
- 4.1.5 Submit consent of surety.
- 4.1.6 Submit final liquidated damages settlement statement, acceptable to Owner.
- 4.1.7 Revise and submit evidence of final, continuing insurance coverage complying with insurance requirements.

#### 4.2 <u>RE-INSPECTION PROCEDURE</u>

Upon receipt of Contractor's notice that the work has been completed, including punch-list items resulting from earlier inspections, and excepting incomplete items delayed work. Upon completion of re-inspection, Architect will either prepare certificate of final acceptance or advise Contractor of work not completed or obligations not fulfilled as required for final acceptance. If necessary, procedure will be repeated.

#### 5. **RECORD DOCUMENT SUBMITTALS**

#### GENERAL

Specific requirements for record documents are indicated in individual sections of these specifications. Other requirements are indicated in General Conditions. General submittal requirements are indicated in "Submittals" sections. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for Architect's reference during normal working hours. See section 01720 for additional information on Record Drawings and Specifications.

#### PART 2 - PRODUCTS (Not Applicable)

#### PART 3 - EXECUTION

#### 6. CLOSEOUT PROCEDURES

6.1 <u>GENERAL OPERATING/MAINTENANCE INSTRUCTIONS</u>

Arrange for each installer of work requiring continuing maintenance or operation, to meet with Owner's personnel, at project site, to provide basic instructions needed for proper operation and maintenance of entire work. Include instructions by manufacturer's representatives where installers are not expert in the required procedures. Review maintenance manuals, record documentation, tools, spare parts and materials, lubricants, fuels, identification system, control sequences, hazards, cleaning and similar procedures and facilities. For operational equipment, demonstrate start-up, shut-down, emergency operations, noise and vibration adjustments, safety, economy/efficiency adjustments, energy effectiveness, and similar operations. Review maintenance and operations in relation with applicable warranties, agreements to maintain, bonds, and similar continuing commitments.

# 6.2 Maintenance Manuals: Supply to the Owner (3) copies of care, cleaning and maintenance for all interior finishes. EX. Ceramic Tile etc.

#### 7. FINAL CLEANING

#### 7.1 <u>GENERAL</u>

- 7.1.1 Special cleaning for specific units of work is specified in sections of Divisions 2 through 16. General cleaning during progress of work is specified in General Conditions and as temporary services in "Temporary Facilities" section of this Division. Provide final cleaning of the work, at time indicated, consisting of cleaning each surface or unit of work to normal "clean" condition expected for a first-class building cleaning and maintenance program. Comply with manufacturer's instructions for cleaning operations. The following are examples, but not by way of limitation, of cleaning levels required.
- 7.1.2 Remove labels which are not required as permanent labels.
- 7.1.3 Clean transparent materials, including mirrors and window/door glass, to a polished condition, removing substances which are noticeable as vision-obscuring materials. Replace broken glass and damaged transparent materials.
- 7.1.4 Clean exposed exterior and interior hard-surfaced finishes, to a dirt-free condition, free of dust, stains, films and similar noticeable distracting substances. Except as otherwise indicated, avoid disturbance of natural weathering of exterior surfaces. Restore reflective surfaces to original reflective condition.
- 7.1.5 Wipe surfaces of mechanical and electrical equipment clean, remove excess lubrication and other substances.

- 7.1.6 Remove debris and surface dust from limited-access spaces including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
- 7.1.7 Clean concrete floors in non-occupied spaces broom clean.
- 7.1.8 Clean plumbing fixtures to a sanitary condition, free of stains including those resulting from water exposure.
- 7.1.9 Clean food service equipment to a condition of a sanitation ready and acceptable for intended food service use.
- 7.1.10 Clean light fixtures and lamps so as to function with full efficiency.
- 7.1.11 Clean project site (yard and grounds), including landscape development areas, of litter and foreign substances. Remove stains, petro-chemical spills, and other foreign deposits. Rake grounds, which are neither planted nor paved, to a smooth even textured surface.

#### 7.2 <u>REMOVAL OF PROTECTION</u>

Except as otherwise indicated or requested by Architect, remove temporary protection devices and facilities that were installed during course of the work to protect previously completed work during remainder of construction period.

#### 7.3 <u>COMPLIANCE</u>

Comply with safety standard and governing regulations for cleaning operations. Do not burn waste materials at site, or bury debris or excess materials on Owner's property, or discharge volatile or other harmful or dangerous materials into drainage systems; remove waste materials from site and dispose of in a lawful manner.

Where extra materials of value remaining after completion of associated work have become Owner's property, dispose of these to Owner's best advantage as directed.

#### PREPARATION OF SITE

#### 1. GENERAL

- 1.1 All work included under this heading shall be subject to the General Conditions of the entire operation. The Contractor for this portion of the work is required to refer especially thereto.
- 1.2 All work shall comply with the requirements of the State of Kansas Department of Education adopted Building Codes and Accident and Fire Prevention Regulations.
- 1.3 It will be the responsibility of the Contractor to procure dumping facilities or other means of disposal for items specified to be removed from the site.
- 1.4 The Earthwork Contractor for the General Contractor shall grade the paving areas to **within ±** 1% of final grade. Providing all cut and fill as required.
- 1.5 The General Contractor is responsible for the building pad, sidewalks, and curbs. The General Contractor is responsible for the total coordination of the project and sequence of the work.

#### 2. WORK INCLUDED

This Contractor shall furnish all labor and materials required to complete all demolition as shown on the drawings and/or specified as follows:

- 2.1 Coordination of construction
- 2.2 Site Demolition
- 2.3 Topsoil stripping
- 2.4 Temporary fencing
- 2.6 Re-route storm water drainage during construction
- 2.7 Remove all debris from site
- 2.8 Soil deadening and Termite Treatment. (See Section 02281)

#### **3. PREPARATION**

- 3.1 Provide, erect, and maintain catch platforms, fences, planking, bridges, bracing, shoring, guards, lights, barriers, weather protection, warning signs and other items as required for the protection of the workmen engaged in demolition operations, adjacent construction, occupants (public, staff and students) of the building and surrounding property. Arrangements to maintain the exits during this operation will be the responsibility of the Contractor.
- 3.2 Provide fire protection in accordance with local fire department requirements.
- 3.3 Do not close or obstruct streets or sidewalks without the proper permit. Conduct operations with minimum traffic interference.

- 3.4 Protect public and private property adjacent to and on the job site, including platforms, vents, utility lines, streets, sidewalks, light standards, hydrants, street signs, mailboxes and fire alarm boxes. Make repairs to the complete satisfaction of the Owner of the damaged property, without additional cost to the Owner.
- 3.5 Make such explorations and probes as necessary to ascertain any required protective measures before proceeding with demolition and removal work.
- 3.6 Execute the Work in a careful and orderly manner, with the least possible disturbance to the public.
- 3.7 Where noted to do so cut and cap existing service piping, including sewer, water, gas, electric, telephone and other lines in compliance with the requirements of the local public utility corporations and of City Departments having jurisdiction. Notify the proper officials, persons or corporations owning services before cutting and capping services. Obtain instructions for carrying out the Work and take precautionary measures they any deem necessary. Furnish evidence of the termination of these services in the form of proper releases from the appropriate agencies. Shut off, as soon as demolition work is completed, individual water taps and electrical lines used for demolition purposes and furnish to the Architect similar evidence of the termination of such temporary services.
- 3.8 No burning of material on the premises will be permitted.
- 3.9 Report to the Architect any underground voids, chambers, vaults, tanks, etc., discovered during demolition.
- 3.10 Upon completion, remove tools, materials, plant, apparatus, and rubbish. Leave premises clean. Final grading of the grass areas around the new building shall be left in a condition ready to receive grass seeding by the Owner. Clods shall be broken up to pea size and compacted topsoil (6" minimum) installed in the same area in sufficient quantity to bring the site to final grade.

#### 4. **DEMOLITION OUTLINE**

Refer to the Floor Plans, Sections and Elevations for detailed description of work.

- 4.1 Existing sidewalks, trees and planting shall be removed in the path of the new construction.
- 4.2 Remove top 6" of soil and stockpile for reuse in planting areas in an area selected by the Owner. Excavation beyond the topsoil shall be used for building up the site within the limits of the soil's investigation. Excess material shall be stored and or used on the site as directed by the Owner. In the event the Owner does not wish to keep the material provide proper disposal.

#### EXCAVATION AND/OR FILL AND GEOTECHNICAL REPORT

#### 1. GENERAL

All work included under this heading shall be subject to the General Conditions of the entire operation. This Contractor is required to refer especially thereto.

#### 2. WORK INCLUDED

- 2.1 This Contractor shall furnish all labor and materials to complete all excavation and/or fill as required by the drawings and/or herein specified, including the following:
  - 2.1.1 Protection against damage of all walls, walks, streets, buildings, adjacent to or on the premises
  - 2.1.2 General excavations in or adjacent to the building to grades, lines, and levels as indicated for foundations, footings, floor slabs, column footings, grade beams, etc., as required.
  - 2.1.3 Excavation and/or fill to subgrades indicated for new exterior sidewalks.
  - 2.1.4 Filling and backfilling for all work herein as required to bring work to finished grades including furnishing of any extra material as required.
    - A. Where excavation is made below depth required for footings, foundations or any bearing work, fill to required grade with concrete.
    - B. Provide free draining granular fill under all floor slabs on grade with a FA-A or MA-1 gradation or approved equal.
  - 2.1.5 Pipe and conduits to remain on the site shall be supported and protected.
  - 2.1.6 Water shall be diverted and/or pumped out of all areas requiring fill.
  - 2.1.7 Provide all required shoring, bracing, planking, and cribbing as required and provide removal of same.
  - 2.1.8 Removal of old footings, foundations, pipelines, etc., which interfere with the progress of the work and are located at all new footing locations.
  - 2.1.9 The Dirt Work Contractor shall strip topsoil from all areas of the building, sidewalks, drives and parking surfaces. Stockpile on the site verify location with Architect. No materials to be removed from site without approval of Owner/Architect.
  - 2.1.10 Provide 6" topsoil over all fill areas indicated to be grass areas. Fine grade with rake, removing stones and debris.
  - 2.1.11 Contractor to provide laboratory tests for compaction of fill and backfill at his expense.
  - 2.1.12 Contractor to provide hook-up and protect temporary utilities for school operations during construction.

#### 3. GENERAL EXCAVATION

- 3.1 All Excavations shall be made to the proper depth in accordance with requirements of O.S.H.A. with proper allowance made for fill, floor slabs, forms, centers, and sheath piling. Bottoms of piers and footings shall be clean, clear of loose material, approximately level and lower sections true to size. Trench bottoms shall be evenly pitched as required.
- 3.2 Excavations greater than five feet in depth shall have sloped embankments and/or shoring for protection from cave-ins in accordance with current O.S.H.A. requirements.
- 3.3 All footing shall be carried to the depth below the finished grade indicated on the drawings.
- 3.4 Work that is excavated to a greater extent than required and which is within the bearing area of the footings shall be filled with concrete.
- 3.5 When such occurs in pipe trenches, provide brick or concrete piers as required to support pipes at required elevations.
- 3.6 Soils may vary somewhat in consistency both vertically and horizontally and "soft spots" may occur between boring locations. All excavations for footings shall be left open and protected from disintegration and inclement weather until inspected by the Architect prior to placement of concrete.
- 3.7 This Contractor shall notify the Architect before proceeding with the work when any unusual or questionable soil condition is encountered during construction.
- 3.8 Additional Exploratory operations: Additional test borings or other exploratory operations may be performed by the Contractor, at the Contractor's option; however, no additional payment will be authorized for such additional operations.

#### 4. SUB-SURFACE SOIL DATA/EXCAVATION

Results of sub-surface soil investigations indicated are for the information of the Contractor. However, the Architect assumes no responsibility for variations in soil characteristics, or for the continuity of noted strata or formations. Soil reports were taken by: Terracon, 1815 S. Eisenhower Street, Wichita, Kansas 67209.

The Geotechnical Report follows.

#### 5. CLEANING UP

Loose rocks and debris shall be removed from the site and clods broken up leaving the grass areas ready for planting.



# **Geotechnical Engineering Report**

### **Proposed Oxford Elementary/High School Additions**

**Oxford, Kansas** 

April 9, 2019 Terracon Project No. 01195000

#### **Prepared for:**

USD No. 358 Oxford, Kansas

#### **Prepared by:**

Terracon Consultants, Inc. Wichita, KS April 9, 2019

USD No. 358 315 W. College Street Oxford, Kansas 67119

- Attn: Mr. Greg Mugler P: (620) 455-2410 cc: E: chris@haarchitects.com
- Re: Geotechnical Engineering Report Proposed Oxford Elementary/High School Additions USD 358 Campus Oxford, Kansas Terracon Project No. 01195000

Dear Mr. Mugler:

We have completed the Geotechnical Engineering exploration and report for the above referenced project. This study was performed in general accordance with Terracon Proposal No. P01195000 dated February 4, 2019. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and floor slabs for the proposed project.

We appreciate the opportunity to be of service to you on this project, and we are prepared to provide the construction observation and materials testing services recommended in this report (please contact the CMT manager in our office, Mr. Kurt Heimerman, kurt.heimerman@terracon.com). If you have any questions concerning this report or if we may be of further service, please contact us.



George A. Tannoury, P.E. Principal/Geotechnical Dept. Manager

Terracon Consultants, Inc. 1815 S. Eisenhower Wichita, Kansas 67209 P (316) 262-0171 F (316) 262-6997 terracon.com

Facilities

Geotechnical

llerracon

GeoReport

# **REPORT TOPICS**

INTRODUCTION	1
SITE CONDITIONS	1
PROJECT DESCRIPTION	2
GEOTECHNICAL CHARACTERIZATION	2
GEOTECHNICAL OVERVIEW	3
EARTHWORK	4
SHALLOW FOUNDATIONS	9
FLOOR SLABS	10
LATERAL EARTH PRESSURES	14
EXTERIOR SLAB SUBGRADE PREPARATION	16
GENERAL COMMENTS	17
FIGURES	18

**Note:** This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the *GeoReport* logo will bring you back to this page. For more interactive features, please view your project online at <u>client.terracon.com</u>.

## **ATTACHMENTS**

### EXPLORATION AND TESTING PROCEDURES SITE LOCATION AND EXPLORATION PLANS EXPLORATION RESULTS SUPPORTING INFORMATION

Note: Refer to each individual Attachment for a listing of contents.

# Geotechnical Engineering Report Proposed Oxford Elementary/High School Additions USD 358 Campus Oxford, Kansas Terracon Project No. 01195000

April 9, 2019

# **INTRODUCTION**

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed Oxford Elementary/High School additions to be located at USD 358 Campus in Oxford, Kansas. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Foundation design and construction
- Floor slab design and construction
- Lateral earth pressures
- Exterior slab subgrade preparation

The geotechnical engineering Scope of Services for this project included the advancement of four test borings to depths ranging from approximately 10 to 15 feet below existing site grades.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section.

## SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

ltem	Description
Parcel Information	The project is located at the USD 358 Campus in Oxford, Kansas.
Existing Improvements	Additions connect to slab-on-grade single story structures
Current Ground Cover	Surfaced with asphalt/concrete or grass covered
Existing Topography	Relatively level



# **PROJECT DESCRIPTION**

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	Provided via email from Mr. Chris Hanney with Hanney & Associates
Project Information	<ul> <li>The project will include the following:</li> <li>Elementary School addition: A single-story, slab-on-grade (non-basement) building addition. The approximately 5,000 ft<sup>2</sup> building addition will have maximum plan dimensions of about 75 feet by 75 feet.</li> <li>High School addition: A single-story, slab-on-grade (non-basement) building addition. The approximately 5,000 ft<sup>2</sup> building addition will have maximum plan dimensions of about 40 feet by</li> </ul>
Duilding Construction	120 feet.
Building Construction	Steel-frame construction with brick veneer
Finished Floor Elevation	Match existing floor slabs, approximately elevation 1,201.7 feet and 1,199 feet at the High School and Elementary School, respectively
<b>Maximum Loads</b> (estimated by Terracon)	<ul> <li>Columns: 50 kips</li> <li>Walls: 4 kips per linear foot (klf)</li> <li>Slabs: 150 pounds per square foot (psf)</li> </ul>
Grading/Slopes	We anticipate that cuts/fills of about 2 feet will be required to achieve final grades.
Retaining Walls	Up to about 3 feet of grade separation between the north side of the Elementary School addition and surrounding grade.
Pavements	Not anticipated

# **GEOTECHNICAL CHARACTERIZATION**

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section and the GeoModel can be found in the **Figures** section of this report.


As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	Existing Fill	lean clay, lean to fat clay
2	Lean to Fat Clay	medium stiff to stiff
3	Lean Clay	medium stiff to stiff
4	Lean Clay with sand	stiff

# **Groundwater Conditions**

The boreholes were observed while drilling and after completion for the presence and level of groundwater. Groundwater was not observed in our borings while drilling, or for the short duration the borings could remain open. However, this does not necessarily mean the borings terminated above groundwater. Due to the low permeability of the soils encountered in the borings, a relatively long period may be necessary for a groundwater level to develop and stabilize in a borehole. Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be different than the levels indicated on the boring logs. Also, it is possible that groundwater could temporarily perch seasonally at shallow depths. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

# **GEOTECHNICAL OVERVIEW**

Based on the information obtained from our subsurface exploration, it is our opinion that the sites can be developed for the proposed project. The **Earthwork** section addresses site preparation and compaction. The **Shallow Foundations** section addresses support of the building additions bearing on engineered fill or native stiff clays. The **Floor Slabs** section addresses slab-on-grade support of the building additions. The **Lateral Earth Pressures** addresses grade separation between inside and outside grades. The **Exterior Slab Subgrade Preparation** section addresses subgrade preparation adjacent to the additions. The **General Comments** section provides an understanding of the report limitations.

Existing fill materials were found to depths of about 1½ to 4 feet BGS at our boring locations. Fill should be expected to occur (possibly to a greater depth) in other areas across the sites. We are not aware that the existing fill has been placed with moisture and density control. Foundations and



floor slabs supported on or above existing uncontrolled fill material that has not been uniformly placed and compacted with strict moisture and density control may not perform predictably. We consider the existing fill in its current condition to be unsuitable to support the proposed building additions. The depth and composition of the existing fill materials can vary greatly over relatively small lateral and vertical distances. Because of this variability, it may not be possible (until site grading is underway) to accurately predict the amount of fill that will need to be removed and replaced to develop suitable support for the proposed improvements. Caution should be exercised when using the depth and composition of the fill observed at the discrete boring locations, for estimating purposes.

The fill observed in our borings generally appears suitable for re-use as new controlled fill below the recommended Low Volume Change (LVC) zone, provided it is properly moisture conditioned and compacted. However, the fill could contain unobserved materials that would render it unsuitable for re-use as new controlled fill. We encourage the owner to secure a base bid for removing and replacing a specified quantity of the existing fill. The owner should also secure unit rates for adding or deducting quantities from the base bid that include costs for exporting unsuitable materials and importing approved replacement materials, if required.

Moderately expansive soils are present on this site. This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and cracking in the structures should be anticipated. The severity of cracking and other damage such as uneven floor slabs will probably increase if any modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and distress may not be feasible, but it may be possible to further reduce the risk of movement if significantly more expensive measures are used during construction. Some of these options could include increasing the thickness of the recommended low volume change zone and/or constructing structural slabs. We would be pleased to discuss other construction alternatives with you upon request.

The owner or contractor could consider a contingency budget to provide for additional earthwork items such as moisture conditioning dry subgrade soils, repairing soft subgrade soils, and removing unsuitable foundation bearing soils.

# EARTHWORK

Earthwork is anticipated to include clearing and grubbing, excavations, and fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, and pavements.



# **Site Preparation**

We recommend removing all asphalt/concrete from building addition areas. Also, we recommend removing any vegetation/root mat, topsoil, and all existing fill from building addition areas. We also recommend removing from within and at least 5 feet beyond the building addition areas presently proposed for construction. After completing these operations and any cuts needed to allow for the moisture conditioned zone (if needed), we recommend the exposed subgrade be thoroughly proofrolled (under the observation of Terracon personnel) with a loaded tandem-axle dump truck or other heavy, rubber-tired construction equipment weighing at least 20 tons, to locate any zones that are soft or unstable. The subgrade in the building addition areas where excessive rutting or pumping occurs during proofrolling should be removed and replaced or aerated/reworked and recompacted in place to our recommendations for engineered fill (see below for details) prior to placement of areal fill.

# Fill Material Types

Soil Type <sup>1</sup>	USCS Classification	Acceptable Parameters (for Structural Fill)					
Lean Clay <sup>2</sup>	CL <sup>3</sup> (LL<46 & PI>15)	> 18 inches below building additions finished subgrade					
Lean to Fat Clay <sup>2</sup>	CL/CH <sup>3</sup> (46≤LL<50)	> 18 inches below building additions finished subgrade					
Fat Clay <sup>2</sup>	CH (LL≥50)	> 18 inches below building additions finished subgrade					
Well-graded granular and silty gravel	GM-GW GM <sup>4</sup>	All locations and elevations					
Low Volume Change Material (LVC) <sup>5</sup>	CL or GM-GW, GM <sup>4</sup> and (LL<40 & 5≤PI<15)	All locations and elevations					
On-Site Soils	Varies	The on-site soils, free of organic matter and debris, typically appear suitable for reuse as engineered fill. However, these soils do not meet the low volume change zone criteria and these soils should not be utilized within 18 inches of finished subgrade beneath the proposed building additions.					

Engineered fill should meet the following material property requirements:



#### Continued:

- Controlled, compacted fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the geotechnical engineer for evaluation.
- 2. Delineation of fat clays and lean clays should be performed in the field by a qualified geotechnical engineer or their representative and could require additional laboratory testing.
- 3. By our definition, cohesive soils with a liquid limit of 46 to 49 are classified as lean to fat clay (with the borderline symbol CL/CH) to alert of the expansive potential of clay soils with liquid limits close to 50 (see ASTM D2487-11, Section 1.1, Note 1).
- 4. Similar to KDOT AB-3 crushed limestone aggregate, limestone screenings, or granular material such as sand, gravel or crushed stone containing at least 15% low plasticity fines (-#200).
- 5. Low volume change cohesive soil or granular soil having at least 15% low plasticity fines (-#200).

## **Fill Compaction Requirements**

Structural fill should meet the following compaction requirements.

ltem	Structural Fill
Lift Thickness	<ul> <li>9-inches or less in loose thickness when heavy, self-propelled compaction equipment is used</li> <li>or</li> <li>4 to 6 inches in loose thickness when hand-guided equipment (jumping jack or plate compactor) is use</li> </ul>
Compaction Requirements <sup>1</sup>	At least 95%, but not more than 100%, of the material's maximum standard Proctor dry density (ASTM D698).
Moisture Content Cohesive Soils with PI of 35 and higher	At least 3 percentage points above the optimum moisture content value as determined by the standard Proctor test at the time of placement and compaction
Moisture Content Cohesive Soils with PI of 25 to 34	At least 2 percentage points above the optimum moisture content value as determined by the standard Proctor test at the time of placement and compaction
Moisture Content Cohesive Soils with PI of 18 to 24	Above the optimum moisture content value as determined by the standard Proctor test at the time of placement and compaction
Moisture Content Cohesive Soils with PI less than 18	No drier than 2 percentage points below the optimum moisture content value as determined by the standard Proctor test at the time of placement and compaction
Moisture Content Granular Material <sup>2</sup>	Workable moisture levels

1. We recommend the moisture content and compaction be determined for each lift of engineered fill during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved. The zone of fill compacted to meet these criteria should extend at least 5 feet and 2 feet horizontally beyond the building addition footprints and exterior slab areas, respectively.

2. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without the cohesionless fill material pumping.



# **Utility Trench Backfill**

Utility trenches are a common source of water infiltration and migration. Utility trenches penetrating beneath the building additions should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below the building additions. The trench should provide an effective trench plug that extends at least 5 feet from the face of the building addition exteriors. The plug material should consist of cementitious flowable fill or low permeability clay. The trench plug material should be placed to surround the utility line. If used, the clay trench plug material should be placed to comply with the water content and compaction recommendations for structural fill stated previously in this report.

# **Grading and Drainage**

All grades must provide effective drainage away from the building additions during and after construction and should be maintained throughout the life of the structure. Water retained next to the building additions can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto pavement or splash blocks at a distance of at least 10 feet from the building additions.

Exposed ground should be sloped and maintained at a minimum 5% away from the building additions for at least 10 feet beyond the perimeter of the proposed building additions. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After building construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

# **Earthwork Construction Considerations**

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment. These soils could become unstable with typical earthwork and construction traffic, especially after precipitation events. Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrade or in excavations. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed, or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab and pavement construction and observed by Terracon.



Surface water should not be allowed to pond on the site and soak into the soil during construction. Construction staging should provide drainage of surface water and precipitation away from the building addition areas. Any water that collects over or adjacent to construction areas should be promptly removed, along with any softened or disturbed soils. Surface water control in the form of sloping surfaces, drainage ditches and trenches, and sump pits and pumps will be important to avoid ponding and associated delays due to precipitation and seepage.

Based on our understanding of the proposed building additions, we do not expect groundwater to adversely affect construction. If groundwater is encountered during construction, some form of temporary or permanent dewatering may be required. Conventional dewatering methods, such as pumping from sumps, should likely be adequate for temporary removal of any groundwater encountered during excavation at the site.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, state, and federal safety regulations. The contractor should be aware that slope height, slope inclination, and excavation depth should in no instance exceed those specified by these safety regulations. Flatter slopes than those dictated by these regulations may be required depending upon the soil conditions encountered and other external factors. These regulations are strictly enforced and if they are not followed, the owner, contractor, and/or earthwork and utility subcontractor could be liable and subject to substantial penalties.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

# Fill Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation, top soil, existing fill, proof-rolling and mitigation of areas delineated by the proof-roll.

The exposed subgrade and each lift of compacted fill should be tested, evaluated, and reworked, as necessary, until approved by the geotechnical engineer's representative prior to placement of additional lifts. We recommend that each lift of fill be tested for density and moisture content at a frequency of at least one test for every 1,000 square feet of compacted fill in the structure areas. We recommend at least one density and moisture content test for every 50 linear feet of compacted utility trench backfill.



# SHALLOW FOUNDATIONS

In our opinion, the proposed building additions can be supported by a shallow, spread footing foundation system bearing on newly constructed compacted structural fill prepared in accordance with the requirements noted in the **Earthwork** section of this report or suitable native materials consisting of medium stiff to stiff clays. Design recommendations for shallow foundations are presented in the following paragraphs.

## **Design Recommendations and Parameters**

Item	Column	Continuous			
Net Allowable Bearing pressure <sup>1</sup> on newly constructed compacted structural fill <sup>2</sup> and/or suitable native soils consisting of medium stiff to stiff clays	2,000 psf	2,000 psf			
Minimum footing width	30 inches	12 inches (trenched) 16 inches (formed)			
Minimum embedment below finished grade for frost protection <sup>3</sup>	42 inches	42 inches			
Estimated Total Settlement <sup>4</sup>	<1 inch	<1 inch			
Estimated Differential Settlement <sup>4</sup>	<¾ inch between columns	<¾ inch over 40 feet			

- 1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Assumes any unsuitable fill or soft soils, if encountered, will be undercut and replaced with engineered fill.
- 2. All new engineered fill beneath footings should be constructed as recommended in **Fill Compaction Requirements** of the **Earthwork** section of this report.
- 3. And to reduce the effects of seasonal moisture variations in the subgrade soils. For perimeter footings and footings beneath unheated areas.
- 4. The foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of compacted fill, and the quality of the earthwork operations. The above settlement estimates have assumed that the maximum loads stated previously in the Project Description section of this report will not be exceeded

# **Foundation Construction Considerations**

The footing excavations should be evaluated under the direction of the Terracon Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Should the soils at bearing level become excessively dry, disturbed or saturated, or frozen, the affected soil should be removed prior to placing concrete. Consider placing a lean concrete mud-mat over the bearing soils if the excavations must remain open over night or for an extended time.



Regarding construction of footings, we generally anticipate that material suitable for support of the design bearing pressure will be present at the base of the footings. However, there is a possibility that isolated zones of soft, low density fill or native soils could be encountered below footing bearing level, even though field density tests are expected to be performed during fill placement operations. Therefore, we recommend that the geotechnical engineer be retained to observe, test, and evaluate the soil foundation bearing prior to placing reinforcing steel and concrete to determine if additional footing excavation depth is needed.

If unsuitable bearing soils are encountered in footing excavations, the excavations should be extended deeper to suitable soils and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. As an alternative an overexcavation and backfill procedure could be utilized wherein the foundation could bear on properly compacted backfill extending down to suitable soils. The overexcavation for compacted backfill placement should extend laterally beyond the edges of the footing in all directions at least 8 inches per foot of overexcavation depth below design bearing level. The overexcavation should then be backfilled up to the footing base elevation with approved well-graded granular material constructed as described in section **Compaction Requirements** of the **Earthwork** section of this report.

Care should be taken during construction not to disturb the soils beneath the existing foundations. Some overlap of stresses between the new and existing footings will occur if the two foundation systems abut each other possibly causing some movement of the existing footings and supported structures. To reduce this overlap of stresses between the new and existing footings we recommend maintaining a clear distance between the edge of the new and existing footings at least equal to one-half the width of the new footings. Connections between the new and existing structures should accommodate some movement between the additions and adjoining existing buildings.

# **FLOOR SLABS**

# **Building Pad Subgrade Preparation**

In addition to providing a subgrade suitable from a strength perspective as addressed in the **Earthwork** section of this report, a factor affecting floor slab performance is the potential for the subgrade soils to shrink/swell due to variations in moisture content. Typically, some increase in the floor slab subgrade moisture content will occur because of gradual accumulation of capillary moisture, which would otherwise evaporate if the floor slab had not been constructed. A soil's swell potential is dependent primarily on its plasticity, and moisture content. The confining pressure provided by the weight of the floor slab and the overburden pressure (including the fill required to develop design grade) also effect swell potential. Subgrade soils with higher plasticity and lower moisture content and confining pressure, generally have greater swell potential.



The near-surface soils encountered in our borings have high plasticity and were generally in a relatively moist condition at the time of our subsurface exploration. Based on a method of analyses that uses Atterberg limits values, total unit weight, and our experience with similar soils, we estimated a potential vertical rise (PVR) greater than 1 inch for these soils. In our opinion, this amount of potential vertical rise could cause excessive heave of floor slabs. This potential to swell could increase if further drying occurs prior to, or during, construction. To reduce the swell potential to a relatively small amount, less than about 1 inch, we recommend that at least the upper 18 inches of subgrade soils below the floor slabs be low volume change (LVC) material that we describe in detail in **Fill Material Types** of the **Earthwork** section of this report.

Because we expect that the high plasticity clay materials could have greater swell potential if they are drier at the start of construction than they were at the time the borings were performed, constructing an 18-inch thick LVC zone may not be adequate to limit floor slab heave to a small amount. Therefore, we recommend that Terracon evaluate the material within at least 30 inches of the bottom of the LVC zone just prior to placement of any additional fill (see Building Subgrade Preparation Diagram below). Where the existing materials within this depth range at the start of construction are drier than the minimum moisture requirements stated in **Fill Compaction Requirements** of the **Earthwork** section of this report, we recommend corrective procedures be implemented. These procedures would include over-excavating if dry soils are present and either uniformly increasing their moisture content to the minimum moisture contents stated in **Fill Compacting** the soil in lifts or replacing them with LVC material. If LVC material is used to replace the dried soils, it should be placed at the moisture content values described in **Fill Compaction Requirements** of the **Earthwork** section of this report.





### **BUILDING SUBGRADE PREPARATION DIAGRAM (NOT TO SCALE)**

Note: Presently the near surface soils are typically relatively moist. Also, remove and replace unsuitable materials including uncontrolled existing fill that may extend to greater depths than shown in the above diagrams.

Prior to placing additional areal fill where moisture conditioning (as described above) is not needed, we recommend the upper 6 inches of exposed subgrade be scarified and recompacted to the compaction requirements and at the moisture contents stated in **Fill Compaction Requirements** in the **Earthwork** section of this report.

## Low Volume Change Zone

As stated previously, we recommend the upper 18 inches of material directly below the floor slabs be LVC material. This is primarily to help protect the newly placed fill from moisture fluctuations during construction and provide a layer of soil that will not experience significant volume change as the moisture content fluctuates.

By our definition, LVC materials have a liquid limit (LL) less than 40 and a plasticity index (PI) of at least 5, but less than 15. LVC materials that meet this requirement may include granular soils (such as limestone/concrete screenings or clayey sand) or possibly silty, sandy or lean clays, although laboratory testing of prospective LVC materials proposed for use by the contractor should be conducted to confirm their suitability prior to bidding/construction. Cohesive LVC soils may need extensive "wetting maintenance" by the contractor to maintain the required above optimum moisture content in the cohesive LVC material until construction of the floors. Based on the soils encountered in the borings, the near-surface fat clays do not meet the criteria for LVC material.



If cohesive material meeting the above criteria cannot be readily obtained, an LVC soil may be developed with the clay overburden soils by modifying them with hydrated lime, Class C fly ash, cement, or possibly Cement Kiln Dust (CKD) although using the dry agents may result in objectionable dusting problems. A lime slurry or cement slurry application (or the use of granular LVC materials) would reduce the dusting problems. It has been our experience that some CKD products have excessively high sulfate contents that would react adversely when mixed with soils, causing undesirable swell and heave. When CKD is considered, we recommend that a recent chemical laboratory analysis is submitted to us for review prior to approval of the CKD product.

For clay materials, it has been our experience that hydrated lime contents of 4% to 6%, cement contents of 5% to 6%, CKD contents of 6% to 8%, or Class C fly ash contents of 14% to 16, based on the dry weight of the soil, would typically be required to appreciably reduce the shrink/swell characteristics of clayey soils not meeting the previously described plasticity requirements for LVC materials. A more precise application rate should be developed based on additional laboratory testing. Recognized guidelines such as those specified by KDOT or City of Wichita (including minimum mixing temperatures) should be followed during the mixing and construction of the fly ash- or lime-modified subgrade. A lime/cement slurry application or the use of a granular LVC material may reduce the dusting problems that could occur with subgrade modification using dry products. The modified zone should extend at least 3 feet beyond the edges of the proposed building additions. Soils mixed with Class C fly ash should be compacted within 2 hours following blending operations.

The LVC soils should be placed in lifts not exceeding 9 inches in loose thickness and compacted to at least 95%, but not more than 100%, of maximum dry density. Cohesive soils should be placed and maintained at moisture contents not less than 2 percentage points below their optimum moisture content. Granular soils should be placed at workable moisture content. If lime-or fly ash-modified soils are used, they should be placed and maintained at moisture contents above their optimum moisture content.

Cohesive LVC materials can be swell susceptible if allowed to dry before constructing the floor slab; therefore, it is important that the recommended moisture content of the cohesive LVC material be maintained. As a check, we recommend the subgrade moisture content be evaluated about 3 to 4 days before placing concrete. If drying of the subgrade materials has occurred at this time, measures should be taken to increase the moisture content of the subgrade soils before placing the sand leveling course or concrete, which may also include recompaction. If the subgrade was modified with fly ash and recompaction is required, additional fly ash would be needed.

We suggest constructing the upper 4 to 6 inches of the LVC zone using crushed limestone silty gravel similar to KDOT AB-3-Type material to reduce the above stated swell potential associated with cohesive LVC materials or on-site soils that are allowed to dry excessively. This granular zone would reduce the moisture fluctuations in the bottom portion of the LVC zone and, also provide a more stable working surface during construction following inclement weather.



# **Floor Slab Construction Considerations**

We recommend that all HVAC supply/return ducts be above floor level as air-flow and heat transfer through these ducts can cause substantial post-construction drying and shrinkage of clay subgrade and result in severe floor slab/interior wall distress.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

# LATERAL EARTH PRESSURES

During construction, the sides of excavations should be sloped or braced for stability to comply with OSHA criteria. You should expect unbalanced lateral pressures to develop against walls with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to those indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained.

# **Design Parameters**

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The "at-rest" condition assumes no wall movement and is commonly used for building walls. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).





Lateral Earth Pressure Design Parameters										
Earth Pressure	Coefficient for Backfill	Surcharge	Effective Fluid Pressures, p <sub>2</sub> (psf) <sup>2, 4, 5</sup>							
Condition <sup>1</sup>	Type <sup>2</sup>	Pressure, p₁ (psf)	Unsaturated <sup>6</sup>	Submerged <sup>6</sup>						
$\Lambda$ otivica ( $I$ ( $\Lambda$ a)	Granular - 0.33	(0.33)S	(40)H	(85)H						
Active (Ka)	Clay - 0.45	(0.45)S	(55)H	(90)H						
At Deat (Ka)	Granular - 0.45	(0.45)S	(55)H	(90)H						
At-Rest (KO)	Clay - 0.63	(0.63)S	(75)H	(100)H						
	Granular - 3.0		(360)H	(235)H						
	Clay - 2.2		(264)H	(190)H						

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance.

2. Uniform, horizontal backfill, compacted to at least 95 percent of the ASTM D 698 maximum dry density, rendering a maximum unit weight of 120 pcf.

- 3. Uniform surcharge, where S is surcharge pressure.
- 4. Loading from heavy compaction equipment is not included.

5. No safety factor is included in these values.

6. In order to achieve "Unsaturated" conditions, follow guidelines in **Subsurface Drainage for Walls with Unbalanced Backfill Levels on Opposite Sides** below. "Submerged" conditions are recommended when drainage behind walls is not incorporated into the design.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively. To calculate the resistance to sliding, a value of 0.30 should be used as the ultimate coefficient of friction where the footing bears on suitable soil.

If continuous or isolated loads are imposed beyond the zone that extends up from the bottom of the wall at an angle no steeper than 1H:1V, the effect of the vertical loads on the wall would be negligible. Compaction of each lift of fill adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors. Over-compaction may cause excessive lateral earth pressures that could result in wall movement. Final exterior grades should be sloped to provide positive drainage away from foundations.



# Subsurface Drainage for Below-Grade Walls

To reduce the potential for hydrostatic pressure behind walls, we recommend that drainage be provided. Although it appears that the groundwater table will be below wall foundation bearing level, groundwater level fluctuations and perched water conditions could develop seasonally at shallow depths after prolonged periods of rainfall, possibly resulting in hydrostatic loading on the walls. To prevent hydrostatic loading on walls with unbalanced backfill levels on opposite sides, we recommend constructing drain lines at the base of the wall or weep holes be installed along the base of the wall with a collection pipe leading to the weep holes. We recommend the drain lines be perforated, rigid plastic or metal drain pipes with a minimum diameter of 4 inches. The drain lines should daylight or be connected to a sump equipped with a pump.

To prevent intrusion of fines, the drain lines should be surrounded by a minimum thickness of 6 inches of appropriately-sized, graded, granular filter material. As an alternative, the drains could be surrounded with at least 6 inches of free-draining granular material, and the granular material encapsulated with suitable filter fabric. The area above the drain lines extending at least 24 inches out from the wall should be backfilled with free-draining coarse sand with no more than 2% passing the #200 sieve. As an alternative to free-draining granular fill, a pre-fabricated drainage structure may be used. A pre-fabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion and is fastened to the wall prior to placing backfill.

# **EXTERIOR SLAB SUBGRADE PREPARATION**

The exterior slab subgrade should be prepared as described previously in the **Site Preparation** of the **Earthwork** section of this report. However, if the Owner is willing to accept the risks associated with constructing exterior slabs on existing fill (possible reduced performance or premature exterior slab failure), consideration could be given to leaving the existing fill in place unless failures are identified during proofrolling. Following proofrolling the upper 8 inches of subgrade should be scarified and compacted to at least 95% of its maximum dry density by ASTM D-698 at moisture contents above optimum moisture content. Any additional fill should be approved material free of organic matter and debris that is placed in lifts not to exceed 9 inches in loose thickness and compacted to at least 95% of its maximum dry density at moisture contents above optimum moisture content the final 18 inches of subgrade beneath exterior slabs meet the minimum moisture recommendations stated for additional fill in **Fill Compaction Requirements** of the **Earthwork** section of this report. This may require subgrade removal, moisture manipulation, and recompaction.



# **GENERAL COMMENTS**

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

# FIGURES

# **Contents:**

GeoModel





This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Existing Fill	lean clay, lean to fat clay
2	Lean to Fat Clay	medium stiff to stiff
3	Lean Clay	medium stiff to stiff
4	Lean Clay with sand	stiff



Fill

Topsoil

Lean Clay with Sand

Lean Clay/Fat Clay

Lean Clay

NOTES:

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

lerracon

# ATTACHMENTS



# **EXPLORATION AND TESTING PROCEDURES**

## **Field Exploration**

**Boring Layout and Elevations:** Terracon's drill crew used a hand-held GPS unit to establish our boring locations in the field at the locations indicated on our **Exploration Plan**. The ground surface elevations indicated on the boring logs are approximate and were obtained from topographic information available from Google Earth. Consider the approximate locations and ground surface elevations of the borings accurate only to the degree implied by these methods.

**Subsurface Exploration Procedures:** We drilled the borings with a truck-mounted drill rig using continuous flight augers to advance the boreholes. We obtained representative samples primarily by the split-barrel sampling procedure. In the split-barrel sampling procedure, a standard, 2-inch O.D., split-barrel sampling spoon is driven into the boring with a 140-pound hammer falling 30 inches. We recorded the number of blows required to advance the sampling spoon the last 12 inches of an 18-inch sampling interval as the standard penetration resistance value, N. We used an automatic SPT hammer to advance the split-barrel. A significantly greater efficiency is achieved with the automatic hammer compared with the conventional safety hammer operated with a cathead and rope. This higher efficiency has an appreciable effect on the standard penetration resistance blow count (N) values. We considered the effect of the automatic hammer's efficiency in our interpretation and analysis.

We also obtained a thin-walled tube sample. In the thin-walled tube sampling procedure, we hydraulically pushed a seamless steel tube with a sharpened cutting edge into the boring to obtain a relatively undisturbed sample of cohesive soil. We reported the sampling depths, penetration distances, and the standard penetration resistance values on the boring logs. In the field, we placed the samples into containers, sealed them, and returned them to the laboratory for observation, testing and classification.

Our drill crew prepared boring logs in the field as part of the drilling operations. These boring logs include visual classifications of the materials encountered during drilling and the driller's interpretation of the subsurface conditions between samples. The final boring logs included with this report represent the engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in the laboratory.



# Laboratory Testing

We tested the split-barrel samples to determine their moisture contents. We estimated the unconfined compressive strength of the cohesive samples with a hand penetrometer. The hand penetrometer test values can be correlated with the unconfined compressive strengths and provide a better estimate of soil consistency than visual and tactual examination alone. We performed an Atterberg limits test on a representative portion of the near-surface soils to aid in classification and to evaluate their shrink/swell characteristics. The laboratory test results are provided on the boring logs included in the **Exploration Results** section of the report with this report.

An engineer examined the samples in the laboratory as part of the testing program. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with our *General Notes* and the *Unified Soil Classification System*, respectively. The estimated group symbols using the *Unified Soil Classification System* are shown in the appropriate column on the boring logs. We are including our *General Notes* and a brief description of the Unified System in the **Supporting Information** section of the report.

# SITE LOCATION AND EXPLORATION PLANS

# Contents:

Site Location Plan Exploration Plan

Note: All attachments are one page unless noted above.

## SITE LOCATION

Proposed Oxford Elementary/High School Additions 
Oxford, Kansas April 9, 2019 
Terracon Project No. 01195000





## **EXPLORATION PLAN**

Proposed Oxford Elementary/High School Additions 
Oxford, Kansas April 9, 2019 
Terracon Project No. 01195000





DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

# **EXPLORATION RESULTS**

# **Contents:**

Boring Logs (B-1 through B-4)

Note: All attachments are one page unless noted above.

	BORING LOG NO. B-1 (HS) Page 1 of 1													
Γ	PRO	JECT: Proposed Oxford Elementary/ Additions	High Schoo	I	CLI	ENT	: US Ox	SD #358 ford, KS						
	SITE	: Oxford, KS			ARC	CHI	ГЕСТ	Hanney & Wichita,	Assoc KS	ciates				
MODEL LAVER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.2794° Longitude: -97.1656° Surface E	ilev.: 1200.5 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pď)	ATTERBERG LIMITS LL-PL-PI
1		FILL - Gravel approximately 3" thick FILL - LEAN CLAY, trace sand and grav brown			-	X	4	3-2-1 N=3	1	5000 (HP)		14		
5PJ 4/9/19		4.0 <u>LEAN TO FAT CLAY (CL/CH)</u> , trace sand brown, medium stiff	1196.5 d,	- 5 -	-	X	12	2-3-3 N=6	2	8000 (HP)		20		
PJ MODELLAYER.C		7.0 LEAN CLAY (CL), trace sand, brown, stil	<u>1193.5</u> ff	-	-									
		10.0 Boring Terminated at 10 Feet	1190.5	- 10-	-	X	12	3-4-5 N=9	3	7500 (HP)		20		
IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 01195000 PROP 2	dvance Power Dandor Boring	Stratification lines are approximate. In-situ, the transition m ment Method: ' Auger	ay be gradual. See Exploration of fiel used and addition See Supporting I symbols and abb	and Tes Id and la nal data nformati oreviatio	tting Probaborato	ocedi ry pro ).	ures for occedure	Hammer Ty a Notes: of	/pe: Auto	omatic				
SING LOG		WATER LEVEL OBSERVATIONS No free water observed	16		זר			Boring Starter	d: 02-04-:	2019	Borin	g Com	oleted: (	)2-04-2019
THIS BU			181	5 S Eise Wichit	enhowe a, KS	r St		Drill Rig: 972 Project No.: 0	1195000		Drille	er: JD/JI	<	

	BORING LOG NO. B-2 (HS) Page 1 of 1													
I	PROJ	ECT: Proposed Oxford Elementary/H Additions	igh School		CLI	ΞΝ٦	: US Oxt	D #358 ford, KS						
\$	SITE:	Oxford, KS			ARCHITECT: Hanney & Associates Wichita, KS									
MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.2793° Longitude: -97.1653° Surface El DEPTH ELI	lev.: 1201 (Ft.) EVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
1		0.3 Organic topsoil approximately 4" thick <u>FILL - LEAN CLAY</u> , brown to dark brown 1.5 <u>LEAN CLAY (CL)</u> , dark brown to brown, sti	<u>1200.5</u> 			X	12	3-3-7 N=10	1	8500 (HP)		24		
R.GPJ 4/9/19		4.0 LEAN CLAY (CL), trace sand, brown to gray-brown, stiff	1197	_ 5 —		X	14	4-4-5 N=9	2	8000 (HP)		22		
) PROPOSED OXFORD J.GPJ MODELLAYEF 5		- becoming orange-brown, medium stiff be 8'	low	_ _ 10— _		$\times$	14	2-2-3 N=5	3	3500 (HP)		23		
RT LOG-NO WELL 01195000		15.0 Boring Terminated at 15 Feet	1186	- - 15		X	18	2-3-3 N=6	4	3500 (HP)		21		
FROM ORIGINAL REPORT. GEO SMA														
ARATED I	St	atification lines are approximate. In-situ, the transition may	be gradual.					Hammer T	ype: Auto	omatic				
DG IS NOT VALID IF SEP	vanceme Power A andonme Boring b	ent Method: uger ent Method: ackfilled with auger cuttings upon completion.	See Exploration an description of field used and additiona See Supporting Infr symbols and abbre	nd Test and Ial al data formation	ing Pro borato (If any on for o ns.	ocedu ry pro l. expla	ires for a ocedures	Notes:						
	No	WATER LEVEL OBSERVATIONS of ree water observed				- /		Boring Starte	d: 02-04-2	2019	Borin	ıg Com	oleted: (	)2-04-2019
IIS BOF			1815	S Eise	nhowe	r St		Drill Rig: 972			Drille	er: JD/JI	ĸ	
Ę.					a, KS			Project No.: 0	Project No.: 01195000					

	BORING LOG NO. B-3 (ES) Page 1 of 1													
Р	ROJ	ECT: Proposed Oxford Elementary/H Additions	ligh Schoo	I	CLI	EN	Г: U О	SD #358 xford, KS						
S	ITE:	Oxford, KS			ARCHITECT: Hanney & Associates Wichita, KS									
AODEL LAYER	SRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.2785° Longitude: -97.1652° Surface E	Elev.: 1200 (Ft.)	DEPTH (Ft.)	VATER LEVEL BSERVATIONS	AMPLE TYPE	ECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	ABORATORY HP (psf)	JNCONFINED OMPRESSIVE FRENGTH (psf)	WATER SONTENT (%)	DRY UNIT NEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
		DEPTH EL 0.3 Organic topsoil approximately 4" thick FUL - LEAN CLAY, dark brown to brown	<u>EVATION (Ft.)</u> 1199.5		> 0	ŝ	R				202	0		
1		1.5 LEAN CLAY (CL), dark brown to brown, medium stiff	1198.5	_	-		12	3-3-4 N=7	1	4000 (HP)		27		43-20-23
3		- becoming brown below 3'		_			17		2	2500		24	105	
				5 –						(HP)				
				_	-									
		trace cand below 0'		_	-		10	2-2-2	2	3000				
		- trace sand below 9		10-	-		18	N=4	3	(HP)				
				_										
				_	-		18	2-2-2 N=4	4	2000 (HP)		22		
		15.0 Boring Terminated at 15 Feet	1185	15-	-									
	Sti	atification lines are approximate. In-situ, the transition may	y be gradual.				•	Hammer Ty	/pe: Auto	omatic				
Adv P	anceme ower A	ent Method: uger	See Exploration description of fie used and additio	<mark>and Tes</mark> Id and la nal data	<mark>ting Pr</mark> aborato (If any	oced ory pro	<mark>ures</mark> fc ocedur	or a Notes: res						
Aba B	ndonme oring ba	ent Method: ackfilled with auger cuttings upon completion.	See Supporting I symbols and abb	Informati previation	ion for ns.	expla	anation	of						
	N./-	WATER LEVEL OBSERVATIONS					_	Boring Started	d: 02-04-	2019	Borir	ıg Com	oleted:	02-04-2019
	No	o nee water observed	1121					Drill Rig: 972			Drille	er: JD/JI	<	
				5 S Eise Wichita	enhowe a. KS	er St		Project No.: 0	1195000	)				

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 01195000 PROPOSED OXFORD J.GPJ MODELLAYER.GPJ 4/9/19

	BORING LOG NO. B-4 (ES) Page 1 of 1														
	PR	ROJE	ECT: Proposed Oxford Elementary/H Additions	ligh School		CLI	EN	: US Oxt	D #358 ford, KS						
Γ	SI	TE:	Oxford, KS			ARC	CHI	TECT:	Hanney & Wichita,	Assoc KS	iates				
MODEL LAVER		GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.2784° Longitude: -97.1649° Surface Ele	ev.: 1198.5 (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY HP (psf)	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	Atterberg Limits LL-PL-PI
1			<u>DEPTH</u> <u>EIL DEPTH</u> <u>CIL OF</u>		_		X	12	5-6-8 N=14	1	7000 (HP)		21		
PJ 4/9/19	5				- 5 -	-	X	12	3-4-5 N=9	2	7000 (HP)		21		
.GPJ MODELLAYER.G			7.0 LEAN CLAY (CL), with sand, gray-brown,	1191.5 stiff	-	-									
OXFORD J.			10.0	1188.5	-	-	X	16	3-4-5 N=9	3	6500 (HP)		19		
IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 01195000 PROPOS 호  호  호	dvar Pov Bor	Stra ncemeer Au donmeering ba	atification lines are approximate. In-situ, the transition matint Method: Iger	y be gradual. See Exploration a description of fiel used and addition See Supporting Ir symbols and abbi	and Tes d and la al data nformati reviatio	ting Pr aborato (If any ion for ns.	oced ry pr- ). expla	ures for a poedures nation of	Hammer Ty	/pe: Auto	omatic				
SING LOG		No	WATER LEVEL OBSERVATIONS free water observed	76			-,		Boring Started	d: 02-04-:	2019	Borin	g Com	oleted: (	)2-04-2019
THIS BOI				1815	5 S Eise Wichit	enhowe a, KS	er St		Drill Rig: 972 Project No.: 0	1195000		Drille	er: JD/JI	<	

# SUPPORTING INFORMATION

# **Contents:**

General Notes Unified Soil Classification System

Note: All attachments are one page unless noted above.

# GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS Proposed Oxford Elementary/High School Additions Oxford, KS April 9, 2019 Terracon Project No. 01195000



SAMPLING	WATER LEVEL	FIELD TESTS				
	Water Initially Encountered	N	Standard Penetration Test Resistance (Blows/Ft.)			
Shelby Split Spoon	Water Level After a Specified Period of Time	(HP)	Hand Penetrometer			
	▲ Water Level After a Specified Period of Time	(T)	Torvane			
	Water levels indicated on the soil boring logs are	(DCP)	Dynamic Cone Penetrometer			
	indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not	UC	Unconfined Compressive Strength			
	possible with short term water level observations.	(PID)	Photo-Ionization Detector			
		(OVA)	Organic Vapor Analyzer			

#### DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

#### LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

	STRENGTH TERMS											
RELATIVE DENSITY	OF COARSE-GRAINED SOILS	CONSISTENCY OF FINE-GRAINED SOILS										
(More than 50%) Density determined by	retained on No. 200 sieve.) v Standard Penetration Resistance	(50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance										
Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength Qu, (psf)	Standard Penetration or N-Value Blows/Ft.								
Very Loose	0 - 3	Very Soft	less than 500	0 - 1								
Loose	4 - 9	Soft	500 to 1,000	2 - 4								
Medium Dense	10 - 29	Medium Stiff	1,000 to 2,000	4 - 8								
Dense	30 - 50	Stiff	2,000 to 4,000	8 - 15								
Very Dense	> 50	Very Stiff	4,000 to 8,000	15 - 30								
		Hard	> 8,000	> 30								

RELATIVE PROPORTION	S OF SAND AND GRAVEL	RELATIVE PROPORTIONS OF FINES		
Descriptive Term(s) of other constituents	Percent of Dry Weight	Descriptive Term(s) of other constituents	Percent of Dry Weight	
Trace	<15	Trace	<5	
With	15-29	With	5-12	
Modifier	>30	Modifier	>12	
GRAIN SIZE T	ERMINOLOGY	PLASTICITY DESCRIPTION		
Major Component of Sample	Particle Size	Term	Plasticity Index	
Boulders	Over 12 in. (300 mm)	Non-plastic	0	
Cobbles	12 in. to 3 in. (300mm to 75mm)	Low	1 - 10	
Gravel	3 in. to #4 sieve (75mm to 4.75 mm) Medium 11 - 30		11 - 30	
Sand	#4 to #200 sieve (4.75mm to 0.075mm	High	> 30	
Silt or Clay	Passing #200 sieve (0.075mm)			

# UNIFIED SOIL CLASSIFICATION SYSTEM

# Terracon GeoReport

					Soil Classification	
Criteria for Assign	ing Group Symbols	and Group Names	Using Laboratory Tests A	Group Symbol	Group Name <sup>B</sup>	
<b>Coarse-Grained Soils:</b> More than 50% retained on No. 200 sieve	<b>Gravels:</b> More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines <sup>C</sup>	$Cu \ge 4$ and $1 \le Cc \le 3^{E}$	GW	Well-graded gravel F	
			Cu < 4 and/or [Cc<1 or Cc>3.0] <sup>E</sup>	GP	Poorly graded gravel F	
		<b>Gravels with Fines:</b> More than 12% fines <sup>C</sup>	Fines classify as ML or MH	GM	Silty gravel <sup>F, G, H</sup>	
			Fines classify as CL or CH	GC	Clayey gravel <sup>F, G, H</sup>	
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines <sup>D</sup>	$Cu \ge 6$ and $1 \le Cc \le 3^{E}$	SW	Well-graded sand	
			Cu < 6 and/or [Cc<1 or Cc>3.0] <sup>E</sup>	SP	Poorly graded sand	
		Sands with Fines: More than 12% fines <sup>D</sup>	Fines classify as ML or MH	SM	Silty sand <sup>G, H, I</sup>	
			Fines classify as CL or CH	SC	Clayey sand <sup>G, H, I</sup>	
Fine-Grained Soils: 50% or more passes the No. 200 sieve Silts Liquid		Inorganic:	PI > 7 and plots on or above "A"	CL	Lean clay <sup>K</sup> , L, M	
	Silts and Clays:		PI < 4 or plots below "A" line J	ML	Silt <sup>K</sup> , L, M	
	Liquid limit less than 50	Organic:	Liquid limit - oven dried	0	Organic clay <sup>K, L, M, N</sup>	
			Liquid limit - not dried	0L	Organic silt <sup>K, L, M, O</sup>	
	<b>Silts and Clays:</b> Liquid limit 50 or more	Inorganic:	PI plots on or above "A" line	СН	Fat clay <sup>K, L, M</sup>	
			PI plots below "A" line	МН	Elastic Silt <sup>K, L, M</sup>	
		Organic:	Liquid limit - oven dried	ОН	Organic clay <sup>K, L, M, P</sup>	
			Liquid limit - not dried		Organic silt <sup>K, L, M, Q</sup>	
Highly organic soils: Primarily organic matter, dark in color, and organic odor			PT	Peat		

A Based on the material passing the 3-inch (75-mm) sieve.

<sup>B</sup> If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

- <sup>C</sup> Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
- <sup>D</sup> Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

<sup>E</sup> Cu = D<sub>60</sub>/D<sub>10</sub> Cc = 
$$\frac{(D_{30})^2}{D_{10} \times D_{60}}$$

<sup>F</sup> If soil contains  $\geq$  15% sand, add "with sand" to group name.

<sup>G</sup> If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

- <sup>H</sup> If fines are organic, add "with organic fines" to group name.
- $^{|}$  If soil contains  $\geq$  15% gravel, add "with gravel" to group name.
- <sup>J</sup> If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
- <sup>K</sup> If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
- L If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
- <sup>M</sup>If soil contains  $\geq$  30% plus No. 200, predominantly gravel, add "gravelly" to group name.
- $^{\sf N}\,{\sf PI} \geq 4$  and plots on or above "A" line.
- <sup>O</sup>PI < 4 or plots below "A" line.
- P PI plots on or above "A" line.
- <sup>O</sup>PI plots below "A" line.



## **SECTION 03200**

## SEGMENTAL UNIT RETAINING WALL SYSTEMS

### PART 1 – GENERAL

### 1. **DESCRIPTION**

Work shall consist of furnishing materials, labor, equipment, and supervision to install a modular concrete block retaining wall system in accordance with plans and specifications and in reasonably close conformity with the lines, grades, design, and dimensions shown on plans and as specified herein.

### 2. **REFERENCE STANDARDS**

#### 2.1 SEGMENTAL RETAINING WALL UNITS

- A. ASTM C 140 Sampling and Testing Concrete Masonry Units
- B. ASTM C 1372 Standard Specification for Dry-Cast Segmental Retaining Wall Units
- C. Retaining Wall System Manufacturer's Construction, Design & Installation Manual

## 2.2 <u>GEOSYNTHETIC REINFORCEMENT</u>

- A. ASTM D 4595 Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
- B. ASTM D 5262 Standard Test Method for Evaluating the Unconfined Creep and Creep Rupture Behavior of Geosynthetics
- C. ASTM D 5321 Standard Test Method For Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic by Direct Shear Method
- D. ASTM D 5818 Standard Practice for Exposure and Retrieval of Samples to Evaluate Installation Damage of Geosynthetics
- E. ASTM D 6706 Standard Test Method for Measuring Geosynthetic Pullout Resistance in Soil
- 2.3 <u>SOILS</u>
  - A. ASTM D 698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort
  - B. ASTM D 2487 Standard Practice for Classification of Soils for Engineering Purposes
  - C. ASTM D 422 Standard Test Method for Particle-Size Analysis of Soils
  - D. ASTM D 4318 Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils

- 2.4 DRAINAGE
  - A. ASTM F 758– Standard Specification for Smooth-Wall Polyvinyl Chloride (PVC) Plastic Underdrain Systems for Highway, Airport or Similar Drainage
  - B. ASTM F 405 Standard Specification for Corrugated Polyethylene (PE) Pipe and Fittings
- 2.5 <u>ENGINEERING DESIGN</u> "NCMA Design Manual for Segmental Retaining Walls"
- 2.6 Where specifications and reference documents conflict, the Wall Design Engineer shall make the final determination of applicable document.

## 2. DELIVERY, STORAGE, AND HANDLING

- 2.1 Contractor shall check materials upon delivery to ensure that the specified type and grade of materials have been received and proper color and texture of SRW units have been received.
- 2.2 Contractor shall store and handle materials in accordance with manufacturer's recommendations and in a manner to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping or other causes.
- 2.3 Contractor shall prevent excessive mud, wet concrete, epoxies and similar materials that may affix themselves from coming in contact with materials.
- 2.4 Contractor shall protect materials from damage; no damaged material shall be incorporated into the segmental wall.
- 2.5 Geosynthetic shall be protected from UV exposure and the protective covering on geosynthetic shall remain until immediately before installation and shall be stored at temperatures above -10 degrees F.

## PART 2 – MATERIALS

## 3. SEGMENTAL RETAINING WALL UNITS

- 3.1 The Contractor shall submit in accordance with Section 01300 "Submittals" for review and approval, documentation showing the proposed design and materials for the Segmental Retaining Wall (SRW). This documentation shall include retaining wall units, materials, dimensions, methods of construction, and calculations. All design calculations and drawings shall be signed and sealed by qualified Professional Structural Engineer, registered in the State of Kansas.
- 3.2 Unit Dimensions: 12" thick x 202 l.f.
- 3.3 Color of SRW units shall be selected by Owner.
- 3.4 Finish of SRW units shall be selected by Owner.
- 3.5 SRW units shall be capable of being erected with the horizontal gap between adjacent units not exceeding 1/8 inch.
- 3.6 SRW units shall be sound and free of cracks or other defects that would interfere with the proper placement or performance of the units or significantly impair the strength or permanence of the structure. Any cracks or chips observed during construction shall fall within the guidelines outlined in ASTM C 1372.

- 3.7 Concrete SRW units shall conform to the requirements of ASTM 1372 and have a minimum net average 28 days compressive strength of 3000 psi. Compressive strength test specimens shall conform to the saw-cut coupon provisions of ASTM C 140.
- 3.8 SRW unit molded dimensions shall not differ more than +1/8 inch from that specified, as measured in accordance with ASTM C 140. This tolerance does not apply to architectural surfaces, such as split faces.
- 3.9 Cap adhesive shall meet the requirements of the retaining wall supplier.

### 4. SEGMENTAL RETAINING WALL UNIT CONNECTION PINS

SRW units shall be interlocked with County connection pins. The pins shall consist of glass reinforced nylon made for the expressed use with the SRW units supplied

## 5. GEOSYNTHETIC REINFORCEMENT

- A. Geosynthetic reinforcement shall consist of high-tenacity geogrids or geotextiles designed for use in segmental retaining wall systems. The type, strength, and placement of the geosynthetic reinforcement shall be determined by procedures outlined in this specification and the NCMA Design Manual for Segmental Retaining Walls and materials shall be specified by Wall Design Engineer in their final wall plans and specifications. The manufacturers/suppliers of the geosynthetic reinforcement shall have demonstrated construction of similar size and types of segmental retaining walls on previous projects.
- B. The type, strength, and placement of the reinforcing geosynthetic shall be as determined by the Wall Design Engineer, as shown on the final, P.E.-stamped retaining wall plans.

### 6. LEVELING PAD

Material for leveling pad shall consist of compacted sand, gravel, or combination thereof (USCS soil types GP,GW, SP, & SW) and shall be a minimum of 6 inches in depth. Lean concrete with a strength of 200-300 psi and 3 inches thick maximum may also be used as a leveling pad material. The leveling pad should extend laterally at least a distance of 6 inches from the toe and heel of the lowermost SRW unit.

## 7. COOPERATION WITH OTHER CONTRACTORS

This Contractor shall cooperate with all other contractors engaged in work in the building to the end that proper unity of action will facilitate the orderly progress of the work. Shop drawings or other data that may be provided by or for this Contractor for use in the installation of his work shall be given to those contractors who required the information contained therein.

### 8. DRAINAGE AGGREGATE

Drainage aggregate shall be angular, clean crushed stone or granular fill meeting the following gradation as determined in accordance with ASTM D422

Sieve Size	Percent Passing
1 inch	100
3/4 inch	75-100
No. 4	0-60
No. 40	0-50
No. 200	0-5

## 9. DRAINAGE PIPE

- 9.1 The drainage collection pipe shall be a perforated or slotted PVC, or corrugated HDPE pipe. The drainage pipe may be wrapped with a geotextile to function as a filter.
- 9.2 Drainage pipe shall be manufactured in accordance with ASTM F 405 or ASTM F 758.

### **10. REINFORCED BACKFILL SOIL**

10.1 The reinforced soil material shall be free of debris and consist of the inorganic low plasticity soil with a minimum angle of internal friction of 28 degrees, and a liquid limit less than 50.

### **11. GEOTEXTILE FILTER**

Drainage geotextile shall consist of geosynthetic specifically manufactured for use as a preamble soil filter that retains soil while still allowing water to pass throughout the life of the structure. The type and placement of the geotextile filter material shall be as required by the Wall Design Engineer in their final wall plans and specifications.

## PART 3 – DESIGN PARAMETERS

### 12. SOIL

12.1 The following soil parameters, as determined by the Owner's Geotechnical Engineer shall be used for the preparation of the final design:

Unit Weight Internal Friction Cohesion (c)

 $(\gamma)$  (pcf) Angle ( $\phi$ ) (degrees)

(If internal friction angles are not available for the above section, the specifier can provide the USCS soil type classification for the reinforced, retained, and foundation soils and/or attach the geotechnical investigation report for this project.)

12.2 Should the actual soil conditions observed during construction differ from those assumed for the design, design shall be reviewed by the Wall Design Engineer at the Owner's Geotechnical Engineer's direction.

## PART 4 – CONSTRUCTION

### **13. INSPECTION**

- 13.1 The Owner or Owner's Engineer is responsible for verifying that the materials supplied by the Contractor meet all the requirements of the specification. This includes all submittals for materials and design, qualifications, and proper installation of wall system.
- 13.2 Contractor's field construction supervisor shall have demonstrated experience and be qualified to direct all work at the site.

## 14. EXCAVATION

- 14.1. Contractor shall excavate to the lines and grades shown on the project grading plans. Contractor shall take precautions to minimize over-excavation.
- 14.2 Contractor shall verify location of existing structures and utilities prior to excavation. Contractor shall ensure all surrounding structures are protected from the effects of wall excavation.

## **15. FOUNDATION PREPARATION**

15.1. Following the excavation, the foundation soil shall be examined by the Owner's Engineer to assure actual foundation soil strength meets or exceeds the assumed design bearing

strength. Soils not meeting the required strength shall be removed and replaced with infill soils, as directed by the Owner's Geotechnical Engineer.

15.2 Foundation soil shall be proof-rolled and compacted to 95% standard Proctor density and inspected by the Owner's Geotechnical Engineer prior to placement of leveling pad materials.

## 16. LEVELING PAD CONSTRUCTION

- 16.1 Leveling pad shall be placed as shown on the final, P.E.-sealed retaining wall plans with a minimum thickness of 6 inches. The leveling pad should extend laterally at least a distance of 6 inches from the toe and heel of the lowermost SRW unit.
- 16.2 Granular leveling pad material shall be compacted to provide a firm, level bearing surface on which to place the first course of units. Well-graded sand can be used to smooth the top 1/4 inch to 1/2 inch of the leveling pad. Compaction will be with mechanical plate compactors to achieve 95% of maximum standard Proctor density (ASTM D 698).

## 17. SRW UNIT INSTALLATION

All SRW units shall be installed at the proper elevation and orientation as shown on the final, P.E.-sealed wall plans and details or as directed by the Wall Design Engineer. The SRW units shall be installed in general accordance with the manufacturer's recommendations. The specifications and drawings shall govern in any conflict between the two requirements.

## **18.** SRW CAPS

- 18.1. Place the Cap Unit over the last course of retaining wall units. Saw cut units as needed.
- 18.2 Caps shall be properly aligned and glued to underlying units with County Materials adhesive, a flexible, high-strength concrete adhesive. Rigid adhesive or mortar is not acceptable

## **19.** CONSTRUCTION ADJACENT TO COMPLETED WORK

The Owner or Owner's Representative is responsible for ensuring that construction by others adjacent to the wall does not disturb the wall or place temporary construction loads on the wall that exceed design loads, including loads such as water pressure, temporary grades, or equipment loading. Heavy paving or grading equipment shall be kept a minimum of 3 feet behind the back of the wall face. Equipment with wheel loads in excess of 150 psf live load shall not be operated within 10 feet of the face of the retaining wall during construction adjacent to the wall. Care should be taken by the General Contractor to ensure water runoff is directed away from the wall structure until final grading and surface drainage collection systems are completed.

### End of Section 03200
# **SECTION 03300**

# **CONCRETE**

#### 1. GENERAL

- 1.1 All work included under this heading shall be subject to the General Conditions of the entire operation. The Contractor for this portion of the work is required especially, to refer thereto.
- 1.2 Where not modified or exceeded by these specifications, or by the drawings, the "Specifications for Structural Concrete for Buildings" ACI 301-96, current edition shall be the specification for all concrete construction for this project, as if hereto attached or herein repeated. ACI and CRSI standards and recommendations included in ACI 301-96 shall likewise become minimum construction standards for this specification.
- 1.3 Contractor shall consult this document and its reference documents and become thoroughly familiar with their contents. He shall further procure the following documents and keep at least one copy of each on the work and available to the Architect during all concrete operations: ACI 301-96 Specifications for Structural Concrete
  - C31-69-80 Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field.
  - C94-81 Specifications for Ready-Mixed Concrete
  - C143-78 Method of Test for Slump of Portland Cement Concrete
  - C173-78 Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method
  - ACI 318-83 Building Code Requirements for Reinforced Concrete
  - ACI 347-78-84 Recommended Practice for Concrete Form Work
  - ACI 306-R88 Recommended Practice for Cold Weather Concreting
  - ACI 305R-91 Recommended Practice for Hot Weather Concreting
  - ACI 304R-89 Recommended Practice for Measuring, Mixing and Placing Concrete
  - CRSI 78 Recommended Practice for Placing Reinforcing Bars
- 1.4 <u>All poured-in-place concrete</u> including but not limited to footings, grade beams, floor slabs, toppings, stairs, sidewalks, retaining walls, curbs, light pole bases, concrete parking surfaces and drives.
- 1.5 All exterior concrete including parking surface and sidewalks shall be poured with a max. slump of 3" and compaction for base under concrete shall be in accordance with the specifications; compaction shall be certified by the Testing Laboratory.
- 1.6 All sidewalks (4" thick) shall be reinforced with 6x6, #8/#8, W2.1 x W2.1 W.W.F. and all concrete parking and drives (6" thick) shall be reinforced with 6x6, #4/#4, W4.0 x W4.0 W.W.F.

1.7 This section specifies cast-in-place concrete, including formwork, reinforcement concrete, materials, mix design, placement procedures and finishes.

# 2. SUBMITTALS

#### 2.1 <u>PRODUCT DATA</u>

For each type of manufactured material and product indicated.

#### 2.2 <u>DESIGN MIXES</u>

For each concrete mic, include alternate mix design when characteristics of material, project conditions, assembly, and support of formwork. Design and engineering of formwork are Contractors responsibility.

#### 2.3 FORMWORK SHOP DRAWINGS

Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility.

#### 2.4 MATERIAL TEST REPORTS

From a qualified testing agency indicating and interrupting test results for compliance indicated, based on comprehensive testing of current materials.

# 2.5 <u>MATERIAL CERTIFICATES</u>

Signed by manufacture's certifying that each of the following items complies with requirements:

- 2.5.1 Cementitious materials and aggregates.
- 2.5.2 Form materials and form-release agents.
- 2.5.3 Steel reinforcement and reinforcement accessories.
- 2.5.4 Fiber reinforcement
- 2.5.5 Ad mixtures
- 2.5.6 Waterstops
- 2.5.7 Curing materials
- 2.5.8 Bonding agents
- 2.5.9 Adhesives.
- 2.5.10 Epoxy filler strips
- 2.5.11 Repair materials

# **3. QUALITY ASSURANCE**

# 3.1. INSTALLER QUALIFICATIONS

An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

# 3.2. MANUFACTURES QUALIFICATIONS

- 3.2.1 A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- 3.2.2 Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.

#### 4. WORK INCLUDED

This section of the specifications shall include the furnishing of all labor and materials as required in connection with the completion of the following items of concrete - plain and reinforced concrete, or items of a cement nature throughout the building including the following:

- 4.1 Furnish and set all lumber and plywood as required concerning the forming of the concrete work.
- 4.2 Place all bar, steel mesh, rebar, and like reinforcement for all reinforced concrete work.
- 4.3 All concrete as specified herein.
- 4.4 Footings, foundations, and floors.
- 4.5 Cement floor finish and sealer, as required.
- 4.6 The setting in the concrete of all inserts, hangers, anchors, anchor bolts, ties, rods, etc., as required by the drawings or later sections of these specifications.
- 4.7 All labor and materials of a plain or reinforced concrete nature required by the drawings or later sections of these specifications or for the correct and substantial installation of the work included herein.
- 4.8 Sidewalks, slabs, and curbs, as indicated.
- 4.9 All joints materials, curing materials, and installation of vapor barriers.
- 4.10 Expansion joints and tooled joints, as required.
- 4.11 Special concrete foundations for mechanical equipment and electrical work, as required by the drawings.
- 4.12 Shop drawings, inspections, and tests.
- 4.13 The Asphalt contractor shall be clarified to include finish grading of the paved area stabilization with fly ash worked into the top 6" of soil, asphalt paving, and all stripping and signage associated with the paved areas. It shall also be clarified that the Earthwork contractor in the general contract shall be responsible for grading of the asphalt paving areas to within  $\pm 1/10$  of the finish grading. The General contractor shall be responsible for all sidewalks and curbs as shown on detail 6/C1.3. The general contractor shall also be responsible for all bollards.

#### 5. ALTERNATES

Refer to Section 01030 – Alternates where scope and description of Alternates to the contract requirements are given.

#### 6. MATERIALS INSTALLED IN THIS DIVISION AND/OR FURNISHED BY OTHERS

This Contractor shall build into concrete work the following materials, which are furnished by other trades and shall embed and secure same as required.

- 6.1 Concrete inserts, hangers, anchors, sleeves for all piping and ductwork as required for all trades.
- 6.2 Anchor bolts, plates, dovetail anchor slots, reglets, etc.
- 6.3 Loose lintels bearing on concrete work.
- 6.4 Door and window frames, bucks, anchors, occurring in concrete work.

# 7. COOPERATION WITH OTHER CONTRACTORS

This Contractor shall cooperate with all other contractors engaged in work in the building to the end that proper unity of action will facilitate the orderly progress of the work. Shop drawings or other data that may be provided by or for this Contractor for use in the installation of his work shall be given to those contractors who required the information contained therein.

# 8. MATERIALS

#### 8.1 PORTLAND CEMENT

Portland Cement shall conform to the "Standard Specifications for Portland Cement" (ASTM Serial Designation C150) and shall be Type 1, 1a or 111. High early strength concrete may be used only upon approval of the Architect.

#### 8.2 <u>AGGREGATE</u>

Aggregate shall conform to ASTM Serial Specification C33-90.

8.2.1 Fine Aggregate

Fine aggregate shall consist of sand having clean, hard, durable uncoated grains, free from deleterious substances and shall range in size from fine to coarse within the following percentages by weight:

Volume removed by sedimentation.... not more than 3 percent. Not more than 35 percent shall pass a standard size sieve and be retained on the next smaller sieve.

# 8.2.2 <u>Coarse Aggregate</u>

Coarse aggregate shall consist of crushed stone, gravel or other approved inert materials with similar characteristics or combination thereof, having clean, hard, durable, uncoated particles, free from deleterious matter, meeting graduation requirements of ASTM C33, No. 67. After acceptance of a grading, a variation in the amount passing any sieve size of more than 10 percent of the total will not be permitted. The grading shall be within the following percentages by weight:

The maximum sized aggregate shall be not larger than one-fifth (1/5) of the narrowest dimension between form of the member for which the concrete is to be used nor larger than three-fourths (3/4) of the minimum clear spacing between reinforcing bars, and forms as shown on the drawings.

# 8.2.3 <u>Soundness</u>

The fine and coarse aggregate when subjected to five alternations of the sodium sulfate soundness test (ASTM Designation C88-46T) shall not show an average weighted loss of more than 10 percent for the fine aggregate and 13 percent for the coarse aggregate unless evidence satisfactory to the Architect is furnished that concrete of comparable proportions in which similar materials from the same sources were used has been

exposed to natural weathering for a period of at least 5 years without appreciable disintegration.

#### 8.3 <u>MIXING WATER</u>

Mixing water shall be clean and free from oil, acid and injurious amounts of vegetable matter, organic materials, alkalis, salts, or other substances that may be deleterious to concrete or steel.

# 8.4 EXPANSION JOINT FILLER

Expansion joint filler shall be premoulded and composed of fiber board impregnated with asphalt similar and equal to "Flexcell" as manufactured by the Celotex Company. All joint filler material shall be the thickness of the slab or joint and unless otherwise indicated shall be one-half (1/2) inch thick.

#### 8.5 <u>METAL REINFORCEMENT</u>

- 8.5.1 Metal reinforcement shall conform to the requirements of the "Standard Specifications for Billet-Steel Bars Concrete Reinforcement." (Serial Designation ASTM A-615-82 of the American Society for Testing Materials.)
- 8.5.2 Welded wire fabric for concrete reinforcement shall conform to the requirements of the "Standard Specifications for welded steel wire fabric for concrete reinforced" shall conform to ASTM A185-79.

#### 8.6 <u>REINFORCING BAR SUPPORTS</u>

All reinforcing shall be properly and adequately supported at the design heights indicated on the Structural Plans by the use of chair supports. Chair supports with galvanized legs shall be equal to bar supports manufactured by the Dayton Sure Grip & Shore Co., Miamiburgh, Ohio.

- 8.7 <u>DAMPPROOFING</u>: See Division 7, Section 07000.
- 8.8 EDGE INSULATION: See Division 7, Section 07200.

#### 9. EXTREME WEATHER CONDITIONS

- 9.1 Concrete when deposited in hot weather shall be in strict accordance with ACI 305R-91 "Recommended Practice for Hot Weather Concrete."
- 9.2 Concrete when deposited in cold weather shall be handled in strict accordance with ACI 306R-88 "Recommended Practice for Cold Weather Concreting."

#### 10. FORMS

- 10.1 <u>GENERAL</u>
  - The foundation is designed for a combination of trench and formed footings or walls.
  - 10.1.1 Forms shall conform to shape, lines and dimensions of the members as shown on the Plans. They shall be properly spaced or tied together to maintain position and shape and ensure safety to workmen and passerby. Forms shall be made tight to prevent leakage of mortar.
  - 10.1.2 Formwork for concrete shall be designed and constructed in strict accordance with ACI 347 Recommended Practice for Concrete Formwork".
  - 10.1.3 If adequate foundations for shores cannot be secured, trussed supports of adequate design shall be provided.

- 10.2 EXPOSED CONCRETE
  - 10.2.1 Unlined forms shall be used for the face of all exposed concrete walls and all other exposed surfaces where indicated on the Drawings. All forms shall be built in place except that panel forms may be used where a single panel will form an entire area from one reveal to another. The use of panel forms will not be permitted where the joints between adjacent panels must be made on flat surfaces or in any other conspicuous locations.
  - 10.2.2 The contact surface of all unlined forms shall be constructed of 5/8" or 3/4" five-ply Douglas Fir structural plywood of concrete form grade according to Bureau of Standards Commercial Standards CS45-42. All concrete form plywood shall be so designed by grade marking each panel. Full-sized sheets of plywood must be used except where smaller pieces will cover an entire area. The edges of all plywood sheets shall be straightened on the bench to insure close-fitting, tight joints.
  - 10.2.3 When the outside form is erected and reinforcement is in place and before the inside form is erected, the Architect shall be notified, and the inside form shall not be placed until work already done is approved. Open joints, which would permit leakage of grout, shall be sufficient cause for rejection of forms.
  - 10.2.4 If, in the opinion of the Architect, pointing of an occasional slightly open joint will prevent leakage, then such pointing shall be done using a material approved by the Architect. Pointing shall be carefully done and there shall be no trace of the pointing mixture on the surfaces of the sheathing.

#### 11. **REINFORCEMENT**

11.1 Reinforcement shall be detailed, fabricated, and placed in strict accordance with SP66-94 "Manual of Standard Practice for Detailing Reinforced Concrete Structures".

#### 11.2 <u>CLEANING</u>

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

#### 11.3 BENDING AND STRAIGHTENING

- 11.3.1 Reinforcement shall be carefully formed to the dimensions indicated on the Plans. Cold bends shall be made around a pin having a diameter of six or more times the least dimensions of the reinforcement bars.
- 11.3.2 Metal reinforcement shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bands not shown on the Plans shall not be used. Heating of reinforcement will be permitted only when the entire operation is approved by the Architect.

#### 11.4 <u>PLACING</u>

11.4.1 Metal reinforcement shall be accurately positioned and secured against displacement by using annealed wire of not less than No. 16 gauge or suitable clips of intersections and shall be supported in a manner that will keep all metal away from the exposed surface of the wall. Structural concrete reinforcement shall be adequately secured in position by concrete or metal chairs and spacers. Nails shall not be driven into the outside forms to

support reinforcement not shall any other device for this purpose come in contact with the outside form except that wood strips shall be inserted between the reinforcement and the forms at intervals to maintain the required clear distance between the reinforcement and the inside and outside surfaces of the concrete.

11.4.2 The strips shall be pulled up and removed from the wall as the level of the concrete rises. The minimum clear distance between any bar and the weather side of all exterior walls shall not be less than two (2") inches. At all, wall surfaces not exposed to the weather a minimum of one (1") inch of concrete cover over all steel shall be provided

# 11.5 CONCRETE PROTECTION FOR REINFORCEMENT

- 11.5.1 Other metal reinforcement shall be protected by the thickness of concrete indicated on the Plans. Where not otherwise shown, the thickness over the reinforcement shall be as follows:
  - 11.5.1.1 Where concrete is deposited against ground without the use of forms, not less than three inches (3").
  - 11.5.1.2 Where concrete is exposed to the weather or exposed to the ground but is placed in forms, not less than two inches (2") for bars #6 through #18 and one and one-half inches (1-1/2") for bars #5 and smaller.
  - 11.5.1.3 In slabs and walls not exposed to the ground or the weather, not less than 3/4".
  - 11.5.1.4 In beams, girders and columns not exposed to the ground or to the weather, not less then 1-1/2".
  - 11.5.1.5 In all cases the thickness of concrete over the reinforcement shall be at least equal to the diameter of round bars and one and one-half times the side dimension of square bars.

# 11.6 <u>SPLICING</u>

- 11.6.1 Wherever it is necessary to splice reinforcement otherwise than as shown on the Plans, the character of the splice shall be decided by the Architect on the basis of allowable bond stress and the stress in the reinforcement at the splice. Splicing shall not be made at points of maximum stress nor shall adjacent bars be spliced at the same point.
- 11.6.2 All bars shall be lapped at least 30 bar diameters or 24" minimum unless otherwise noted at all corners and at abrupt changes in directions of walls.
- 11.6.3 In slabs, beams and girders, splices of reinforcement at points of maximum stress shall generally be avoided. Splices shall provide sufficient lap to transfer the stress between bars by bond and shear.

#### 12. PROPORTIONING AND STRENGTH REQUIREMENTS

#### 12.1 TRIAL BATCHES

The Contractor shall employ and pay for services of a testing laboratory approved by the Architect, who will be responsible for analysis on design of the concrete in accordance with these specifications.

## 12.2 MEASURING INGREDIENTS

12.2.1 All measurements of fine and coarse aggregates shall be made separately by weight. Proportioning aggregates for fractional sacks of cement will not be permitted unless the cement is weighed for each batch. Weighing equipment shall be arranged to permit making compensation for changes in the weight of moisture contained in the aggregates. Weighing equipment shall meet the approval of the Architect and shall be accurate within one percent of the net load being weighed.

- 12.2.2 A satisfactory auxiliary device shall be used in connection with the scale beam to indicate or register at least the last 100 lbs. of each of the aggregates required for the batch.
- 12.2.3 One gallon of water shall be considered as weighing 8.33 lbs.
- 12.2.4 Portland Cement in standard unopened cloth or paper sacks as packed by the manufacturer may be considered as weighing 94 lbs. per sack. Batches shall be proportioned that only full bags of cement are required for a single batch.

#### 12.3 STRENGTH REQUIREMENTS

All concrete shall have a minimum compressive strength of 3,500 lbs. per square inch at twentyeight (28) days. Refer to the Structural Notes on the Drawings for additional strength requirements.

#### 12.4 WATER-CEMENT RATIO

The proportioning of materials shall be based on the requirements for a plastic and workable mix with the use of not less than 5-1/2 sacks of cement per cubic yard and no more water than is necessary to gain desired strength, expressed in terms of the quantity of cement. The water in the aggregate must be included in the quantity specified and subtracted from the amount added to the mixture. It shall be measured by methods satisfactory to the Architect which will give results within one (1) pound for each one hundred (100) pounds of aggregate.

#### 12.5 PROPORTIONING AND CONSISTENCY

- 12.5.1 The proportions of aggregate to cement shall produce concrete that can be thoroughly compacted.
- 12.5.2 The combined aggregate shall be of such composition of sizes that when separated by the No. 4 standard sieve, the weight retained on the sieve shall be not less than one-half (1/2) nor more than two-thirds (2/3) of the total based on dry materials, except where adjustment is necessary in the opinion of the Architect for casting in special details. In all cases, the regular mix can be used for casting details, except where detail is intricate it may be necessary to reduce the amount of coarse aggregate.

# 12.6 QUALITY CONTROL

#### Determination of Maximum Water Content

The strength quality of the concrete proposed for use shall be established by tests made in advance of the beginning of operations using consistencies suitable for the work meeting the requirements of these specifications. Trial design batches and testing shall be the responsibility of the Contractor. Certified copies of all tests and proportions used therein shall be furnished to the Architect for approval. Specimens shall be made and cured in accordance with ASTM Standard C192-49. A curve representing the relation between the water content and the average 28-day compressive strength shall be established for a range of values including the compressive strength specified herein. The curves shall be established by at least three (3) points, each point representing average values from at least 4 test specimens. The maximum allowable water content for the concrete to be used in the work shall be as determined from this curve and shall correspond to a strength fifteen (15) percent greater than specified. No substitutions shall be made in the materials used in the work without additional tests in accordance herewith to show that the quality of the concrete is satisfactory.

# **13.** CONCRETE MIXING PLANT

Job mixed concrete will not be allowed. Concrete shall be batched at a central plant and conveyed to the job in mixing trucks. Ready-mix concrete shall conform to ASTM Tentative Specifications C94. It shall be the responsibility of the Contractor to maintain a proper and uniform air content as determined by test <u>at the jobsite</u> and variations in air content beyond the specified limits for two consecutive tests shall be sufficient cause for rejection of all concrete until evidence of adequate corrective measures has been furnished the Architect.

# 14. **DEPOSITING CONCRETE**

# 14.1 <u>CLEANING EQUIPMENT</u>

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

# 14.2 TRANSPORTATION

Concrete shall be handled from the mixer to the place of final deposit in cars, buggies or conveyers. The concrete shall not be spouted nor delivered by spout or trough from the hoists, not dumped into carts with a free fall from the mixer of more than three feet. Every possible precaution shall be kept on temporary runways built over the floor system and runway supports shall not bear upon reinforcement steel or fresh concrete.

# 14.3 <u>TIME OF PLACING</u>

Concrete shall not be placed until all reinforcement is secured and properly fastened in its correct position, nor until the trenches have been inspected and approved by the Architect, nor until all sleeves, hangers, pipers, conduits, bolts, wires, and any other fixtures required to be embedded therein have been placed and anchored by the Contractor not until the trenches and reinforcement have been cleaned. Concrete shall not be placed at any time except under the direct supervision of the Architect nor outside of regular working hours unless the Architect is notified at least 4 hours in advance and the Architect's superintendent or inspector is on the job.

#### 14.4 PREPARATION FOR PLACING

- 14.4.1 Water shall be removed for excavations before concrete is deposited. Any flow of water shall be diverted through proper side drains and shall be removed without washing over freshly deposited concrete. Hardened concrete, debris and foreign materials shall be removed from interior of forms, unless lines, shall be oiled or except in freezing weather, wet with water in advance of concrete placement to prevent seepage of cement grout from the mix.
- 14.4.2 Reinforcement shall be secured in position, inspected, and approved by the Architect before placing concrete. All concrete placed in violation of this provision shall be rejected and removed. Runways or other means approved by the Architect shall be provided for wheeled equipment to convey concrete to points of deposit. Equipment used to deposit concrete shall not be wheeled over reinforcement not shall runways be supported on reinforcement.

# 14.5 <u>PLACING</u>

14.5.1 Special care must be exercised to prevent segregation of the concrete and to prevent splashing the trench or reinforcement with concrete and any such splashes or accumulations of hardened or partially hardened concrete on the forms or reinforcement above the general level of the concrete already in place must be removed before the work proceeds.

- 14.5.2 Concrete shall be handled from mixer or transport vehicle to place of final deposit in a continuous manner and as rapidly a practicable until the given unit of operation, approved by the Architect is completed. Concrete that has attained its initial set or has contained its water content for more than 1-1/2 hours shall not be used in the work. Reinforcement shall not be splashed with concrete in advance of placing operation.
- 14.5.3 Concrete shall be deposited in the trenches in uniform layers not exceeding 24" in depth and as nearly as practicable in final position to avoid rehandling. Immediately after depositing, concrete shall be compacted by thoroughly agitating in a manner approved by the Architect, to force out air pockets, work the mixture into corners and around reinforcement and inserts, and prevent formation of voids.

# 15. DEPOSITING AGAINST OTHER CONCRETE

Before depositing new concrete in the walls on or against concrete that has hardened, the forms shall be retightened, the surface of the hardened concrete shall be roughened, as required, thoroughly cleaned of foreign matter and laitance, and moistened with water. The new concrete placed in contact with hardened or partially hardened concrete shall contain an excess of mortar to insure bond. To ensure sufficient mortar at the juncture of the hardened and the newly deposited concrete, a layer of Portland Cement-sand mortar one inch to two inches thick shall be deposited against the hardened concrete into which the regular mix concrete shall be deposited immediately. The cement-sand mortar shall be of the same proportions as the regular concrete mix except that the coarse aggregate is omitted.

#### 16. CONCRETE FLOOR FINISH

16.1 Concrete slabs shall be finished as hereinafter described. The dusting of wearing surfaces with dry materials WILL NOT be permitted. In preparation for finishing, floor slabs shall be struck off true to the required level at or below the elevation or grade of the finished floors as shown on the drawings. Floors shall be left with a tolerance (Class "B") of 1/4" in 10 feet except where drains occur, or a definite slope is given in which case the floors shall be finished to the lines and grades shown on the drawings or as directed by the Architect.

#### 16.2 <u>MONOLITHIC FINISH</u>

Tamping the concrete with special tools to force the coarse aggregate away from the surface shall finish floors shown on the drawings to receive a monolithic finish. Then screeding and floating with straight edges to bring the surface to require finish level shown on the drawings. While the concrete is still green but sufficiently hardened to bear a man's weight without imprinting, it shall be wood floated to a true even plane with not coarse aggregate visible. Sufficient pressure shall be used on the wood floats to bring moisture to the surface. The concrete shall then be hand-trowelled to produce a surface free from trowel marks.

#### 16.3 WOOD OR CORK FLOAT FINISH

Floors indicated on the drawing to receive wood or cork float or broomed finish shall be finished by tamping the concrete with special tools to force aggregate away from the surface, then screeding with straight edges to bring surface to required line as shown on the drawings. While the concrete is still green but hardened sufficiently to bear the cement finisher's weight, the surface shall be floated with a wood or cork float to a true uniform plane with no coarse aggregate visible.

## 16.4 <u>POWER MACHINE FINISHING</u>

In lieu of hand finishing, the contractor may use a power machine for finishing concrete floors in accordance with the direction of the machine manufacturer. The preparation of concrete surfaces for finishing by machine shall in general be as herein before required for hand finishing.

#### 16.5 <u>SEALED CONCRETE</u>

Interior concrete floors are exposed and sealed. Contractor shall protect floors throughout the duration of the project.

#### **17. PROTECTION AND CURING**

#### 17.1 PROTECTION AGAINST MOISTURE LOSS

Immediately after placing or finishing concrete surfaces not covered by forms shall be protected from loss of surface moisture for not less than 7 days where a normal Portland cement has been used or 3 days where a high-early strength Portland cement has been used by covering with Kraft paper mats. Kraft paper shall be sealed. Protect concrete from too rapid drying or freezing for 6 days.

#### 17.2 CURING COMPOUND

Membrane curing compound shall comply with ASTM C-309, Type I, Class A and B and AASHTO M-148, Type 1 and/or Type I-D. Curing compound shall be equal to "Conspec Cureseal" as manufactured by Conspec Marketing and Manufacturing Co., Inc., 636 South 66th Terrace, Kansas City, Kansas; (800) 348-7351, or the approved equal. Materials shall be applied to all newly finished concrete floors and walks.

#### 17.3 <u>PATCHING</u>

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

#### 17.4 <u>CLEANING</u>

- 17.4.1 No cleaning operations shall be undertaken until the walls of the building are entirely completed. Cleaning portions of the walls as the work progresses will not be permitted. Mix one-part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint. White Portland cement shall be used for all or part of the cement in the grout, as directed by the Architect, to give the color directed. Wet the surface of the concrete and apply the grout, float the surface with a cork float, scouring the wall vigorously. While the grout is still plastic, the surface shall be finished with a sponge rubber float, removing all excess grout. This finishing shall be done at the time when grout will not be pulled from holes or depressions.
- 17.4.2 Next, allow the surface to dry thoroughly, then rub it vigorously with dry burlap to completely remove any dried grout. There shall be no visible fill or grout remaining after this rubbing. The entire cleaning operation for any areas must be completed the day it is started. No grout shall be left on the wall overnight. After the surfaces to be treated have been grout clean, if any slightly dark spots or streaks remain, they shall be wiped off lightly with a fine abrasive hone without using water, but the rubbing with the hone shall not be sufficient to change the texture of the concrete.

# 18. GROUT

Furnish U.S. Grout Corporations' pre-mixed, five-star, non-shrink, non-metallic grout or Euo N.S. grout for setting column bases and beam bearing. Grout shall be used in strict accordance with the manufacturer's printed instructions.

# **19.** JOINTS IN CONCRETE

#### 19.1 <u>EXPANSION JOINTS</u>

Provide expansion joints where so indicated on the drawings. Expansion joints shall be continuous of width to extend full thickness of the concrete on plans. In no case shall the reinforcement, corner protection angles, or other fixed metal items embedded in or bonded into concrete, be run continuous through an expansion joint.

- 19.2 Concrete walks and ramps shall have expansion joints across the width of the walk or ramp, spaced where indicated on the drawings, but shall not exceed 30' o.c.
- 19.3 All concrete slabs on fill that are not made an integral part of the concrete vertical surface they intersect, such as walls, columns, etc., shall be provided with continuous expansion strips at the intersection.

#### 19.4 <u>CONSTRUCTION JOINTS</u>

The unit of operation shall not exceed 80 feet in any horizontal direction unless otherwise approved by the Architect, concrete shall be placed continuously so that the unit will be monolithic in construction. At least 48 hours shall elapse between casting the adjoining units unless this requirement is waived by the Architect. Construction joints, if required, shall be located near the midpoint of spans for slabs, seams, or girders unless a beam intersects a girder at its center in which case the joints in the girder shall be offset a distance equal to twice the width of the beam and provision for shear shall be made by use of inclined reinforcement. Vertical joints in wall footings shall be reduced to a minimum. Except where indicated on drawings, no jointing shall be made in footings or foundation work without specific approval of the Architect. Placement of concrete shall be at such rate that surfaces of concrete not carried to joint levels will not have attained initial set before additional concrete is place thereto.

#### 19.5 <u>CONTROL JOINTS</u>

Shall be as detailed on the drawings and accurately located to comply with design requirements. Extreme care shall be taken to assure that the break point of reinforcing bars designated to be cut or stopped at control joints coincides exactly with the center line of the joint as shown on the Drawings.

#### 20. SIDEWALKS

- 20.1 Furnish and install a four (4) inch minimum thickness leveling compacted gravel fill for all sidewalks and provide continuous joints adjacent to the building. Expansion joints shall be installed the full width of the walks at approximately thirty (30) foot intervals.
- 20.2 Sidewalks shall be at least four (4) inches thick and graded to an even slope to building entrances. Finish as per detail on the Drawings.
- 20.3 All sidewalks shall have reinforcing of 6" x 6" mesh of No. 8 wires. All reinforcing shall terminate at expansion joints. All reinforced sidewalks (4" thick) shall be with 6x6, #8/#8, W2.1 x W2.1 W.W.F. and all concrete parking and drives (6" thick) shall be reinforced with 6x6, #4/#4, W4.0 x W4.0 W.W.F..
- 20.4 Finish is to be monolithic with cork or wood floats to provide a reasonable non-slip surface and the surface shall be marked off with tooled joints in approximately five (5) foot squares with a finish to be similar to details of the Plans.

# 21. TEST AND SAMPLES ON CONCRETE

- 21.1 Test cylinders Fieldwork shall be done per "Standard Method of Making and Curing Compression and Flexure Test Specimens in the Field" (ASTM Designation:C31) and as follows:
  - 21.1.1 The General Contractor shall include in the Base Bid, all costs with having technician from a certified testing laboratory to be present at the Job Site for each concrete pour (foundations and floor slab), to sample the concrete mix, to prepare the test cylinders, perform filled slump tests, perform air test on the concrete, note temperature of concrete and temperature of the environment.
  - 21.1.2 <u>Extent of sampling</u>: One set of 3 test cylinders shall be made for each 50 cu. yards of concrete placed. Location of concrete represented shall be recorded and shown on test cylinders and reports.
  - 21.1.3 Procedure requirements for ASTM C-31 are as follows: Place concrete cylinders in 3 equal layers. Rod each layer by 25 strokes for 6" diameter cylinders or 50 strokes for 8" diameter cylinders. Rod shall penetrate each lower layer by only 1/2". Cure and protect cylinders from freezing and/or too rapid drying. Cover each cylinder with plastic. During first 24 hours, store cylinders at location and temperature equal to concrete being tested. After 24 hours, store cylinders under moist conditions and at about 73 degrees F until test breaks are made.

# 21.2 LABORATORY TESTING OF CYLINDERS

- 21.2.1 Test cylinders per ASTM C-39 for compressive strength. Test one cylinder at 7 days and one at 28 days, out of each set of specimens. Test third cylinder, when and if requested by the Architect.
- 21.2.2 Copies of each test report shall be submitted within 5 days of date test was made; one to concrete supplier, two to Contractor and one to the Architect.
- 21.2.3 Test Laboratory will be employed by the Contractor.
- 21.2.4 <u>Air Content</u>: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural light weight concrete, one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
- 21.2.5 <u>Concrete Temperature</u>: ASTM C 1064, one test hourly when air temperature is 40° F and below and when 80° F and above and one test for each composite sample.

#### 21.3 <u>Slump Tests</u>: Fieldwork shall be done per ASTM C-143 and as follows:

- 21.3.1 Extent of sampling: Make slump test from first truckload of each day's pour and at any other time when mix consistency appears to have changed.
- 21.3.2Maximum to Minimum slumps permitted:<br/>Foundation:4" to 1"<br/>4" to 1"Slab on grade:4" to 2"<br/>Other reinforced concrete:4" to 1"

# 21.3.3 Procedure requirements of ASTM C-143 are as follows:Obtain metal slump cone of 12" height x 8" diameter bottom and 4" diameter top. Place cone on a smooth, level, moist board. Place concrete in cone in 3 equal layers. Rod each layer by 25 strokes. Rod shall penetrate lower layer by 1/2" and uniformly rod that layer. Strike concrete off top of cone after final rodding. Remove cone so as not to disturb

concrete. Measure height difference between top of cone and slumped concrete and compare that measurement with permitted limits specified above. Reject concrete, which exceeds these limits.

- 21.4 Specimens shall be cured under laboratory conditions except that when in the opinion of the Architect or Engineer, there is a possibility of the surrounding air temperature falling below 40 degrees F., he may require additional specimens to be cured under job conditions.
- 21.5 The standard age of test shall be 28 days, but 7-day tests may be used provided that the relation between the 2 and 28-days strength of the concrete is established by test for the materials and proportions used.
- 21.6 If the average strength of the laboratory control cylinders for any portion of the structure falls below the compressive strengths called for on the Plans, the Architect shall have the right to order a change in the proportions or the water content for the remaining portion of the structure. if the average strength of the job cured cylinders falls below the required strength, the Architect shall have the right to require tests in accordance with the "Standard Methods of Securing, Preparing and Flexure Strengths" (ASTM Designation C42) or order load tests to be made on the portions of the building affected.
- 21.7 When required, the load test shall be at the Contractor's expense, in accordance with Section 202 of the ACI Building Code (ACI 318). In the event the load test indicate that concrete placed does not conform to the drawings and these specifications, measures as prescribed by the Architect shall be taken to correct the deficiency and the cost of all such remedial measures shall be responsibility of the Contractor.
- 21.8 If the average strength of laboratory cylinders for any portion of the job falls below the minimum allowable strength of 28 days, the Architect reserves the right to order a change in proportions of water or cement content of concrete, or both, for the remaining portions of the job without extra cost to the Owner.

#### 22. DRAWINGS

- 22.1 The drawings and schedules show the typical arrangement of reinforcement.
- 22.2 Before proceeding with the work, the Contractor shall submit complete drawings and working details for approval.
- 22.3 Bar list, bonding diagrams and erection diagrams of the reinforcement steel shall be prepared by a licensed engineer. The Engineer whose name appears of the structural drawings is recommended by the Architect.

# 23. AIR CONTENT

All concrete subjected to freezing and thawing after curing and or required to be watertight shall be air entrained. Total air content as determined in accordance with ASTM C173 shall be: 23.1 5 plus/minus (1) percent for coarse aggregate size No. 467 (1-1/2" max.)

- 23.2 6 plus or minus (1) percent for coarse aggregate size No. 57 (1" max.) or No. 67 (3/4" max.)
- 23.3 All interior slabs to receive a surface hardener or subject to abrasion shall have a maximum total air content of three percent.

#### End of Section 03300

#### **SECTION 04100**

#### **MORTARS**

#### 1. GENERAL

All work included under this heading shall be subject to the General Conditions of the entire operation. The Contractor for this portion of the work is required to refer especially thereto.

#### 2. WORK INCLUDED

This Contractor shall furnish all labor and materials to complete all masonry mortar work as required by the drawings and/or herein specified.

#### **3. USES OF MORTAR**

Type "N" Portland -Cement -lime mortar, as herein specified, shall be used for exterior and interior masonry units of all exterior and interior walls. (ASTM C-270 or BIA M1-72.) Type "M" shall be used for masonry below grade and in contact with the Earth.

#### 4. MATERIALS

4.1 <u>CEMENTITIOUS MATERIALS</u>

Shall conform to the appropriate ASTM Standard Specifications, amended to date for the materials as follows:

- A. Masonry cement shall be Lehigh Masonry Cement from their plant at Iola, Kansas, or Ash Grove Masonry Cement from their plant at Chanute, Kansas or Atlas Masonry Cement from their plant at Independence, Kansas.
- B. This masonry cement shall be an inter-ground mixture of Portland Cement Clinker and Limestone and shall meet the requirements of the ASTM Specifications C91-53, type 11. Expansion shall not be greater than 1% when tested in accordance with ASTM Specifications C0154-49, except that the test bars shall remain in molds for 48 hours prior to test.
- C. This Contractor will be allowed the option of using hydrated lime (High Calcium, type S) or quick lime.
- D. Quicklime: Standard Specifications for Quick Lime for Structural purposes. (ASTM C-5-26).
- E. Hydrated Lime: Tentative Specifications for Hydrated Lime for Masonry purposes (ASTM20).
- 4.2 <u>AGGREGATES</u> Standard Specifications for Aggregate for Masonry Mortar (ASTM C-144).

#### 4.3 <u>WATER</u>

Water shall be clean and free of deleterious amounts of acids, alkalis, or organic materials.

#### 4.4 <u>ADMIXTURES</u>

Admixtures not mentioned in these specifications shall not be used in mortar without the approval of the Architect.

# 4.5 <u>ANTI-FREEZE COMPOUNDS</u> No Anti-Freeze liquid, salts or other substances shall be used in the mortar to lower the freezing point.

# 4.6 STORAGE OF MATERIALS

Cementitious materials and aggregates shall be stored in such a manner as to prevent deterioration and intrusion of foreign matter. Any material having become unsuitable for good construction shall not be used.

# 5. MEASURING AND MIXING

# 5.1 MEASUREMENT OF MATERIALS

Method of measuring materials for the mortar shall be such that the specified proportions of the mortar materials can be controlled and accurately maintained during the entire progress of the work. Mortar mixer sized to accommodate full bags of Portland cement and lime. Mixing mortar shall be in compete accord with BIA technical notes 8B.

# 5.2 MIXING MORTAR

Cementitious materials and aggregate shall be mixed with the maximum amount of water consistent with satisfactory workability for a minimum period of 3 minutes in a drum type batch mixer.

# 5.3 <u>MIXING GROUT</u>

Grout shall consist of mortar meeting the applicable specification requirements to which sufficient additional water is added to cause the mixture to flow readily.

# 5.4 <u>MINIMUM AGGREGATE RATIO</u>

The damp loose volume of aggregate in mortar shall be not less than 2-1/4 time nor more than 3-1/2 time the total separate volumes of cementitious materials used.

#### 6. MORTAR PROPORTIONS

Type "M" and "N" Mortar mix shall be designed in accordance with ASTM C-270 thru a testing laboratory.

#### End of Section 04100

#### **SECTION 04200**

#### MASONRY

#### 1. GENERAL

- 1.1 All work included under this heading shall be subject to the General Conditions of the entire operation. The Contractor for this portion of the work is required to refer especially thereto.
- 1.2 This Contractor will be held responsible for obtaining a waterproof wall with all mortar joints filled with a full joint of mortar. The masonry foreman shall supervise carefully the work continuously; any work not complying with these specifications shall be torn down and replaced with proper workmanship.
- 1.3 Scored CMU (Concrete Masonry Units) to appear as 8 x 8, elsewhere shall be CMU laid in a running bond. Specified in various locations.
- 1.4 All CMU outside corners (90°) shall have a bullnose edge.
- 1.5 Exterior cavity wall construction with CMU (Concrete Masonry Units) back-up to the brick masonry shall have the cavity side of the CMU parged with mortar or all the CMU joints struck as you would on the finish side of the wall. No voids or non-compressed joints shall be left on the cavity side of the wall if the General Contractor chooses not to parge the wall.
- 1.6 CMU SHALL HAVE FLUID-APPLIED MOISTURE/WATER BARRIER (WATERPROOFING) installed prior to the specified exterior finish materials.

#### 2. WORK INCLUDED

This Contractor shall furnish all labor and materials to complete all masonry work as required by the drawings and/or herein specified, as follows:

- 2.1 All concrete block work indicated on the drawings.
- 2.2 All brickwork indicated on the drawings, new and remodel.
- 2.3 Demolition and repair of existing structures as noted on the Drawings.
- 2.4 All required anchors and ties.
- 2.4 Beam blocks, lintels, etc.

#### 3. DELIVERY, STORAGE & HANDLING

- 3.1. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, containment's, corrosion, and other causes. If units become wet, do not install until they are in air-dried condition.
- 3.2. Store cementitious materials on elevated platforms, under cover, and in a dry location.
- 3.3. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- 3.4. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 4. MATERIALS

4.1 <u>CONCRETE MASONRY</u>

Block-Lightweight Concrete Masonry units shall conform to the current ASTM C-90 for hollow load bearing grade "A" units. Block shall be Standard Haydite weighing not more than thirty (30) pounds per unit. All block shall be produced by either the high pressure

Autoclave curing system or "Lo-Shrink" method to produce material acceptable to the Corps of Engineers Group II standards. Blocks shall be kept dry from point of manufacture until the units have been laid in the walls. Size and locations as shown on the Drawings.

4.2 <u>MORTAR</u>

Mortar shall be Mason Mix: Type "S" Mortar conforming to the property specifications of ASTM C 270, as manufactured by Air Vol Block., San Luis Obispo, CA. Colors utilized shall be as selected by the Architect. (Refer to Section 4100 – "Mortar".)

4.3 <u>MASONRY TIES</u>

#### 4.3.1 Truss Type

- 4.3.1.1 Masonry wall reinforcement as noted on the plans shall be equal to Dur-O-Eye D/A 370 as manufactured by Dur-O-Wal Truss design or approved equal truss design and shall be installed in strict accordance with the manufacturer's recommendations at all corners and above openings.
- 4.3.1.2 Material shall be standard weight 9-gauge cross rods and 9-gauge side rods galvanized with drip. Install truss reinforcement at 16" o/c vertically.

# 4.3.1 <u>Control and Expansion Joints</u> As shown on the drawings, or 25' horizontal. Care should be used to keep these joints free and open. Install water stops.

#### 4.4 FACE BRICK

- 4.4.1 Brick shall be approved by the Owner and Architect before an order is placed. All brick shall be free of chips and cracks and in accordance with the specifications. Face brick shall conform to the Standard Specifications for Facing Brick (solid masonry units made from clay or shale). ASTM Designation C216-50, ASA No. A99.1-1953.
- 4.3.2 Row lock brick used for windowsills shall use solid brick at the ends, so no holes are visible.
- 4.3.3 Outside corners of soldier course at top of wainscot shall be/use a stack bond to turn corners to ensure quality of structure and appearance.
- 4.4 WEEP JOINT

Weep joints shall be installed in the brick head joints using "Mortar Maize Weep Vents" as manufactured by Willingham & Associates, Cottleville, Missouri, (636) 300-0123, or an approved equal. The spacing and locations of the weeps shall be per the details on the drawings. The cavity pressure vents located at the tops of the walls shall remain as detailed on the drawings.

#### 5. INSTALLATION AND WORKMANSHIP

- 5.1 <u>GENERAL</u>
  - 5.1.1 No masonry shall be erected when the ambient temperature is below 32 degrees F. on a rising temperature or below 40 degrees F. on a falling temperature or when there is a probability of such conditions existing within 48 hours, unless special provisions are made for heating the materials and protecting the work. Such provisions shall be

approved by the Architect. Masonry work which has frozen before the mortar has set to the satisfaction of the Architect shall be removed and replaced.

- 5.1.2 Slush with mortar thoroughly around all windows and doors frames and all other built-in parts. Point with mortar around all windows and windowsills, making this perfectly weathertight. Walls shall be built perfectly true, plumb and straight so as to work in courses to correspond with heights of all openings as indicated on the drawings. Where reinforced concrete floors or slabs extend into walls, brickwork shall be built above such floors or slabs only after the concrete work has been poured. Masonry shall not serve as vertical concrete forms. Pour concrete first and then build masonry.
- 5.1.3 The built surfaces of all walls and piers shall be protected with boards at all times when work is not in progress and shall also be covered with canvas during stormy or damp weather or cold weather and in case of delay. Also properly protect with boards, exposed corners and angles of face and other brick work during construction.
- 5.1.4 Brick shall be laid so that three brick plus three joints equal (8") vertically and one brick plus one joint equal (8") horizontally. If the latter does not produce head joints approximately 3/8" wide and appear similar, consult with the Architect for possible adjustments. Exposed joints inside and outside of the building shall be ironed smooth and concave. Tools for striking joints shall be not less than 3/4" in diameter. Use extreme care to not have wide head and bed joints. If necessary, to avoid wide head joints, brick shall be cut. Any face brick cutting which is required must be done with a power saw.
- 5.1.5 Build control joints where shown and as detailed. All such joints shall be completely free of mortar.
- 5.1.6 No brick or other units having a film of water or frost on their surface shall be laid in the walls. All masonry shall be laid plumb, true to line, with level and accurately spaced courses, and reveals, with corners plumb and true, and with each course breaking joint with the course below. Bond shall be kept plumb throughout.
- 5.1.7 Work required to be built in with the masonry, including anchors, wall plugs, and accessories, shall be built in as the erection progresses. Unless otherwise shown on the drawings or specified the space around built-in items shall be filled solidly with masonry. Chases and reglets shall be kept clean and free from mortar or other debris.
- 5.1.8 Masonry units shall be culled so that only perfect faces of the units shall be expressed.
- 5.1.9 The cavity wall side of the concrete masonry units shall be parged or all joints shall be struck and full. In either case, the Architect shall visually inspect the installation prior to covering up the surface.
- 5.1.10 All thru wall flashings shall be installed with end dams. Stair stepped flashings shall have end-dams on the up-hill side so water must stay in the flashings to a weep joint.
- 5.1.11 The Architect shall visually inspect all thru-wall flashings and end-dams prior to covering them up. The Architect shall also visually inspect the surface treatment of all CMU cavity walls prior to covering them.

# 5.2 <u>METAL TIES</u>

Metal ties in masonry shall be spaced 2'-0" o/c. horizontally and not over sixteen (16) inches vertically, accurately spaced and fully embedded in mortar.

# 5.3 <u>CONCRETE MASONRY UNITS (8" and 12" CMU)</u>

ASTM C 90 and as follows:

- 5.3.1 Concrete masonry units shall be erected for interior facing and interior partitions where shown on the drawings. Each course shall be solidly bedded in mortar, running bond pattern. Vertical joints shall be buttered their entire length. Joints in exposed work shall be approximately 3/8" wide and be tooled slightly concave.
- 5.3.2 Each course shall be bonded at corners and intersection and shall be bonded into or anchored to adjacent construction with metal anchors. Where concrete masonry walls butt into concrete walls, provide dovetail slots continuous, in concrete wall and securely anchor masonry wall to same with metal ties spaced not over 16" o/c. vertically. All metal bucks set in concrete masonry unit work shall have back of bucks filled solid with mortar.

# 5.4 <u>FLUID-APPLIED MOISTURE/WATER BARRIER (WATERPROOFING)</u>

Fluid-applied moisture/water barrier shall be provided and applied to concrete masonry units (CMUs) by the Contractor, per manufacturer recommendations.

First Coat: Sherwin Williams Pro Industrial Heavy Duty Block filler B42W150

Second Coat: Sherwin Williams Loxon Self-Cleaning Acryolic Coating- Flat, LX13-50

Third Coat: Sherwin Williams Loxon Self-Cleaning Acryolic Coating- Flat, LX13-50

#### 5.5 <u>CUTTING AND PATCHING</u>

Masonry mechanic shall perform cutting and patching of masonry required by the plans. Any required masonry cut should be performed with a power abrasive saw for a clean cut.

#### 5.6 <u>UNFINISHED WORK</u>

Unfinished work shall be stepped back for joining with new work; toothing may be resorted to only when specifically approved by the Architect. Before new work is started, all loose mortar shall be removed.

#### 5.7 <u>PROTECTION</u>

Surfaces of masonry not being worked on shall be properly protected at all times, during the construction operation. At such times as rain or snow is imminent and the work is discontinued, the tops of exposed masonry walls and similar surfaces shall be covered with a strong waterproof membrane well secured in place.

#### 6. WALL HEIGHTS

This Contractor shall build-up masonry walls to the elevations indicated.

#### 7. BOND BEAM

Lay-up and pour bond beams with two number four reinforcing bars at elevations for bearing indicated on the plans. Bond beams shall extend the length of the walls. The bond beams shall be filled with concrete. Bond beams only occur where noted on the plans.

#### 8. MORTAR JOINTS

All mortar joints shall be completely filled, especially the head joints. Special care shall be taken to ensure head joints are filled completely. Cavities and expansion joints shall be kept clean and free of mortar and/or mortar drippings.

# 9. TOOLING OF MORTAR JOINTS

The tool shall be slightly larger than the masonry joint and shall be of concave profile struck to a weather tight joint.

#### 10. WALL FLASHING, WEEPS & VENTS

- 10.1 Wall flashing shall be furnished and installed over all openings in exterior masonry walls at base of masonry walls, shelf angles and where shown on the Drawings. Flashing material shall be 26 Ga. Galvanized steel, cut to size.
- 10.2 Flashing over openings shall be in one (1) piece and shall extend eight (8) inches beyond opening on each side. End dams shall be provided for all such conditions.
- 10.3 Where material must be spliced, the ends shall form a six (6) inch wide lap joint. Seal joints with butyl caulk.
- 10.4 Flashing shall be laid in mortar and covered with mortar. Through wall flashing above windows and doors shall have the leading edge stand proud of the finished face of masonry 1/8".
- 10.5 Weep Holes and Vents: Install weep holes and vents at proper intervals (32" O.C. and 2" long, above bed joints, typical) at courses above grade, above flashing, and at any water stops over windows, doors, and beams. Refer to details on Sheet A5.1. Please note this project is using the "rain screen principal" which has vents near the cap flashing.

#### 11. FLASHING INSPECTION

Prior to covering up any through wall flashings the installation must be approved and noted by the architect or the architect's representative. Installations that are covered up prior to approval will be removed.

#### 12. WALL CAP/COPINGS

Wall caps and copings are specified elsewhere in these specifications.

#### **13. WETTING BRICK**

- 13.1 Brick with initial rate of absorption (suction) more than 30g/30sq. inches per minute when tested per ASTM C67 shall be wetter and permitted to surface dry prior to laying. Reference BIA Technical Notes on rick construction 7B, revised. Allow units to absorb the water so they are damp but not wet at the time of laying.
- 13.2 Wetting of the brick and the water content of the mortar shall be such to form a perfect bond without shrinkage cracks.

#### 14. CLEANING

- 14.1 When masonry work is complete, proceed with cleaning and caulking. Remove excess mortar and stains using scrapers and brushes.
- 14.2 After walls have been completed and allowed to dry out a minimum of twenty-eight (28) days, clean exterior, and interior brick surfaces with "Sure Klean" cleaning agent, as manufactured by Process Solvent Co., Inc.
- 14.3 Product to be determined by consulting cleaner manufacturer and the brick manufacturer.
- 14.4 Before cleaning agent is applied, thoroughly wet wall down with clear water.

# Arch Relocation Oxford USD # 358

- 14.5 Apply solution over no area greater than twenty (20) square feet, clean with a stiff fiber brush, then hose down with clean water immediately after cleaning, removing all traces of cleaning agent.
- 14.6 Protect all trim, windows, or concrete against contact with the solution.

#### 15. POINTING

This contractor shall examine all exterior and interior masonry joints carefully, especially head joints, rake out all defective joints to a minimum depth of 3/4" removing all loose mortar, specified under Section 4100 – "Mortar", of these specifications. Re-clean areas to remove excess mortar and streaks.

#### End of Section 04200

# SECTION 04531

# MASONRY TUCK POINTING

#### PART 1 – GENERAL

#### 1. **DESCRIPTION**

- 1.1 This section specifies requirements for tuck pointing (pointing) of existing brick masonry and stone (cast stone) elements on the building.
- 1.2 The purpose of this project is to remove the loose grout and replace with new; cut out and remove cracked or damaged mortar and replace with new; in order to maintain the integrity of the exterior masonry skin.
- 1.3 Match the color of the existing mortar. This contractor shall prepare a mock-up of the proposed grout, showing a finished look color and finish.
- 1.4 Cleaning the wall prior to the start of the work. This process will help identify damaged or deteriorated areas.
- 1.5 During the construction phase, all precaution shall be taken to protect any other building surfaces, pedestrians, and automobiles.

#### 2. RELATED WORK

- 2.1 Mortars: Refer to Section 04100
- 2.2 Cleaning
- 2.3 Caulking

#### 3. APPLICABLE PUBLICATIONS

- 3.1 Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.
- American Society for Testing and Materials (ASTM):
  C67 07 ...... Brick and Structural Clay Tile, Sampling and Testing
  C216 07 ..... Facing Brick (Solid Masonry Units Made from Clay or Shale)
  C270-07 ...... Mortar for Unit Masonry

# **PART 2 – PRODUCTS**

# 4. TUCK POINTING MORTAR

As per appendix X3 of ASTM C270.

# 5. **REPLACEMENT OF MASONRY UNITS**

#### 5.1 FACE BRICK

- 5.1.1 ASTM C216, Grade SW, Type FBS. Brick shall be classified slightly efflorescent or better when tested in accordance with ASTM C67.
- 5.1.2 Face brick (if required to be replaced) shall match facing brick of the existing building (color, size and texture) that is being tuck pointed.

#### 5.2 CAST STONE / STONE

Tuck pointing work shall include the joints in the accent stone and windowsills, etc.

# PART 3 – EXECUTION

#### 6. CUT OUT OF EXISTING MORTAR JOINTS

- 6.1 Cut out existing mortar joints (both bed and head joints) and remove by means of a toothing chisel or a special pointer's grinder, to a uniform depth of to 19 mm (3/4 inch), or until sound mortar is reached. Take care to not damage edges of existing masonry units to remain.
- 6.2 Remove dust and debris from the joints by brushing, blowing with air or rinsing with water. Do not rinse when temperature is below freezing.

#### 7. JOB CONDITIONS

- 7.1 <u>Protection</u>: Protect newly pointed joints from rain, until pointed joints are sufficiently hard enough to prevent damage.
- 7.2 All masonry surfaces shall be washed with pressurized water, approximately 1000 PSI, to remove all dust, dirt, and residue from surface areas, leaving the surface in a reasonably clean, bright form.
- 7.3 A careful inspection of all mortar joints shall be completed and joints that are found to be void, open or defective shall be cut back to a depth <sup>1</sup>/<sub>4</sub>-inch deeper than the width of the joints, or to sound backing. All cut mortar joints and face masonry shall be cleaned with air and/or water pressure to remove any loose or foreign residue.
- 7.4 Defective mortar joins that have been cut and cleaned shall then be pointed (filled and tightly packed) with a non-staining, non-shrinking, Type "N", masonry pointing mortar, colored and tooled to match the adjacent joints in appearance as closely as possible.

#### 8. INSTALLATION OF TUCK POINTING MORTAR

- 8.1 Immediately prior to application of mortar, dampen joints to be tuck pointed. Prior to application of pointing mortar, allow masonry units to absorb surface water.
- 8.2 Tightly pack mortar into joints in thin layers, approximately 6 mm (1/4 inch) thick maximum.
- 8.3 Allow layer to become "thumbprint hard" before applying next layer.
- 8.4 Pack final layer flush with surfaces of masonry units. When mortar becomes "thumbprint hard", tool joints.

#### 9. TOOLING OF JOINTS

Tool joints in patch work with a jointing tool to match the existing surrounding joints.

- **10.** The perimeter of all door frames (masonry-to-frame joints) shall have all existing fill materials removed, the joint surface area shall be cleaned of all foreign residue and resealed with a polyurethane rubber sealant, tooled to a watertight condition. Color of new sealant shall match the adjacent door trim or adjacent mortar joins as closely as possible.
- **11.** At the steel lintels above the windows, cut out the existing sealant to allow for water trapped at the lintels to escape.

# Arch Relocation Oxford USD # 358

- 12. The vertical head joints between the water tables stones shall be cut back to a depth of approximately <sup>1</sup>/<sub>2</sub>-inch, cleaned of all dust, dirt and loose debris. All joints shall have bond breaker tape or foam backer rod installed to prevent three-sided adhesion. The joints shall then be resealed utilizing a polyurethane sealant, Masterseal NP1 or equal. New sealant shall be tooled to a neat, uniform appearance and shall match the original material in color as closely as possible.
- 13. Upon completion of the previously outlined work, all exterior masonry surfaces shall be given **one** (1) application of a transparent, penetrating siloxane water repellent solution. This material shall be applied in strict accordance with manufacturer's recommendations.

# 14. **REPLACEMENT OF MASONRY UNITS (IF REQUIRED – ADDITIONAL COST)**

- 14.1 Cut out mortar joints surrounding masonry units that are to be removed and replaced.14.1.1 Units removed may be broken and removed, providing surrounding units to remain are not damaged.
  - 14.1.2 Once the units are removed, carefully chisel out the old mortar and remove dust and debris.
  - 14.1.3 If units are located in exterior wythe of a cavity or veneer wall, exercise care to prevent debris falling into cavity.
- 14.2 Dampen surfaces of the surrounding units before new units are placed.
  - 14.2.1 Allow existing masonry to absorb surface moisture prior to starting installation of the new replacement units.
  - 14.2.2 Butter contact surfaces of existing masonry and new replacement masonry units with mortar.
  - 14.2.3 Center replacement masonry units in opening and press into position.
  - 14.2.4 Remove excess mortar with a trowel.
  - 14.2.5 Point around replacement masonry units to ensure full head and bed joints.
  - 14.2.6 When mortar becomes "thumbprint hard" tool joint.

#### 15. CLEANING

- 15.1 Clean exposed masonry surfaces on completion.
- 15.2 Remove mortar droppings and other foreign substances from wall surfaces.
- 15.3 First wet surfaces with clean water, then wash down with a solution of soap-less detergent specially prepared for cleaning brick.
- 15.4 Brush with stiff fiber brushes while washing, and immediately thereafter hose down with clean water.
- 15.5 Free clean surfaces from traces of detergent, foreign streaks or stains. Protect materials during cleaning operations including adjoining construction.
- 15.6 Use of muriatic acid for cleaning is prohibited.

#### End of Section 04531

# **SECTION 05100**

# STRUCTURAL STEEL

#### 1. GENERAL

- 1.1 All work included under this heading shall be subject to the General Conditions of the entire operation. The contractor for this portion of the work is required to refer especially thereto.
- 1.2 Fabricate and erect steel in accordance with AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel Building" and AISC "Code of Standard Practice for Steel Buildings and Bridges," latest editions and amendments, except as may hereinafter be specified.
- 1.3 Include in structural steel work all such items indicated and implied by structural and/or architectural drawings.
- 1.4 Fabricate and erect steel joists in accordance with "Standard Specifications and Load Tables, Steel Joists and bridging," latest edition of Steel Joist Institute.
- 1.5 Drawings indicate structural system of principal members. Provide all miscellaneous parts and connections necessary for a complete structural system; connections designed to sustain all loads imposed by structure.

#### 2. WORK INCLUDED

The contractor shall furnish all labor and materials to complete all iron and steel work required by the drawings and/or herein specified as follows:

- 2.1 Fabrication and erection of all iron and steel herein specified or shown on the drawings.
- 2.2 Steel channels, angles, hangers, welds, separators, stiffeners, brackets, plates, anchors, loose lintels, bolts, nuts, all connections as required to complete the work.
- 2.3 All steel framing including but not limited to columns, beams, trusses, and steel joists.
- 2.4 Fascia angle supports.
- 2.5 Steel plate, anchors, etc. as detailed.
- 2.6 Hole cutting, etc., providing for installation of other work.
- 2.7 Handrails and brackets.
- 2.8 Shop painting.
- 2.9 Complete shop drawings.

# 3. MATERIALS

- 3.1 <u>STEEL</u>
  - 3.1.1 Structural steel shall conform to ASTM A992 (Fy = 50 KSI)
  - 3.1.2 Structural tubing shall conform to ASTM A500, Grade B, (Fy = 46 KSI)

- 3.1.3 Bolts set in concrete shall conform to ASTM A307 (anchor bolts). All other bolts shall conform to ASTM A325.
- 3.1.4 The grout for steel bearing shall be non-metallic shrinkage-resistant grout of pre-mixed non-metallic, non-corrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C588, Type A as offered by the Following Manufacturers:

Supreme Grout, Gifford-Hill Crystex; L & M Construction Chemicals Masterflow 713; Master Builders Sonogrout; Sonneborn F-100; Sauereisen Cement

#### 3.2 <u>STEEL JOISTS</u>

Steel joists shall be of the type designated on the structural drawings and shall comply with all the specifications of the Steel Joist Institute.

#### 3.3 <u>METAL REINFORCEMENTS</u> Is specified under Section 03300 of these specifications.

#### 3.4 <u>SHOP PAINTING</u>

Before leaving the shop, all steelwork shall be thoroughly cleaned, by effective means, of all loose mill scale, rust and foreign matter. All steelwork shall be given one coat of approved metal protection, applied thoroughly and evenly and well worked into the joints and other open places. All paint shall be applied to dry surfaces.

#### 3.5 <u>FIELD MEASUREMENTS</u>

Take all measurements in the field as required to verify or supplement dimensions shown on the drawings before fabrication.

3.6 Refer to architectural drawings for miscellaneous plates and angles in additions to those shown on the structural drawings.

#### 4. FABRICATION AND ERECTION

#### 4.1 <u>GENERAL</u>

- 4.1.1 Insofar as possible, work shall be fitted and shop assembled, ready for erection.
- 4.1.2 Structural steel framing connection, parts and accessories shall, where applicable, conform to the handbook of the American Institute of Steel Construction with latest amendments. Minimum steel joist shall bear 4" minimum on structural steel. Steel joist

bearing on structural steel may be anchored by placing a 1" long weld on each side of the bearing section, or as indicated on the Structural Drawings.

- 4.1.3 Jointing and intersections of metals shall be accurately made, tightly fitted, and made in true planes with adequate fasteners.
- 4.1.4 Provide holes and connections for the work of other trades and make connections thereto, unless otherwise indicated.

#### 4.2 <u>WELDING</u>

Welding and equipment shall conform to the American Welding Society's Code for Welding in Building Construction, latest edition. All Welders shall be AISC Certified.

Welding shall conform to the best modern practices, be of adequate strength and durability, with jointing made tight, flush, in true planes with base metal clean and smooth.

#### 4.3 ERECTION OF STRUCTURAL STEEL

Work shall be made and erected square, plumb, straight and true, accurately fitted and with tight joints and intersections. Work shall be adequately reinforced and anchored in place. Erection and bracing shall be the responsibility of the Contractor until final structure is in its completed form.

#### 5. SHOP DRAWINGS

Submit complete shop fabrication and erection drawings to the Architect for approval; a professional structural engineer, registered in Kansas shall prepare such drawings in keeping with current National Standard: AISC

End of Section 05100