RFB NO. 320012

CONSTRUCTION DOCUMENTS
PROJECT MANUAL

DANE COUNTY DEPARTMENT OF PUBLIC WORKS,
HIGHWAY AND TRANSPORTATION

PUBLIC WORKS ENGINEERING DIVISION
1919 ALLIANT ENERGY CENTER WAY
MADISON, WISCONSIN 53713

REQUEST FOR BIDS NO.320012
DANE COUNTY JAIL CONSOLIDATION
COURTHOUSE ELECTRICAL VAULT RELOCATION
215 S. HAMILTON ST
MADISON, WISCONSIN

Due Date / Time: **TUESDAY, June 16, 2020 / 2:00 P.M.**

Location: **PUBLIC WORKS OFFICE**

Performance / Payment Bond: **100% OF CONTRACT AMOUNT**

Bid Deposit: **5% OF BID AMOUNT**

FOR INFORMATION ON THIS REQUEST FOR BIDS, PLEASE CONTACT:

Todd Draper, PROJECT MANAGER
TELEPHONE NO.: 608/267-0119
FAX NO.: 608/267-1533
E-MAIL: draper@COUNTYOFDANE.COM

SECTION 00 01 07

SEALS PAGE

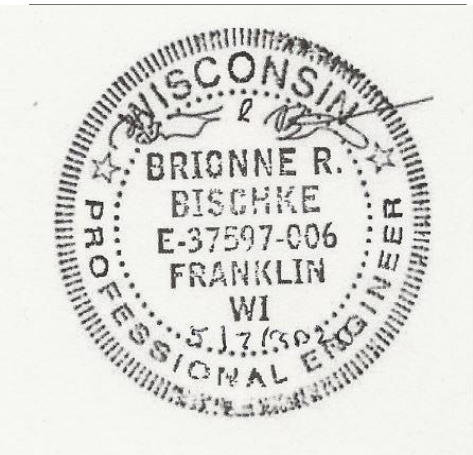
BID NO. 320012
PROJECT: ELECTRICAL VAULT RELOCATION
DANE COUNTY COURTHOUSE

ARCHITECT
I hereby certify that this drawing, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Architect under the laws of the State of Wisconsin.

Jan David Horsfall; A-5860

Dated: May 7, 2020

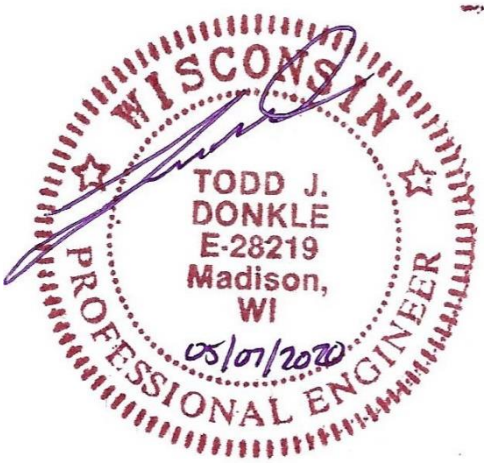
CIVIL ENGINEER
I hereby certify that this drawing, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Wisconsin.



Brionne R. Bischke; E-37597-006

Dated: May 7, 2020

STRUCTURAL ENGINEER
I hereby certify that this drawing, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Wisconsin.



Todd J. Donkle; E-28219

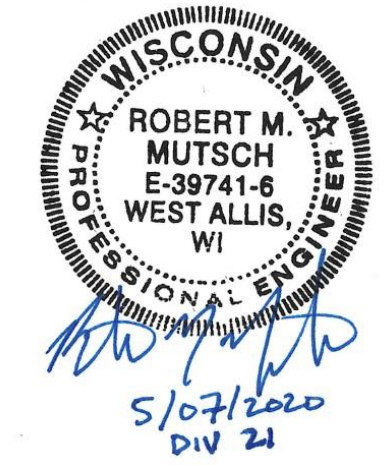
Dated: May 7, 2020

ELECTRICAL ENGINEER
I hereby certify that this drawing, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Wisconsin.

Mark A. Stifter; E-36742

Dated: May 7, 2020

FIRE PROTECTION ENGINEER
I hereby certify that this drawing, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Wisconsin.



Robert M. Mutsch; E-39741-6

Dated: May 7, 2020

END OF SECTION

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DRAWINGS
Plot drawings on 22” x 34” (ANSI D) paper for correct scale or size.

END OF SECTION

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INVITATION TO BID

LEGAL NOTICE

Dane County Dept. of Public Works, Hwy & Transp., 1919 Alliant Energy Center Way, Madison, WI 53713, will receive sealed Bids until:

2:00 P.M., TUESDAY, JUNE 16, 2020

RFB NO. 320012

DANE COUNTY JAIL CONSOLIDATION

COURTHOUSE ELECTRICAL VAULT RELOCATION

DANE COUNTY COURTHOUSE

215 S HAMILTON, MADISON, WI

Dane County is inviting Bids for construction services to construct a new electrical vault to serve the Dane County Courthouse. Work will involve relocation and protection of major utilities and all coordination associated to complete construction of new vault and restore the right of way. Only firms with capabilities, experience & expertise with similar projects should obtain this Request for Bids (RFB) document & submit Bids.

RFB document may be obtained after **2:00 p.m. on May 7, 2020** by downloading it from bids-pwht.countyofdane.com. Please call Todd Draper, Project Mgr., at 608/267-0119, or our office at 608/266-4018, for any questions or additional information.

All Bidders must be qualified as, or apply to be a Best Value Contractor before Bid Due Date. Complete Pre-qualification Application for Contractors at pwht.countyofdane.com/bvc_application.aspx or obtain one by calling 608/267-0119.

A pre-bid site tour will be held May 19, 2020 at 10 a.m. at Dane County Courthouse, starting on Wilson St side of building. Bidders are required to attend this mandatory tour in order to bid on the Work.

*Due to COVID 19 there will be social distancing guidelines imposed at this meeting and proper PPE is encouraged. A total group of ten people or less will be required. Two sessions will be provided if numbers exceed this threshold.

PUBLISH: MAY 7 & MAY 14, 2020 - WISCONSIN STATE JOURNAL

MAY 6 & MAY 13, 2020 - THE DAILY REPORTER

END OF SECTION

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INSTRUCTIONS TO BIDDERS

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1. GENERAL

A. Before submitting Bid, bidder shall thoroughly examine all Construction Documents. Successful Bidder shall be required to provide all the Work that is shown on Drawings, set forth in Specifications, or reasonably implied as necessary to complete Contract for this project.

B. Bidder shall visit site to become acquainted with adjacent areas, means of approach to site, conditions of actual site and facilities for delivering, storing, placing, and handling of materials and equipment.

C. Pre-bid meeting is scheduled on May 19, 2020 at 10 a.m. at Public Safety Building, 115 W Wilson. Meeting will be held outdoors in the parking lot of the Public Safety Building.. Attendance by all bidders is mandatory. Other subcontractors and bidders are encouraged to attend.

2. DRAWINGS AND SPECIFICATIONS

A. Drawings and Specifications that form part of this Contract, as stated in Article 1 of General Conditions of Contact are enumerated in Document Index of these Construction Documents.

B. Complete sets of Drawings and Specifications for all trades will be available to all Bidders, irrespective of category of work to be bid on, in order that all Bidders may be familiar with work of other trades as they affect their bid.

3. INTERPRETATION

A. No verbal explanation or instructions will be given in regard to meaning of Drawings or Specifications before Bid Due Date. Bidders shall bring inadequacies, omissions or conflicts to Owner or Architect / Engineer's attention at least ten (10) calendar days before Bid Due Date. Prompt clarification will be available to all bidders by Addendum.

B. Failure to so request clarification or interpretation of Drawings and Specifications will not relieve successful Bidder of responsibility. Signing of Contract will be considered as implicitly denoting that Contractor has thorough understanding of scope of the Work and comprehension of Construction Documents.

C. Owner, Engineer will not be responsible for verbal instructions.

4. QUALIFICATIONS OF BIDDER (CONTRACTOR AND SUBCONTRACTOR)

A. Before award of Contract can be approved, Owner shall be satisfied that Bidder involved meets following requirements:

1. Has completed at least one (1) project of at least fifty percent (50%) of size or value of Division of work being bid and type of work completed is similar to that being bid. If greater magnitude of experience is deemed necessary, other than size or value of work, such requirements will be described in appropriate section of Specifications.

2. Maintains permanent place of business.

3. Can be bonded for terms of proposed Contract.

B. County's Public Works Project Manager will make such investigations as are deemed necessary to determine ability of bidder to perform the Work, and bidder shall furnish to County's Public Works Project Manager or designee all such information and data for this purpose as County's Public Works Project Manager may request. Owner reserves right to reject Bid if evidence submitted by, or investigation of, bidder fails to satisfy Owner that bidder is responsible and qualified to carry out obligations of Contract and to complete the Work contemplated therein.

5. BID GUARANTEE

A. Bank certified check, cashier's check or Bid Bond, payable to County in amount not less than five percent (5%) of maximum bid, shall accompany each Bid as guarantee that if Bid is accepted, Bidder will execute and return proposed Contract and Performance and Payment Bonds within ten (10) business days after being notified of acceptance of Bid. Company issuing bonds must be licensed to do business in Wisconsin.

B. Any bid, which is not accompanied by bid guarantee, will be considered "No Bid" and will not be read at Bid Due Date.

C. If successful Bidder so delivers Contract, Certificate of Insurance, and Performance and Payment Bonds, check will be returned to Bidder. In case Bidder fails to deliver such Contract, insurance, and bond, amount of bid guarantee will be forfeited to County as liquidated damages.

D. All checks tendered as bid guarantee, except those of three (3) lowest qualified, responsible bidders, will be returned to their makers within three (3) business days after Bid Due Date. All such retained checks will be returned immediately upon signing of Contract and Performance and Payment Bonds by successful Bidder.

6. WITHDRAWAL OF BIDS

A. Bids may be withdrawn by written request received from bidder or authorized representative thereof prior to time fixed for Bid Due Date, without prejudice to right of bidder to file new Bid. Withdrawn Bids will be returned unopened. Negligence on part of bidder in preparing their Bid confers no right for withdrawal of Bid after it has been opened.

B. No Bid may be withdrawn for period of sixty (60) calendar days after Bid Due Date.

C. If Bid contains error, omission or mistake, bidder may limit liability to amount of bidder's guarantee by giving written Notice of Intent not to execute Contract to Owner within seventy-two (72) hours of Bid Due Date.

7. CONTRACT FORM

A. Sample copy of contract that successful Bidder will be required to enter into is included in these Construction Documents and bidders are required to familiarize themselves with all conditions contained therein.

8. CONTRACT INTERESTS BY COUNTY PUBLIC OFFICIALS

A. In accordance with Wisconsin Statute 946.13, county official may not bid for or enter into any contract involving receipts or disbursements of more than $15,000.00 in a year, in which they have private pecuniary interest, direct or indirect if at same time they are authorized to take official action with respect to making of this Contract. Any contract entered into in violation of this Statute is void and County incurs no liability thereon. This subsection does not affect application and enforcement of Wisconsin Statute 946.13 by state prosecutors in criminal courts of this state.

9. EMERGING SMALL BUSINESS PROVISIONS

A. **Emerging Small Business Definition.** For purposes of this provision, ESB is defined as:

1. Independent business concern that has been in business minimum of one year;

2. Business located in State of Wisconsin;

3. Business comprised of less than twenty-five (25) employees;

4. Business must not have gross sales in excess of three million dollars ($3,000,000.00) over past three years; and

5. Business does not have history of failing to complete projects.

B. **Emerging Small Business (ESB) Involvement.** Bidder shall make good faith effort to award minimum of ten percent (10%) of the Work to ESBs. Bidder shall submit report to Dane County Contract Compliance Specialist within ten (10) business days of Bid Due Date demonstrating such efforts. Good faith efforts means significant contact with ESBs for

purposes of soliciting bids from them. Failure to make or demonstrate good faith efforts will be grounds for disqualification.

C. **Emerging Small Business Report.** Emerging Small Business Enterprise Report is to be submitted by Bidder in separate envelope marked "Emerging Small Business Report". This report is due by 2:00 p.m. following specified ten (10) business days after Bid Due Date. Bidder who fails to submit Emerging Small Business Report shall be deemed not responsive.

D. **ESB Goal.** Goal of this project is ten percent (10%) ESB participation. ESB utilizations are shown as percentage of total Bid. If Bidder meets or exceeds specified goal, Bidder is only required to submit Form A - Certification, and Form B - Involvement. Goal shall be met if Bidder qualifies as ESB.

E. **Report Contents.** Following award of Contract, Bidder shall submit copies of executed contracts for all Emerging Small Businesses. Emerging Small Business Report shall consist of these:

1. Form A - Certification;
2. Form B - Involvement;
3. Form C - Contacts;
4. Form D - Certification Statement (if appropriate); and
5. Supportive documentation (i.e., copies of correspondence, telephone logs, copies of advertisements).

F. ESB Listing. Bidders may solicit bids from this ESB listing: pdf.countyofdane.com/commissions/2013-2015_Targeted_Business_Directory.pdf.

G. **ESB Certification.** All contractors, subcontractors and suppliers seeking ESB certification must complete and submit Emerging Small Business Report to Dane County Contract Compliance Program.

H. **Certification Statement.** If ESB firm has not been certified by County as ESB prior to submittal of this Bid, ESB Report cannot be used to fulfill ESB goal for this project unless firm provides "Form D - Certification Statement". Certification statement must be completed and signed by ESB firm.

I. **Questions.** Questions concerning Emerging Small Business provisions shall be directed to:

OEI@countyofdane.com
or
Dane County Contract Compliance Specialist
City-County Building, Room 356
210 Martin Luther King, Jr. Blvd.
Madison, WI 53703
608/266-4192

J. **Substituting ESBs.** In event of any significant changes in subcontract arrangements or if need arises to substitute ESBs, Bidder shall report such proposed changes to Contract Compliance Specialist to making any official changes and request authorization to substitute ESB firm. Bidder further agrees to make every possible effort to replace ESB firm with another qualified ESB firm.

K. **Good Faith Efforts.** Good faith efforts can be demonstrated by meeting all of these obligations:

1. Selecting portions of the Work to be performed by ESBs in order to increase likelihood of meeting ESB goal including, where appropriate, breaking down Contract into smaller units to facilitate ESB participation.

2. Advertising in general circulation, trade associations and women / minority focus media concerning subcontracting opportunities.

3. Providing written notices to reasonable number of specific ESBs that their interest in Contract was being solicited in sufficient time to allow ESBs to participate effectively.

4. Following up on initial solicitations of interest by contacting ESBs within five (5) business days prior to Bid Due Date to determine with certainty whether ESB were interested, to allow ESBs to prepare bids.

5. Providing interested ESB with adequate information about Drawings, Specifications and requirements of Contract.

6. Using services of available minority, women and small business organizations and other organizations that provide assistance in recruitment of MBEs / WBEs / ESBs.

7. Negotiating in good faith with interested ESBs, not rejecting ESBs as unqualified without sound reason based on thorough investigation of their capabilities.

8. Submitting required project reports and accompanying documents to County's Contract Compliance Specialist within twenty-four (24) hours after Bid Due Date.

L. **Appeals Disqualification of Bid.** Bidder who is disqualified may appeal to Public Works & Transportation Committee and Equal Opportunity Commission.

10. METHOD OF AWARD - RESERVATIONS

A. Following will be basis of award of Contract, providing cost does not exceed amount of funds then estimated by County as available to finance Contract(s):

1. Lowest dollar amount submitted by qualified responsible bidder on Base Bid for all work comprising project, combined with such additive Owner accepted alternates.

2. Owner reserves right to reject all bids or any bid, to waive any informality in any bid, and to accept any bid that will best serve interests of County.

3. Unit Prices and Informational Bids will not be considered in establishing low bidder.

11. SECURITY FOR PERFORMANCE AND PAYMENTS

A. Simultaneous with delivery of signed Contract, Bidder shall be required to furnish Performance and Payment Bonds as specified in Article 29 of General Conditions of Contract, "Contract Security". Surety Company shall be licensed to do business in Wisconsin. Performance and Payment Bonds must be dated same date or subsequent to date of Contract. Performance and Payment Bonds must emulate information in Sample Performance and Payment Bonds in Construction Documents.

B. Provide certified copy of power of attorney from Surety Company showing that agent who signs Bond has power of attorney to sign for Surety Company. Secretary or Assistant Secretary of company must sign this certification, not attorney-in-fact. Certification must bear same or later date as Bond. Power of Attorney must emulate model power of attorney information detailed in Sample Performance and Payment Bonds.

C. If Bidder is partnership or joint venture, State certified list, providing names of individuals constituting partnership or joint venture must be furnished. Contract itself may be signed by one partner of partnership, or one partner of each firm comprising joint venture, but Performance and Payment Bonds must be signed by all partners.

D. If Bidder is corporation, it is necessary that current certified copy of resolution or other official act of directors of corporation be submitted showing that person who signs Contract is authorized to sign contracts for corporation. It is also necessary that corporate seal be affixed to resolution, contract, and performance and payment bonds. If your corporation has no seal, it is required that above documents include statement or notation to effect that corporation has no seal.

12. TAXES

A. Wisconsin Statute 77.54 (9m) allows building materials that become part of local unit government facilities to be exempt from sales & use tax. Vendors & materials suppliers may not charge Bidders sales & use tax on these purchases. This does not include highways, streets or roads. Any other Sales, Consumer, Use & other similar taxes or fees required by law shall be included in Bid.

B. In accordance with Wisconsin Statute 71.80(16)(a),successful nonresident bidder, whether incorporated or not, and not otherwise regularly engaged in business in this state, shall file surety bond with State of Wisconsin Department of Revenue payable to Department of Revenue, to guarantee payment of income taxes, required unemployment compensation contributions, sales and use taxes and income taxes withheld from wages of employees, together with any penalties and interest thereon. Amount of bond shall be three percent (3%) of Contract or subcontract price on all contracts of $50,000 or more.

13. SUBMISSION OF BIDS

A. All Bids shall be submitted on standard Bid Form bound herein and only Bids that are made on this Bid Form will be considered. Entire Bid Form and other supporting documents, if any, shall be removed or copied from Construction Documents, filled out, and submitted in manner specified hereinafter. Submit completed Bid Bond with Bid as well.

B. No bids for any subdivision or any sub-classification of this Work, except as indicated, will be accepted. Any conditional Bid, amendment to Bid Form or appended item thereto, or inclusion of any correspondence, written or printed matter, or details of any nature other than that specifically called for, which would alter any essential provision of Construction Documents, or require consideration of unsolicited material or data in determining award of Contract, will disqualify Bid. Telecommunication alterations to Bid will not be accepted.

C. Bidders must submit single Bid for all the Work.

D. Bid amounts shall be inserted in words and in figures in spaces provided on Bid Form; in case of conflict, written word amounts will govern.

E. Addenda issued after Bid Letting shall become part of Construction Documents. Bidders shall acknowledge receipt of such addenda in appropriate space provided on Bid Form. Bid may be rejected if receipt of any particular addendum applicable to award of Contract has not been acknowledged on Bid Form.

F. Bids shall be signed, placed in envelope, sealed and delivered before due time to place designated in Invitation to Bid, and identified with project name, bid number, location, category of work being bid upon, Bid Due Date, name and address of bidder.

G. Bidder shall be responsible for sealed Bid being delivered to place designated for Bid Due Date on or before date and time specified. Bids received after time of closing will be rejected and returned to bidder unopened.

H. Bid will be considered invalid and will be rejected if bidder has not signed it.

I. Faxed or emailed Bids will not be accepted.

J. Bidder's organization shall submit completed with Bid, Fair Labor Practices Certification form, included in these Construction Documents.

14. SUBCONTRACTOR LISTING

A. Bidders shall be required to submit list of major subcontractors for General Construction, Plumbing, HVAC, and Electrical work proposed for this project to include committed prices for each subcontractor. List shall be placed in separate sealed envelope that must be clearly identified as "Major Subcontractor List", for named project and name of Bidder submitting it. County must receive envelope no later than date by which successful Bidder is required to submit his or her signed Contract, as established in Construction Documents.

15. ALTERNATE BIDS

A. Not Applicable

16. INFORMATIONAL BIDS

A. Not Applicable

17. UNIT PRICES

A. Not Applicable

18. COMMENCEMENT AND COMPLETION

A. Successful Bidder shall commence work when schedule and weather permit, but no later than stated in Bid Form. Contractor shall pursue the Work regularly and continuously at reasonable rate to insure completion of the Work within time stated in Bid.

B. Should it be found impossible to complete the Work on or before time specified for completion, written request may be submitted for extension of time setting forth reasons believed to justify granting of such request. Refer to Article 20 of General Conditions of Contract, titled "Time for Completion",.

19. WORK BY OWNER

A. Not Applicable.

20. SPECIAL HAZARDS COVERAGE

A. Not Applicable.

FORM A

DANE COUNTY
EMERGING SMALL BUSINESS REPORT - CERTIFICATION

In accordance with General Conditions of Contract, submit this Emerging Small Business Report within ten (10) days after Bid Due Date.

PROJECT NAME: _____

_____

BID NO.: _____ BID DUE DATE: _____

BIDDER INFORMATION

COMPANY NAME: _____

ADDRESS: _____

_____

TELEPHONE NO.: _____

CONTACT PERSON: _____

EMAIL ADDRESS: _____

FORM B

DANE COUNTY
(Copy this Form as necessary to provide complete information)
EMERGING SMALL BUSINESS REPORT - INVOLVEMENT

COMPANY NAME: _____

PROJECT NAME: _____

BID NO.: _____ BID DUE DATE: _____

ESB NAME: _____

CONTACT PERSON: _____

ADDRESS: _____

_____

PHONE NO & EMAIL.: _____

_____

Indicate percentage of financial commitment to this ESB: _____% Amount: $_____

ESB NAME: _____

CONTACT PERSON: _____

ADDRESS: _____

_____

PHONE NO & EMAIL.: _____

_____

Indicate percentage of financial commitment to this ESB: _____% Amount: $_____

FORM C

DANE COUNTY
(Copy this Form as necessary to provide complete information)
EMERGING SMALL BUSINESS REPORT - CONTACTS

COMPANY NAME: _____

PROJECT NAME: _____

BID NO.: _____ BID DUE DATE: _____

	ESB FIRM NAME CONTACTED	DATE	PERSON CONTACTED	DID ESB BID?	ACC-EPT BID?	REASON FOR REJECTION
1)						
2)						
3)						
4)						
5)						
6)						
7)						
8)						

FORM D

DANE COUNTY
EMERGING SMALL BUSINESS REPORT - CERTIFICATION STATEMENT

I, _____ , _____ of
Name Title

_____ certify to best of my knowledge and
Company

belief that this business meets Emerging Small Business definition as indicated in Article 9 and that information contained in this Emerging Small Business Report is true and correct.

_____ _____
Bidder's Signature Date

GEOTECHNICAL DATA

SUBSURFACE DRILLING AND SAMPLING INFORMATION

BID NO. 320012
PROJECT: DANE COUNTY JAIL CONSOLIDATION COURTHOUSE ELECTRICAL VAULT RELOCATION
DANE COUNTY COURTHOUSE

INVESTIGATION DATA

Subsurface investigations have been made and soil boring report by Soils & Engineering Services, Inc (57 pages) are included following this page. This information was obtained for use in preparing the design; however, Bidders shall draw their own conclusions therefrom. No responsibility for subsoil quality or conditions are assumed by Architect / Engineer or Owner. See Figure 2.0 –Geotech Exploration & Analysis Report

Name of Bidding Firm: ____________________________________

SECTION 00 41 13

BID FORM

BID NO. 320012
PROJECT: DANE COUNTY JAIL CONSOLIDATION – COURTHOUSE ELECTRICAL VAULT RELOCATION DANE COUNTY COURTHOUSE

TO: DANE COUNTY DEPARTMENT OF [PUBLIC WORKS, HIGHWAY & TRANSPORTATION PROJECT MANAGER
1919 ALLIANT ENERGY CENTER WAY
MADISON, WISCONSIN 53713

NOTE: WISCONSIN STATUTE 77.54 (9M) ALLOWS FOR NO SALES & USE TAX ON THE PURCHASE OF MATERIALS FOR COUNTY PUBLIC WORKS PROJECTS.

BASE BID - LUMP SUM:
Construction services to construct a new electrical vault to serve the Dane County Courthouse. Work will involve relocation and protection of major utilities and all coordination associated to complete construction of new vault and restore the right of way. The undersigned, having examined the site where the Work is to be executed and having become familiar with local conditions affecting the cost of the Work and having carefully examined the Drawings and Specifications, all other Construction Documents, Figure 1.0 and Addenda thereto prepared by Dane County Department of Public Works, Highway & Transportation hereby agrees to provide all labor, materials, equipment and services necessary for the complete and satisfactory execution of the entire Work, as specified in the Construction Documents, for the Base Bid stipulated sum of:

____ and __ /100 Dollars
Written Price

$__________________________
Numeric Price

LUMP SUM ALLOWANCE
Provide a lump sum allowance to be included in the Base Bid of two hundred twenty five thousand dollars ($225,000). This allowance will cover MG&E scope of work. Relocation of 4"gas main and service to window around electric structure. Relocation of duct package including but not limited to new elbows, switches, transformers, protectors, secondary conductors and secondary bus bars in the new vault.

Two Hundred Twenty Five Thousand -
____ and ______00 /100 Dollars
Written Price

$225,000
Numeric Price

LUMP SUM ALLOWANCE
Provide a lump sum allowance to be included in the Base Bid of twenty two thousand dollars ($22,000). This allowance will cover potential relocation of Century Link fiber vault to street or to location near courthouse drive.

Twenty Two Thousand - and 00 /100 Dollars
Written Price

$22,000
Numeric Price

Receipt of the following addenda and inclusion of their provisions in this Bid is hereby acknowledged:

Addendum No(s). _____ through _____

Dated _____

Dane County Public Works Highway and Transportation must have this project completed by January 4, 2021. Assuming this Work can be started by July 27, 2020, what dates can you commence and complete this job?

Commencement Date: _____ Completion Date: _____
(final, not substantial)

I hereby certify that all statements herein are made on behalf of:

_____
(Name of Corporation, Partnership or Person submitting Bid)

Select one of the following:
1. A corporation organized and existing under the laws of the State of _____, or

2. A partnership consisting of _____, or

3. A person conducting business as _____;

Of the City, Village, or Town of _____ of the State of _____.

I have examined and carefully prepared this Bid from the associated Construction Documents and have checked the same in detail before submitting this Bid; that I have full authority to make such statements and submit this Bid in (its) (their) (my) behalf; and that the said statements are true and correct. In signing this Bid, we also certify that we have not, either directly or indirectly, entered into any agreement or participated in any collusion or otherwise taken any action in restraint of free competition; that no attempt has been made to induce any other person or firm to submit or not to submit a Bid; that this Bid has been independently arrived at without collusion with any other bidder, competitor, or potential competitor; that this Bid has not been knowingly

disclosed prior to the Bids Due Date to another bidder or competitor; that the above statement is accurate under penalty of perjury.

The undersigned agrees to be qualified as a Best Value Contractor or will prove their exemption. New or updated applications are due on or before Bid Due Date / Time; qualification or rejection will be complete within five (5) business days after Bid Due Date.

The undersigned further agrees to honor the Base Bid and the Alternate Bid(s) for sixty (60) calendar days from date of Award of Contract.

SIGNATURE: _____

(Bid is invalid without signature)

Print Name: _____ Date: _____

Title: _____

Address: _____

Telephone No.: _____ Fax No.: _____

Email Address: _____

Contact Person: _____

END OF SECTION

THIS PAGE IS FOR BIDDERS' REFERENCE

DO NOT SUBMIT WITH BID FORM.

BID CHECK LIST:
These items **must** be included with Bid:
☐ Bid Form ☐ Bid Bond ☐ Fair Labor Practices Certification

DANE COUNTY BEST VALUE CONTRACTING QUALIFICATION

General Contractors & all Subcontractors must be qualified as a Best Value Contractor with the Dane County Public Works Engineering Division. Qualification & listing is not permanent & must be renewed every 24 months. Complete a *Best Value Contracting Application* online at:
pwht.countyofdane.com/bvc_application.aspx

DANE COUNTY VENDOR REGISTRATION PROGRAM

All bidders are strongly encouraged to be a registered vendor with Dane County. Registering allows vendors an opportunity to receive notifications for RFBs & RFPs issued by the County and provides the County with up-to-date company contact information. Complete a new form or renewal online at:
danepurchasing.com/Account/Login?

COUNTY OF DANE

PUBLIC WORKS CONSTRUCTION CONTRACT

Contract No. _____ Bid No. 320012

Authority: 2019 RES -_____

THIS CONTRACT, made and entered into as of the date by which authorized representatives of both parties have affixed their signatures, by and between the County of Dane (hereafter referred to as "COUNTY") and _____ (hereafter, "CONTRACTOR"), and

W I T N E S S E T H :

WHEREAS, COUNTY, whose address is c/o Deputy Public Works Director, 1919 Alliant Energy Center Way, Madison, WI 53713, desires to have CONTRACTOR install Dane County Jail Consolidation Courthouse Electrical Vault Relocation ("the Project"); and

WHEREAS, CONTRACTOR, whose address is _____ _____ is able and willing to construct the Project, in accordance with the Construction Documents;

NOW, THEREFORE, in consideration of the above premises and the mutual covenants of the parties hereinafter set forth, the receipt and sufficiency of which is acknowledged by each party for itself, COUNTY and CONTRACTOR do agree as follows:

1. CONTRACTOR agrees to construct, for the price of $_____ the Project and at the CONTRACTOR'S own proper cost and expense to furnish all materials, supplies, machinery, equipment, tools, superintendence labor, insurance, and other accessories and services necessary to complete the Project in accordance with the conditions and prices stated in the Bid Form, , General Conditions of Contract, the drawings which include all maps, plats, plans, and other drawings and printed or written explanatory matter thereof, and the specifications therefore as prepared by Mead & Hunt (hereinafter referred to as "the Architect / Engineer"), and as enumerated in the Project Manual Table of Contents, all of which are made a part hereof and collectively evidence and constitute the Contract.

2. COUNTY agrees to pay the CONTRACTOR in current funds for the performance of the Contract subject to additions and deductions, as provided in the General Conditions of Contract, and to make payments on account thereof as provided in Article entitled, "Payments to Contractor" of the General Conditions of Contract.

3. During the term of this Contract, CONTRACTOR agrees to take affirmative action to ensure equal employment opportunities. The CONTRACTOR agrees in accordance with Wisconsin Statute 111.321 and Chapter 19 of the Dane County Code of Ordinances not to discriminate on the basis of age, race, ethnicity, religion, color, gender, disability, marital status, sexual orientation, national origin, cultural differences, ancestry, physical appearance, arrest record or conviction record, military participation or membership in the national guard, state defense force

or any other reserve component of the military forces of the United States, or political beliefs. Such equal opportunity shall include, but not be limited to, the following: employment, upgrading, demotion, transfer, recruitment, advertising, layoff, termination, training, rates of pay, and any other form of compensation. CONTRACTOR agrees to post in conspicuous places, available to all employees and applicants for employment, notices setting forth the provisions of this paragraph.

4. CONTRACTOR shall file an Affirmative Action Plan with the Dane County Contract Compliance Specialist in accord with Chapter 19 of the Dane County Code of Ordinances. CONTRACTOR must file such plan within fifteen (15) business days of the effective date of this Contract. During the term of this Contract CONTRACTOR shall also provide copies of all announcements of employment opportunities to COUNTY'S Office of Equity & Inclusion, and shall report annually the number of persons, by race, ethnicity, gender, and disability status, which apply for employment and, similarly classified, the number hired and number rejected.

5. During the term of this Contract, all solicitations for employment placed on CONTRACTOR'S behalf shall include a statement to the effect that CONTRACTOR is an "Equal Opportunity Employer".

6. CONTRACTOR agrees to furnish all information and reports required by COUNTY'S Contract Compliance Specialist as the same relate to affirmative action and nondiscrimination, which may include any books, records, or accounts deemed appropriate to determine compliance with Chapter 19, Dane County Code of Ordinances, and the provisions of this Contract.

7. This Contract is intended to be a Contract solely between the parties hereto and for their benefit only. No part of this Contract shall be construed to add to, supplement, amend, abridge or repeal existing rights, benefits or privileges of any third party or parties including, but not limited to, employees of either of the parties.

8. The entire agreement of the parties is contained herein and this Contract supersedes any and all oral agreements and negotiations between the parties relating to the subject matter hereof. The parties expressly agree that the express terms of this Contract shall not be amended in any fashion except in writing, executed by both parties.

9. CONTRACTOR and subcontractors must be qualified as, or apply to be a Best Value Contractor with Dane County Public Works Engineering Division before Bid Due Date. All contractors must be qualified as a Best Value Contractor to perform any work under this Contract.

IN WITNESS WHEREOF, COUNTY and CONTRACTOR, by their respective authorized agents, have caused this Contract and its Schedules to be executed, effective as of the date by which all parties hereto have affixed their respective signatures, as indicated below.

* * * * * * *

FOR CONTRACTOR:

Signature Date

Printed or Typed Name and Title

Signature Date

Printed or Typed Name and Title

NOTE: If CONTRACTOR is a corporation, Secretary should attest. In accordance with IRS Regulations, unincorporated entities are required to provide either their Social Security or Employer Number in order to receive payment for services rendered.

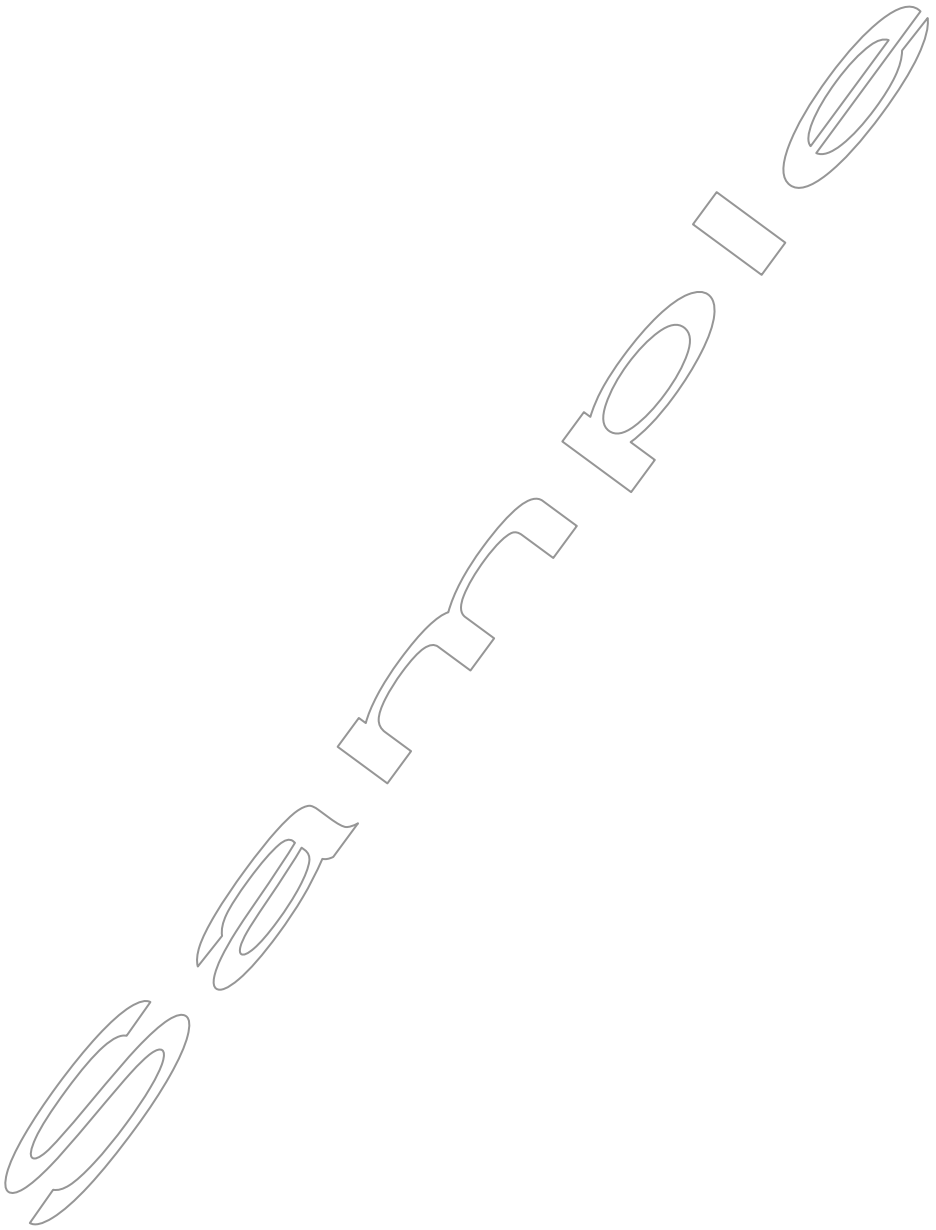
* * * * * * *

This Contract is not valid or effectual for any purpose until approved by the appropriate authority designated below, and no work is authorized until the CONTRACTOR has been given notice to proceed by COUNTY'S Deputy Public Works Director.

FOR COUNTY:

Joseph T. Parisi, County Executive Date

Scott McDonell, County Clerk Date



AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)

BOND AMOUNT:

PROJECT:
(Name, location or address, and Project number, if any)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this day of

(Witness)	*(Contractor as Principal)* *(Seal)*
	(Title)
(Witness)	*(Surety)* *(Seal)*
	(Title)

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

Init.
/

AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

AIA Document A312–2010 combines two separate bonds, a Performance Bond and a Payment Bond, into one form. This is not a single combined Performance and Payment Bond.

CONSTRUCTION CONTRACT
Date:

Amount:

Description:
(Name and location)

BOND
Date:
(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	Name	Name and Title:	

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address		Address	

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)

CONSTRUCTION CONTRACT
Date:

Amount:

Description:
(Name and location)

BOND
Date:
(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	Name	Name and Title:	

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)
AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

AIA Document A312–2010 combines two separate bonds, a Performance Bond and a Payment Bond, into one form. This is not a single combined Performance and Payment Bond.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

.2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address		Address	

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

SECTION 00 72 12

GENERAL CONDITIONS OF CONTRACT

TABLE OF CONTENTS

1. CONSTRUCTION DOCUMENTS

A. Construction Documents, listed in Table of Contents of this Specification volume shall form part of this Contract and provisions of Construction Documents shall be as binding upon parties as if they were fully set forth in Contract itself.

B. These shall also be considered as part of Construction Documents: Addenda, including additions and modifications incorporated in such addenda before execution of Contract; requests for information; construction bulletins; change orders; and written interpretations by Architect / Engineer or Public Works Project Manager that are made after execution of Contract.

C. Construction Documents are complementary, and what is required by one shall be as binding as if required by all. Intent of Construction Documents is to include all labor, materials and equipment necessary for proper execution of the Work.

2. DEFINITIONS

A. These terms as used in this Contract are respectively defined as follows:
   1. All uses of term "County" in Construction Documents shall mean Dane County.
   2. All uses of term "Department" in Construction Documents shall mean Department of Public Works, Highway & Transportation, which is a unit of Dane County government. Department is County agency overseeing Contract with Contractor.
   3. Public Works Project Manager is appointed by and responsible to Department. Public Works Project Manager has authority to act on behalf of Department and will sign change orders, payment requests and other administrative matters related to projects.
   4. Public Works Project Manager is responsible for supervision, administration and management of field operations involved in construction phase of this Work.
   5. Term "Work" includes all labor, equipment and materials necessary to produce project required by Construction Documents.
   6. Term "Substantial Completion" is date when project or specified area of project is certified by Architect / Engineer that construction is sufficiently completed, in accordance with Construction Documents, and as modified by any subsequent changes agreed to by parties, so that County may occupy project or specified area of project for use for which it was intended subject to permit approval for occupancy.
   7. Contractor is person, firm, or corporation with whom County makes Contract. Though multiple contracts may be involved, Construction Documents treat them throughout as if each were of singular number.

3. ADDITIONAL INSTRUCTIONS AND DRAWINGS

A. Contractor may be furnished additional instructions and detail drawings as necessary to carry out the Work included in Contract. Additional drawings and instructions thus supplied to Contractor will coordinate with Construction Documents and will be so prepared that they can be reasonably interpreted as part thereof. Contractor shall carry out the Work in accordance with additional detail drawings and instructions.

4. SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. Unless otherwise specified, Contractor shall submit three (3) copies of all Shop Drawings for each submission, until receiving final approval. After final approval, provide five (5) additional copies for distribution and such other copies as may be required.

B. Contractor shall submit, on an on-going basis and as directed, Product Data such as brochures that shall contain catalog cuts and specifications of all furnished mechanical and electrical equipment. After Architect / Engineer's approval, one (1) copy shall remain in Architect / Engineer's file, one (1) kept at Department's office and one (1) kept at job site by Contractor for reference purposes.

C. Samples shall consist of physical examples furnished by Contractor in sufficient size and quantity to illustrate materials, equipment or workmanship, and to establish standards to compare the Work.
   1. Submit Samples in sufficient quantity (minimum of two (2)) to permit Architect / Engineer to make all necessary tests and of adequate size showing quality, type, color range, finish, and texture. Label each Sample stating material, type, color, thickness, size, project name, and Contractor's name.
   2. Submit transmittal letter requesting approval, and prepay transportation charges to Architect / Engineer's office on samples forwarded.
   3. Materials installed shall match approved Samples.

D. Contractor shall review Shop Drawings and place their dated stamp thereon to evidence their review and approval and shall submit with reasonable promptness and in orderly sequence to cause no delay in the Work or in work of any other contractor. At time of submission, Contractor shall inform Architect / Engineer in writing of any deviation in Shop Drawings or Samples from requirements of Construction Documents. Architect / Engineer will not consider partial lists.

E. Architect / Engineer will review and approve or reject Shop Drawings with reasonable promptness to cause no delay. Architect / Engineer's approval shall not relieve Contractor from responsibility for errors or omissions in Shop Drawings.

F. Contractor shall not commence any work requiring Shop Drawing, Product Data or Sample submission until Architect / Engineer has approved submission. All such work shall be in accordance with approved Shop Drawings, Product Data and Samples.

G. Contractor shall keep on site of the Work, approved or conformed copy of Shop Drawings and shall at all times give Department access thereto.

H. By stamping and submitting Shop Drawings, Product Data and Samples, Contractor thereby represents that he or she has or will determine and verify all field measurements, field construction criteria, materials, catalog numbers, and similar data and that he or she has checked and coordinated each Shop Drawing, Product Data and Sample with requirements of the Work and of Construction Documents. Architect / Engineer shall return without examination, Shop Drawings, Product Data and Samples not so noted.

I. All Shop Drawings from any one Contractor should be numbered consecutively and on cover sheet shall bear name and location of project, name of Contractor, date of submittal and date of each correction or revision and associated Specification section and page number.

5.

6.

7. USE OF SITE

A. Contractor shall provide County and Architect / Engineer access to the Work under all circumstances.

B. Contractor shall confine operations at site to areas permitted by County, law, ordinance, permits and Construction Documents and shall not unreasonably encumber site with materials or equipment. Contractor shall assure free, convenient, unencumbered, direct and safe access to all properties adjacent to the Work for County, its employees, invitees and guests.

8. MATERIALS AND WORKMANSHIP

A. Contractor shall perform all work and furnish all supplies and materials, machinery, equipment, facilities and means, necessary to complete the Work required by this Contract, within time specified, in accordance with provisions of Construction Documents.

B. All equipment and materials incorporated in the Work covered by this Contract are to be new; use recycled and / or recovered materials to extent that such use is technically and economically feasible. Recovered materials are products recovered from solid waste in form identical to original form for use that is same as, or similar to original use. Recycled materials are products manufactured from solid waste.

C. If requested, Contractor shall furnish satisfactory evidence as to kind and quality of construction materials proposed or used. Contractor shall furnish to Architect / Engineer, for approval, manufacturer name and model, performance capacities and other pertinent information of machinery, mechanical, electrical or other types of equipment, which Contractor plans to install.

D. If not otherwise provided, materials and labor called for in this Contract shall be provided and performed in accordance with established practice and standards recognized by Architects, Engineers, Department, and construction industry.

E. Reference to “Standard” specifications of any association or manufacturer, or codes of County authorities, intends most recent printed edition or catalog in effect on date that corresponds with date of Construction Documents.

F. Whenever reference is made in Specifications that work shall be “performed”, “applied”, in accordance with “manufacturer’s directions or instructions”, Contractor to whom those instructions are directed shall furnish three (3) printed copies of such instructions to Architect / Engineer before execution of the Work.

9. CONTRACTOR’S TITLE TO MATERIALS

A. Contractor or any subcontractor shall not purchase materials or supplies for the Work subject to any chattel mortgage or under conditional sale contract or other agreement by which seller retains interest. Contractor warrants that all materials and supplies used in the Work are free from all liens, claims or encumbrances and Contractor has good title to them.

10. “OR EQUAL” CLAUSE

A. Whenever equipment or materials are identified on Drawings or in Specifications by reference to manufacturer's or vendor's name, trade name, catalog number, and other identifying information, it is intended to establish standards; and any equipment or material of other manufacturers and vendors which will perform adequately duties imposed by general design will be considered equally accepted provided equipment or material so proposed is, in opinion of Architect / Engineer, of equal substance and function. Architect / Engineer and Department shall provide written approval before Contractor may purchase or install it.

B. Equipment or materials of manufacturers, other than those named, may be used only upon following conditions:
   1. That, in opinion of Architect / Engineer and Department, proposed material or equipment item is fully equal or superior (in design, materials, construction, workmanship, performance, finish, etc.) to named item. No compromise in quality level, however small, is acceptable.
   2. That, in substituting materials or equipment, Contractor assumes responsibility for any changes in system or for modifications required in adjacent or related work to accommodate such substitution despite Architect / Engineer's and Department's approval, and all costs growing out of approval of "or equal" items shall be responsibility of Contractor. No extra costs resulting from such approval shall become responsibility of Department, Architect / Engineer or any other separate Contractor.
   3. It shall be understood that use of materials or equipment other than those specified, or approved equal by Architect / Engineer and Department, shall constitute violation of Contract, and that Architect / Engineer and Department shall have right to require removal of such materials or equipment and their replacement with specified materials or equipment at Contractor's expense.
   4. Product and manufacturer named first in Specifications or on information shown on Drawings is basis of selection of manufactured items and equipment, particularly mechanical equipment. In using other than first named products or manufacturers, including those specified as additionally approved or acceptable, Contractor assumes responsibility for any changes in system and for modifications in any work required to accommodate them. Architect / Engineer's approval of such additionally acceptable products or manufacturers, either in Specifications or in Addendum, does not relieve Contractor from obligation to coordinate such optional products with other Contractors, whose work may be affected by them, and to pay all additional costs resulting from their inclusion into the Work. Contractor's liability shall include payment of Architect / Engineer's fees for any additional services made necessary by or directly connected to such product changes. No extra costs resulting from such changes shall become responsibility of Department, Architect / Engineer or any other separate Contractor.

C. No request for approval of "or equal" materials will be entertained except from Contractor. Identify any request for substitution as substitution on Contractor's letter of transmittal and give reasons for substitution. Department may in its sole discretion allow substitutions of materials.

11. PATENTS AND ROYALTIES

A. If Contractor uses any design, device or material covered by letters, patent or copyright, it is mutually agreed and understood, that, without exception, contract prices shall include all royalties or costs arising from use of such design, device or materials, in any way involved in the Work.

B. Contractor shall indemnify and save harmless County from any and all claims for infringement by reason of use of such patent or copyright in connection with the Work agreed

to be performed under this Contract, and shall indemnify County for any cost, expense or damage which it may be obliged to pay by reason of such infringement at any time during prosecution of the Work or after completion of the Work.

12. SURVEYS, PERMITS, REGULATIONS AND TAXES

A. Department will furnish to Contractor all site, topography and property surveys necessary for execution of the Work.

B. Contractor shall procure all permits, licenses and approvals necessary for execution of this Contract.

C. Contractor shall give all notices and comply with all State of Wisconsin, Federal and local laws, codes, rules and regulations relating to performance of the Work, protection of adjacent property, and maintenance of passageways, guard fences or other protective facilities.

D. Contractor does not need to pay State and local sales & use taxes. See Wisconsin Statute 77.54 (9m).

E. Contractor shall promptly notify Architect / Engineer of any variances of Drawings or Specifications with that of any State of Wisconsin, federal or local law, code, rule or regulation. Upon such notification, Architect / Engineer will require correction of variance to comply with applicable law, code, rule or regulation at no additional cost to Contractor.

F. Work under this Contract shall comply with all applicable State of Wisconsin, Federal and local laws, codes and regulations.

G. Contractor shall pay charges for water, sewer and other utility connections made by municipalities where required by Specifications.

13. CONTRACTOR'S OBLIGATIONS AND SUPERINTENDENCE

A. Contractor shall provide and pay for all materials, labor, tools, equipment, transportation and superintendence necessary to execute, complete and deliver the Work within specified time. Contractor agrees to secure at their own expense all personnel necessary to carry out the Work. Such personnel shall not be deemed County employees nor shall they have or be deemed to have any direct contractual relationship with County.

B. Performance of any work necessary after regular working hours, on Sundays or Legal Holidays shall be without additional expense to County. Performance of any work at site at other than normal working hours must be coordinated with Public Works Project Manager.

C. Contractor shall furnish, erect, maintain and remove such temporary works as may be required.

D. Contractor shall observe, comply with, and be subject to all terms, conditions, requirements and limitations of Construction Documents.

E. At the Work site, Contractor shall give personal superintendence to the Work or shall employ construction superintendent or foreman, experienced in character of work covered by Contract, who shall have full authority to act for Contractor. Understand that such superintendent or foreman shall be acceptable to Architect / Engineer and Department.

F. Remove from project or take other corrective action upon notice from Architect / Engineer or Department for Contractor's employees whose work is considered by Architect / Engineer or Department to be unsatisfactory, careless, incompetent, unskilled or otherwise objectionable.

G. Contractor and subcontractors shall be required to conform to Labor Laws of State of Wisconsin and various acts amendatory and supplementary thereto and to other laws, ordinances and legal requirements applicable to the Work.

H. Presence and observation of the Work by Architect / Engineer or Public Works Project Manager shall not relieve Contractor of any obligations.

14. WEATHER CONDITIONS

A. In event of temporary suspension of work, or during inclement weather, or whenever Architect / Engineer shall direct, Contractor shall, and shall cause subcontractors to protect carefully all work and materials against damage or injury from weather. If, in opinion of Architect / Engineer or Department, any work or materials that have been damaged or injured due to failure on part of Contractor or any subcontractors so to protect the Work, such materials shall be removed and replaced at expense of Contractor.

15. PROTECTION OF WORK AND PROPERTY

A. Contractor shall at all times safely guard County's property from injury or loss in connection with this Contract. Contractor shall at all times safely guard and protect the Work, and adjacent property, from damage. Contractor shall replace or make good any such damage, loss or injury unless such is caused directly by errors contained in Contract, or by County, or County's duly authorized representative.

B. Contractor may act diligently, without previous instructions from Architect / Engineer and / or Department, in emergency that threatens loss or injury of property, or safety of life. Contractor shall notify Architect / Engineer and / or Department immediately thereafter. Promptly submit any claim for compensation by Contractor due to such extra work to Architect / Engineer and / or Department for approval as provided for in Article 18 herein.

16. INSPECTION AND TESTING OF MATERIALS

A. Authorized representatives and agents of County government shall have access at all times to the Work wherever it is in preparation or progress and Contractor shall provide facilities for such access and for inspection.

B. Should it be considered necessary or advisable at any time before final acceptance of the Work to make examination of work already completed, by removing or tearing out same, Contractor shall upon request, promptly furnish all necessary facilities, labor and materials. If such work is found to be defective in any aspect, due to fault of Contractor or subcontractors thereof, Contractor shall assume all expenses of such examination and of satisfactory reconstruction. Contractor will be reimbursed for such examination and replacement in accordance with Article 18 - A.3., of these General Conditions of Contract if such work is found to meet requirements of Contract.

C. If Specifications, Architect / Engineer's, or Public Works Project Manager's instructions require any work to be specially tested or approved, Contractor shall give Architect / Engineer and Public Works Project Manager timely notice of its readiness for testing or

inspection. Test all materials and equipment requiring testing in accordance with accepted or specified standards, as applicable. Architect / Engineer shall recommend laboratory or inspection agency and Department will select and pay for all initial laboratory inspection services. Should retesting be required, due to failure of initial testing, cost of such retesting shall be borne by Contractor.

D. Cost of any testing performed by manufacturers or Contractor for substantiating acceptability of proposed substitution of materials and equipment, or necessary conformance testing in conjunction with manufacturing processes or factory assemblage, shall be borne by Contractor or manufacturer responsible.

17. REPORTS, RECORDS AND DATA

A. Contractor shall submit to Architect / Engineer and Public Works Project Manager such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, invoices, records and other data as either may request concerning work performed or to be performed under this Contract.

18. CHANGES IN THE WORK

A. Make no changes, except in cases of emergency, in the Work covered by approved Construction Documents without having prior written approval of Department. Charges or credits for the Work covered by approved change shall be determined by one of these methods:
   1. Unit bid prices previously approved.
   2. Agreed lump sum based on actual cost of:
      a) Labor, including foremen, and all fringe benefits that are associated with their wages.
      b) Materials entering permanently into the Work.
      c) Ownership or rental cost of construction tools and equipment during time of use on extra work.
      d) Power and consumable supplies for operation of power equipment.
      e) Workmen's Compensation Insurance, Contractor's Public Liability and Property Damage Insurance, and Comprehensive Automobile Liability Insurance.
      f) Social Security and old age and unemployment contributions.
      g) Add to cost under (2), fixed fee to be agreed upon, but not to exceed fifteen percent (15%) of actual cost of work performed with their own labor force. Fee shall be compensation to cover cost of supervision, overhead, bond, profit and any other general expense.
      h) On that portion of the Work under (2) done under subcontract, Contractor may include not over seven and one-half percent (7½%) for supervision, overhead, bond, profit and any other general expense.
      i) Department may require correct amount of costs with supporting vouchers; Contractor shall keep and present in such form as directed.
   3. Cost-plus work, with not-to-exceed dollar limit, based on actual cost of:
      a) Labor, including foremen, and all fringe benefits that are associated with their wages.
      b) Materials entering permanently into the Work.
      c) Ownership or rental cost of construction tools and equipment during time of use on extra work. Rental cost cannot exceed fifty percent (50%) replacement value of rented equipment.
      d) Power and consumable supplies for operation of power equipment.
      e) Workmen's Compensation Insurance, Contractor's Public Liability and Property Damage Insurance, and Comprehensive Automobile Liability Insurance.
      f) Social Security and old age and unemployment contributions.

g) To cost under (3), there shall be added fixed fee to be agreed upon but not to exceed fifteen percent (15%) of actual cost of work performed with their own labor force. Fee shall be compensation to cover cost of supervision, overhead, bond, profit, and any other general expense.
h) On that portion of the Work under (3) done under subcontract, Contractor may include not over seven and one-half percent (7½%) for supervision, overhead, bond, profit, and any other general expense.
i) Contractor shall keep and present, in such form as directed, correct amount of cost together with such supporting vouchers as may be required by Department.

B. If Contractor claims that by any instructions given by Architect / Engineer, Department, by drawings or otherwise, regarding performance of the Work or furnishing of material under Contract, involves extra cost, Contractor shall give Department written notice of cost thereof within two (2) weeks after receipt of such instructions and in any event before proceeding to execute work, unless delay in executing work would endanger life or property.

C. No claim for extra work or cost shall be allowed unless it was done in pursuance of written Change Order from Architect / Engineer and approved by Department, as previously mentioned, and claim presented with payment request submitted after changed or extra work is completed.

D. Negotiation of cost for change in the Work shall not be cause for Contractor to delay prosecution of the Work if Contractor has been authorized in writing by Public Works Project Manager to proceed.

19. EXTRAS

A. Without invalidating Contract, Department may order extra work or make changes by altering, adding to or deducting from the Work, contract sum being adjusted in accordance with Article 18 herein.

20. TIME FOR COMPLETION

A. Contractor agrees that the Work shall be prosecuted regularly and diligently and complete the Work as stated in Construction Documents.

21. CORRECTION OF WORK

A. All work, all materials whether incorporated in the Work or not, and all processes of manufacture shall at all times and places be subject to inspection of Architect / Engineer and Public Works Project Manager who shall be judge of quality and suitability of the Work, materials, and processes of manufacture for purposes for which they are used. Should they fail to meet Architect / Engineer's and Public Works Project Manager's approval they shall be reconstructed, made good, replaced or corrected, by Contractor at Contractor's expense. Immediately remove all rejected material from site.

B. If Contractor defaults or neglects to carry out the Work in accordance with Construction Documents or fails to perform any provision of Contract, Department may, after ten (10) business days' written notice to Contractor and without prejudice to any other remedy County may have, make good such deficiencies. In such case, appropriate Change Order shall be issued deducting from Contractor's payments then or thereafter, cost of correcting such

deficiencies, including cost of Architect / Engineer's additional services made necessary by such default, neglect or failure.

22. SUBSURFACE CONDITIONS FOUND DIFFERENT

A. If Contractor encounters subsurface or latent conditions at site materially differing from those shown on Drawings or indicated in Specifications, Contractor shall immediately give notice to Architect / Engineer and Public Works Project Manager of such conditions before they are disturbed. Architect / Engineer will thereupon promptly investigate conditions, and if Architect / Engineer finds that they materially differ from those shown on Drawings or indicated in Specifications, Architect / Engineer will at once make such changes as necessary, any increase or decrease of cost resulting from such changes to be adjusted in manner provided in above Article 18 entitled "Changes in the Work".

23. RIGHT OF DEPARTMENT TO TERMINATE CONTRACT

A. In event that any provisions of this Contract are violated by Contractor or by any subcontractors, County may serve written notice upon Contractor and Surety of its intention to terminate Contract, such notice to contain reasons for such intention to terminate Contract, and unless within ten (10) business days after serving of such notice upon Contractor, such violation or delay shall cease and satisfactory arrangement or correction be made, Contract shall, upon expiration of said ten (10) business days, cease and terminate.

B. In event of any such termination, County shall immediately serve notice thereof upon Surety and Contractor, and Surety shall have right to take over and perform Contract subject to County's approval; provided, however, that if Surety does not commence performance thereof within ten (10) business days from date of mailing to such Surety of notice of termination, County may take over the Work and prosecute same to completion by contract, or by force account, at expense of Contractor; Contractor and Surety shall be liable to County for any excess cost occasioned County thereby, and in such event County may take possession of and utilize in completing the Work, such materials and equipment as may be on the Work site and therefore necessary.

24. CONSTRUCTION SCHEDULE AND PERIODIC ESTIMATES

A. Contractor shall be responsible for Construction Schedule and coordination. Immediately after execution and delivery of Contract and before making first payment, Contractor shall notify all subcontractors to furnish all required information to develop Construction Schedule. Contractor and all subcontractors associated with the Work shall furnish following information from each Division of Specifications:
   1. List of construction activities;
   2. Start, finish and time required for completion of each activity;
   3. Sequential relationships between activities;
   4. Identify all long lead-time items, key events, meetings or activities such as required submittals, fabrication and delivery, procurement of materials, installation and testing;
   5. Weekly definition of extent of work and areas of activity for each trade or Subcontract; and
   6. Other information as determined by Public Works Project Manager.

B. In addition to above requested items, Contractor shall request delivery dates for all County-furnished equipment, materials or labor. This shall include any work handled by Department

under separate contracts such as asbestos abatement, air and water balancing, etc. Indicate on Construction Schedule these associated delivery and installation dates.

C. Progress Reporting:
   1. Contractor shall update and publish Construction Schedule on monthly basis. Revisions to Schedule shall be by Contractor and made in same detail as original Schedule and accompanied by explanation of reasons for revision; and shall be subject to approval by Department.
   2. Failure of Contractor to keep Schedule in updated format shall result in County hiring firm specializing in construction schedule development and deducting those costs associated with updating process from payments due Contractor.
   3. Contractor shall submit show actual percentage of each activity completed, estimated future progress, and anticipated completion time.

D. Responsibility for timely completion requires:
   1. Contractor and subcontractors understand that performance of each is interdependent upon performance of others.
   2. Whenever it becomes apparent from current schedule, that phasing or progress completion dates will not be met, Contractor must take some or all following actions at no additional cost to County:
      a) Increase construction labor in such quantities and crafts as will eliminate backlog of work.
      b) Increase number of working hours per shift, shifts per working day, working days per week, amount of construction equipment, or any combination of foregoing to eliminate backlog of work.
      c) Reschedule work (yet remain in conformance with Drawings and Specifications).
   3. Prior to proceeding with any of above actions, Contractor shall notify Public Works Project Manager.

E. Maintain current Construction Schedule at all times. Revise Construction Schedule in same detail as original and accompany with explanation of reasons for revision. Schedule shall be subject to approval by Architect / Engineer and Public Works Project Manager.

25. PAYMENTS TO CONTRACTOR

A. Contractor shall provide:
   1. Detailed estimate giving complete breakdown of contract price by Specification Division; and
   2. Periodic itemized estimates of work done for purpose of making partial payments thereon.

B. Submit these estimates for approval first to Architect / Engineer, then to Public Works Project Manager. Costs employed in making up any of these schedules are for determining basis of partial payments and not considered as fixing basis for additions to or deductions from Contract price.

C. County will make partial payments to Contractor for value, proportionate to amount of Contract, of all labor and material incorporated in the Work during preceding calendar month upon receipt of Application and Certificate for Payment form from Architect / Engineer and approval of Department.

D. Contractor shall submit for approval first to Architect / Engineer, and then to Public Works Project Manager all Application and Certificate for Payment forms. If requested, Application

and Certificate for Payment shall be supported by such additional evidence as may be required, showing Contractor's right to payment claimed.

E. Application and Certificate for Payment for preparatory work and materials delivered and suitably stored at site to be incorporated into the Work at some future period, will be given due consideration. Requesting payment for materials stored off site, may be rejected, however, if deemed essential for reasons of job progress, protection, or other sufficient cause, requests will be considered, conditional upon submission by Contractor of bills of sale, photographs and such other procedures as will adequately protect County's interest such as storage in bonded warehouse with adequate coverage. If there is any error in payment, Contractor is obligated to notify Department immediately, but no longer than ten (10) business days from receipt of payment.

F. Payments by County will be due within forty-five (45) business days after receipt by Department of Application and Certificate for Payment.

G. County will retain five percent (5%) of each Application and Certificate for Payment until final completion and acceptance of all the Work covered by Contract. However, anytime after fifty percent (50%) of the Work has been furnished and installed at site, County will make remaining payments in full if Architect / Engineer and Public Works Project Manager find that progress of the Work corresponds with Construction Schedule. If Architect / Engineer and Public Works Project Manager find that progress of the Work does not correspond with Construction Schedule, County may retain up to ten percent (10%) of each Application and Certificate for Payment for the Work completed.

H. All material and work covered by partial payments made shall become sole property of County, but this provision shall not be construed as relieving Contractor from sole responsibility for care and protection of materials and work upon which payments have been made, or restoration of any damaged work, or as waiver of right of County to require fulfillment of all of terms of Contract.

I. County will make final payment within sixty (60) calendar days after final completion of the Work, and will constitute acceptance thereof.

J. County may make payment in full, including retained percentages and less authorized deductions, upon completion and acceptance of each Division where price is stated separately in Contract.

K. Every contractor engaged in performance of any contract for Department of Public Works, Highway & Transportation shall submit to this Department, as requested and with final application for payment for work under said contract, affidavit(s) as required to prove that all debts and claims against this Work are paid in full or otherwise satisfied, and give final evidence of release of all liens against the Work and County.

26. WITHHOLDING OF PAYMENTS

A. County, after having served written notice on said Contractor, may either pay directly any unpaid bills of which Department has written notice, or withhold from Contractor's unpaid compensation sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged; whereupon, payment to Contractor shall be resumed in accordance with terms of this Contract, but in no event shall these provisions be construed to impose any obligations upon County to either Contractor or Contractor's Surety.

B. In paying any unpaid bills of Contractor, County shall be deemed agent of Contractor, and any payment so made by County, shall be considered as payment made under Contract by County to Contractor and County shall not be liable to Contractor for any such payment made in good faith.

C. Contractor shall indemnify, hold harmless and defend Dane County, its boards, commissions, agencies, officers, employees and representatives from all claims growing out of lawful demands of subcontractors, laborers, workers, mechanics, material men, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in performance of this Contract.

D. At Department's request, Contractor shall furnish satisfactory evidence that all obligations of nature designated above have been paid, discharged or waived.

27. ACCEPTANCE OF FINAL PAYMENT AS RELEASE

A. Making of final payment shall constitute waiver of all claims by County except those arising from:
   1. Unsettled lien;
   2. Faulty or defective work appearing after substantial completion;
   3. Failure of the Work to comply with requirements of Construction Documents; or
   4. Terms of any special guarantees required by Construction Documents.

B. Acceptance of final payment shall constitute waiver of all claims by Contractor.

28. PAYMENTS BY CONTRACTOR

A. Contractor shall pay following not later than fifth (5^{th}) business day following each payment received from County:
   1. All transportation and utility services rendered;
   2. All materials, tools, and other expendable equipment that have been delivered at site of the Work to extent of ninety percent (90%) of cost thereof, and balance of cost thereof when said balance is paid to Contractor; and
   3. Each subcontractor, respective amount allowed Contractor because of work performed by subcontractor to extent of subcontractor's interest therein.

29. CONTRACT SECURITY

A. Contractor shall furnish Performance and Payment Bonds in amount at least equal to one hundred percent (100%) of Contract price as security for faithful performance of this Contract and payment of all persons performing labor on project under this Contract and furnishing materials in connection with this Contract.

B. Sample Performance and Payment Bonds that Contractor will be required to execute is bound into these Construction Documents. Before construction Contract is consummated, completed Performance and Payment Bonds must be approved by Department.

30. ASSIGNMENTS

A. Contractor shall not assign whole or any part of this Contract or any moneys due or to become due hereunder without written consent of Department. In case Contractor assigns all

or any part of any moneys due or to become due under this Contract, instrument of assignment shall contain clause substantially to effect that it is agreed that right of assignee in and to any moneys due or to become due to Contractor shall be subject to prior claims of all persons, firms and corporations for services rendered or materials supplied for performance of the Work called for in this Contract.

31. MUTUAL RESPONSIBILITY OF CONTRACTORS

A. If, through acts of neglect on part of Contractor or any subcontractor shall suffer loss or damage on the Work, Contractor agrees to settle with such subcontractor by agreement or arbitration if such other subcontractor will so settle. If such subcontractor shall assert any claim against County on account of any damage alleged to have been sustained, Department shall notify Contractor, who shall indemnify, hold harmless and defend Dane County, its boards, commissions, agencies, officers, employees and representatives against any such claim.

32. SEPARATE CONTRACTS

A. Department may award other contracts for the Work and all Contractors shall fully cooperate with each other and carefully adjust their work to that provided under other contracts as may be directed by Department. No Contractor shall commit or permit any act that will interfere with performance of the Work by any other Contractor.

B. Contractor shall coordinate the Work with those of other Contractors. Cooperation will be required in arrangement for storage of materials and in detailed execution of the Work. Contractor, including subcontractors, shall keep informed of progress and detail work of others and shall notify Architect / Engineer or Department immediately of lack of progress or defective workmanship on part of others. Failure of Contractor to keep informed of the Work progressing on site and failure to give notice of lack of progress or defective workmanship by others shall be construed as acceptance by Contractor of status of the Work as being satisfactory for proper coordination with Contractor's own work.

33. SUBCONTRACTS

A. Contractor may use services of specialty subcontractors on those parts of the Work that, under normal contracting practices, are performed by specialty subcontractors.

B. Contractor shall not award any work to any subcontractor without prior approval of Department. Qualifications of subcontractors shall be same as qualifications of Contractor. Request for subcontractor approval shall be submitted to Department fifteen (15) business days before start of subcontractor's work. If subcontractors are changed or added, Contractor shall notify Department in writing.

C. Contractor shall be as fully responsible to County for acts and omissions of subcontractors, and of persons either directly or indirectly employed by them, as Contractor is for acts and omissions of persons directly employed by Contractor.

D. Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the Work to bind subcontractors to Contractor by terms of General Conditions of Contract and other Construction Documents insofar as applicable to work of subcontractors and to give Contractor same power as regards terminating any subcontract that Department may exercise over Contractor under any provision of Construction Documents.

E. Nothing contained in this Contract shall create any contractual relation between any subcontractor and County.

F. Contractor shall insert in all subcontracts, Articles 26, 33, 43 and 45, respectively entitled: "Withholding of Payments", "Subcontracts", "Affirmative Action Provision and Minority / Women / Disadvantaged Business Enterprises", and "Minimum Wages", and shall further require all subcontractors to incorporate physically these same Articles in all subcontracts.

34. PROJECT MANAGER'S AUTHORITY

A. Public Works Project Manager shall:
   1. Administer and ensure compliance with Construction Documents;
   2. Provide responsible on-site observations of construction and have authority to request work and to stop work whenever necessary to insure proper enforcement of Construction Documents;
   3. Convene and chair project meetings and foreman's coordination meetings when necessary to coordinate resolution of conflicts between Contractors, Architects, Engineers, Consultants, and Department; and
   4. Check and inspect material, equipment and installation procedures of all trades for proper workmanship and for compliance with Drawings, Specifications and Shop Drawings, permit no material on project site that is not satisfactory and reject work not in compliance with Construction Documents.

35. CONSULTANT'S AUTHORITY

A. Architect / Engineer is retained by, and is responsible to Department acting for County.

B. Architect / Engineer shall determine amount, quality, acceptability, and fitness of several kinds of work and materials that are provided under this Contract and shall decide all questions that may arise in relation to said work and construction thereof.

C. Architect / Engineer shall decide meaning and intent of any portion of Specifications and of any Drawings where they may be found obscure or be in dispute.

D. Architect / Engineer shall provide responsible observation of construction. Architect / Engineer has authority to stop the Work whenever such stoppage may be necessary to insure proper execution of Construction Documents.

E. Architect / Engineer shall be interpreter of conditions of Construction Documents and judge of its performance.

F. Within reasonable time, Architect / Engineer shall make decisions on all matters relating to progress of the Work or interpretation of Construction Documents.

G. Architect / Engineer's decisions are subject to review by Public Works Project Manager.

36. STATED ALLOWANCES

A. Stated allowances enumerated in Instructions to Bidders shall cover net cost of materials or equipment, and all applicable taxes. Contractor's cost of delivery and unloading at site, handling costs on site, labor, installation costs, overhead, profit and any other incidental costs shall be included in Contractor's bid, but not as part of cash allowance.

B. Department will solicit at least two (2) bids on materials or equipment for which allowance is stated and select on basis of lowest qualified responsible bid. Contractor will then be instructed to purchase "Allowed Materials". If actual price for purchasing "Allowed Materials", including taxes, is more or less than "Cash Allowance", Contract price shall be adjusted accordingly. Adjustment in Contract price shall not contain any cost items excluded from cash allowance.

37. ESTIMATES OF QUANTITIES

A. Whenever estimated quantities of work to be done and materials to be furnished under this Contract are shown in any of Construction Documents, they are given for use in comparing bids and right is especially reserved to increase or diminish them as they may be deemed reasonably necessary or desirable by Department to complete the Work included in this Contract, and cost for such increase or diminution shall be adjusted in manner provided for in General Conditions of Contract Article 18 entitled "Changes in the Work".

38. LANDS AND RIGHTS-OF-WAY

A. Prior to start of construction, County shall furnish all land and rights-of-way necessary for carrying out and completion of the Work to be performed under this Contract.

39. GENERAL GUARANTEE

A. Neither final certificate of payment nor any provision in Construction Documents nor partial or entire occupancy of premises by County shall constitute acceptance of work not done in accordance with Construction Documents or relieve Contractor of liability in respect to any expressed warranties or responsibility for faulty materials or workmanship.
   1. In no event shall making of any payment required by Contract constitute or be construed as waiver by County of any breach of covenants of Contract or waiver of any default of Contractor and making of any such payment by County while any such default or breach shall exist shall in no way impair or prejudice right of County with respect to recovery of damages or other remedy as result of such breach or default.

B. Contractor shall remedy and make good all defective workmanship and materials and pay for any damage to other work resulting there from, which appear within period of one (1) year from date of substantial completion, providing such defects are not clearly due to abuse or misuse by County. Department will give notice of observed defects with reasonable promptness.

C. Guarantee on work executed after certified date of substantial completion will begin on date when such work is inspected and approved by Architect / Engineer and Public Works Project Manager.

D. Where guarantees or warrantees are required in sections of Specifications for periods in excess of one (1) year, such longer terms shall apply; however, Contractor's Performance and Payment Bonds shall not apply to any guarantee or warranty period in excess of one (1) year.

40. CONFLICTING CONDITIONS

A. Any provision in any of Construction Documents which may be in conflict or inconsistent with any Articles in these General Conditions of Contract or Supplementary Conditions shall be void to extent of such conflict or inconsistency.

B. In case of ambiguity or conflict between Drawings and Specifications, Specifications shall govern.

C. Printed dimensions shall be followed in preference to measurements by scale. Large-scale drawings take precedence over small-scale drawings. Dimensions on Drawings and details are subject to field measurements of adjacent work.

41. NOTICE AND SERVICE THEREOF

A. Any notice to Contractor from Department relative to any part of this Contract shall be in writing and considered delivered and service thereof completed, when said notice is posted, by certified or registered mail, to Contractor at Contractor's last given address, or delivered in person to said Contractor, or Contractor's authorized representative on the Work.

42. PROTECTION OF LIVES AND HEALTH

A. In order to protect lives and health of Contractor's employees under Contract, Contractor shall comply with all pertinent provisions of Wisconsin Administrative Code, Rules of Department of Commerce, relating to Safety and Health.

B. Contractor alone shall be responsible for safety, efficiency and adequacy of Contractor's tools, equipment and methods, and for any damage that may result from their failure or their improper construction, maintenance or operation.

43. AFFIRMATIVE ACTION PROVISION AND MINORITY / WOMEN / DISADVANTAGED BUSINESS ENTERPRISES

A. Affirmative Action Provisions.
   1. During term of their Contract, Contractor agrees not to discriminate on basis of race, religion, color, sex, handicap, age, sexual preference, marital status, physical appearance, or national origin against any person, whether recipient of services (actual or potential), employee, or applicant for employment. Such equal opportunity shall include but not be limited to following: employment, upgrading, demotion, transfer, recruitment, advertising, layoff, termination, training, rates of pay, and any other form of compensation or level of service(s). Contractor agrees to post in conspicuous places, these affirmative action standards so as to be visible to all employees, service recipients and applicants for this paragraph. Listing of prohibited bases for discrimination shall no be construed to amend in any fashion state or federal law setting forth additional bases and exceptions shall be permitted only to extent allowable in state or federal law.
   2. Contractor is subject to this Article only if Contractor has twenty (20) or more employees and receives $20,000.00 or more in annual aggregate contracts with County. Contractor shall file and Affirmative Action Plan with Dane County Contract Compliance Officer in accord with Chapter 19 of Dane County Code of Ordinances. Such plan must be filed within fifteen (15) business days of effective date of this Contract and failure to do so by said date shall constitute ground for immediate termination of Contract by County. Contractor shall also, during term of this Contract, provide copies of all announcements of employment opportunities to County's Contract Compliance Office, and shall report annually number of persons, by race, sex and handicap status, who apply for employment, and, similarly classified, number hired and number rejected.
   3. Contact Dane County Contract Compliance Officer at Dane County Contract Compliance Office, 210 Martin Luther King, Jr. Blvd., Room 421, Madison, WI 53703, 608/266-4192.
   4. In all solicitations for employment placed on Contractor's behalf during term of this Contract, Contractor shall include statement to affect Contractor is "Equal Opportunity Employer". Contractor agrees to furnish all information and reports required by County's Contract Compliance Officer as same relate to affirmative action and nondiscrimination, which may include any books, records, or accounts deemed appropriate to determine compliance with Chapter 19, Dane County Code of Ordinances, and provision of this Contract.

B. Minority / Women / Disadvantaged / Emerging Small Business Enterprises.
   1. Chapter 19.508 of Dane County Code of Ordinances is official policy of Dane County regarding utilization of, to fullest extent of, Minority Business Enterprises (MBEs), Women Business Enterprises (WBEs) Disadvantage Business Enterprises (DBEs) and Emerging Small Business Enterprises (ESBEs).
   2. Contractor may utilize MBEs / WBEs / DBEs / ESBEs as subcontractors or suppliers. List of subcontractors will be required of low bidder as stated in this Contract. List shall

indicate which are MBEs / WBEs / DBEs / ESBEs and percentage of subcontract awarded, shown as percentage of total dollar amount of bid.

44. COMPLIANCE WITH FAIR LABOR STANDARDS

A. During term of this Contract, Contractor shall report to County Contract Compliance Officer, within ten (10) business days, any allegations to, or findings by National Labor Relations Board (NLRB) or Wisconsin Employment Relations Commission (WERC) that Contractor has violated statute or regulation regarding labor standards or relations. If investigation by Contract Compliance Officer results in final determination that matter adversely affects Contractor's responsibilities under this Contract, and which recommends termination, suspension or cancellation of this Contract, County may take such action.

B. Contractor may appeal any adverse finding by Contract Compliance Officer as set forth in Dane County Ordinance 25.015(11)(c) through (e).

C. Contractor shall post this statement in prominent place visible to employees: "As condition of receiving and maintaining contract with Dane County, this employer shall comply with federal, state and all other applicable laws prohibiting retaliation or union organizing."

45. DOMESTIC PARTNERSHIP BENEFITS

A. Not Used.

46. USE AND OCCUPANCY PRIOR TO ACCEPTANCE

A. Contractor agrees to use and occupancy of portion or unit of the Work before formal acceptance by Department, provided Department:
   1. Secures written consent of Contractor; except when in opinion of Public Works Project Manager, Contractor is chargeable with unwarranted delay in final cleanup of punch list items or other Contract requirements.
   2. Secures endorsement from insurance carrier and consent of Surety permitting occupancy of building or use of the Work during remaining period of construction, or, secures consent of Surety.
   3. Assumes all costs and maintenance of heat, electricity and water.
   4. Accepts all work completed within that portion or unit of the Work to be occupied, at time of occupancy.

47. MINIMUM WAGES

A. Not used

48. CLAIMS

A. No claim may be made until Department's Deputy Public Works Director has reviewed Architect / Engineer's decision as provided for in Article 35 of General Conditions of Contract. If any claim remains unresolved after such review by Department's Deputy Public Works Director the claim may be filed under Wisconsin Statute 893.80. Work shall progress during period of any dispute or claim. Unless specifically agreed between parties, venue will be in Dane County, Wisconsin.

49. ANTITRUST AGREEMENT

A. Contractor and County recognize that in actual economic practice, overcharges resulting from antitrust violations are in fact usually borne by County. Therefore, Contractor hereby assigns to County any and all claims for such overcharges as to goods and materials purchased in connection with this Contract, except as to overcharges which result from antitrust violations commencing after price is established under this Contract and any change order thereto.

50. INSURANCE

A. Contractor Carried Insurance:
   1. Contractor shall not commence work under this Contract until Contractor has obtained all insurance required under this Article and has provided evidence of such insurance to Risk Manager, 425 City-County Building, 210 Martin Luther King Jr. Blvd., Madison, WI 53703. Contractor shall not allow any subcontractor to commence work until insurance required of subcontractor has been so obtained and approved. Company providing insurance must be licensed to do business in Wisconsin.
   2. Worker's Compensation Insurance:
      a) Contractor shall procure and shall maintain during life of this Contract, Worker's Compensation Insurance as required by statute for all of Contractor's employees engaged in work at site of project under this Contract and, in case of any such work sublet, Contractor shall require subcontractor similarly to provide Worker's Compensation Insurance for all of latter's employees to be engaged in such work unless such employees are covered by protection afforded by Contractor's Worker's Compensation Insurance.
      b) If any claim of employees engaged in hazardous work on project under this Contract is not protected under Worker's Compensation Statute, Contractor shall provide and shall cause each subcontractor to provide adequate Employer's Liability Insurance for protection of such of Contractor's employees as are not otherwise protected.
   3. Contractor's Public Liability and Property Damage Insurance:
      a) Contractor shall procure and maintain during life of this Contract, Contractor's Public Liability Insurance and Contractor's Property Damage Insurance in amount not less than $1,000,000 bodily injury, including accidental death, to any one person, and subject to same limit for each person, in amount not less than $1,000,000 on account of one accident, and Contractor's Property Damage Insurance in amount not less then $1,000,000 or combined single limit of at least $1,000,000 with excess coverage over and above general liability in amount not less than $5,000,000. Contractor shall add "Dane County" as additional insured for each project.
      b) Contractor's Public Liability and Property Damage Insurance shall include Products, Completed Operation, and Contractual Liability under Insurance Contract. "Contractor shall in all instances save, defend, indemnify and hold harmless County and Architect / Engineer against all claims, demands, liabilities, damages or any other costs which may accrue in prosecution of the Work and that Contractor will save, defend, indemnify and hold harmless County and Architect / Engineer from all damages caused by or as result of Contractor's operations" and each shall be listed as additional insured on Contractor's and subcontractors' insurance policies.
      c) Obligations of Contractor under Article 50.A.2.b) shall not extend to liability of Architect / Engineer, agents or employees thereof, arising out of:
         1) Preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications; or
         2) Giving of or failure to give directions or instructions by Architect / Engineer, agents or employees thereof provided such giving or failure to give is primary cause of injury or damage.

d) Contractor shall procure and shall maintain during life of this Contract, Comprehensive Automobile Liability Insurance covering owned, non-owned and hired automobiles for limits of not less than $1,000,000 each accident single limit, bodily injury and property damage combined with excess coverage over and above general liability in amount not less than $5,000,000.

e) Contractor shall either:

1) Require each subcontractor to procure and to maintain during life of subcontract, subcontractor's Public Liability Property Damage Insurance, and Comprehensive Automobile Liability Insurance of type and in same amount specified in preceding paragraphs; or

2) Insure activities of subcontractors in Contractor's own policy.

4. Scope of Insurance and Special Hazards: Insurance required under Article 50.A.2 & 50.A.3. hereof shall provide adequate protection for Contractor and subcontractors, respectively, against damage claims which may arise from operations under this Contract, whether such operation be by insured or by anyone directly or indirectly employed by insured and also against any of special hazards which may be encountered in performance of this Contract as enumerated in Supplementary Conditions.

5. Proof of Carriage of Insurance: Contractor shall furnish Risk Manager with certificates showing type, amount, class of operations covered, effective dates, dates of expiration of policies and "Dane County" listed as additional insured. Such certificates shall also contain (substantially) following statement: "Insurance covered by this certificate will not be canceled or materially altered, except after ten (10) business days written notice has been received by Risk Manager."

B. Builder's Risk:

1. County shall provide Builder's Risk insurance coverage for its insurable interests in construction or renovation projects with completed value of $1,000,000 or less. Therefore, if project completed value is more than $1,000,000, Contractor shall obtain and maintain in force, at its own expense, Builder's Risk Insurance on all risks for amount equal to full completed value of covered structure or replacement value of alterations or additions. Any deductible shall not exceed $25,000 for each loss. Policy shall include occupancy clause and list Dane County as loss payee.

C. Indemnification / Hold Harmless:

1. Contractor shall indemnify, hold harmless and defend Dane County, its boards, commissions, agencies, officers, employees and representatives from and against all claims, damages, losses and expenses including attorneys' fees arising out of or resulting from performance of the Work, provided that any such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom, and is caused in whole or in part by any act or omission of Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by part indemnified hereunder.

2. In any and all claims against Dane County, its boards, commissions, agencies, officers, employees and representatives or by any employee of Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, indemnification obligation under this Contract shall not be limited in any way by any limitation on amount or type of damages, compensation or benefits payable by or for Contractor or any subcontractor under worker's compensation acts, disability benefits or other employee benefit acts.

3. Obligations of Contractor under this Contract shall not extend to liability of Architect / Engineer, its agents or employees arising out of:

a) Preparation or approval of maps, drawings, opinion, reports, surveys, change orders, designs or specifications; or
b) Giving of or failure to give directions or instruction by Architect / Engineer, its agents or employees provided such giving or failure to give is primary cause of injury or damage.

4. Dane County shall not be liable to Contractor for damages or delays resulting from work by third parties or by injunctions or other restraining orders obtained by third parties.

51. WISCONSIN LAW CONTROLLING

A. It is expressly understood and agreed to by parties hereto that in event of any disagreement or controversy between parties, Wisconsin law shall be controlling.

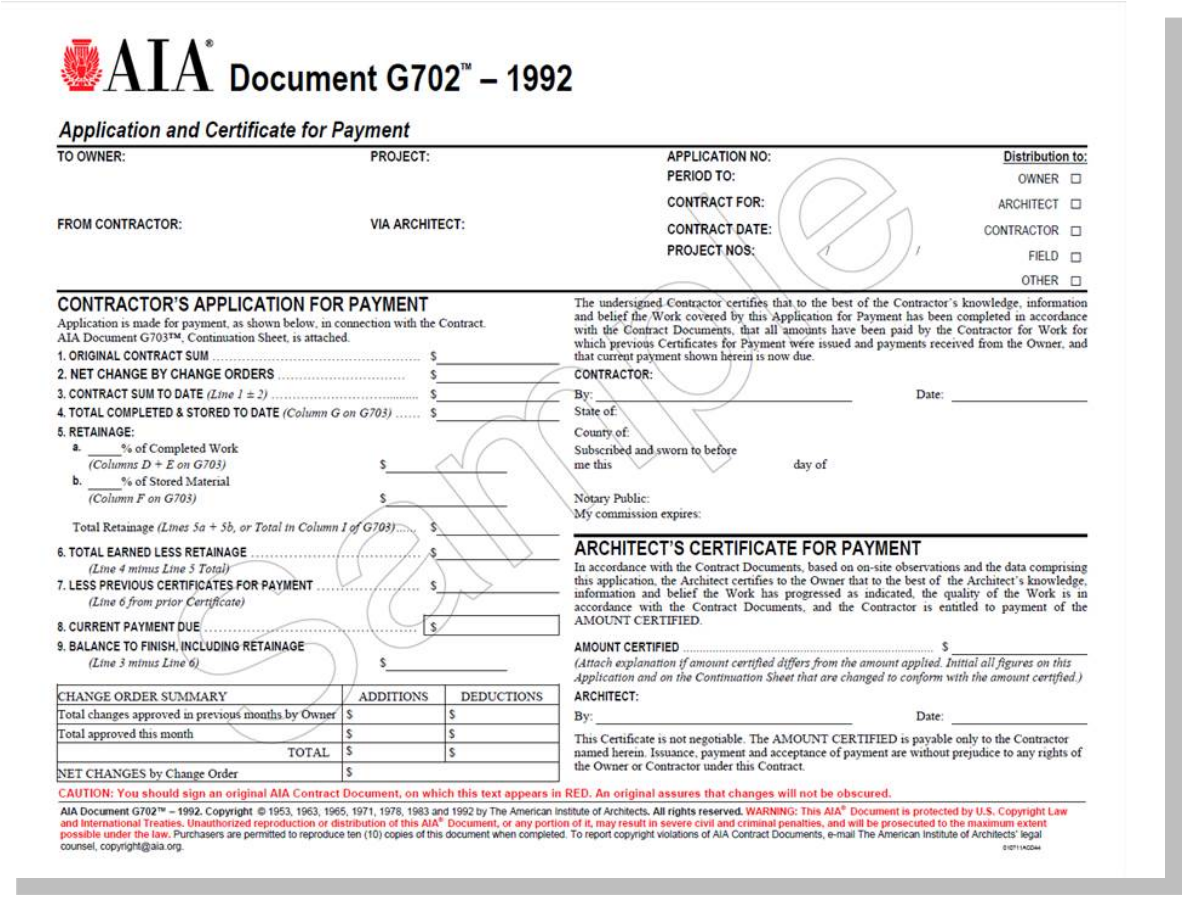
END OF SECTION

SECTION 00 73 00

SUPPLEMENTARY CONDITIONS

1. APPLICATION & CERTIFICATE FOR PAYMENT

A. Every contractor engaged in performance of any contract for Department of Public Works, Highway & Transportation shall submit partial and final Application & Certificate for Payment for work under said contract. Form shall provide similar information as shown on AIA G702™ and G703™ forms (samples shown below). Forms shall be submitted to project Architect / Engineer for approval.



AIA® Document G702™ – 1992

Application and Certificate for Payment

TO OWNER: PROJECT: APPLICATION NO: Distribution to:
PERIOD TO: OWNER ☐
CONTRACT FOR: ARCHITECT ☐
FROM CONTRACTOR: VIA ARCHITECT: CONTRACT DATE: CONTRACTOR ☐
PROJECT NOS: / / FIELD ☐
OTHER ☐

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
AIA Document G703™, Continuation Sheet, is attached.

1. ORIGINAL CONTRACT SUM ..... $
2. NET CHANGE BY CHANGE ORDERS ..... $
3. CONTRACT SUM TO DATE *(Line 1 ± 2)* ..... $
4. TOTAL COMPLETED & STORED TO DATE *(Column G on G703)* ..... $
5. RETAINAGE:
   a. ____% of Completed Work *(Columns D + E on G703)* $
   b. ____% of Stored Material *(Column F on G703)* $
   Total Retainage *(Lines 5a + 5b, or Total in Column I of G703)* ..... $
6. TOTAL EARNED LESS RETAINAGE ..... $ *(Line 4 minus Line 5 Total)*
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT ..... $ *(Line 6 from prior Certificate)*
8. CURRENT PAYMENT DUE ..... $
9. BALANCE TO FINISH, INCLUDING RETAINAGE *(Line 3 minus Line 6)* $

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$	$
Total approved this month	$	$
TOTAL	$	$
NET CHANGES by Change Order	$	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:
By: Date:
State of:
County of:
Subscribed and sworn to before me this day of
Notary Public:
My commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED ..... $
(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)
ARCHITECT:
By: Date:

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

AIA® Document G703™ – 1992

Continuation Sheet

AIA Document G702™–1992, Application and Certificate for Payment, or G732™–2009, Application and Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.
In tabulations below, amounts are in US dollars.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED: FROM PREVIOUS APPLICATION (D + E)	WORK COMPLETED: THIS PERIOD	MATERIALS PRESENTLY STORED (Not in D or E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C – G)	RETAINAGE (If variable rate)
	GRAND TOTAL								

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

Department of Public Works, Highway & Transportation
Public Works Engineering Division
608/266-4018

Gerald J. Mandli, P.E.
Commissioner / Director

Joseph T. Parisi
County Executive

Deputy Director
Todd Draper

1919 Alliant Energy Center Way
Madison, Wisconsin 53713
Fax: 608/267-1533
www.countyofdane.com/pwht/public_works.aspx

BEST VALUE CONTRACTING APPLICATION

CONTRACTORS / LICENSURE APPLICANTS

The Dane County Department of Public Works requires all contractors & subcontractors to be a best value contractor before being hired. Application documents are due to the County prior to Bid Due Date. Approval or rejection shall be within five (5) days of Bid Due Date. This document shall be completed, properly executed, along with the necessary attachments and additional information that the County requires for the protection and welfare of the public in the performance of a County contract.

Contractors or subcontractors of any tier who attain qualification status will retain that status for a period of two (2) years from the date of qualification. Contractors shall notify the Dane County Department of Public Works, Highway & Transportation within fifteen (15) days of any changes to its business or operations that are relevant to the application. Failure to do so could result in suspension, revocation of the contractor's qualification, debarment from County contracts for up to three (3) years and / or other sanctions available under the law.

No contracts will be awarded for construction work performed on Dane County projects unless the contractor is currently approved as a Wisconsin Trade Trainer or has applied for approval as an Apprenticeship Trade Trainer to the Wisconsin Department of Workforce Development and agrees to an acceptable apprenticeship program. If you are not currently approved as a Wisconsin Trade Trainer, or have not applied for approval as an Apprenticeship Trade Trainer, please contact the Department of Workforce Development - Bureau of Apprenticeship Standards at 608/266-3133 or visit their web site at: https://dwd.wisconsin.gov/apprenticeship/.

EXEMPTIONS

- Contractors who employ less than five (5) apprenticeable trade workers are not required to qualify.
- Contractors performing work that does not apply to an apprenticeable trade, as outlined in Appendix A.
- The contractor / subcontractor provides sufficient documentation to demonstrate one or more of the following:
  - apprentices are not available in a specific geographic area;
  - the applicable apprenticeship program is unsuitable or unavailable; or
  - there is a documented depression of the local construction market which prevents compliance.

SEC.	PROOF OF RESPONSIBILITY	CHECK IF APPLICABLE
1	Does your firm possesses all technical qualifications and resources, including equipment, personnel and financial resources, necessary to perform the work required for any project or obtain the same through the use of responsible, qualified subcontractors?	Yes: ☐ No: ☐
2	Will your firm possess all valid, effective licenses, registrations or certificates required by federal, state, county, or local law, which are necessary for the type of work to be performed including, but not limited to, those for any type of trade work or specialty work?	Yes: ☐ No: ☐
3	Will your firm meet all bonding requirements as required by applicable law or contract specifications?	Yes: ☐ No: ☐
4	Will your firm meet all insurance requirements as required by applicable law or specifications, including general liability insurance, workers compensation insurance and unemployment insurance requirements?	Yes: ☐ No: ☐
5	Will your firm maintain a substance abuse policy for employees hired for public works contracts that comply with Wis. Stats. Sec. 103.503?	Yes: ☐ No: ☐
6	Will your firm fully abide by the equal opportunity and affirmative action requirements of all applicable laws, including County ordinances?	Yes: ☐ No: ☐
7	In the past three (3) years, has your firm had control or has another corporation, partnership or other business entity operating in the construction industry controlled it? If so, please attach a statement explaining the nature of the firm relationship?	Yes: ☐ No: ☐ If Yes, attach details.
8	In the past three (3) years, has your firm had any type of business, contracting or trade license, certification or registration revoked or suspended?	Yes: ☐ No: ☐ If Yes, attach details.
9	In the past three (3) years, has your firm been debarred by any federal, state or local government agency?	Yes: ☐ No: ☐ If Yes, attach details.
10	In the past three (3) years, has your firm defaulted or failed to complete any contract?	Yes: ☐ No: ☐ If Yes, attach details.
11	In the past three (3) years, has your firm committed a willful violation of federal, state or local government safety laws as determined by a final decision of a court or government agency authority.	Yes: ☐ No: ☐ If Yes, attach details.
12	In the past three (3) years, has your firm been in violation of any law relating to your contracting business where the penalty for such violation resulted in the imposition of a penalty greater than $10,000?	Yes: ☐ No: ☐ If Yes, attach details.
13	Is your firm an active Wisconsin Trade Trainer as determined by the Wisconsin Bureau of Apprenticeship Standards?	Yes: ☐ No: ☐
14	Is your firm exempt from being qualified with Dane County?	Yes: ☐ No: ☐ If Yes, attach reason for exemption.
15	Does your firm acknowledge that in doing work under any County Public Works Contract, it will be required to use as subcontractors only those contractors that are also qualified with the County or become so within five (5) days after the Bid Due Date?	Yes: ☐ No: ☐
16	Contractor has been in business less than one year?	Yes: ☐ No: ☐
17	Is your firm a first time Contractor requesting a one time exemption, but, intend to comply on all future contracts and are taking steps typical of a “good faith” effort?	Yes: ☐ No: ☐

SIGNATURE SECTION

Your firm's Officer, or the individual who would sign a bid and / or contract documents must sign this document.

I do hereby certify that all statements herein contained are true and correct to the best of my knowledge:

Signature: _____

(Application is invalid without signature)

Print Name: _____ Date: _____

Title: _____

NAME AND ADDRESS OF CONTRACTOR	
Name of Firm:	
Address:	
City, State, Zip:	
Phone Number:	
Fax Number:	
E-mail Address:	

REMEMBER!

RETURN ALL TO FORMS AND ATTACHMENTS, OR QUESTIONS TO:

TODD DRAPER
EMAIL: DRAPER@COUNTYOFDANE.COM
OFFICE: (608) 267-0119, FAX: (608) 267-1533

DANE COUNTY DEPARTMENT OF PUBLIC WORKS, HGHWAY & TRANSPORTATION
1919 ALLIANT ENERGY CENTER WAY
MADISON, WI 53713

APPENDIX A

APPRENTICEABLE TRADES:

- Bricklayer
- Carpenter
- Cement Mason (Concrete Finisher)
- Cement Mason (Heavy Highway)
- Construction Craft Laborer
- Data Communications Installer
- Electrician
- Elevator Mechanic / Technician
- Environmental Systems Technician / HVAC Service Technician / HVAC Install & Service
- Glazier
- Heavy Equipment Operator / Operating Engineer
- Insulation Worker (Heat & Frost)
- Iron Worker (Assembler, Metal Buildings)
- Painter / Decorator
- Plasterer
- Plumber
- Roofer / Waterproofer
- Sheet Metal Worker
- Sprinkler Fitter
- Steamfitter (Service & Refrigeration)
- Taper & Finisher
- Telecommunications (Voice, Data & Video) Installer / Technician
- Tile Setter

END OF SECTION

SECTION 00 73 11

FAIR LABOR PRACTICES CERTIFICATION

The undersigned, for and on behalf of the BIDDER, APPLICANT or PROPOSER named herein, certifies as follows:

A. That he or she is an officer or duly authorized agent of the above-referenced BIDDER, APPLICANT or PROPOSER, which has a submitted a bid, application or proposal for a contract or agreement with the county of Dane.

B. That BIDDER, APPLICANT or PROPOSER has (check one):

_____ not been found by the National Labor Relations Board ("NLRB") or the Wisconsin Employment Relations Commission ("WERC") to have violated any statute or regulation regarding labor standards or relations in the seven years prior to the signature date of this Certification.

_____ been found by the National Labor Relations Board ("NLRB") or the Wisconsin Employment Relations Commission ("WERC") to have violated any statute or regulation regarding labor standards or relations in the seven years prior to the signature date of this Certification.

_____ _____

Officer or Authorized Agent Signature Date

_____

Printed or Typed Name and Title

_____

Printed or Typed Business Name

NOTE: You can find information regarding the violations described above at: www.nlrb.gov and werc.wi.gov.

For reference, Dane County Ordinance 25.09 is as follows:

(1) BIDDER RESPONSIBILITY. (a) Any bid, application or proposal for any contract with the county, including public works contracts regulated under chapter 40, shall include a certification indicating whether the bidder has been found by the National Labor Relations Board (NLRB) or the Wisconsin Employment Relations Committee (WERC) to have violated any statute or regulation regarding labor standards or relations within the last seven years. The Controller shall investigate any such finding and make a recommendation to the committee, which shall determine whether the conduct resulting in the finding affects the bidder's responsibility to perform the contract.

If you indicated that the NLRB or WERC have found you to have such a violation, you must include copies of any relevant information regarding such violation with your proposal, bid or application.

Include this completed Certification with your bid, application or proposal.

END OF SECTION

SECTION 01 00 00

GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Summary
2. Summary of the Work
3. Contractor Use of Premises
4. Applications for Payment
5. Change Procedures
6. Alternates
7. Lump Sum Allowances for Work
8. Coordination
9. Cutting and Patching
10. Conferences
11. Progress Meetings
12. Job Site Administration
13. Submittal Procedures
14. Proposed Products List
15. Shop Drawings
16. Product Data
17. Samples
18. Manufacturers' Instructions
19. Manufacturers' Certificates
20. Quality Assurance / Quality Control of Installation
21. References
22. Interior Enclosures
23. Protection of Installed Work
24. Parking
25. Staging Areas
26. Occupancy During Construction and Conduct of Work
27. Protection
28. Progress Cleaning
29. Products
30. Transportation, Handling, Storage and Protection
31. Product Options
32. Substitutions
33. Starting Systems
34. Demonstration and Instructions
35. Contract Closeout Procedures
36. Final Cleaning
37. Adjusting
38. Operation and Maintenance Data
39. Spare Parts and Maintenance Materials

40. As-Built and Record Drawings and Specifications

1.2 SUMMARY OF THE WORK

A. Project Description: Perform the Work as specified and detailed in Construction Documents package. Contractor to provide cast in place concrete vault and all associated work. Provide new electrical equipment in reconfigured courthouse electrical room including new main overcurrent protective device. Schedule and coordinate site utility relocation work by MG&E and shore/protect utilities remaining in place including but not limited to water and fiber optic lines for Century Link and Charter Communications. See Figure 1.0 for MG&E vault details.

B. Permits: Prior to commencement of the Work, Contractor to secure any and all necessary permits for completion of the Work and facility occupancy. Provide Public Works Project Manager with copies of all permits.

C. Diggers Hotline:
1. It is General Contractor's responsibility to contact Diggers Hotline to have all utility locations marked prior to excavation and planning excavation so as not to delay the Work.
2. Diggers Hotline shall also be used to obtain information on safe working clearances from overhead lines.
3. Completely comply with all requirements of each affected utility company.
4. It is General Contractor's responsibility to contact & hire private utility locating services if necessary.

1.3 CONTRACTOR USE OF PREMISES

A. Limit use of premises to allow work by Contractors or Subcontractors and access by Owner.

B. Coordinate utility outages and shutdowns with Owner.

1.4 APPLICATIONS FOR PAYMENT

A. Submit one (1) original copies with "wet" signatures of each application on AIA G702™ and G703™ forms or approved contractors invoice form.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Payment Period: Monthly.

D. Submit Applications for Payment to Architect / Engineer for initial approval. Architect / Engineer will forward approved copies to Owner who will also approve & process for payment.

E. Submit Applications for Payment to Public Works Project Manager for approval & processing for payment.

1.5 CHANGE PROCEDURES

A. Contractor's costs for Products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from contingency allowance.

1.6 LUMP SUM ALLOWANCES FOR WORK

A. Include in Base Bid lump sum allowance of $225,000 for MG&E scope of work. Relocation of 4" gas main and service to window around electric structure. Relocation of duct package including new elbows, switches, transformers, protectors, secondary conductors and secondary bus bars in the new vault. Allowance shall include all necessary labor, equipment, materials, plus cost for delivery, installation, insurance, overhead, profit and applicable taxes. Coordinate this with Public Works Project Manager & Architect / Engineer. .

1.7 COORDINATION

A. Coordinate scheduling, submittals, and work of various sections of Specifications to assure efficient and orderly sequence of installation of interdependent construction elements.

B. Verify utility requirement characteristics of operating equipment are compatible with building utilities.

C. Coordinate space requirements and installation of mechanical and electrical work that are indicated diagrammatically on Drawings.

D. Contractor shall provide Public Works Project Manager with work plan that ensures the Work will be completed within required time of completion.

1.8 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching new work; restore work with new Products.

B. Submit written request in advance of cutting or altering structural or building enclosure elements.

C. Fit work tight to adjacent elements. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

D. Refinish surfaces to match adjacent finishes.

1.9 CONFERENCES

A. Project shall have pre-bid conference; see Instructions to Bidders.

B. Owner will schedule preconstruction conference after Award of Contract for all affected parties.

C. Contractor shall submit Construction Schedule at pre-construction meeting.

D. When required in individual Specification section, convene pre-installation conference at project site prior to commencing work of Section.

1.10 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at minimum of one (1) per week with Public Works.

B. Preside at meetings, record minutes, and distribute copies within two (2) business days to those affected by decisions made.

C. Attendance at progress meetings by General Contractor, subcontractors, or their authorized representative, is mandatory.

D. Contractors shall give verbal reports of progress on the Work, discuss schedule for upcoming period and present all conflicts, discrepancies or other difficulties for resolution.

E. Day & time of progress meetings to be determined at pre-construction meeting.

1.11 JOB SITE ADMINISTRATION

A. Contractor shall have project superintendent on site minimum of eight (8) hours per week during progress of the Work.

B. Contractor shall not change their project superintendent or project manager for duration of the Work without written permission of Public Works Project Manager.

C. Architect / Engineer shall have representative on site two (2) hours per week on average during progress of the Work.

1.12 SUBMITTAL PROCEDURES

A. Submittal form to identify Project, Contractor, Subcontractor or supplier; and pertinent Construction Documents references.

B. Apply Contractor's stamp, signed or initialed, certifying that review, verification of Products required, field dimensions, adjacent construction work, and coordination of information is in accordance with requirements of the Work and Construction Documents.

C. Identify variations from Construction Documents and Product or system limitations that may be detrimental to successful performance of completing the Work.

D. Revise and resubmit submittals as required; identify all changes made since previous submittal.

1.13 PROPOSED PRODUCTS LIST

A. Within fifteen (15) business days after date of Award of Contract, submit complete list of major Products proposed for use, with name of manufacturer, trade name, and model number of each Product.

1.14 SHOP DRAWINGS

A. Submit number of copies that Contractor requires, plus three (3) copies that shall be retained by Public Works Project Manager.

1.15 MANUFACTURERS' INSTRUCTIONS

A. When specified in individual Specification sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

1.16 MANUFACTURERS' CERTIFICATES

A. When specified in individual Specification sections, submit manufacturers' certificate to Public Works Project Manager for review, in quantities specified for Product Data.

B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

1.17 QUALITY ASSURANCE / QUALITY CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply fully with manufacturers' instructions.

C. Comply with specified standards as minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

1.18 REFERENCES

A. Conform to reference standard by date of issue current as of date for receiving bids.

B. Should specified reference standard conflict with Construction Documents, request clarification from Public Works Project Manager before proceeding.

1.19 INTERIOR ENCLOSURES

A. Provide temporary partitions as required to separate work areas from Owner occupied areas, to prevent distribution of dust and moisture into Owner occupied areas, and to prevent damage to existing materials and equipment.

1.20 PROTECTION OF INSTALLED WORK

A. Protect installed work and provide special protection where specified in individual Specification sections.

1.21 PARKING

A. Arrange for temporary parking areas to accommodate construction personnel. Parking shall not be available at the Work site.

B. All contractors and their employees shall cooperate with General Contractor and others in parking of vehicles to avoid interference with normal operations and construction activities.

C. Do not obstruct existing service drives and parking lots with equipment, materials and / or vehicles. Keep accessible for Owner's use at all times.

1.22 STAGING AREAS

A. Coordinate staging areas with Public Works Project Manager prior to starting the Work.

B. On-site space for use as staging areas and storage of materials is limited and will be apportioned among various Contractors as their needs dictate with due regard for storage requirements of each Contractor. Each Contractor shall be responsible for safety of equipment and materials that are stored on site.

1.23 OCCUPANCY DURING CONSTRUCTION AND CONDUCT OF WORK

A. Contractors are asked to not work at facility if they are ill with something contagious.

B. All contractors are expected to leave work areas in conditions; such that area can be occupied immediately upon leaving area.

C. Smoking is prohibited on Dane County property.

D. Dane County Sheriff's Office will supply two escorts for duration of the Work. If there are changes in work schedule, 48 hour notice would be appreciated.

E. Any Contractor employee, or group of employees, inside inmate occupied area of Jail must be with one of two assigned escorts at all times. It will not be required to have escort present when working non-inmate occupied areas.

F. Owner reserves right at any time to dismiss from premises any Contractor or construction personnel that do not uphold requirements of this Section.

G. Owner shall not be held liable for any lost time, wages, or impacts to construction schedule by any Contractor or construction personnel dismissed for failure to uphold requirements of this Section.

H. Areas of existing facility will be occupied during period when the Work is in progress. Work may be done during normal business hours (8:00 am to 4:30 pm), but confer with Owner, schedule work and store materials so as to interfere as little as possible with normal use of premises. Work performed on Saturday shall be by permission of Owner. Notify Owner when coring or similar noise making work is to be done and obtain Owner's written approval of schedule. If schedule is not convenient for Owner, reschedule and resubmit new times for Owner approval. Coring of floor along with other noisy work may have to be done on second and third shifts.

I. Work shall be done and temporary facilities furnished so as not to interfere with access to any occupied area and so as to cause least possible interference with normal operation of facility or any essential service thereof.

J. Contractor shall, at all times, provide approved, safe walkways and facility entrances for use by Owner, employees and public.

K. Contractor shall provide adequate protection for all parts of facility, its contents and occupants wherever the Work under this Contract is to be performed.

L. Each Contractor shall arrange with Owner to make necessary alterations, do new work, make connections to all utilities, etc., and at such times as will not cause interruption of utility services to facility. Contractor doing this work shall protect, cap, cut off and / or replace and relocate existing pipes, electrical work and other active utilities encountered which may interfere with new construction work.

M. New work in extension of existing work shall correspond in all respects with that to which it connects or similar existing work unless otherwise indicated or specified.
   1. Existing work shall be cut, altered, removed or replaced as necessary for performance of Contract obligations.
   2. Work remaining in place, damaged or defaced by reason of work done under this Contract shall be restored equal to its condition at time of Award of Contract.
   3. If removal of work exposes discolored or unfinished surfaces or work out of alignment, such surfaces shall be refinished or materials replaced as necessary to make continuous work uniform and harmonious.

N. Contractor is responsible for providing & maintaining temporary toilet facilities.

1.24 PROTECTION

A. Contractor shall protect from damage / injury all trees, shrubs, hedges, plantings, grass, mechanical, electrical & plumbing equipment, walks and driveways and pay for any damage to same resulting from insufficient or improper protection.

B. Contractor shall provide and maintain Jersey barrier perimeter with top fencing & signage to prohibit public access to construction site.

C. Contractor shall provide and maintain guard lights at all barricades, railings, obstructions in streets, roads or sidewalks and at all trenches adjacent to public walks or roads.

D. Contractor shall provide sheet plating over roadway excavation to allow for vehicular travel

1.25 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.

1.26 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components specifically identified for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically identified or allowed by Construction Documents.

1.27 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

A. Transport, handle, store and protect Products in accordance with manufacturer's instructions.

1.28 PRODUCT OPTIONS

A. Where definite material is specified, it is not intentional to discriminate against "equal" product made by another manufacturer. Intention is to set definite standard of material quality. Should bidder choose to bid materials other than those specified, bidder shall submit said materials specifications to Public Works Project Manager for approval at least seven (7) business days prior to Bid Due Date.

B. Products and materials that are not specified, but have been approved for use by Public Works Project Manager shall be identified in addenda to all bidding contractors.

C. Requests for material or product substitutions submitted after Bid Due Date may be considered. Owner reserves right to approve or reject substitutions based on Specification requirements and intended use.

1.29 SUBSTITUTIONS

A. Public Works Project Manager shall consider requests for Substitutions only up to seven (7) business days prior to date of Bid Due Date.

B. Document each request with complete data substantiating compliance of proposed Substitution with Construction Documents.

C. Submit three (3) copies of requests for Substitution for consideration. Limit each request to one (1) proposed Substitution.

D. Substitutions shall not change contract price established at Bid Due Date.

1.30 STARTING SYSTEMS

A. Provide written notification prior to start-up of each equipment item or system.

B. Ensure that each piece of equipment or system is ready for operation.

C. Execute start-up under supervision of responsible persons in accordance with manufacturers' instructions.

D. Submit written report that equipment or system has been properly installed and is functioning correctly.

1.31 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel prior to date of final inspection.

B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at designated location.

C. Owner may choose to photograph or videotape demonstration session; demonstration and demonstrator shall be to level of satisfaction of Owner.

1.32 CONTRACT CLOSEOUT PROCEDURES

A. Submit written certification that Construction Documents have been reviewed, the Work has been inspected, and the Work is complete in accordance with Construction Documents and ready for Public Works Project Manager's inspection.

B. Submit final Application for Payment identifying total adjusted Contract Sum / Price, previous payments, and amount remaining due.

1.33 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean interior and exterior surfaces exposed to view.

C. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.34 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.35 OPERATION AND MAINTENANCE MANUAL

A. Provide two (2) bound, hard-copy operation and maintenance manuals that include all systems, materials, products, equipment, mechanical and electrical equipment and systems supplied and installed in the Work. Provide electronic version of operation and maintenance manual also.

1.36 AS-BUILT AND RECORD DRAWINGS AND SPECIFICATIONS

A. Contractor-produced Drawings and Specifications shall remain property of Contractor whether Project for which they are made is executed or not. Contractor shall furnish Architect / Engineer with original marked up redlines of Construction Documents' drawings and specifications that shall include all Addendums, Change Orders, Construction Bulletins, on-site changes, field corrections, etc. These are project As-Built Drawings & Specifications.

B. Architect / Engineer, shall update original Construction Documents to include all Addendums & any other changes including those provided by Contractor in As-Built Drawings & Specifications. These updates are project Record Drawings & Specifications.

C. Architect / Engineer shall furnish Public Works Project Manager with Record Drawings as detailed in Professional Services Agreement.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT, DISPOSAL & RECYCLING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Summary
2. Waste Management Goals
3. Construction and / or Demolition Waste Management
4. Waste Management Plan
5. Reuse
6. Recycling
7. Materials Sorting and Storage On Site
8. Lists of Recycling Facilities Processors and Haulers
9. Waste Management Plan Form

B. Related Sections:
1. Section 01 00 00 - General Requirements

1.2 WASTE MANAGEMENT GOALS

A. Dane County requires that as many waste materials as possible produced as result of this project be salvaged, reused or recycled in order to minimize impact of construction waste on landfills and to minimize expenditure of energy and cost in fabricating new materials. Additional information may be found in Dane County Green Building Policy, Resolution 299, 1999-2000.

1.3 CONSTRUCTION AND / OR DEMOLITION WASTE MANAGEMENT

A. All construction and demolition waste suitable for recycling must go to Dane County Construction & Demolition Recycling Facility located at 7102 US Hwy 12, Madison, located across from Yahara Hills Golf Course. This facility can receive mixed loads of construction and demolition waste. For complete list of acceptable materials see www.countyofdane.com/pwht/recycle/CD_Recycle.aspx.

B. Dane County Landfill, also at 7102 US Hwy 12, Madison, must receive all other waste from this project. www.countyofdane.com/pwht/recycle/landfill.aspx.

1.4 WASTE MANAGEMENT PLAN

A. Contractor shall develop Waste Management Plan (WMP) for this project. Dane County's Special Projects & Materials Manager may be contacted with questions. Outlined in RECYCLING section of this specification are examples of materials that can be recycled or reused as well as recommendations for waste sorting methods.

B. Contractor shall complete WMP and include cost of recycling / reuse in Bid. WMP will be submitted to Public Works Project Manager within fifteen (15) business days of Bid Due date. Copy of blank WMP form is in this Section. Submittal shall include cover letter and WMP form with:

1. Information on:
   a. Types of waste materials produced as result of work performed on site;
   b. Estimated quantities of waste produced;
   c. Identification of materials with potential to be recycled or reused;
   d. How materials will be recycled or reused;
   e. On-site storage and separation requirements (on site containers);
   f. Transportation methods; and
   g. Destinations.

1.5 REUSE

A. Contractors and subcontractors are encouraged to reuse as many waste materials as possible. Salvage should be investigated for materials not reusable on site.

1.6 RECYCLING

A. These materials must be recycled at Dane County Construction & Demolition Recycling Facility:

1. Wood.
2. Wood Pallets.
3. PVC Plastic (pipe, siding, etc.).
4. Asphalt & Concrete.
5. Bricks & Masonry.
6. Vinyl Siding.
7. Cardboard.
8. Metal.
9. Unpainted Gypsum Drywall.
10. Shingles.

B. These materials can be recycled elsewhere in Dane County area:

1. Fluorescent Lamps.
2. Foam Insulation & Packaging (extruded and expanded).
3. Carpet Padding.
4. Barrels & Drums.

C. All materials must be recycled at WDNR permitted waste processing facilities that adhere to all State Statutes.

1.7 MATERIALS SORTING AND STORAGE ON SITE

A. Contractor shall provide separate containers for recyclable materials. Number of containers will be dependent upon project and site conditions.

B. Contractor shall provide on-site locations for subcontractors supplied recycling containers to help facilitate recycling.

C. Mixed loads of recycled materials are allowed only per instructions at www.countyofdane.com/pwht/recycle/CD_Recycle.aspx.

1.8 LISTS OF RECYCLING FACILITIES PROCESSORS AND HAULERS

A. Refer to www.countyofdane.com/pwht/recycle/CD_Recycle.aspx for information on Dane County Construction & Demolition Recycling Facility.

B. Web site www.countyofdane.com/pwht/recycle/categories.aspx lists current information for Dane County Recycling Markets. Contractors can also contact Allison Rathsack at 608/266-4990, or local city, village, town recycling staff listed at site www.countyofdane.com/pwht/recycle/contacts.aspx. Statewide listings of recycling / reuse markets are available from UW Extension at https://www.uwgb.edu/shwec/.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

WASTE MANAGEMENT PLAN FORM

Contractor Name: _____

Address: _____

_____

Phone No.: _____ Recycling Coordinator: _____

MATERIAL	ESTIMATED QUANTITY	DISPOSAL METHOD (CHECK ONE)	RECYCLING / REUSE COMPANY OR DISPOSAL SITE
Salvaged & reused building materials	_____ cu. yds. _____ tons	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Wood	_____ cu. yds. _____ tons	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Wood Pallets	_____ units	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
PVC Plastic	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Asphalt & Concrete	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Bricks & Masonry	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Vinyl Siding	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Cardboard	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Metals	_____ cu. yds. _____ tons	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Unpainted Gypsum / Drywall	_____ cu. yds. _____ tons	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Shingles	_____ cu. yds. _____ tons	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Fluorescent Lamps	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Foam Insulation	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Carpet Padding	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Barrels & Drums	_____ units	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Glass	_____ cu. yds. _____ tons	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____

WASTE MANAGEMENT PLAN FORM

Other	_____	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Other	_____	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Other	_____	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Other	_____	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Other	_____	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

SUMMARY

Section Includes:

Demolition and removal of selected site elements.

DEFINITIONS

Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

Authorized Additional Excavation: Excavation beyond indicated lines and dimensions as directed by Architect/Engineer. Authorized additional excavation will be paid for according to Contract provisions for changes in the Work.

Unauthorized Excavation: Excavation beyond indicated lines and dimensions without direction by Architect/Engineer. Unauthorized excavation shall be without additional compensation.

MATERIALS OWNERSHIP

Unless otherwise indicated, demolition waste becomes property of Contractor.

Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

Carefully salvage in a manner to prevent damage and promptly return to Owner.

PREINSTALLATION MEETINGS

Conduct meeting as part of the overall pre-construction meeting.

INFORMATIONAL SUBMITTALS

Proposed Protection Measures: Submit brief narrative that indicates the measures proposed for protecting individuals and property**,** dust control, and noise control]. Indicate proposed locations and construction of barriers.

Schedule of selective demolition activities with starting and ending dates for each activity.

Predemolition photographs or video.

CLOSEOUT SUBMITTALS

Inventory of items that have been removed and salvaged.

FIELD CONDITIONS

Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

Notify Architect/Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

Storage or sale of removed items or materials on-site is not permitted.

Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

Maintain fire-protection facilities in service during selective demolition operations.

Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

PERFORMANCE REQUIREMENTS

Regulatory Requirements: Comply with Wisconsin DNR and City of Madison Department of Public Works notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

SOIL MATERIALS

Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

PART 3 - EXECUTION

EXAMINATION

Verify that utilities have been disconnected and capped before starting selective demolition operations.

Field verify the existing condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

Inventory and record the condition of items to be removed and salvaged.

EXCAVATION FOR STRUCTURES

Conform to Article 201 – Excavation Cut and Article 203 – Removal of Miscellaneous Structures of City of Madison Standard Specifications for Public Works Construction. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

EXCAVATION FOR WALKS AND PAVEMENTS

Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

On prepared subgrade, place subbase course and base course under pavements and walks as follows:

Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.

Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to the Modified Proctor Test.

EXCAVATION FOR UTILITY TRENCHES

Excavate trenches to indicated gradients, lines, depths, and elevations.

Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

Clearance: 12 inches each side of pipe or conduit.

Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

UTILITY TRENCH BACKFILL

Place backfill on subgrades free of mud, frost, snow, or ice.

Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

Trenches under Roadways: Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course.

Initial Backfill: Place and compact initial backfill of subbase material, free of particles larger than 1 inchin any dimension, to a height of 12 inches over the pipe or conduit.

Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing. Compact at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to the Modified Proctor Test.

Final Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.

Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to the Modified Proctor Test.

Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

Arrange to shut off utilities with utility companies.

If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

Disconnect, demolish, and remove, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.

Equipment to Be Removed: Disconnect and cap services and remove equipment.

Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

PROTECTION

Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

Remove temporary barricades and protections where hazards no longer exist.

SELECTIVE DEMOLITION

General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

Neatly cut openings plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.

Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

Maintain fire watch during and for at least 4 hours after flame-cutting operations.

Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

Dispose of demolished items and materials promptly.

Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

Removed and Salvaged Items:

Clean salvaged items.

Pack or crate items after cleaning. Identify contents of containers.

Store items in a secure area until delivery to Owner.

Transport items to Owner's storage area designated by Owner.

Protect items from damage during transport and storage.

Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition, cleaned, and reinstalled in their original locations after selective demolition operations are complete.

CLEANING

Remove demolition waste materials from Project site and dispose of them**.**

Do not allow demolished materials to accumulate on-site.

Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

Burning: Do not burn demolished materials.

Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

SUMMARY

Section Includes:

- Form-facing material for cast-in-place concrete.
- Shoring, bracing, and anchoring.

Related Requirements:

- Section 321313 "Concrete Paving" for formwork related to concrete pavement and walks.

DEFINITIONS

Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

PREINSTALLATION MEETINGS

Preinstallation Conference: Conduct conference at Project site

Review the following:

- Inspection and testing and inspecting agency procedures for field quality control.
- Construction, movement, contraction, and isolation joints
- Forms and form-removal limitations.
- Shoring and reshoring procedures.
- Anchor rod and anchorage device installation tolerances.

ACTION SUBMITTALS

Product Data: For each of the following:

- Concealed surface form-facing material.
- Form ties.

Waterstops.

Form-release agent.

Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.

For exposed vertical concrete walls, indicate dimensions and form tie locations.

Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.

Location of construction joints is subject to approval of the Architect.

Indicate location of waterstops.

Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.

Samples:

For waterstops.

INFORMATIONAL SUBMITTALS

Qualification Data: For testing and inspection agency.

Field quality-control reports.

Minutes of preinstallation conference.

QUALITY ASSURANCE

Testing and Inspection Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

DELIVERY, STORAGE, AND HANDLING

Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

PERFORMANCE REQUIREMENTS

Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."

Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

For architectural concrete specified in Section 033300 "Architectural Concrete," limit deflection of form-facing material, studs, and walers to 0.0025 times their respective clear spans (L/400).

Design, engineer, erect, shore, brace, and maintain insulating concrete forms in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

Design cross ties to transfer the effects of the following loads to the cast-in-place concrete core:

Wind Loads: As indicated on Drawings.

Horizontal Deflection Limit: Not more than 1/360of the wall height.

FORM-FACING MATERIALS

As-Cast Surface Form-Facing Material:

Provide continuous, true, and smooth concrete surfaces.

Furnish in largest practicable sizes to minimize number of joints.

Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:

Plywood, metal, or other approved panel materials.

Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

APA HDO (high-density overlay).

APA MDO (medium-density overlay); mill-release agent treated and edge sealed.

APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.

APA Plyform Class I, B-B or better; mill oiled and edge sealed.

Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

Provide lumber dressed on at least two edges and one side for tight fit.

WATERSTOPS

Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Carlisle Coatings & Waterproofing Inc.

CETCO, a Minerals Technologies company.

Concrete Sealants Inc.

Henry Company.

JP Specialties, Inc.

Sika Corporation.

RELATED MATERIALS

Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

Formulate form-release agent with rust inhibitor for steel form-facing materials.

Form release agent for form liners shall be acceptable to form liner manufacturer.

Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.

Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.

Furnish ties with integral water-barrier plates to walls indicated to receive waterproofing.

PART 3 - EXECUTION

INSTALLATION OF FORMWORK

Comply with ACI 301.

Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes .

Limit concrete surface irregularities as follows:

Surface Finish-3.0: ACI 117 Class A, 1/8 inch

Construct forms tight enough to prevent loss of concrete mortar.

Minimize joints.

Exposed Concrete: Symmetrically align joints in forms.

Construct removable forms for easy removal without hammering or prying against concrete surfaces.

Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.

Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

Install keyways, reglets, recesses, and other accessories, for easy removal.

Do not use rust-stained, steel, form-facing material.

Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

Provide and secure units to support screed strips

Use strike-off templates or compacting-type screeds.

Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.

Locate temporary openings in forms at inconspicuous locations.

Chamfer exterior corners and edges of permanently exposed concrete.

At construction joints, overlap forms onto previously placed concrete not less than 12 inches.

Form openings, chases, offsets, sinkages, keyways, blocking, screeds, and bulkheads required in the Work.

Determine sizes and locations from trades providing such items.

Obtain written approval of Architect prior to forming openings not indicated on Drawings.

Construction and Movement Joints:

Construct joints true to line with faces perpendicular to surface plane of concrete.

Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

Place joints perpendicular to main reinforcement.

Locate joints for beams, slabs, joists, and girders in the middle third of spans.

Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

Space vertical joints in walls as indicated on Drawings .

Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.

Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

INSTALLATION OF EMBEDDED ITEMS

Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

Clean embedded items immediately prior to concrete placement.

INSTALLATION OF WATERSTOPS

Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings, according to manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing into place.

Install in longest lengths practicable.

Locate waterstops in center of joint unless otherwise indicated on Drawings.

Protect exposed waterstops during progress of the Work.

REMOVING AND REUSING FORMS

Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg Ffor 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.

Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

Clean and repair surfaces of forms to be reused in the Work.

Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.

Apply new form-release agent.

When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

Align and secure joints to avoid offsets.

Do not use patched forms for exposed concrete surfaces unless approved by Architect.

SHORING AND RESHORING INSTALLATION

Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

Do not remove shoring or reshoring until measurement of slab tolerances is complete.

In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

FIELD QUALITY CONTROL

Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

Inspections:

Inspect formwork for shape, location, and dimensions of the concrete member being formed.

Inspect insulating concrete forms for shape, location, and dimensions of the concrete member being formed.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

SUMMARY

Section Includes:

- Steel reinforcement bars.
- Welded-wire reinforcement.

Related Requirements:

- Section 321313 "Concrete Paving" for reinforcing related to concrete pavement and walks.

PREINSTALLATION MEETINGS

Preinstallation Conference: Conduct conference at Project site.

Review the following:

- Inspection and testing and inspecting agency procedures for field quality control.
- Construction contraction and isolation joints.
- Steel-reinforcement installation.

ACTION SUBMITTALS

Product Data: For the following:

- Each type of steel reinforcement.
- Epoxy repair coating.
- Zinc repair material.
- Bar supports.

Shop Drawings: Comply with ACI SP-066:

- Include placing drawings that detail fabrication, bending, and placement.

Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

Construction Joint Layout: Indicate proposed construction joints required to build the structure.

Location of construction joints is subject to approval of the Architect.

INFORMATIONAL SUBMITTALS

Qualification Statements: For testing and inspection agency.

Welding certificates.

Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M

Material Certificates: For each of the following, signed by manufacturers:

Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."

Material Test Reports: For the following, from a qualified testing agency:

Steel Reinforcement:

For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

Field quality-control reports.

Minutes of preinstallation conference.

QUALITY ASSURANCE

Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

DELIVERY, STORAGE, AND HANDLING

Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. and to avoid damaging coatings on steel reinforcement.

Store reinforcement to avoid contact with earth.

Do not allow epoxy-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.

Do not allow dual-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.

PART 2 - PRODUCTS

STEEL REINFORCEMENT

Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

Low-Alloy Steel Reinforcing Bars: ASTM A706/A706M, deformed.

Headed-Steel Reinforcing Bars: ASTM A970/A970M.

Epoxy-Coated Reinforcing Bars:

Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.

Epoxy Coating: ASTM A775/A775M or ASTM A934/A934M with less than 2 percent damaged coating in each 12-inch bar length.

Epoxy-Coated Welded-Wire Reinforcement: ASTM A884/A884M, Class A coated, Type 1, plain steel.

REINFORCEMENT ACCESSORIES

Epoxy-Coated Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, ASTM A775/A775M epoxy coated.

Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.

For dual-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.

For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

For stainless steel reinforcement, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

Finish: ASTM A884/A884M, Class A, Type 1, epoxy coated, with less than 2 percent damaged coating in each 12-inch wire length.

Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A775/A775M.

FABRICATING REINFORCEMENT

Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

PREPARATION

Protection of In-Place Conditions:

Do not cut or puncture vapor retarder.

Repair damage and reseal vapor retarder before placing concrete.

Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

INSTALLATION OF STEEL REINFORCEMENT

Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

Accurately position, support, and secure reinforcement against displacement.

Locate and support reinforcement with bar supports to maintain minimum concrete cover.

Do not tack weld crossing reinforcing bars.

Preserve clearance between bars of not less than 1 inch , not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

Provide concrete coverage in accordance with ACI 318.

Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

Splices: Lap splices as indicated on Drawings.

Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.

Stagger splices in accordance with ACI 318.

Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.

Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.

Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating in accordance with ASTM D3963/D3963M.

JOINTS

Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

Place joints perpendicular to main reinforcement.

Continue reinforcement across construction joints unless otherwise indicated.

Do not continue reinforcement through sides of strip placements of floors and slabs.

Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

INSTALLATION TOLERANCES

Comply with ACI 117.

FIELD QUALITY CONTROL

Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

Inspections:

Steel-reinforcement placement.

END OF SECTION 032000

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

SUMMARY

Section Includes:

- Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

Related Requirements:

- Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
- Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
- Section 321313 "Concrete Paving" for concrete pavement and walks.

DEFINITIONS

Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

PREINSTALLATION MEETINGS

Preinstallation Conference: Conduct conference at Project site.

Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

- Contractor's superintendent.
- Independent testing agency responsible for concrete design mixtures.
- Ready-mix concrete manufacturer.
- Concrete Subcontractor.
- Special concrete finish Subcontractor.

Review the following:

- Inspection and testing and inspecting agency procedures for field quality control.
- Construction joints, control joints, isolation joints, and joint-filler strips.
- Vapor-retarder installation.
- Anchor rod and anchorage device installation tolerances.
- Cold and hot weather concreting procedures.
- Concrete finishes and finishing.
- Curing procedures.
- Forms and form-removal limitations.
- Shoring and reshoring procedures.
- Methods for achieving specified floor and slab flatness and levelness.
- Concrete repair procedures.
- Concrete protection.
- Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
- Protection of field cured field test cylinders.

ACTION SUBMITTALS

Product Data: For each of the following.

- Portland cement.
- Fly ash.
- Slag cement.
- Aggregates.
- Admixtures:

  Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

- Vapor retarders.
- Floor and slab treatments.

Curing materials.

Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.

Joint fillers.

Repair materials.

Design Mixtures: For each concrete mixture, include the following:

Mixture identification.

Minimum 28-day compressive strength.

Durability exposure class.

Maximum w/cm.

Calculated equilibrium unit weight, for lightweight concrete.

Slump limit.

Air content.

Nominal maximum aggregate size.

Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.

Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.

Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.

Intended placement method.

Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

Shop Drawings:

Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

Location of construction joints is subject to approval of the Architect.

Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

Concrete Class designation.

Location within Project.

Exposure Class designation.

Formed Surface Finish designation and final finish.

Final finish for floors.

Curing process.

Floor treatment if any.

INFORMATIONAL SUBMITTALS

Qualification Data: For the following:

Installer: Include copies of applicable ACI certificates.

Ready-mixed concrete manufacturer.

Testing agency: Include copies of applicable ACI certificates.

Material Certificates: For each of the following, signed by manufacturers:

Cementitious materials.

Admixtures.

Curing compounds.

Floor and slab treatments.

Bonding agents.

Adhesives.

Vapor retarders.

Repair materials.

Material Test Reports: For the following, from a qualified testing agency:

Portland cement.

Fly ash.

Slag cement.

Aggregates.

Admixtures:

Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

Research Reports:

For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.

For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.

Preconstruction Test Reports: For each mix design.

Field quality-control reports.

Minutes of preinstallation conference.

QUALITY ASSURANCE

Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician with experience installing and finishing concrete, incorporating permeability-reducing admixtures.

Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

Field Quality Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

Personnel conducting field tests shall be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

PRECONSTRUCTION TESTING

Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

Include the following information in each test report:

Admixture dosage rates.

Slump.

Air content.

Seven-day compressive strength.

28-day compressive strength.

Permeability.

DELIVERY, STORAGE, AND HANDLING

Comply with ASTM C94/C94M and ACI 301.

FIELD CONDITIONS

Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

Do not use frozen materials or materials containing ice or snow.

Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.

Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

Maintain concrete temperature at time of discharge to not exceed 95 deg F .

Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

WARRANTY

Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder barrier material and accessories for sheet vapor retarder barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

CONCRETE, GENERAL

ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

CONCRETE MATERIALS

Source Limitations:

Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.

Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.

Obtain aggregate from single source.

Obtain each type of admixture from single source from single manufacturer.

Cementitious Materials:

Portland Cement: ASTM C150/C150M, Type I, gray.

Fly Ash: ASTM C618, Class C or F.

Slag Cement: ASTM C989/C989M, Grade 100 or 120.

Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

Alkali-Silica Reaction: Comply with one of the following:

Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.

Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.

Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.

Maximum Coarse-Aggregate Size: 1 inch nominal.

Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

Air-Entraining Admixture: ASTM C260/C260M.

Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

Water-Reducing Admixture: ASTM C494/C494M, Type A.

Retarding Admixture: ASTM C494/C494M, Type B.

Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.

High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.

High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.

Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C494/C494M, Type C.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

BASF Corporation.

Euclid Chemical Company (The); an RPM company.

GCP Applied Technologies Inc.

Sika Corporation.

Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Aggregate Industries (US); Lafarge.

Barrier-Bac; Inteplast Group.

BASF Corporation.

Cortec Corporation.

GCP Applied Technologies Inc.

Specialty Products Group.

Permeability-Reducing Admixture: ASTM C494/C494M, Type S, hydrophilic, permeability-reducing crystalline admixture, capable of reducing water absorption of concrete exposed to hydrostatic pressure (PRAH).

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

AQUAFIN, Inc.

Kryton International Inc.

Xypex Chemical Corporation.

Permeability: No leakage when tested in accordance with U.S. Army Corps of Engineers CRD C48 at a hydraulic pressure of 200 psi for 14 days.

Water and Water Used to Make Ice: ASTM C94/C94M, potable.

VAPOR RETARDERS

Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Barrier-Bac; Inteplast Group.

Fortifiber Building Systems Group.

ISI Building Products.

Poly-America, L.P.

Raven Industries, Inc.

Reef Industries, Inc.

Stego Industries, LLC.

Tex-Trude.

W.R. Meadows, Inc.

CURING MATERIALS

Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

BASF Corporation.

ChemMasters, Inc.

Dayton Superior.

Euclid Chemical Company (The); an RPM company.

Sika Corporation.

W.R. Meadows, Inc.

Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

Color:

Ambient Temperature Below 50 deg F: Black.

Ambient Temperature between 50 deg F and 85 deg F: Any color.

Ambient Temperature Above 85 deg F: White.

Water: Potable or complying with ASTM C1602/C1602M.

Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

ChemMasters, Inc.

Dayton Superior.

Euclid Chemical Company (The); an RPM company.

W.R. Meadows, Inc.

RELATED MATERIALS

Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 in accordance with ASTM D2240.

Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

CONCRETE MIXTURES, GENERAL

Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

Fly Ash or Other Pozzolans: 25 percent by mass.

Slag Cement: 50 percent by mass.

Silica Fume: 10 percent by mass.

Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

Admixtures: Use admixtures in accordance with manufacturer's written instructions.

Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

Use water-reducing admixture in pumped concrete, concrete for underground vault structure slabs, and concrete with a w/cm below 0.50].

Use corrosion-inhibiting admixture in concrete mixtures where indicated.

CONCRETE MIXTURES

Class A: Normal-weight concrete used for footings, grade beams, and tie beams.

Exposure Class: ACI 318-14 F3, S0, W1, C2.

Minimum Compressive Strength: 5000 psi strength at 28 days.

Maximum w/cm: 0.40.

Slump Limit: 3 inches, plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.

Slump Flow Limit: 22 inches, plus or minus 1.5 inches.

Air Content:

Exposure Classes F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size.

Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

CONCRETE MIXING

Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.

For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..

Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

EXAMINATION

Verification of Conditions:

Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.

Do not proceed until unsatisfactory conditions have been corrected.

PREPARATION

Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

Daily access to the Work.

Incidental labor and facilities necessary to facilitate tests and inspections.

Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.

Security and protection for test samples and for testing and inspection equipment at Project site.

INSTALLATION OF EMBEDDED ITEMS

Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

INSTALLATION OF VAPOR RETARDER

Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

Install vapor retarder with longest dimension parallel with direction of concrete pour.

Face laps away from exposed direction of concrete pour.

Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.

Lap joints 6 inches and seal with manufacturer's recommended tape.

Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.

Seal penetrations in accordance with vapor retarder manufacturer's instructions.

Protect vapor retarder during placement of reinforcement and concrete.

Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

JOINTS

Construct joints true to line, with faces perpendicular to surface plane of concrete.

Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.

Place joints perpendicular to main reinforcement.

Continue reinforcement across construction joints unless otherwise indicated.

Do not continue reinforcement through sides of strip placements of floors and slabs.

Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.

Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

CONCRETE PLACEMENT

Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.

Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.

Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

If a section cannot be placed continuously, provide construction joints as indicated.

Deposit concrete to avoid segregation.

Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

Do not use vibrators to transport concrete inside forms.

Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.

Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.

At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

Do not place concrete floors and slabs in a checkerboard sequence.

Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

Maintain reinforcement in position on chairs during concrete placement.

Screed slab surfaces with a straightedge and strike off to correct elevations.

Level concrete, cut high areas, and fill low areas.

Slope surfaces uniformly to drains where required.

Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.

Do not further disturb slab surfaces before starting finishing operations.

FINISHING FORMED SURFACES

As-Cast Surface Finishes:

ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

Patch voids larger than 3/4 inch wide or 1/2 inch deep.

Remove projections larger than 1/4 inch.

Patch tie holes.

Surface Tolerance: ACI 117 Class B.

Locations: Apply to concrete surfaces at the electrical vault.

FINISHING FLOORS AND SLABS

Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

Float Finish:

When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.

Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 (ACI A117M) tolerances for conventional concrete.

Apply float finish to surfaces outside the electrical vault on the vault lid.

Trowel Finish:

After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.

Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.

Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

Do not add water to concrete surface.

Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.

Apply a trowel finish to surfaces inside the electrical vault interior slab.

Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:

Slabs on Ground:

Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

Provide a uniform 0.5% downward sloping surface to the sump pump basin.

Suspended Slabs:

Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch

Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

Coordinate required final finish with Architect before application.

INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

Filling In:

Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.

Mix, place, and cure concrete, as specified, to blend with in-place construction.

Provide other miscellaneous concrete filling indicated or required to complete the Work.

CONCRETE CURING

Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.

Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.

Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1,) before and during finishing operations.

Curing Formed Surfaces: Comply with ACI 308.1 as follows:

Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.

If forms remain during curing period, moist cure after loosening forms.

If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.

Continuous Sprinkling: Maintain concrete surface continuously wet.

Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.

Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.

Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

Recoat areas subject to heavy rainfall within three hours after initial application.

Maintain continuity of coating and repair damage during curing period.

Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

Begin curing immediately after finishing concrete.

Interior Concrete Floors:

Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:

Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

Lap edges and ends of absorptive cover not less than 12-inches (300-mm).

Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive.

Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

Cure for not less than seven days.

Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

Water.

Continuous water-fog spray.

Floors to Receive Curing Compound:

Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

Recoat areas subjected to heavy rainfall within three hours after initial application.

Maintain continuity of coating, and repair damage during curing period.

Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer[unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project].

Floors to Receive Curing and Sealing Compound:

Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.

Recoat areas subjected to heavy rainfall within three hours after initial application.

Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

TOLERANCES

Conform to ACI 117.

JOINT FILLING

Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

Defer joint filling until concrete has aged at least one month(s).

Do not fill joints until construction traffic has permanently ceased.

Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

Overfill joint, and trim joint filler flush with top of joint after hardening.

CONCRETE SURFACE REPAIRS

Defective Concrete:

Repair and patch defective areas when approved by Architect.

Remove and replace concrete that cannot be repaired and patched to Architect's approval.

Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

Limit cut depth to 3/4 inch.

Make edges of cuts perpendicular to concrete surface.

Clean, dampen with water, and brush-coat holes and voids with bonding agent.

Fill and compact with patching mortar before bonding agent has dried.

Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.

Compact mortar in place and strike off slightly higher than surrounding surface.

Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

Repairing Unformed Surfaces:

Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.

Correct low and high areas.

Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

After concrete has cured at least 14 days, correct high areas by grinding.

Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.

Finish repaired areas to blend into adjacent concrete.

Correct other low areas scheduled to receive floor coverings with a repair underlayment.

Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

Feather edges to match adjacent floor elevations.

Correct other low areas scheduled to remain exposed with repair topping.

Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.

Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.

Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.

Dampen concrete surfaces in contact with patching concrete and apply bonding agent.

Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.

Place, compact, and finish to blend with adjacent finished concrete.

Cure in same manner as adjacent concrete.

Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.

Dampen cleaned concrete surfaces and apply bonding agent.

Place patching mortar before bonding agent has dried.

Compact patching mortar and finish to match adjacent concrete.

Keep patched area continuously moist for at least 72 hours.

Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

Repair materials and installation not specified above may be used, subject to Architect's approval.

FIELD QUALITY CONTROL

Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.

Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.

Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

Project name.

Name of testing agency.

Names and certification numbers of field and laboratory technicians performing inspections and testing.

Name of concrete manufacturer.

Date and time of inspection, sampling, and field testing.

Date and time of concrete placement.

Location in Work of concrete represented by samples.

Date and time sample was obtained.

Truck and batch ticket numbers.

Design compressive strength at 28 days.

Concrete mixture designation, proportions, and materials.

Field test results.

Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.

Type of fracture and compressive break strengths at seven days and 28 days.

Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

Inspections:

Headed bolts and studs.

Verification of use of required design mixture.

Concrete placement, including conveying and depositing.

Curing procedures and maintenance of curing temperature.

Verification of concrete strength before removal of shores and forms from beams and slabs.

Batch Plant Inspections: On a random basis, as determined by Architect.

Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:

Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

Slump: ASTM C143/C143M:

One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.

Perform additional tests when concrete consistency appears to change.

Slump Flow: ASTM C1611/C1611M:

One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.

Perform additional tests when concrete consistency appears to change.

Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;.

One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

Concrete Temperature: ASTM C1064/C1064M:

One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.

One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

Compression Test Specimens: ASTM C31/C31M:

Cast and laboratory cure two sets of four 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.

Cast, initial cure, and field cure two sets of four standard cylinder specimens for each composite sample.

Compressive-Strength Tests: ASTM C39/C39M.

Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.

Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.

A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.

Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

Additional Tests:

Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.

Acceptance criteria for concrete strength shall be in accordance with ACI 301, section 1.6.6.3.

Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

PROTECTION

Protect concrete surfaces as follows:

Protect from petroleum stains.

Diaper hydraulic equipment used over concrete surfaces.

Prohibit vehicles from interior concrete slabs.

Prohibit placement of steel items on concrete surfaces.

Prohibit use of acids or acidic detergents over concrete surfaces.

END OF SECTION 033000

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

SUMMARY

Section Includes:

- Structural steel.

Related Requirements:

- Section 055000 "Metal Fabrications" for miscellaneous steel fabrications and other steel items not defined as structural steel.

DEFINITIONS

Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

Protected Zone: Structural members or portions of structural members indicated as "protected zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

Demand-Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the seismic-load-resisting system and which are indicated as "demand critical" or "seismic critical" on Drawings.

COORDINATION

Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PREINSTALLATION MEETINGS

Preinstallation Conference: Conduct conference at Project site.

ACTION SUBMITTALS

Product Data:

- Structural-steel materials.

- High-strength, bolt-nut-washer assemblies.

Shear stud connectors.

Threaded rods.

Galvanized repair paint.

Shrinkage-resistant grout.

Shop Drawings: Show fabrication of structural-steel components.

Include details of cuts, connections, splices, camber, holes, and other pertinent data.

Include embedment Drawings.

Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

Identify members and connections of the seismic-load-resisting system.

Indicate locations and dimensions of protected zones.

Identify demand-critical welds.

Identify members not to be shop primed.

Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M for each welded joint whether prequalified or qualified by testing, including the following:

Power source (constant current or constant voltage).

Electrode manufacturer and trade name, for demand-critical welds.

INFORMATIONAL SUBMITTALS

Qualification Data: For fabricator.

Welding certificates.

Mill test reports for structural-steel materials, including chemical and physical properties.

Product Test Reports: For the following:

Bolts, nuts, and washers, including mechanical properties and chemical analysis.

Tension-control, high-strength, bolt-nut-washer assemblies.

Shear stud connectors.

QUALITY ASSURANCE

Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant.

Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.

Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

DELIVERY, STORAGE, AND HANDLING

Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.

Clean and relubricate bolts and nuts that become dry or rusty before use.

Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

PERFORMANCE REQUIREMENTS

Comply with applicable provisions of the following specifications and documents:

ANSI/AISC 303.

ANSI/AISC 341.

ANSI/AISC 360.

RCSC's "Specification for Structural Joints Using High-Strength Bolts."

Connection Design Information:

Option 1: Connection designs have been completed and connections indicated on the Drawings.

STRUCTURAL-STEEL MATERIALS

W-Shapes: ASTM A992/A992M.

Channels, Angles: ASTM A36/A36M.

Plate and Bar: ASTM A36/A36M.

Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C structural tubing.

Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.

Weight Class: Standard.

Finish: Black except where indicated to be galvanized.

Welding Electrodes: Comply with AWS requirements.

BOLTS AND CONNECTORS

Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

Finish: Hot-dip or mechanically deposited zinc coating.

Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, round head assemblies, consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

Finish: Mechanically deposited zinc coating.

Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

RODS

Threaded Rods: ASTM A36/A36M.

Nuts: ASTM A63 hex carbon steel.

Washers: ASTM F436, Type 1, hardened carbon steel.

Finish: Mechanically deposited zinc coating, ASTM B695, Class 50.

SHRINKAGE-RESISTANT GROUT

Metallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

FABRICATION

Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

Camber structural-steel members where indicated.

Fabricate beams with rolling camber up.

Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.

Mark and match-mark materials for field assembly.

Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 3.

Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

SHOP CONNECTIONS

High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

Joint Type: Snug tightened.

Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

GALVANIZING

Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.

Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

Galvanize steel attached to structural-steel frame and located in within the electrical vault structure.

SOURCE QUALITY CONTROL

Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.

Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

Liquid Penetrant Inspection: ASTM E165/E165M.

Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.

Ultrasonic Inspection: ASTM E164.

Radiographic Inspection: ASTM E94/E94M.

In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:

Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.

Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.

Prepare test and inspection reports.

PART 3 - EXECUTION

EXAMINATION

Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

Proceed with installation only after unsatisfactory conditions have been corrected.

PREPARATION

Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

ERECTION

Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

Set plates for structural members on wedges, shims, or setting nuts as required.

Weld plate washers to top of baseplate.

Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure.

Maintain erection tolerances of structural steel within ANSI/AISC 303.

Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.

Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

Splice members only where indicated.

Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

FIELD CONNECTIONS

High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

Joint Type: Snug tightened.

Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

REPAIR

Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

FIELD QUALITY CONTROL

Testing Agency: Engage a qualified testing agency to perform tests and inspections.

Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.

END OF SECTION 051200

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

SUMMARY

Section Includes:

- Metal ladders.
- Metal ships' ladders.
- Elevator pit sump covers.

Related Requirements:

- Section 051200 "Structural Steel Framing" for steel framing, supports, elevator machine beams, hoist beams, divider beams, door frames, and other steel items attached to the structural-steel framing.

ACTION SUBMITTALS

Product Data: For the following:

- Manufactured metal ladders.
- Metal ships' ladders.

Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

- Steel framing and supports for mechanical and electrical equipment.
- Steel framing and supports for applications where framing and supports are not specified in other Sections.
- Metal ladders.
- Metal ships' ladders.
- Elevator pit sump covers.

INFORMATIONAL SUBMITTALS

Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.

Welding certificates.

Research Reports: For post-installed anchors.

QUALITY ASSURANCE

Welding Qualifications: Qualify procedures and personnel in accordance with the following:

AWS D1.1/D1.1M, "Structural Welding Code - Steel."

FIELD CONDITIONS

Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

METALS

Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

Steel Plates, Shapes, and Bars: ASTM A36/A36M.

Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.

Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

FASTENERS

High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.

Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

FABRICATION, GENERAL

Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

Form exposed work with accurate angles and surfaces and straight edges.

METAL LADDERS

General:

Comply with ANSI A14.3.

Steel Ladders:

Space siderails 16 inches apart unless otherwise indicated.

Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.

Rungs: 1-inch-diameter, steel bars.

Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.

Provide nonslip surfaces on top of each rung.

Source Limitations: Obtain nonslip surfaces from single source from single manufacturer.

Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 3/4 inch in least dimension.

Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.

Galvanize ladders, including brackets.

METAL SHIPS' LADDERS

Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.

Treads shall be not less than 5 inches exclusive of nosing or less than 8-1/2 inches including the nosing, and riser height shall be not more than 9-1/2 inches.

Fabricate ships' ladders, including railings from steel.

Fabricate treads from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 3/4 inch in least dimension.

Comply with applicable railing requirements in Section 055213 "Pipe and Tube Railings."

Galvanize steel ships' ladders, including treads, railings, brackets, and fasteners.

STEEL AND IRON FINISHES

Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

PART 3 - EXECUTION

INSTALLATION, GENERAL

Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

Field Welding: Comply with the following requirements:

Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

Obtain fusion without undercut or overlap.

Remove welding flux immediately.

At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

Provide temporary bracing or anchors in formwork for items that are to be built into concrete, , or similar construction.

INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

END OF SECTION 055000

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SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

SUMMARY

Section Includes:

- Steel railings.

Related Requirements:

- Section 055000 "Metal Fabrication" for steel tube railings associated with landings and metal ship's ladders.

COORDINATION

Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

ACTION SUBMITTALS

Product Data:

- Manufacturer's product lines of mechanically connected railings.
- Post-installed anchors.
- Metal finishes.

Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

INFORMATIONAL SUBMITTALS

Welding certificates.

Mill Certificates: Signed by manufacturers of stainless steel products, certifying that products furnished comply with requirements.

Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

QUALITY ASSURANCE

Welding Qualifications: Qualify procedures and personnel in accordance with the following:

AWS D1.1/D1.1M, "Structural Welding Code - Steel."

DELIVERY, STORAGE, AND HANDLING

Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

FIELD CONDITIONS

Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

PERFORMANCE REQUIREMENTS

Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

Handrails and Top Rails of Guards:

Uniform load of 50 lbf/ ft. applied in any direction.

Concentrated load of 200 lbf applied in any direction.

Uniform and concentrated loads need not be assumed to act concurrently.

METALS, GENERAL

Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

STEEL RAILINGS

Source Limitations: Obtain each type of railing from single source from single manufacturer.

Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

Provide galvanized finish.

Plates, Shapes, and Bars: ASTM A36/A36M.

FASTENERS

Fastener Materials:

Galvanized-Steel Railing Components: Plated steel fasteners complying with ASTM F1941, Class Fe/Zn 5 for zinc coating.

Hot-Dip Galvanized Railing Components: hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.

Fasteners for Interconnecting Railing Components:

Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

MISCELLANEOUS MATERIALS

Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.

Galvanizing Repair Paint: High-zinc-dust-content paint, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

FABRICATION

General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

Clearly mark units for reassembly and coordinated installation.

Use connections that maintain structural value of joined pieces.

Cut, drill, and punch metals cleanly and accurately.

Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.

Remove sharp or rough areas on exposed surfaces.

Form work true to line and level with accurate angles and surfaces.

Fabricate connections that are exposed to weather in a manner that excludes water.

Provide weep holes where water may accumulate.

Locate weep holes in inconspicuous locations.

Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

Connections: Fabricate railings with welded connections unless otherwise indicated.

Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

Obtain fusion without undercut or overlap.

Remove flux immediately.

Form changes in direction as follows:

As detailed.

By bending to smallest radius that will not result in distortion of railing member.

Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

Provide inserts and other anchorage devices for connecting railings to concrete work.

Fabricate anchorage devices capable of withstanding loads imposed by railings.

Coordinate anchorage devices with supporting structure.

STEEL

Galvanized Railings:

Hot-dip galvanize indicated steel railings, including hardware, after fabrication.

Comply with ASTM A123/A123M for hot-dip galvanized railings.

Comply with ASTM A153/A153M for hot-dip galvanized hardware.

Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.

Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

PART 3 - EXECUTION

INSTALLATION, GENERAL

Perform cutting, drilling, and fitting required for installing railings.

Fit exposed connections together to form tight, hairline joints.

Install railings level, plumb, square, true to line; without distortion, warp, or rack.

Set railings accurately in location, alignment, and elevation; measured from established lines and levels.

Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

Set posts plumb within a tolerance of 1/16 inch in 3 feet.

Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

Adjust railings before anchoring to ensure matching alignment at abutting joints.

Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

RAILING CONNECTIONS

Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

ATTACHING RAILINGS

Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends, using nonwelded connections.

CLEANING

Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

PROTECTION

Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055213

SECTION 055313 - BAR GRATINGS

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

SUMMARY

Section includes metal bar gratings.

Related Requirements:

Section 051200 "Structural Steel Framing" for structural-steel framing system components.

Section 055000 "Metal Fabrication" for grating treads and landings of steel-framed ship’s ladder.

Section 055213 "Pipe and Tube Railings" for metal pipe and tube handrails and railings.

COORDINATION

Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

ACTION SUBMITTALS

Product Data: For the following:

Clips and anchorage devices for gratings.

Shop Drawings: Include plans, sections, details, and attachments to other work.

INFORMATIONAL SUBMITTALS

Mill Certificates: Signed by manufacturers of stainless steel certifying that products furnished comply with requirements.

Welding certificates.

QUALITY ASSURANCE

Welding Qualifications: Qualify procedures and personnel according to the following:

AWS D1.1/D1.1M, "Structural Welding Code - Steel."

FIELD CONDITIONS

Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

PART 2 - PRODUCTS

MANUFACTURERS

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

All American Grating.

BarnettBates Corporation.

Fisher & Ludlow; a NUCOR Company.

Grating Pacific, Inc.

PERFORMANCE REQUIREMENTS

Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

Walkways and Elevated Platforms Used as Exits: Uniform load of 100 lbf/sq. ft.

Limit deflection to L/360 or 1/4 inch, whichever is less.

METAL BAR GRATINGS

Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual" and NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual."

Welded Steel Grating:

Bearing Bar Spacing: 1-3/16 inches o.c.

Bearing Bar Depth: 1-1/2 inches.

Bearing Bar Thickness: 1/4 inch.

Crossbar Spacing: 4 inches o.c.

Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft.of coated surface.

Steel Plates, Shapes, and Bars: ASTM A36/A36M.

Steel Bars for Bar Gratings: ASTM A36/A36M or steel strip, ASTM A1011/A1011M or ASTM A1018/A1018M.

FASTENERS

Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563 and, where indicated, flat washers.

MISCELLANEOUS MATERIALS

Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

FABRICATION

Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

Fit exposed connections accurately together to form hairline joints.

Welding: Comply with AWS recommendations and the following:

Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

Obtain fusion without undercut or overlap.

Remove welding flux immediately.

Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

Fabricate toeplates to fit grating units and weld to units in shop unless otherwise indicated.

Fabricate toeplates for attaching in the field.

Toeplate Height: 4 inches unless otherwise indicated.

Do not notch bearing bars at supports to maintain elevation.

STEEL FINISHES

Finish gratings, frames, and supports after assembly.

Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

PART 3 - EXECUTION

INSTALLATION, GENERAL

Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.

Fit exposed connections accurately together to form hairline joints.

Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

Field Welding: Comply with AWS recommendations and the following:

Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

Obtain fusion without undercut or overlap.

Remove welding flux immediately.

INSTALLING METAL BAR GRATINGS

General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

ADJUSTING AND CLEANING

Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055313

SECTION 071016 - WATERPROOFING FOR UTILITIES

PART 1 – GENERAL

SUMMARY

This section includes specifications for waterproofing systems.

RELATED WORK

Section 03 30 00 Cast-in-Place Concrete

REFERENCE

Applicable provisions of Division 1 shall govern work under this section.

SHOP DRAWINGS

Product Data: Provide data on waterproofing primer and protection board.

PART 2 – PRODUCTS

BLINDSIDE WATERPROOFING MEMBRANE

Manufacturers:

W.R Grace “Preprufe”,Preprufe 300R-Below slab.

Carlisle, “MiraPly”

Material: Composite sheet, HDPE film, adhesive and water resistant protective coating.

Elongation: 300%, ASTM D 412

Peel Adhesion to Concrete:	5 lb./in. ASTM D903
Tensile Strength:	1200 lbs./in. ASTM D412
Hydrostatic Head Resistance:	230 feet min.
Accessories:	Primer, mastic, joint sealers, Joint Seam Tape, cant straps and protection boards as recommended by manufacturers.

SPRAY-ON WATERPROOFING MEMBRANE

Manufacturers: Grace Procor, Global Polymer Solutions 6000C or approved equal.

Provide 80 mils coating to exterior tunnel surface.

Accessories: Spray equipment, and other accessories as recommended by product manufacturer.

LIQUID MEMBRANE

Manufacturers: W.R Grace “Bithuthene Liquid Membrane”, Carlisle “CCW-703”.

Material: Liquid elastomeric, cold applied, trowel applied.

Accessories: Trowel, Paddle mixer and other accessories as recommended by product manufacturer.

DRAIN BOARD

Manufacturers: Grace Hydroduct 220 or Carlise CCW Miradrain 6200

Material: 0.4” High impact polystyrene

Non-woven geotextile fabric

12 GPM flow rate

SHEET WATERPROOFING MEMBRANE

Manufacturers:

W.R. Grace, "Bituthene".

Carlisle, “MiraDri”.

Material: .060 inch thick 100% bonded to concrete surfaces with joints lapped minimum 6".

Accessories: Primer, mastic, joint sealers, cant strips and protection boards as recommended by manufacturer.

Tensile Strength (ASTM D 412): 250 psi min.

Ultimate Elongation (ASTM D 412): 300% min.

Brittleness Temperature (ASTM D 746): 25° F. (32° C.)

Hydrostatic Head Resistance: 150 feet min.

Water Absorption (ASTM D 570): Not more than 0.5% weight gain for 48 hours of immersion at 70° F.

WATERPROOFING MEMBRANE PRIMER

Manufacturers: W.R Grace “B2”, Carlisle “CCW-715”.

Material: Rubber based solvent (OIL BASED). Suitable for application to green concrete.

Accessories: Roller or brush, and other accessories as recommended by product manufacturer.

BACKFILL PROTECTION BOARD

Manufacturers: Grace Protection board 03, Carlisle CCW –HS Board

Material:

Bitumen protection board

Thickness: 90 mils - 3mm

Dow Styrofoam SM., Formula 250, or approved equal.

Material:

2" rigid cellular polystyrene ASTM C-578-87a, Type IV.

Density: 1.60 lbs/ft^3.

"R" Value: 5.0 per inch at 75° F.

Compressive Resistance: 25 psi.

Flexural Strength: 50 psi.

Water Vapor Permeability: 1.1 perm-inch.

Water Absorption: 0.3%.

Dimensional Stability: 2.0% maximum.

Oxygen Index: 24%.

PART 3 - EXECUTION

GENERAL

Contractor shall follow all manufacturers' recommended preparation, installation and personnel protection instructions. Contractor shall verify that all materials are compatible with bonding agents and or all other adjacent materials.

SURFACE PREPARATION

Ambient, surface and material temperatures should be over 40 degrees F. during the application of waterproofing membrane mastic and primer. Application at temperatures below 40° F. shall be with manufacturers approval and per their recommendations.

Inspect that surfaces are in condition to receive the waterproofing. Start of application shall be considered as acceptance of surface conditions. All concrete is to be surface dry and cured for at least three (3) days prior to start of waterproofing work.

Remove fins and loose material, fill wire holes and cracks with mortar and caulk with plastic cement around pipe, anchors and other items penetrating the walls. Clean surfaces of loose dirt, grease, dust, oil or other material. Dry surface according to manufacturer's directions.

Clean existing concrete surfaces of existing concrete with repair mortar to accept new waterproofing.

Remove existing loose, peeling or flaking waterproofing or debris from structure by mechanical methods before installing new waterproofing. All new waterproofing shall be attached to concrete or well bonded substrate. Any waterproofing that is adhered to failing substrate shall be removed, the substrate mechanically cleaned back to solid material and the waterproofing reinstalled at no expense to the project.

PRIMING

Membranes without self-adhesive properties may require separate primer or may combine this operation with application of main body adhesive as per manufacturer's recommendations.

Prime all concrete surfaces below grade with the membrane manufacturer's approved primer in accordance with the primer manufacturer's recommended installation instructions.

Primer shall be compatible with green and damp concrete.

INSTALLATION (SHEET MEMBRANE WATERPROOFING)

Roll membrane sheet onto the primed surface. Remove wrinkles or air spaces. ALL seams shall be lap seams. Butt joint seam are not allowed. Lap seams not less than six inches. Cover all interior (concrete side) lap seams with 6” seam tape. Cover all exterior (soil side) lap seams with liquid membrane six (6) inches wide minimum.

Seal laps with membrane manufacturer's approved mastic. A one-fourth (1/4) inch bead of approved mastic shall be gunned about one-half (2") inch in from the edge of each strip after it has been laid and the succeeding strip must be laid on it with a minimum six (6) inches overlap and rolled down.

Round outside corners and fill inside corners with an inorganic cant strip prior to the application of membrane. Double cover inside and outside corners with membrane by applying an additional twelve (12) inch wide strip of membrane centered along the axis of the corner, adhered to all surfaces.

Lay membrane sheets from the low point to the high point across the fall line so that the laps shed water. Seal expansion, construction and control joints in accordance with standard practice. Apply membrane in double thickness over control and construction joints. Over expansion joints a minimum eight (8) inches wide strip of membrane must be laid on the joint before applying the standard double thickness for joints.

Set the top edge of the membrane on the vertical surface and press or roll down firmly and completely in two (2) parallel one-fourth (1/4") inch beads of membrane manufacturer's approved mastic and held in place with continuous batten strips of wood or pre-drilled aluminum nailed at one foot intervals. Install battens as the work progresses and at the end of each day's work.

Precautions: Cover membranes within two (2) days after application with protection board.

Do not puncture or tear the membrane prior to covering it.

Careful inspection shall be made prior to covering the waterproofing membrane and any ruptures must be patched with new membrane material or approved mastic.

Whenever a job must be left partially complete, set and roll down the exposed edges of the outside strips in two parallel beads of mastic to prevent water from getting under the membrane before it is completely installed.

INSTALLATION (SPRAY-ON WATERPROOFING)

Install primer per manufacturer’s recommendation.

Spray waterproofing membrane over spray Polyurethane insulation.

Provide a minimum 80 mils coating to exterior tunnel and manhole surfaces where shown on drawings.

Follow manufacturer’s application instructions. Surface preparation shall be in accordance with manufacturer’s recommendations.

Trowel or mortar (repair) mix to fill in all voids and cracks.

Allow 24-hours cure time prior to backfilling.

INSTALLATION (UNDERSLAB WATERPROOFING)

Roll membrane out over flat surface cleared of all sharp or puncturing material. ALL seams shall be lap seams. Butt joint seam are not allowed. Install adhesive side up. Lap seams not less than 6 inch.

Roll excess membrane outside footprint of base slab to lap vertical at least 6 inch on base slab.

Protect waterproofing during construction in accordance with manufacturers recommendations.

BACKFILL PROTECTION BOARD WORK

Apply protection board in strict accordance with manufacturer's directions to steam pit and box conduits as a protection board for waterproofing.

Use adhesive to secure protection board to wall. Adhesive shall be compatible with waterproofing.

Tape ALL joints and seams as work proceeds to prevent stones or debris from migrating between protection board and waterproofing.

Protection board should be laid with closed joints and staggered end joints.

After membrane waterproofing barrier has been installed, allow a 24 hour waiting period before installation of board and backfilling.

Apply board and backfill within two (2) days (or time frame as recommended by the manufacturer) to prevent shrinkage of the membrane and cracking.

If Protection board has sagged or fallen of structure remove the area clean the waterproofing and re-attach and tape all seams.

Protect backfill board high traffic areas with ½" plywood or other suitable material until excavation is backfilled.

Protection board damaged by construction activities shall be removed and replaced at no additional cost to the project.

DRAIN BOARD WORK

Apply drain board in strict accordance with manufacturer's directions to steam pit and box conduits as a protection board for waterproofing.

Use adhesive to secure board to wall. Adhesive shall be compatible with waterproofing.

Overlap all open joints with geotextile fabric as recommended by manufacturer while work proceeds to prevent stones or debris from migrating between board and waterproofing.

Drain board should be laid with closed joints and staggered end joints.

After membrane waterproofing barrier has been installed, allow a 24 hour waiting period before installation of board and backfilling.

Apply board and backfill within two (2) days (or time frame as recommended by the manufacturer) to prevent shrinkage of the membrane and cracking.

Protect drain board high traffic areas with ½" plywood or other suitable material until excavation is backfilled.

Drain board damaged by construction activities shall be removed and replaced at no additional cost to the project.

COLD WEATHER PROTECTION

Waterproofing shall be applied only in air temperatures above the minimum recommended by the manufacturer.

Waterproofing membrane shall not be installed at temperatures below 25° F. If waterproofing must be laid in conditions below 25°F contractor shall provide tenting and temporary heaters to create local conditions above 25°F for manufacturers recommended duration.

APPLICATION

Waterproof Membrane: Install on exterior concrete surfaces (including floors) of new steam pits, tunnels and box conduit.

Extend minimum 18" onto existing construction or as shown on drawings.

All terminal ends of waterproofing sheet membrane shall be secured with a termination bar.

Protection board: Install over all waterproofed membrane surfaces of steam pits, tunnels, box conduits and where indicated on plan.

END OF SECTION 071016

SECTION 078413 – PENETRATION FIRESTOPPING

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

SUMMARY

Section Includes:

Penetrations in fire-resistance-rated walls.

Related Sections:

DIVISION 07 Section "Fire-Resistive Joint Systems" for joints in or between fire- resistance-rated constructions.

REFERENCES

American Society for Testing and Materials (ASTM):

E84 - Test Method for Surface Burning Characteristics of Building Materials.
E814 - Test Method for Fire Tests of Through-Penetration Fire Stops.

Underwriters Laboratories Inc. (UL):

Qualified Firestop Contractor Program Requirements.
1479 - Fire Tests of Through-Penetration Firestops (ANSI).
Fire Resistance Directory.

SUBMITTALS

Product Data: For each type of product indicated. .

Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire- resistance-rated assembly.

Qualification Data: For qualified Installer.

Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

QUALITY ASSURANCE

Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.

Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:

Penetration firestopping products bear classification marking of qualified testing and inspecting agency.

Classification markings on penetration firestopping correspond to designations listed by the following:

UL in its "Fire Resistance Directory."

Preinstallation Conference: Conduct conference at Project site.

DELIVERY, STORAGE, AND HANDLING

Deliver through-penetration firestop system products to Project Site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

PROJECT CONDITIONS

Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

COORDINATION

Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

Notify testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

MANUFACTURERS

Manufacturers: Manufacturers' names are given to clarify the designer's intent and are not intended to limit selection of similar manufacturer's with similar products.

Grace Construction Products.
3M Fire Protection Products.
Tremco, Inc.; Tremco Fire Protection Systems Group.

PENETRATION FIRESTOPPING

Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire- resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

Fire-resistance-rated walls include fire walls, fire-barrier walls, and fire partitions.
F-Rating: Not less than the fire-resistance rating of constructions penetrated.

Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

Permanent forming/damming/backing materials, including the following:

Slag-wool-fiber or rock-wool-fiber insulation.

Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.

Fire-rated form board.

Fillers for sealants.

Temporary forming materials.
Substrate primers.
Collars.
Steel sleeves.

FILL MATERIALS

Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

MIXING

For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment,

selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

EXAMINATION

Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

Proceed with installation only after unsatisfactory conditions have been corrected.

PREPARATION

Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

- Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
- Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
- Remove laitance and form-release agents from concrete.

Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

INSTALLATION

General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

- After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

Install fill materials for firestopping by proven techniques to produce the following results:

- Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
- Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
- For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

IDENTIFICATION

Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
Contractor's name, address, and phone number.
Designation of applicable testing and inspecting agency.
Date of installation.
Manufacturer's name.
Installer's name.

FIELD QUALITY CONTROL

Installer will engage a qualified testing agency to perform tests and inspections.

Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

CLEANING AND PROTECTION

Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

PENETRATION FIRESTOPPING SCHEDULE

Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

Firestopping with No Penetrating Items FS-1:

UL-Classified Systems: C-AJL-0001-0999.
W-Rating: No leakage of water at completion of water leakage testing.
Type of Fill Materials: As required to achieve rating.

Firestopping for Metallic Pipes, Conduit, or Tubing FS-2:

UL-Classified Systems: C-AJL-1001-1999.
W-Rating: No leakage of water at completion of water leakage testing.

Type of Fill Materials: As required to achieve rating.

Firestopping for Nonmetallic Pipe, Conduit, or Tubing FS-3:

UL-Classified Systems: C-AJL-2001-2999.
W-Rating: No leakage of water at completion of water leakage testing.
Type of Fill Materials: As required to achieve rating.

Firestopping for Electrical Cables FS-4:

UL-Classified Systems: C-AJL-3001-3999.
W-Rating: No leakage of water at completion of water leakage testing.
Type of Fill Materials: As required to achieve rating.

Firestopping for Cable Trays with Electric Cables FS-5:

UL-Classified Systems: W-AJL-4001-4999.
W-Rating: No leakage of water at completion of water leakage testing.
Type of Fill Materials: As required to achieve rating.

Firestopping for Insulated Pipes FS-6:

UL-Classified Systems: C-AJL-5001-5999.
W-Rating: No leakage of water at completion of water leakage testing.
Type of Fill Materials: As required to achieve rating.

Firestopping for Miscellaneous Electrical Penetrants FS-7:

UL-Classified Systems: C-AJL-6001-6999.
W-Rating: No leakage of water at completion of water leakage testing.
Type of Fill Materials: As required to achieve rating.

Firestopping for Miscellaneous Mechanical Penetrants FS-8:

UL-Classified Systems: C-AJL-7001-7999.
W-Rating: No leakage of water at completion of water leakage testing.
Type of Fill Materials: As required to achieve rating.

Firestopping for Groupings of Penetrants FS-9:

UL-Classified Systems: C-AJL-8001-8999.
W-Rating: No leakage of water at completion of water leakage testing.
Type of Fill Materials: As required to achieve rating.

END OF SECTION 078413

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SECTION 219000 - WATER BASED FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

DEFINITIONS

Standard-Pressure Sprinkler Piping: Fire suppression system piping designed to operate at working pressure of 175 psig (1200 kPa) maximum.

NFPA: National Fire Protection Association

SYSTEM DESCRIPTIONS

Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

PERFORMANCE REQUIREMENTS

Standard-Pressure Piping System Component: Listed for 175-psig (1200-kPa) minimum working pressure.

Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a NICET Level III designer, using performance requirements and design criteria indicated.

Sprinkler system design shall be approved by authorities having jurisdiction.

Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

SUBMITTALS

For each item indicated, to be submitted prior to start of construction.

Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified FPE responsible for their preparation. Design documents shall include the features indicated in NFPA 13, which include but are not limited to:

- Piping layout.
- Valve locations.
- Drains and drain outlet locations.

Installation details.

Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable. Contractor shall submit plans to AHJ for review per AHJ requirements.

Final acceptance test plan. Plan shall include all tests to be performed, and the performance level required to pass each test. Required tests shall verify proper operation of all subsystems, including but not limited to:

Fire alarm.
Electrical power.
Mechanical.
Plumbing.
Controls.

CLOSEOUT SUBMITTALS

For each item indicated, to be submitted within 30 days of substantial completion of construction. All submittals shall be delivered to Owner 30 days prior to proposed scheduled final acceptance of system.

Welding certificates, if field welding was performed.

Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

QUALITY ASSURANCE

Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

NFPA 13, "Installation of Sprinkler Systems."

Exception: Welded stainless steel pipe may be used.

NFPA 20, "Installation of Stationary Pumps for Fire Protection."

ASCE/SEI 7, “Minimum Design Loads for Buildings and Other Structures.”

PROJECT CONDITIONS

Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

Notify Owner no fewer than seven days in advance of proposed interruption of sprinkler service.
Do not proceed with interruption of sprinkler service without Owner's written permission.

COORDINATION

Coordinate layout and installation of sprinkler systems with other construction, including but not limited to light fixtures, HVAC equipment, and partition assemblies.

PART 2 - PRODUCTS

PIPING MATERIALS

Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

STEEL PIPE AND FITTINGS

Schedule 40, Black-Steel Pipe: ASTM A 53/A 53M, Schedule 40.

Thinwall Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, with wall thickness less than Schedule 40 and equal to or greater than Schedule 10.

Schedule 10, Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, Schedule 10, plain end.

Ferrous fittings per NFPA 13.

Listed ferrous, rubber-gasketed pipe fittings per NFPA 13.

Grooved-Joint, Steel-Pipe Appurtenances:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Anvil International, Inc.
Tyco Fire & Building Products LP.
Victaulic Company.

Pressure Rating: 300 psig (2070 kPa) minimum.
Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

SPECIALTY VALVES

General Requirements:

Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
Pressure Rating:

Standard-Pressure Piping Specialty Valves: 175 psig (1200 kPa) minimum.

Body Material: Cast or ductile iron.
Size: Same as connected piping.
End Connections: Flanged or grooved.

Automatic (Ball Drip) Drain Valves:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Reliable Automatic Sprinkler Co., Inc. (The).
Tyco Fire & Building Products LP.

Standard: UL 1726.
Pressure Rating: 175 psig (1200 kPa) minimum.
Type: Automatic draining, ball check.

HOSE CONNECTIONS

Nonadjustable-Valve Hose Connections:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Elkhart Brass Mfg. Co., Inc.
Potter Roemer LLC.
Tyco Fire & Building Products LP.
Viking Corporation.

Standard: UL 668 hose valve for connecting fire hose.
Pressure Rating: 300 psig (2070 kPa) minimum.
Material: Brass or bronze.
Size: NPS 2-1/2 (DN 65.
Inlet: Female pipe threads.
Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads according to NFPA 1963 and matching local fire-department threads.

PART 3 - EXECUTION

PIPING INSTALLATION

Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.

Install sprinkler piping with drains for complete system drainage.

Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

Fill wet-type sprinkler system piping with water.

Install sleeves and escutcheons for piping penetrations of walls, ceilings, and floors.

JOINT CONSTRUCTION

Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.

Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

Apply appropriate tape or thread compound to external pipe threads.
Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

IDENTIFICATION

Paint all exterior piping. Apply exterior paint per requirements listed in Division 9.

Paint interior piping where exposed in finished rooms. Paint pipe to match the room background color as viewed from the center of the room. Apply paint per requirements listed in Division 9.

Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

FIELD QUALITY CONTROL

Perform tests and inspections.

Tests and Inspections:

Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
Coordinate with fire-pump tests. Operate as required.
Verify that equipment hose threads are same as local fire-department equipment.

Sprinkler piping system will be considered defective if it does not pass tests and inspections.

Prepare test and inspection reports.

Report test results promptly and in writing to AHJ.

CLEANING

Clean dirt and debris from sprinklers.

Remove and replace sprinklers with paint other than factory finish.

PIPING SCHEDULE

Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast-iron threaded fittings; and threaded joints or grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

Standard-pressure, wet-pipe sprinkler system, NPS 2 (DN 50) and smaller, shall be one of the following:

Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 (DN 65)and larger, shall be one of the following:

Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

Schedule 40, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

Schedule 10, black-steel pipe with plain ends; welding fittings; and welded joints.

END OF SECTION 219000

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SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

DESCRIPTION

Work to be performed under the sections of Division 26 includes all labor, materials, and equipment required to install complete electrical systems as described in these specifications and as shown on the drawings. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections**.**

Before submitting a bid, the Contractor shall examine the drawings and specifications, visit the work site, and be informed of local conditions, all federal, state and local ordinances, regulations and all other pertinent items which may affect cost, schedule, and completion of this project.

Drawings accompanying these specifications are a part of these specifications. Drawings are intended to show general arrangement, design, and extent of work and are diagrammatic. Drawings are not intended to show exact locations except where dimensions are shown. Any substantial differences existing between drawings and conditions in the field shall be submitted to the Construction Manager for consideration before proceeding with work. Electrical work is shown on plans using standard industry symbols.

Before ordering materials or doing work, the Contractor shall verify all measurements pertaining to work scope and assume installation responsibility for complete and fully functional electrical systems.

The electrical work included in all other divisions of this specification and related documents is the responsibility of the contractor performing the division 26 work unless specifically noted otherwise.

Coordinate all work in the new electrical vault with MG&E (Madison Gas and Electric). Refer to MG&E Document MIS-3A – attached at the end of this specification section.

REFERENCED STANDARDS

Abbreviations of standards organizations referenced in this and other sections are as follows:

ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
EPA	Environmental Protection Agency
ETL	Electrical Testing Laboratories, Inc.
IBC	International Building Code

IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
NEC	National Electric Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
UL	Underwriters Laboratories Inc.

QUALITY ASSURANCE

Manufacturer references used herein are intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.

Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed.

All materials shall be listed by and shall bear the label of an approved electrical testing laboratory. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards, subject to approval by the Engineer, shall apply and such items shall bear those labels. Where one of the approved electrical testing laboratories has an applicable system listing and label, the entire system shall be so labeled. The Contractor shall not modify new equipment in such a way as to nullify the Testing Laboratories label. All equipment and materials shall be used or installed in accordance with any instruction included in the listing by the laboratory.

DEFINITIONS

ARC: Aluminum rigid conduit.

ATS: Acceptance Testing Specifications.

CPT: Control power transformer.

Data Bus: Two wires used to communicate with bus connected devices.

Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.

Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.

Duct Bank: Two or more ducts installed in parallel, with or without additional casing materials

and or multiple duct bank.

EMI: Electromagnetic interference.

EMT: Electrical metallic tubing.

Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

FMG: Factory Mutual Group

GFCI: Ground-Fault Circuit Interrupter.

GRC: Galvanized rigid steel conduit.

IBC: International Building Code.

IMC: Intermediate metal conduit.

Inominal: Nominal discharge current.

IR: Infrared.

Jacket: A continuous nonmetallic outer covering for conductors or cables.

LED: Light-emitting diode.

Legally Required: As used in this Section, it shall have the same meaning as used in NFPA 70.

Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or remote-control, signaling and power-limited circuits.

MCCB: Molded-case circuit breaker.

MCOV: Maximum continuous operating voltage.

Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.

NC: Normally closed.

NETA ATS: Acceptance Testing Specification.

NO: Normally open.

OCPD: Overcurrent protective device.

One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

PT: Potential transformer.

RMC: Rigid metal conduit.

SCCR: Short-circuit current rating.

Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

SPD: Surge protective device.

TVSS: Transient voltage surge suppressor.

REGULATORY REQUIREMENTS

All work and materials are to conform in every detail to applicable rules and requirements of local codes and regulations, the National Electrical Code (NFPA 70), other applicable National Fire Protection Association codes, and current manufacturing standards (including NEMA) and any additional local modifications enacted by the Local Authority Having Jurisdiction. Contractor shall be responsible to verify what if any local modifications are in place or enacted by the Local Authority Having Jurisdiction.

All work shall be installed in accordance with NECA standards of installation.

All work shall conform where applicable to the Williams-Steiger Occupational Safety and Health Act of 1970 (OSHA), Part 1910, "Occupational Safety and Health Standards." This shall include any local or state modifications enacted by the Authority having Jurisdiction.

TEMPORARY CONSTRUCTION POWER

Provide temporary lighting and construction power for the project. Pay the usage charges to the serving utility for electric service associated with temporary lighting and power for construction. Confirm with CM.

OMISSIONS

No later than ten (10) days before bid opening, the Contractor shall call to the attention of the Construction Manager any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

SUBMITTALS

Refer to Division 01 for Submittal requirements.

Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name or number, as indicated in the contract documents. Failure to do this may result in the submittal(s) being returned to the Contractor

for correction and resubmission. Failing to follow these instructions does not relieve the Contractor from the requirement of meeting the project schedule.

On request, the Contractor shall furnish additional drawings, illustrations, catalog data, performance characteristics, etc. to clarify intent of construction or operations.

Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.

The submittals must be approved before fabrication.

PROJECT/SITE CONDITIONS

Install Work in locations shown on Drawings, unless prevented by Project conditions.

Prepare drawings showing proposed rearrangement of work to meet Project conditions, including changes to work specified in other Sections. Obtain written permission of Construction Manager before proceeding.

Tools, materials, and equipment shall be confined to areas designated by the Construction Manager.

WORK SEQUENCE AND SCHEDULING

See the General Conditions of the Contract, Scheduling and Coordination of Work, Time for Completion of the Project, and Division 1 General Requirements, Mutual Responsibility for additional requirements.

Contractor to include all costs for work sequences and electric service work, including cutover requirements performed outside of Dane County business hours.

WORK BY OTHER TRADES

Every attempt has been made to indicate in this trade's specifications and drawings all work required of this Contractor. However, there may be additional specific paragraphs in other trade specifications and addenda, and additional notes on drawings for other trades which pertain to this Trade's work, and thus those additional requirements are hereby made a part of these specifications and drawings.

Electrical details on drawings for equipment to be provided by others is based on preliminary design data only. This Contractor shall lay out the electrical work and shall be responsible for its correctness to match equipment actually provided by others.

OPERATING AND MAINTENANCE INSTRUCTIONS

Refer to Division 1, General Requirements, Operating and Maintenance Instructions for additional requirements.

TRAINING

Instruct Owner’s personnel in the proper operation and maintenance of systems and equipment provided as part of this project; video record all training sessions. Use the Operating and Maintenance manuals during this instruction. Demonstrate startup and shutdown procedures for all equipment. All training to be during normal working hours.

The requirement for recording training sessions may be deleted on some projects but not the requirement for the training itself.

Refer to other sections in Division 26 for specific section and equipment training requirements.

RECORD DRAWINGS

Contractor shall provide drawings to document as-built conditions per Division 1.

A set of prints shall be kept at the job site upon which all changes and deviations from the original design are to be recorded daily. All changes shall be clearly marked. These drawings shall indicate as a minimum, all changes made to the drawings, changes in circuiting, equipment location, accurate locations of embedded conduit, and all other significant changes and deviations from the original design.

The daily record of changes shall be the responsibility of the Contractor's field representative. No arbitrary mark-ups will be permitted.

The record drawing set shall be made available and may be audited periodically by the Owners' construction representative to assure the changes are being recorded.

At the completion of the project, the Contractor shall submit the marked-up record drawings to the Owners' construction representative prior to request for final payment.

PART 2 - PRODUCTS

MANUFACTURERS

Reference applicable sections within Division 26.

PART 3 - EXECUTION

WORK INCLUDED

The scope of work shall include all work, including all labor, materials and equipment, testing required to install a complete electrical system as indicated in the project Manual. The Project Manual consists of the bidding documents, the contract, specifications, contract drawings and all subsequent addenda and modifications. The contractor shall furnish and install all necessary materials, apparatus and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.

All work items shown on the drawings is within the scope of work and shall be provided as indicated. Only items that are clearly indicated as being provided by others or under a separate contract shall be out of scope.

In general, the specifications indicate the requirements and quality for products required and the executions for those products. Only items that are clearly indicated as being provided by others or under a separate contract shall be out of scope.

If there is any discrepancy between the drawings and the specifications, it is the contractor's responsibility to notify the Construction Manager for resolution, prior to procuring equipment or starting work.

Coordinate and verify all equipment being supplied by equipment supplier and other trades. Verify equipment size, motor HP, dimensions, locations, etc. as all are subject to change.

Contractor shall verify all door swings and the location of all cabinets, diffusers, HVAC, plumping, process and building equipment before installing electrical equipment, fixtures, outlets and conduit.

The Contractor shall provide all plywood backboards and supports for all electrical equipment as indicated on the drawings and as required or specified.

All permits and inspection fees required to complete the work shall be paid for by the Contractor unless noted otherwise.

All electrical equipment and fixtures shall be installed in complete accordance with the manufacturers' recommendations.

Contractor shall provide all motor connections as shown on the drawings and as specified herein.

CONCRETE

All concrete work required for the proper installation of electrical equipment including transformer and switchgear pads and other equipment pads shall be provided by the Contractor and shall conform to specifications in Division 3.

SITE WORK

The Contractor shall provide excavation and backfill for all electrical underground work as indicated on the drawings and as required. The Contractor shall perform this work and provide compaction as specified in Division 2. Finish grading and final restoration shall be by the General Contractor.

PERMITS, FEES, TAXES, INSPECTIONS

Procure all applicable permits and licenses.

Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.

ELECTRICAL CONTRACTOR

Pay all charges for permits or licenses.

Pay all fees and taxes imposed by State, Municipal, and other regulatory bodies.

Pay all charges arising out of required inspections by an authorized body.

Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.

Where applicable, all fixtures, equipment and materials shall be listed by Underwriter's Laboratories, Inc. or a nationally recognized testing organization.

SERVICE INSTALLATION

The service installation shall comply with the latest applicable standards of the utility. Refer to the current electrical service installation manuals.

The Contractor shall meet with the electric utility prior to rough-in to review and coordinate the installation of the electrical service and verify existing conditions and special requirements.

BUILDING ACCESS

Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

EQUIPMENT ACCESS

Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster or drywall walls or ceilings, furnish the access doors to the General Contractor and reimburse the General Contractor for installation of those access doors.

COORDINATION

The Contractor shall cooperate with other trades and the Owner's Construction Manager in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.

The Contractor shall verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to, light fixtures, panelboards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces.

Coordinate all work with other trades prior to installation. Any installed work that is not coordinated and that interferes with another trades work shall be removed or relocated at the installing contractor's expense.

HOUSEKEEPING AND CLEAN UP

Refer to Division 1, General Requirements, and Cleaning for additional requirements.

The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, the Contractor shall remove all tools, excess material and equipment, etc., from the site.

END OF SECTION 260500

SECTION 260502 - ELECTRICAL DEMOLITION AND ALTERATION

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

Section 260500 "Common Work Results for Electrical."

NFPA 70 – National Electrical Code

COORDINATION

Coordinate sequencing with Owner and other Contractors. Coordinate scope of work with all other Contractors and the Owner at the project site. Schedule removal of equipment and electrical service to avoid conflicts.

SUMMARY

Electrical Demolition

The drawings are intended to indicate the scope of work required and do not indicate every box, conduit, or wire that must be removed. The Contractor shall visit the site prior to submitting a bid and verify existing conditions.

CONTINUITY OF EXISTING SERVICES AND SYSTEMS

No outages shall be permitted on existing systems except at the time and during the interval specified by the Construction Manager. The Construction Manager may require written approval. Any outage must be scheduled when the interruption causes the least interference with normal Owner/Government schedules and business routines. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours.

This Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible. Note that facility operations may be on a seven-day week schedule, confirm with Construction Manager.

Prior to demolition or alteration of structures, the following shall be accomplished:

- New service to courthouse switchboard installation complete and service energized.
- Owner (MG&E) release of structure.
- Existing Electrical Service: Disable system only to make switchovers and connections. Obtain permission no fewer than seven days in advance of proposed interruption of electric service before partially or completely disabling system. Minimize outage duration. If required, make temporary connections to maintain service in areas adjacent to work area. Do not proceed with interruption of electric service without Construction Manager's written permission.

- Disconnection of electrical power to utilization equipment and circuits removed or affected by demolition work.
- Electrical services shut off outside area of demolition.
- Survey and record condition of existing facilities to remain in place that may be affected by demolition operations. After demolition operations are completed, survey conditions again and restore existing facilities to their predemolition condition.
- Notify utilities prior to razing operations to permit them to disconnect and remove or relocate equipment that served existing facilities.
- Contractor shall notify Architect/Engineer of existing code violations observed during the course of performing his work. If corrective action needs to be taken that changes the scope of the work, corrective action to proceed only after approved by Architect/Engineer.
- Provide temporary wiring and connections to maintain existing systems in service during construction. Assume all equipment and systems must remain operational unless specifically noted otherwise on drawings.

PART 2 - PRODUCTS

MATERIALS AND EQUIPMENT

Materials and equipment for patching and extending work as specified in the individual Sections.

PART 3 - EXECUTION

EXAMINATION

Verify that abandoned wiring and equipment serve only abandoned equipment or facilities. Extend conduit and wire to facilities and equipment that will remain in operation following demolition. Extension of conduit and wire to equipment shall be compatible with the surrounding area.

PREPARATION

Where walls, ceilings, structures, etc., are indicated as being renovated and/or removed on general drawings, the Contractor shall be responsible for the removal of all electrical equipment, devices, fixtures, raceways, wiring, systems, etc., from the removed area.

Where ceilings, walls, structures, etc., are temporarily removed and replaced by others, this Contractor shall be responsible for the removal, storage, and replacement of equipment, devices, fixtures, raceways, wiring, systems, etc.

DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed. Patch openings created from removal of devices to match surrounding finishes.

Repair adjacent construction and finishes damaged during demolition and extension work. Patch openings to match existing surrounding finishes.

Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

Extend existing installations using materials and methods compatible with existing electrical installations, or as specified. This includes the extension of the circuit from the last active device to the next device in the system to be activated.

Equipment removal in certain locations may require the installation of a junction box to reconnect circuits that remain in operation. Extend conduit and wiring as required to maintain power to remaining equipment.

Contractor shall remove and install all ceiling tiles as required for the execution of electrical work that is outside the contract limits of construction. Contractor shall replace ceiling tiles with identical material where damaged by this Contractor.

Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

Floor slabs may contain conduit systems. This Contractor is responsible for taking any measures required to ensure no conduits or other services are damaged. This includes x-ray or similar non-destructive means.

Contractor is responsible for all costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.

CLEANING AND REPAIR

Clean and repair existing materials and equipment that remain or are to be reused.

Panelboards: Within the project scope. Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

Electrical items (i.e., lighting fixtures, panelboard motor controllers, disconnects, switches, conduit, wire, etc.) Removed and not relocated remain the property of the owner. The contractor shall dispose of material the owner does not want.

ASBESTOS REMOVAL

If this Contractor shall discover the presence of asbestos material, he shall cease work immediately and notify Owner architect and Engineer of condition.

INSTALLATION

Install relocated materials and equipment under the provisions of Division 26 Specifications.

END OF SECTION 26 05 02

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SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

SUMMARY

Section Includes:

- Copper building wire rated 600 V or less.
- Connectors, splices, and terminations rated 600 V and less.

ACTION SUBMITTALS

Product Data: For each type of product.

PART 2 - PRODUCTS

COPPER BUILDING WIRE

Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- American Bare Conductor.
- Alpha Wire
- Belden Inc.
- Encore Wire Corporation.
- General Cable Technologies Corporation.
- Southwire Company.

Standards:

Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
RoHS compliant.
Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 or ASTM B496 for stranded conductors.

Conductor Insulation:
Type THHN and Type THWN-2: Comply with UL 83.
Type XHHW-2: Comply with UL 44.

CONNECTORS AND SPLICES

Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

3M Electrical Products.
ABB (Electrification Products Division).
Appleton - O-Z/Gedney; Emerson Electric Co., Automation Solutions.
Hubbell Incorporated, Power Systems.
ILSCO.

Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

Material: Copper.
Type: Two hole with standard barrels.
Termination: Compression.

PART 3 - EXECUTION

CONDUCTOR MATERIAL APPLICATIONS

Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

Service Entrance: Type XHHW-2, single conductors in raceway.

Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

Exposed Branch Circuits: Type THHN/THWN-2, single conductors in raceway.

INSTALLATION OF CONDUCTORS AND CABLES

Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

CONNECTIONS

Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

IDENTIFICATION

Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

FIRESTOPPING

Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

FIELD QUALITY CONTROL

Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

Perform tests and inspections.

After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

Perform each of the following visual and electrical tests:

Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
Test bolted connections for high resistance using one of the following:

A low-resistance ohmmeter.
Calibrated torque wrench.
Thermographic survey.

Inspect compression-applied connectors for correct cable match and indentation.
Inspect for correct identification.
Inspect cable jacket and condition.
Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
Continuity test on each conductor and cable.
Uniform resistance of parallel conductors.

Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

Cables will be considered defective if they do not pass tests and inspections.

Prepare test and inspection reports to record the following:

Procedures used.
Results that comply with requirements.
Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 26 05 19

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

SUMMARY

Section includes grounding and bonding systems and equipment.

ACTION SUBMITTALS

Product Data: For each type of product indicated.

CLOSEOUT SUBMITTALS

Operation and Maintenance Data: Plan showing as-built location of grounding arrangements for service.

QUALITY ASSURANCE

Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

SYSTEM DESCRIPTION

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Comply with UL 467 for grounding and bonding materials and equipment.

MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Appleton - O-Z/Gedney; Emerson Electric Co., Automation Solutions.
Burndy; Hubbell Incorporated, Construction and Energy.
ILSCO.

CONDUCTORS

Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

Bare Copper Conductors:

Solid Conductors: ASTM B3.
Stranded Conductors: ASTM B8.
Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

CONNECTORS

Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.

Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

Cable-to-Cable Connectors: Compression type, copper or copper alloy.

Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

Conduit Hubs: Mechanical type, terminal with threaded hub.

Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt

Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.

Straps: Solid copper, cast-bronze clamp or copper lugs. Rated for 600 A.

U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

GROUNDING ELECTRODES

Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

PART 3 - EXECUTION

APPLICATIONS

Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

Grounding Conductors: Green-colored insulation with continuous yellow stripe.

Conductor Terminations and Connections:

Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
Underground Connections: Welded connectors.
Connections to Ground Rods at Test Wells: Bolted connectors.
Connections to Structural Steel: Welded connectors.

GROUNDING AT THE SERVICE

Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

EQUIPMENT GROUNDING

Install insulated equipment grounding conductors with all feeders and branch circuits.

Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

Feeders and branch circuits.
Lighting circuits.
Receptacle circuits.
Flexible raceway runs.

INSTALLATION

Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

Ground Rods: Drive rods until tops are 12 inches below finished floor or final grade unless otherwise indicated.

Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

Use exothermic welds for all below-grade connections.

For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

Grounding and Bonding for Piping:

Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.

Make connections with clean, bare metal at points of contact.

Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.

Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

FIELD QUALITY CONTROL

Testing Agency: Engage a qualified testing agency to perform tests and inspections.

Tests and Inspections:

After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal and at individual ground rods.

Perform tests by fall-of-potential method according to IEEE 81.

Prepare dimensioned as-built drawing locating each ground rod and ground-rod assembly, and other grounding electrodes.

Grounding system will be considered defective if it does not pass tests and inspections.

Prepare test and inspection reports.

Report measured ground resistances that exceed the following values:

Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
Substations and Pad-Mounted Equipment: 5 ohms.

Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

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SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

SUMMARY

Section Includes:

- Steel slotted support systems.
- Aluminum slotted support systems.
- Conduit and cable support devices.
- Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
- Fabricated metal equipment support assemblies.

ACTION SUBMITTALS

Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

- Hangers. Include product data for components.
- Slotted support systems.
- Equipment supports.

QUALITY ASSURANCE

Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M and D1.2/D1.2M

PART 2 - PRODUCTS

SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- ABB (Electrification Products Division).
- Eaton (B-line).
- G-Strut.
- nVent (CADDY).

Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
Material for Channel, Fittings, and Accessories: Galvanized steel.
Channel Width: Selected for applicable load criteria.
Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

Aluminum Slotted Support Systems: Extruded-aluminum channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

ABB (Electrification Products Division).
Cooper Industries, Inc.
Flex-Strut Inc.

Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
Channel Material: 6063-T5 aluminum alloy.
Fittings and Accessories Material: 5052-H32 aluminum alloy.
Channel Width: Selected for applicable load criteria.
Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

Conduit and Cable Support Devices: Hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
Manufacturers: Subject to compliance with requirements, provide products by one of the following:
Eaton (B-line).
Hilti, Inc.
ITW Ramset/Red Head; Illinois Tool Works, Inc.
Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
Toggle Bolts: Steel springhead type.

Hanger Rods: Threaded steel.

FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

Materials: Comply with project requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

APPLICATION

Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

NECA 1.
NECA 101
NECA 105.

Comply with requirements in Division 7 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT and RMC as required by NFPA 70. Minimum rod size shall be 1/2 inch in diameter.

Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

Secure raceways and cables to these supports with two-bolt conduit clamps.

Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and fastening raceways to trapeze supports.

SUPPORT INSTALLATION

Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by openings through structure members, according to NFPA 70.

Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

- To New Concrete: Bolt to concrete inserts.
- To Existing Concrete: Expansion anchor fasteners.
- To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.

- To Light Steel: Sheet metal screws.
- Items Mounted on Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

INSTALLATION OF FABRICATED METAL SUPPORTS

Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

Field Welding: Comply with AWS D1.1/D1.1M.

CONCRETE BASES

Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."

Anchor equipment to concrete base as follows:

Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
Install anchor bolts to elevations required for proper attachment to supported equipment.
Install anchor bolts according to anchor-bolt manufacturer's written instructions.

PAINTING

Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

Touchup: Clean and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 26 05 29

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

SUMMARY

Section Includes:

- Metal conduits and fittings.
- Metal wireways and auxiliary gutters.
- Boxes, enclosures, and cabinets.

Related Requirements:

- Division 7 for firestopping at conduit and box entrances.

COORDINATION

Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction, including but not limited to electrical equipment and components by utility, cable tray, light fixtures, entrances and access to vault.

PART 2 - PRODUCTS

METAL CONDUITS AND FITTINGS

Metal Conduit:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- Allied Tube & Conduit; a part of Atkore International.
- Republic Conduit.
- Thomas & Betts Corporation; A Member of the ABB Group.
- Western Tube and Conduit Corporation.
- Wheatland Tube Company.

Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

RMC: Comply with ANSI C80.1 and UL 6.

PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

- Comply with NEMA RN 1.
- Coating Thickness: 0.040 inch, minimum.

EMT: Comply with ANSI C80.3 and UL 797.

FMC: Comply with UL 1; zinc-coated steel.

LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

Metal Fittings:

Comply with NEMA FB 1 and UL 514B.
Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
Fittings, General: Listed and labeled for type of conduit, location, and use.
Fittings for EMT:

Material: Steel.
Type: Compression.

Expansion Fittings: PVC or steel to match conduit type, complying with UL 651for PVC and type XJ for steel, rated for environmental conditions where installed, and including flexible external bonding jumper.
Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

NONMETALLIC CONDUITS AND FITTINGS

Nonmetallic Conduit:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Allied Tube & Conduit; a part of Atkore International.
Kraloy
Thomas & Betts Corporation; A Member of the ABB Group.

RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

Nonmetallic Fittings:

Fittings, General: Listed and labeled for type of conduit, location, and use.
Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
Solvents and Adhesives: As recommended by conduit manufacturer.

METAL WIREWAYS AND AUXILIARY GUTTERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B-line, an Eaton business.
Hoffman; a brand of Pentair Equipment Protection.
Square D.

Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

Wireway Covers: Hinged type**,** unless otherwise indicated.

Finish: ANSI 61 Gray Unpainted galvanized for steel wireways.

BOXES, ENCLOSURES, AND CABINETS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Crouse-Hinds, an Eaton business.
EGS/Appleton Electric.
Hoffman; a brand of Pentair Equipment Protection.
Hubbell Incorporated.
Thomas & Betts Corporation; A Member of the ABB Group.
Wiremold / Legrand.

General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, deep-type, ferrous alloy, Type FD, with gasketed cover, threaded hubs.

Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb.. Outlet boxes designed for attachment of luminaires weighing more than 50 lb. shall be listed and marked for the maximum allowable weight.

Sheet Metal Pull and Junction Boxes: NEMA OS 1, galvanized steel.

Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

Gangable boxes are prohibited.

Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, unless noted otherwise, with continuous-hinge cover with flush latch unless otherwise indicated.

Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

PART 3 - EXECUTION

RACEWAY SIZING

Size conduit as shown on the drawings and specifications. Where not indicated in the contract documents, conduit size shall be according to NEC. (Latest Edition). Conduit and conductor sizing shall be coordinated to limit conductor fill to less than 40%, maintain conductor ampere capacity as required by the National Electrical Code (to include enlarged conductor’s due to temperature and quantity derating values) and to prevent excessive voltage drop and pulling tension due to long conduit/conductor lengths.

Minimum (Unless noted otherwise) Raceway Size: 3/4-inch (21 mm) trade size.

Minimum Raceway Size Control Conduit: 1-inch, unless noted otherwise in documents.

Minimum Raceway Size; Below Grade: 1 inch, unless noted otherwise in documents.

Conduit sizes shall change only at the entrance or exit to a junction box, unless specifically noted on the drawings.

RACEWAY APPLICATION

Outdoors: Apply raceway products as specified below unless otherwise indicated:

Exposed Conduit: RMC.

Concealed Conduit, Aboveground: RMC.
Underground Conduit: Refer to Section 260543.
Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

Indoors: Apply raceway products as specified below unless otherwise indicated:

Exposed, Not Subject to Physical Damage: EMT.
Exposed, Not Subject to Severe Physical Damage: EMT.
Exposed and Subject to Severe Physical Damage: RMC. Location includes vault.
Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
Flexible Metal Conduit (FMC) ¾ inch minimum, unless otherwise noted. Lighting branch circuit wiring to an individual luminaire. Flexible metal conduit may be a manufactured, UL listed 3/8-inch flexible metal conduit and fittings with #14 AWG THHN conductors and an insulated ground wire. Maximum length of 3/8 inch FMC shall be six (6) feet.
Damp or Wet Locations and subject to Physical Damage: RMC

Raceway Fittings: Compatible with raceways and suitable for use and location.

Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
Rigid Nonmetallic Conduit: Use PVC fittings, unless otherwise indicated.
EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

BOXES AND ENCLOSURES APPLICATIONS

Boxes and Enclosures:

NEMA 250, Type 1, except use NEMA 250, Type 4 powder coated steel in damp or wet locations.
Dirty locations: NEMA 250, Type 12, powder coated steel.

INSTALLATION

Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies.

In unfinished spaces, mechanical and utility areas, route conduit exposed as conditions dictate. Installation shall maintain headroom in exposed vicinities of pedestrian or vehicular traffic.

Conduit runs shall be chosen by the Contractor based on information provided in the contract documents, in accordance with manufacturer’s written instructions, applicable codes, and coordinated with other contractors.

Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

Complete raceway installation before starting conductor installation.

Install temporary closures to prevent foreign matter from entering raceways.

Unused openings in boxes and fittings shall be plugged with suitable devices rated for the proper environment.

Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction and within 12 inches of enclosures to which attached to.

Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

Run parallel or banked raceways together on common supports.

Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

Contractor shall be responsible for all openings required in masonry or exterior walls under this division. A qualified mason at the expense of this contractor shall repair all openings to match existing conditions.

CONDUIT TERMINATIONS

Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

Join raceways with fittings designed and approved for that purpose and make joints tight.

When raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.

Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

Where an underground service raceway enters a building or structure.
Conduit extending from interior to exterior of building.
Where otherwise required by NFPA 70.

Comply with manufacturer's written instructions for solvent welding RNC and fittings.

Expansion fittings shall be installed across expansion joints in structures and concrete construction where such joints are shown on the architectural and structural drawings.

Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

BOX INSTALLATION

Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Locate and install boxes to allow access to them.

Electrical box locations shown on drawings are approximate unless dimensioned. Verify location of boxes prior to rough-in.

No outlet shall be located where it will be obstructed by other equipment or component.

It shall be the Contractor’s responsibility to study drawings pertaining to other trades, to discuss location of outlets with workmen installing other piping and equipment and to fit all electrical outlets to job conditions.

The proper location of each outlet is considered a part of this contract and no additional compensation will be paid to the Contractor for moving outlets which were improperly located.

Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

Install hinged-cover enclosures plumb. Support at each corner.

SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

FIRESTOPPING

Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 7.

PROTECTION

Protect coatings, finishes, and cabinets from damage and deterioration.

Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

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SECTION 260536 - CABLE TRAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

SUMMARY

Section Includes:

Ladder cable trays.

ACTION SUBMITTALS

Product Data: For each type of product.

Include data indicating dimensions and finishes for each type of cable tray indicated.

Shop Drawings: For each type of cable tray.

Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.

Field quality-control reports.

PART 2 - PRODUCTS

GENERAL REQUIREMENTS FOR CABLE TRAYS

Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.

Source Limitations: Obtain cable trays and components from single manufacturer.

Configurations: Coordinate sizing requirements with final cable configurations installed specific to this project. Coordinate with secondary from utility's transformers to connector bus and from connector bus to new main circuit breaker for Courthouse service.

Structural Performance: See articles on individual cable tray types for specific values for the following parameters:

Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.

Concentrated Load: A load applied at midpoint of span and centerline of tray.

Load and Safety Factors: Applicable to both side rails and rung capacities.

LADDER CABLE TRAYS

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Allied Tube & Conduit; a Tyco International Ltd. Co.

Chalfant Manufacturing Company.

Cooper B-Line, Inc.

Mono-Systems, Inc.

MP Husky.

Niedax-Kleinhuis USA, Inc.

Description:

Configuration: Two I-beam side rails with transverse rungs welded to side rails.

Rung Spacing: 6 inches o.c.

Radius-Fitting Rung Spacing: 9 inches at center of tray's width.

Minimum Cable-Bearing Surface for Rungs: 7/8-inch width with radius edges.

No portion of the rungs shall protrude below the bottom plane of side rails.

Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb concentrated load, when tested according to NEMA VE 1.

Minimum Usable Load Depth: 6 inches.

Straight Section Lengths: 10 feet except where shorter lengths are required to facilitate tray assembly.

Width: 24 inches minimum, and as required for final cable quantities.

Fitting Minimum Radius: 24 inches minimum.

Class Designation: Comply with NEMA VE 1, Class 8C is basis for project. Final support spacing shall be based on final number of installed cables.

Splicing Assemblies: Bolted type using serrated flange locknuts.

Hardware and Fasteners: ASTM F 593 and ASTM F 594 stainless steel, Type 316.

Splice Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

MATERIALS AND FINISHES

Aluminum:

Materials: Alloy 6063-T6 according to ANSI H35.1/H 35.1M for extruded components, and Alloy 5052-H32 or Alloy 6061-T6 according to ANSI H35.1/H 35.1M for fabricated parts.

Hardware for Aluminum Cable Tray Used Outdoors and in electrical vault: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.

CABLE TRAY ACCESSORIES

Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

Barrier Strips: Same materials and finishes as for cable tray.

Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

WARNING SIGNS

Lettering: 1-1/2-inch-high, black letters on yellow background with legend "Warning! Not to Be Used as Walkway, Ladder, or Support for Ladders or Personnel."

Comply with requirements for fasteners in Section 260553 "Identification for Electrical Systems."

SOURCE QUALITY CONTROL

Testing: Test and inspect cable trays according to NEMA VE 2.

PART 3 - EXECUTION

CABLE TRAY INSTALLATION

Install cable trays according to NEMA VE 2.

Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.

Remove burrs and sharp edges from cable trays.

Join aluminum cable tray with splice plates; use four square-neck carriage bolts and locknuts.

Fasten cable tray supports to building structure.

Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems

Place supports as required by tray loading do not exceed manufacturer recommended maximum spans. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.

Support bus assembly to prevent twisting from eccentric loading.

Locate and install supports according to NEMA VE 2. Do not install more than one cable tray splice between supports.

Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.

Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in NEMA VE 2. Space connectors and set gaps according to applicable standard.

Make changes in direction and elevation using manufacturer's recommended fittings.

Make cable tray connections using manufacturer's recommended fittings.

Seal penetrations through fire and smoke barriers. Comply with requirements in Section 078413 "Penetration Firestopping."

Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

Install cable trays with enough workspace to permit access for installing cables.

Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600, 5000, and 15 000 V.

Install warning signs in visible locations on or near cable trays after cable tray installation.

CABLE TRAY GROUNDING

Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

Cable trays with electrical power conductors shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

Cable trays with single-conductor power conductors shall be bonded together with a grounding conductor run in the tray along with the power conductors and bonded to the tray at 72-inch intervals. The grounding conductor shall be sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors," and Article 392, "Cable Trays."

When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding-bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.

Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

CABLE INSTALLATION

Install cables only when each cable tray run has been completed and inspected.

Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.

Fasten cables on vertical runs to cable trays every 18 inches.

Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches.

CONNECTIONS

Remove paint from all connection points before making connections. Repair paint after the connections are completed.

Connect raceways to cable trays according to requirements in NEMA VE 2.

FIELD QUALITY CONTROL

Perform the following tests and inspections:

After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.

Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.

Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.

Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.

Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.

Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.

Check for improperly sized or installed bonding jumpers.

Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.

Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

Prepare test and inspection reports.

PROTECTION

Protect installed cable trays and cables.

Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.

Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.

END OF SECTION 26 05 36

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

SUMMARY

Section Includes:

Sleeve-seal systems.
Sleeve-seal fittings.
Grout.
Silicone sealants.

Related Requirements:

Section 078413 "Penetration Firestopping".

ACTION SUBMITTALS

Product Data: For each type of product.

PART 2 - PRODUCTS

SLEEVES

Wall Sleeves:

Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

Sleeves for Rectangular Openings:

Material: Galvanized sheet steel.
Minimum Metal Thickness:

- For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
- For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

SLEEVE-SEAL SYSTEMS

Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- Advance Products & Systems, Inc.
- Metraflex Company (The).
- Pipeline Seal and Insulator, Inc.

Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

Pressure Plates: Carbon steel.

Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

SLEEVE-SEAL FITTINGS

Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

GROUT

Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

Design Mix: 5000-psi, 28-day compressive strength.

Packaging: Premixed and factory packaged.

SILICONE SEALANTS

Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

SLEEVE-SEAL-SYSTEM INSTALLATION

Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

SLEEVE-SEAL-FITTING INSTALLATION

Install sleeve-seal fittings in new walls and slabs as they are constructed.

Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

Secure nailing flanges to concrete forms.

Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 26 05 44

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SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

SUMMARY

Section Includes:

- Identification for raceways.
- Identification of power and control cables.
- Identification for conductors.
- Warning labels and signs.
- Instruction signs.
- Equipment identification labels.
- Miscellaneous identification products.

QUALITY ASSURANCE

Comply with ANSI A13.1.

Comply with NFPA 70.

Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

Comply with ANSI Z535.4 for safety signs and labels.

Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

COORDINATION

Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

Coordinate installation of identifying devices with location of access panels and doors.

PART 2 - PRODUCTS

POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

Colors for Raceways Carrying Circuits at 600 V or Less:

Black letters on an orange field.
Legend: Indicate voltage and system or service type.

Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

CONDUCTOR IDENTIFICATION MATERIALS

Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil-thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

FLOOR MARKING TAPE

2-inch-wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

WARNING LABELS AND SIGNS

Comply with NFPA 70 and 29 CFR 1910.145.

Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

Baked-Enamel Warning Signs:

Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
1/4-inch grommets in corners for mounting.
Nominal size, 7 by 10 inches.

Metal-Backed, Butyrate Warning Signs:

Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
1/4-inch grommets in corners for mounting.
Nominal size, 10 by 14 inches.

Warning label and sign shall include, but are not limited to, the following legends:
Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

INSTRUCTION SIGNS

Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

Engraved legend with black letters on white face.
Punched or drilled for mechanical fasteners.
Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

EQUIPMENT IDENTIFICATION LABELS

Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

CABLE TIES

General-Purpose Cable Ties: Fungus inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon.

Minimum Width: 3/16 inch.
Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
Temperature Range: Minus 40 to plus 185 deg F.
Color: Black except where used for color-coding.

UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one-piece, self-locking, Type 6/6 nylon.

Minimum Width: 3/16 inch.
Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
Temperature Range: Minus 40 to plus 185 deg F.

Color: Black.

MISCELLANEOUS IDENTIFICATION PRODUCTS

Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

INSTALLATION

Verify identity of each item before installing identification products.

Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

Apply identification devices to surfaces that require finish after completing finish work.

Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.

System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

Outdoors: UV-stabilized nylon.

Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

IDENTIFICATION SCHEDULE

Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service More Than 30A, and 120V to ground: Identify with self-adhesive vinyl label. Install labels at 10-foot maximum intervals.

Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

Normal
Emergency

Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes use color-coding conductor tape to identify the phase.

Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.

Color shall be factory applied.
Colors for 208Y/120-V Circuits:

Phase A: Black.
Phase B: Red.
Phase C: Blue.

Colors for 480Y/277-V Circuits:

Phase A: Brown.
Phase B: Orange.
Phase C: Yellow.

Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

Comply with 29 CFR 1910.145.
Identify system voltage with black letters on an orange background.
Apply to exterior of door, cover, or other access.

Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

Labeling Instructions:

Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

Equipment to Be Labeled:

Enclosures and electrical cabinets.
Switchboards.

END OF SECTION 26 05 53

SECTION 262413 - SWITCHBOARDS

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

SUMMARY

Section Includes:

- Service and distribution switchboards rated 600 V and less.
- Surge protection devices.
- Disconnecting and overcurrent protective devices.
- Instrumentation.
- Accessory components and features.
- Identification.

ACTION SUBMITTALS

Product Data: For each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

Shop Drawings: For each switchboard and related equipment.

- Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
- Detail bus configuration, current, and voltage ratings.
- Perform and submit a short circuit and arc flash hazard study for the new switchboard section and existing switchboard distribution sections.
- Provide samples of the arc flash labels for new switchboard section and existing switchboard sections.
- Detail short-circuit current rating of switchboards and overcurrent protective devices.
- Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
- Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

Include time-current coordination curves for each type and rating of overcurrent protective device included in new main breaker section.

Include schematic and wiring diagrams for power, signal, and control wiring.

INFORMATIONAL SUBMITTALS

Qualification Data: For qualified Installer.

Field Quality-Control Reports:

Test procedures used.

Test results that comply with requirements.

Results of failed tests and corrective action taken to achieve test results that comply with requirements.

CLOSEOUT SUBMITTALS

Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

Routine maintenance requirements for switchboards and all installed components.

Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

QUALITY ASSURANCE

Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

Testing Agency Qualifications: Member company of NETA or an NRTL.

Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Comply with NEMA PB 2.

Comply with UL 891.

DELIVERY, STORAGE, AND HANDLING

Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.

Remove loose packing and flammable materials from inside switchboards and install temporary electric heating (250 W per section) to prevent condensation.

Handle and prepare switchboards for installation according to NEMA PB 2.1.

PROJECT CONDITIONS

Environmental Limitations:

Do not deliver or install switchboards until wet work in the electrical room is complete and dry and work above switchboard location is complete.

Rate equipment for continuous operation under the following conditions unless otherwise indicated:

Ambient Temperature: Not exceeding 104 deg F.
Altitude: Not exceeding 6600 feet.

Service Conditions: NEMA PB 2, usual service conditions, as follows:

Ambient temperatures within limits specified.
Altitude not exceeding 6600 feet.

COORDINATION

Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

WARRANTY

Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

MANUFACTURED UNITS

Manufacturers:

Square D; a brand of Schneider Electric.

Front-Connected, Front-Accessible Switchboards:

Main Devices: Fixed, individually mounted.

Nominal System Voltage: 480Y/277 V.

Main-Bus Continuous: 4000A.

Indoor Enclosures: Steel, NEMA 250, Type 1.

Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

Barriers: Between adjacent switchboard sections.

Insulation and isolation for main bus of main section.

Service Entrance Rating: Switchboard to be used as service entrance equipment and shall contain the main disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.

Bus Transition and Incoming Pull Sections: Matched and aligned with main switchboard section.

Removable, Hinged Compartment Covers: Secured by captive thumb screws for access to rear interior of switchboard.

Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

Buses and Connections: Three phase, four wire unless otherwise indicated.

Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, with tin-plated copper feeder circuit-breaker line connections.

Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors.

Ground Bus: Minimum-size required by UL 891, hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

Main Phase Buses and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.

Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual bus bars or flame-retardant, spray-applied insulation. Minimum insulation temperature rating of 105 deg C.

Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components including instruments and instrument transformers.

SURGE PROTECTION DEVICES

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Square D; a brand of Schneider Electric.

Surge Protection Device Description: IEEE C62.41-compliant, integrally mounted, wired-in, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, UL 1449, third edition listed, short-circuit current rating matching or exceeding the switchboard short-circuit rating, and with the following features and accessories:

Fuses, rated at 200-kA interrupting capacity.

Fabrication using bolted compression lugs for internal wiring.

Integral disconnect switch.

Redundant suppression circuits.

Redundant replaceable modules.

Arrangement with wire connections to phase buses, neutral bus, and ground bus.

LED indicator lights for power and protection status.

Audible alarm, with silencing switch, to indicate when protection has failed.

Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

Four-digit, transient-event counter set to totalize transient surges.

Peak Single-Impulse Surge Current Rating: 160 kA per mode/320 kA per phase.

Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20-mic.sec. surges with less than 5 percent change in clamping voltage.

Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277-V, three-phase, four-wire circuits shall be as follows:

Line to Neutral: 1200 V for 480Y/277.
Line to Ground: 1200 V for 480Y/277.
Neutral to Ground: 1200 V for 480Y/277.
Line to Line: 2000V for 480Y/277.

DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

Instantaneous trip.
Long- and short-time pickup levels.
Long- and short-time time adjustments.
Ground-fault pickup level, time delay, and I^2t response.

Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

Standard frame sizes, trip ratings, and number of poles.
Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

INSTRUMENTATION

Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:

Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:

- Phase Currents, Each Phase: Plus or minus 1 percent.
- Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
- Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
- Megawatts: Plus or minus 2 percent.
- Megavars: Plus or minus 2 percent.
- Power Factor: Plus or minus 2 percent.
- Frequency: Plus or minus 0.5 percent.

- Accumulated Energy, Megawatt Hours: Plus or minus 2 percent; accumulated values unaffected by power outages up to 72 hours.
- Megawatt Demand: Plus or minus 2 percent; demand interval programmable from five to 60 minutes.
- Contact devices to operate remote impulse-totalizing demand meter.

Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.

ACCESSORY COMPONENTS AND FEATURES

Energy Reduction Maintenance Switch

IDENTIFICATION

Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

Perform and submit a short circuit and arc flash hazard study for the new switchboard section and existing switchboard distribution sections.

PART 3 - EXECUTION

RETROFIT WORK

The manufacturer (Square D; a brand of Schneider Electric) of the existing main overcurrent protective device section in the existing main switchboard for the Dane County Courthouse shall perform modifications to the existing main switch board section. The main switchboard section will be modified to become a pull section that will accept a new feed from the new main switchboard section, specified herein and in the Drawings. The modified section will then feed the existing distribution sections of the existing Courthouse switchboard.

EXAMINATION

Receive, inspect, handle, and store switchboards according to NEMA PB 2.1.

Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.

Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work.

Proceed with installation only after unsatisfactory conditions have been corrected.

INSTALLATION

Install switchboards and accessories according to NEMA PB 2.1.

Equipment Mounting: Install switchboards on concrete base, 4 inch nominal thickness. Comply with requirements for concrete base specified in Division 3.

Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

Install anchor bolts to elevations required for proper attachment to switchboards.

Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

Install overcurrent protective devices, transient voltage suppression devices, and instrumentation.

Set field-adjustable switches and circuit-breaker trip ranges.

Comply with NECA 1.

IDENTIFICATION

Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

Device Nameplates: Label each overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

FIELD QUALITY CONTROL

Perform tests and inspections.

Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

Acceptance Testing Preparation:

Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.

Test continuity of each circuit.

Tests and Inspections:

Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

Perform the following infrared scan tests and inspections and prepare reports:

Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front panels so joints and connections are accessible to portable scanner.

Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

Switchboard will be considered defective if it does not pass tests and inspections.

Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

ADJUSTING

Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

Set field-adjustable circuit-breaker trip ranges as indicated in the overcurrent protective device coordination study performed by the manufacturer.

PROTECTION

Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

DEMONSTRATION

Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories and to use and reprogram microprocessor-based trip, monitoring, and communication units.

END OF SECTION 26 24 13

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SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

SUMMARY

Section Includes:

- GFCI receptacles, 125 V, 20 A.
- Toggle switches, 120/277 V, 20 A.

ACTION SUBMITTALS

Product Data: For each type of product.

Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

PART 2 - PRODUCTS

GENERAL WIRING-DEVICE REQUIREMENTS

Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

Comply with NFPA 70.

RoHS compliant.

Comply with NEMA WD 1.

Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

- Connectors shall comply with UL 2459 and shall be made with stranding building wire.
- Devices shall comply with requirements in this Section.

Device Color:

- Wiring Devices Connected to Normal Power System: Almond unless otherwise indicated or required by NFPA 70 or device listing.
- Wiring Devices Connected to Essential Electrical System: Red.

Wall Plate Color: For plastic covers, match device color.

Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

GFCI RECEPTACLES, 125 V, 20 A

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Hubbell Incorporated; Wiring Device-Kellems.
Leviton Manufacturing Co., Inc.
Pass & Seymour/Legrand (Pass & Seymour).

Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A:

Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
Configuration: NEMA WD 6, Configuration 5-20R.
Type: Non-feed through.
Standards: Comply with UL 498 and UL 943 Class A.
Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" articles.

TOGGLE SWITCHES, 120/277 V, 20 A

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Hubbell Premise Wiring.
Leviton Manufacturing Co., Inc.
Pass & Seymour/Legrand (Pass & Seymour).

Three-Way Switches, 120/277 V, 20 A:

Comply with UL 20 and FS W-S-896.

WALL PLATES

Single Source: Obtain wall plates from same manufacturer of wiring devices.

Single and combination types shall match corresponding wiring devices.

Plate-Securing Screws: Metal with head color to match plate finish.

Material for Damp Locations: Cast aluminum with spring-loaded lift cover and listed and labeled for use in wet and damp locations.

Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

PART 3 - EXECUTION

INSTALLATION

Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

Coordination with Other Trades:

Protect installed devices and their boxes. Do not place wall finish materials over device boxes, and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
Install wiring devices after all wall preparation, including painting, is complete.

Conductors:

Do not strip insulation from conductors until right before they are spliced or terminated on devices.
Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
The length of free conductors at outlets for devices shall comply with NFPA 70, Article 300, without pigtails.

Device Installation:

Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
Use a torque screwdriver when a torque is recommended or required by manufacturer.
When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
Tighten unused terminal screws on the device.
When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

Receptacle Orientation:

Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.

Device Plates: Do not use oversized or extra-deep plates.

Arrangement of Devices: Unless otherwise indicated, surface mount, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

IDENTIFICATION

Comply with Section 260553 "Identification for Electrical Systems."

FIELD QUALITY CONTROL

Perform the following tests and inspections:

Test Instruments: Use instruments that comply with UL 1436.
Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

Tests for Receptacles:

Line Voltage: Acceptable range is 105 to 132 V.
Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
Ground Impedance: Values of up to 2 ohms are acceptable.
GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
Using the test plug, verify that the device and its outlet box are securely mounted.
Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault-current path, defective devices, or similar problems. Correct circuit conditions remove malfunctioning units and replace with new ones, and retest as specified above.

Wiring device will be considered defective if it does not pass tests and inspections.

Prepare test and inspection reports.

END OF SECTION 26 27 26

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

SUMMARY

Section Includes:

Hot-mix asphalt patching.

Related Requirements:

Section 024119 “Selective Demolition” for underground electric structures, underground utilities, and pavements.

Section 321313 "Concrete Paving" for concrete pavement and for separate concrete curbs, gutters, and driveway aprons.

PREINSTALLATION MEETINGS

Preinstallation Conference: Conduct meeting as part of the overall project pre-construction meeting.

ACTION SUBMITTALS

Hot-mix asphalt designs.

INFORMATIONAL SUBMITTALS

Material Certificates: Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.

Aggregates.

Asphalt binder.

Tack coat.

QUALITY ASSURANCE

Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of City of Madison Standard Specifications for Public Works Construction (latest edition) for asphalt paving work.

Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

PART 2 - PRODUCTS

AGGREGATES

Conform to Section 401.1(b) of Article 401 – Crushed Aggregate Base Course of City of Madison Standard Specifications for Public Works Construction.

ASPHALT MATERIALS

Asphalt Binder: Conform to Section 402.1 of Article 402 – Asphalt Construction of City of Madison Standard Specifications for Public Works Construction.

Asphalt Cement: Conform to Section 402.1 of Article 402 – Asphalt Construction of City of Madison Standard Specifications for Public Works Construction.

Tack Coat: Conform to Section 402.4 of Article 402 – Asphalt Construction of City of Madison Standard Specifications for Public Works Construction..

AUXILIARY MATERIALS

Recycled Materials for Hot-Mix Asphalt Mixes: Conform to Section 402.5 of Article 402 – Asphalt Construction of City of Madison Standard Specifications for Public Works Construction. Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled materials from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.

MIXES

Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by Wisconsin DOT.

PART 3 - EXECUTION

PATCHING

Asphalt Pavement: Conform to Article 201 – Excavation Cut of City of Madison Standard Specifications for Public Works Construction. Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd..

Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

SURFACE PREPARATION

Ensure that prepared subgrade is ready to receive paving. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces.

Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd..

Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

HOT-MIX ASPHALT PLACEMENT

Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

Place hot-mix asphalt binder course in number of lifts and thicknesses indicated.

Place hot-mix asphalt surface course in single lift.

Spread mix at a minimum temperature of 250 deg F.

Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

COMPACTION

General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

Complete compaction before mix temperature cools to 185 deg F.

Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

Average Density, Rice Test Method: 92 percent of reference maximum theoretical density in accordance with ASTM D2041/D2041M, but not less than 90 percent or greater than 96 percent.

Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

INSTALLATION TOLERANCES

Pavement Thickness: Compact each course to produce thickness indicated within the following tolerances:

Binder Course: Plus or minus 1/2 inch.

Surface Course: Plus 1/4 inch, no minus.

Pavement Surface Smoothness: Compact each course to produce surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

Binder Course: 1/4 inch

Surface Course: 1/8 inch

Crowned Surfaces: Test with crowned template centered and at right angle to crown.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

SUMMARY

Section Includes Concrete Paving Including the Following:

- Driveways.
- Curbs and gutters.
- Walks.

ACTION SUBMITTALS

Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

QUALITY ASSURANCE

Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

PART 2 - PRODUCTS

CONCRETE, GENERAL

Conform to Section 301.1 of Article 301 – Concrete and Concrete Materials of City of Madison Standard Specifications for Public Works Construction.

STEEL REINFORCEMENT

Reinforcing Bars: Conform to Section 301.3 of Article 301 – Concrete and Concrete Materials of City of Madison Standard Specifications for Public Works Construction.

Joint Dowel Bars: Conform to Section 301.3 of Article 301 – Concrete and Concrete Materials of City of Madison Standard Specifications for Public Works Construction.

CONCRETE MATERIALS

Conform to Section 301.1 of Article 301 – Concrete and Concrete Materials of City of Madison Standard Specifications for Public Works Construction.

CURING MATERIALS

Conform to Section 301.7 of Article 301 – Concrete and Concrete Materials of City of Madison Standard Specifications for Public Works Construction.

CONCRETE MIXTURES

Conform to Section 301.1 of Article 301 – Concrete and Concrete Materials of City of Madison Standard Specifications for Public Works Construction.

PART 3 - EXECUTION

CONCRETE CURB AND GUTTER

Conform to Article 302 – Concrete Curb and Gutter of City of Madison Standard Specifications for Public Works Construction.

CONCRETE SIDEWALK AND CONCRETE DRIVEWAY

Conform to Article 303 – Concrete Sidewalks, Concrete Driveways, Concrete Mountable Median Island Nose and Steps of Concrete Masonry of City of Madison Standard Specifications for Public Works Construction.

PREPARATION

Remove loose material from compacted subbase surface immediately before placing concrete.

EDGE FORMS AND SCREED CONSTRUCTION

Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

STEEL REINFORCEMENT INSTALLATION

Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

JOINTS

General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, to match jointing of existing adjacent concrete paving:

Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inchradius. Repeat tooling of edges after applying surface finishes.

CONCRETE PLACEMENT

Conform to Section 301.5 of Article 301 – Concrete and Concrete Materials of City of Madison Standard Specifications for Public Works Construction.

FLOAT FINISHING

General: Do not add water to concrete surfaces during finishing operations.

Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.

CONCRETE PROTECTION AND CURING

General: Conform to Section 301.8 of Article 301 – Concrete and Concrete Materials of City fo Madison Standard Specifications for Public Works Construction. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

Comply with ACI 306.1 for cold-weather protection.

PAVING TOLERANCES

Comply with tolerances in ACI 117 and as follows:

Elevation: 3/4 inch.

Thickness: Plus 3/8 inch, minus 1/4 inch.

Surface: Gap below 10-feet- long; unleveled straightedge not to exceed 1/2 inch.

Joint Spacing: 3 inches.

Contraction Joint Depth: Plus 1/4 inch, no minus.

Joint Width: Plus 1/8 inch, no minus.

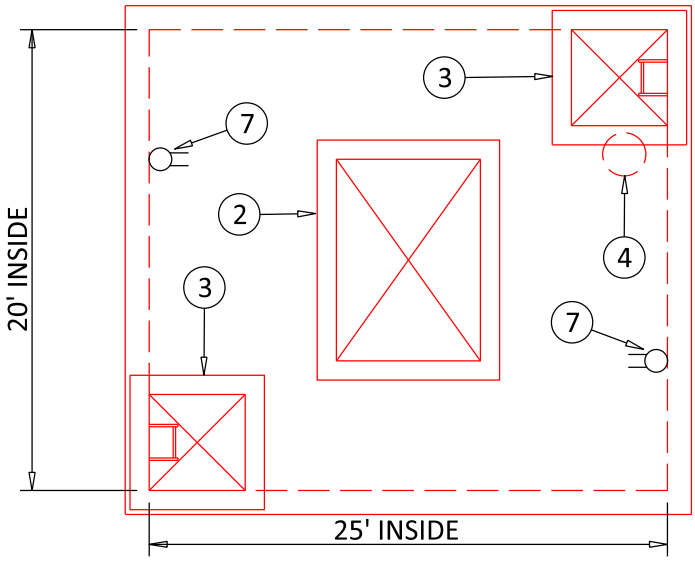
REPAIR AND PROTECTION

Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

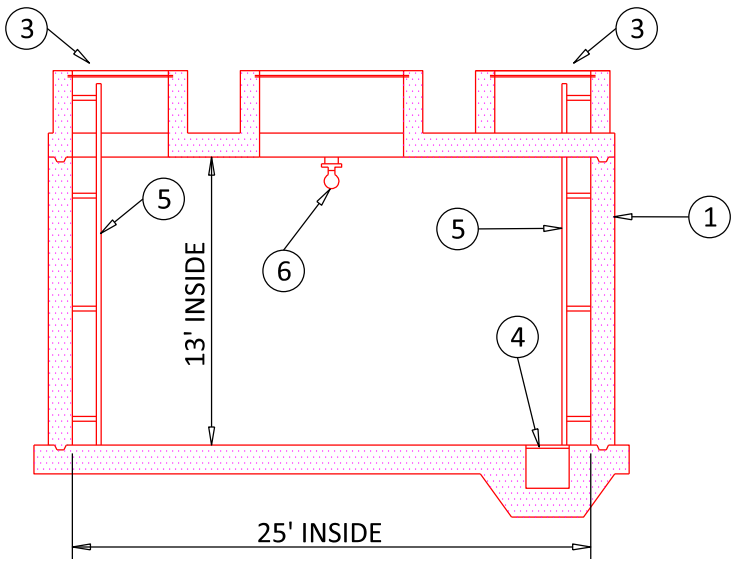
Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313



TOP VIEW



SECTION VIEW

MIS-3A
TYPICAL BELOW-GRADE TRANSFORMER VAULT
TWO TRANSFORMER CONFIGURATION 480 VOLTS OR LESS

Dimensions and configuration shown are typical. Each transformer vault will be treated on an individual basis. Consult MGE for required vault dimensions and configuration. The customer will be responsible for the structural design and construction of the transformer vault.

MGE Will Furnish:

-Submersible network transformer(s).
-Primary cables and terminations at transformer(s).
-Secondary terminations at transformer(s).
-Ground rods (coordination required - installed prior to pouring of vault floor).
-Pulling irons at appropriate locations (furnished by MGE, installed by customer; coordination required - installed prior to pouring of vault wall).

The Customer Will Furnish:

1. Transformer vault, including structural design, construction with proper support of existing facilities, and permanent maintenance.
2. Galvanized equipment access doors, 6'x8' minimum, grilled to provide ventilation.
3. Galvanized personnel access doors, 32"x32" minimum, grilled to provide ventilation.
4. Sump pit, 18"x18" minimum, covered with galvanized steel plate, locate just to the side of one of the ladders; entire floor must drain toward pit. Floor must be smooth troweled.
5. Galvanized steel ladders at personnel access door.
6. Lighting with associated light switches located at each personnel access door no more than 18" below the ceiling.
7. Electrical outlets, as required by code, and at least one 120/208-volt outlet at the light switch location for each personnel access door.
8. Secondary bus duct from main disconnect switch to collector bus including NEMA 2-hole, double-compression copper lugs or secondary wires from main disconnect to collector buss.
9. Ventilation per all applicable codes. Forced air ventilation is required if free air ventilation can not be meet. The code requires 3 square inches of free space per KVA of transformer capacity. Contact MGE for specifics on forced air ventilation.

NOTE:
1. Vaults shall be constructed and maintained in accordance with all applicable codes and regulations.
2. Permanent truck access to the vault is required.
3. MGE requires that the transformer vault be located away from occupied space.
4. This information is intended to supplement the customer's constuction documents. Any discrepancies shall be forwarded to MGE Engineering.

Soils & Engineering Services, Inc.

December 14, 2018 Project 13248 R01

Mr. Christopher C. Harp, AIA
Mead & Hunt, Inc.
2440 Deming Way
Madison, Wisconsin 53562

Subject: Geotechnical Exploration and Analyses Report
Dane County Jail Consolidation Project
114 West Wilson Street
City of Madison
Dane County, Wisconsin
DCPW Project #318003

Dear Mr. Harp:

We have completed the requested geotechnical exploration consisting of the performance of six standard soil borings at the subject building site and the associated laboratory testing and geotechnical engineering analyses. The purpose of these soil borings was to obtain information about the soil, bedrock, and groundwater conditions at the soil boring locations. We present our findings, comments, recommendations, and analyses results in the enclosed *Geotechnical Exploration and Analyses Report* for the subject structure.

Respectfully submitted,

SOILS & ENGINEERING SERVICES, INC.

Craig M. Bower

Craig M. Bower, P.E.

CMB:DER:cmb

Enclosure

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GEOTECHNICAL EXPLORATION AND ANALYSES REPORT

DANE COUNTY JAIL CONSOLIDATION PROJECT
114 WEST WILSON STREET
CITY OF MADISON
DANE COUNTY, WISCONSIN
DCPW PROJECT #318003

SES Project Number 13248

Prepared By

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Craig M. Bower, P.E.

Submitted To

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Madison, Wisconsin 53562
Phone: (608) 273-6380

Mr. Christopher C. Harp, AIA

December 14, 2018

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Appendix B
- Table 1-1: Recommended Soil Design Parameters
- USGS Design Maps Summary Report

I. INTRODUCTION

This *Geotechnical Exploration and Analyses Report* for the Dane County Jail Consolidation Project summarizes the findings of the geotechnical exploration, laboratory and field tests, and geotechnical engineering analyses performed for the design and construction of a new multi-story Jail Facility Addition at 114 West Wilson Street in the City of Madison, in Dane County, Wisconsin. We completed this work under the general direction of Mead & Hunt, Inc. (MHI) who established the general scope of the work.

The intent of this report is to: (1) convey the geotechnical information obtained from six soil borings; (2) present the results of laboratory and field tests; (3) provide the results of our geotechnical engineering analyses; and (4) present our comments and recommendations for the design and construction of the proposed structure. We recommend Dane County Department of Public Works employ Soils & Engineering Services, Inc. to make observations and perform tests at the time of excavation and construction of the structure to verify the soil and groundwater conditions encountered by the exploration performed, and to validate our comments, analyses, and recommendations presented in this report for the subject structure.

II. EXECUTIVE SUMMARY

Originally, additional stories were proposed for the existing Public Works Building. MHI provided photocopies of the building plans and the *Subsurface Exploration* report prepared by Mr. Clifton E.R. Lawson in 1992 for the existing Public Works Building for use in developing a soil exploration plan for the proposed additional stories. Mr. Lawson recommended an allowable soil bearing resistance of 10,000 pounds per square foot (psf) be used for the design of strip and column spread footing foundation systems to support the existing structure. Based on our review of these documents, we recommended three soil borings be performed at select locations adjacent to the existing structure to determine if the soil bearing resistance could be increased.

We understand a subsequent structural engineering analysis of the support members of the existing structure concluded that additional stories could not be supported by the existing structure. Therefore, it was determined that a multi-story building addition could be located adjacent the existing structure where a surface parking lot is currently located. We located the current soil borings within the limits of this surface parking lot.

Based on the results of the soil borings, the associated laboratory and field testing, and our geotechnical analyses, we determined that construction of the proposed multi-story building addition supported on a foundation system consisting of strip and column spread footings is possible. We also determined that the allowable soil bearing resistance to use in designing the foundation footings could range from 20,000 to 30,000 psf dependant

upon the distance between the bottom of the footings and the finished slab-on-grade floor elevation or finished ground surface elevation.

III. PROJECT INFORMATION

The project includes the design and construction of a new jail facility building addition to the existing Dane County Public Safety Building at 115 West Doty Street in the City of Madison, Dane County, Wisconsin. The project site area is located on the southeast side of the existing Public Safety Building at 114 West Wilson Street, which is on the northwest side of West Wilson Street approximately halfway between the intersections of South Carol Street and South Hamilton Street with West Wilson Street.

The proposed building addition will be a multi-story, slab-on-grade structure. The new structure footprint will be approximately 17,160 square feet with approximate exterior dimensions of 132 feet by 130 feet. We understand the proposed building addition will have a top of finished slab elevation of 30'-6", which matches the lowest level of the existing Public Safety Building. For the Public Safety Building, this lower level is used primarily for vehicular parking. For the building addition, the lowest floor level will be the sub-basement and will have storage and mechanical rooms.

IV. FIELD EXPLORATION

The field exploration for the subject structure consisted of the performance of six standard soil borings, designated Borings 1-18, 2-18, 2-18A, and 3-18 through 5-18, at the locations shown on the Location Sketch, Drawing 13248-1, enclosed in Appendix A. Originally, some of the soil borings were located on the ramp to the lower level of the adjacent Dane County Courthouse and Public Safety Building structures. We did not locate any soil borings on the ramps due to the presence of hydronic heating system tubing in the concrete pavement for these ramps,. We also located Borings 2-18 and 2-18A to avoid the below-grade storage room for the hydronic heating system equipment.

We drilled and sampled the borings for the Jail Facility Addition to the following depths below ground surface and corresponding elevation:

Boring	Ground Surface Elevation (feet)	Bottom of Boring	
		Depth Below Ground Surface	Elevation (feet)
1-18	42.1	49'-5"	-7.3

Boring	Ground Surface Elevation (feet)	Bottom of Boring	
		Depth Below Ground Surface	Elevation (feet)
2-18	42.7	3'-0"	39.7
2-18A	42.7	49'-9"	-7.1
3-18	40.3	49'-8.5"	-9.4
4-18	34.3	48'-11.5"	-14.7
5-18	38.7	48'-7"	-9.9

Boring 2-18 encountered auger refusal on an unknown obstruction at the depth presented above. Due to the unknown obstruction, our drilling crew moved the drill rig 5 feet southeast of the original location and completed Boring 2-18A.

At Borings 2-18, 2-18A and 4-18, we used 2¼-inch-inside-diameter hollow-stem augers to maintain open boreholes as we advanced the boreholes to the top of each sample interval. At Borings 1-18, 3-18, and 5-18, we used 2¼-inch-inside-diameter hollow-stem augers to maintain open boreholes as we advanced the boreholes to respective depths of 13.5, 13.5 and 8.5 feet where we switched to 3⅞-inch-diameter tri-cone mud rotary methods to advance the boreholes to the top of each sample interval. We obtained soil samples at 2½-foot intervals starting at a depth of 1-foot below the ground surface and continued to a depth of 15 feet. We increased the sampling interval to 5 feet from a depth of 15 feet to the stated termination depth. We performed this sampling using a 2-inch-outside-diameter split-barrel sampler according to ASTM Designation D1586. For Borings 1-18, 3-18, and 5-18, we also performed pressuremeter tests at depths ranging from 12.3 to 44.8 feet below ground surface. We visually and manually identified the recovered soils in general compliance with the Unified Soil Classification System (USCS) identification procedures as defined in ASTM Designation D2488.

We depict the subsoil stratification at each boring location on the Soil Boring Records enclosed in Appendix A. We provide information pertinent to the Soil Boring Records on the Notes and Legend Record enclosed in Appendix A.

Soils & Engineering Services, Inc. personnel determined the ground surface elevation at the locations of Borings 1-18, 2-18, 2-18A, and 3-18 through 5-18 using a surveying level and a leveling rod. We used a benchmark consisting of the top of the existing floor slab at an entrance door adjacent to a loading dock on the northeast side of the existing Public Safety Building with a *given* elevation of 44.0 feet City of Madison datum. The *given* benchmark elevation is from Sheet 5-19R dated July 21, 1995, for the Public Safety

Building. Based on the November 26, 2018, Boundary Topographic and Utility Survey drawing prepared by JSD Professional Service, Inc., the NAVD88 elevation for this floor slab is 889.5 feet. We plotted the Soil Boring Records with depth and elevation scales for reference.

V. SOIL STRATIGRAPHY

The soil stratigraphy encountered at Borings 1-18, 2-18, 2-18A, and 3-18 through 5-18 can generally be characterized as fill material overlying native soil strata. None of the borings encountered bedrock within the depths drilled.

The soil stratigraphy encountered by Borings 1-18 and 2-18A through 5-18 is similar to the soil stratigraphy encountered by the borings performed in 1992 for the existing Public Safety Building.

The borings encountered a pavement material, fill material, and topsoil stratification of variable thickness and type. We describe the variable fill/topsoil strata encountered at the borings as follows:

- Boring 1-18 encountered 3 inches of hot-mix asphalt (HMA) pavement over 9 inches of brown fine SILTY SAND WITH GRAVEL (SM) FILL crushed stone base course over 24 inches of brown fine SILTY SAND WITH GRAVEL (SM) FILL.

- Boring 2-18 encountered 3 inches of HMA pavement over 10 inches of brown fine SILTY SAND WITH GRAVEL (SM) FILL crushed stone base course over 23 inches of light brown fine SILTY SAND WITH GRAVEL (SM) FILL. Boring 2-18 encountered auger refusal on an unknown obstruction and did not penetrate through the FILL.

- Boring 2-18A encountered 3 inches of HMA pavement over 10 inches of brown fine SILTY SAND WITH GRAVEL (SM) FILL crushed stone base course over 4.9 feet of light brown fine SILTY SAND WITH GRAVEL (SM) FILL over 12 inches of very dark brown to black LEAN CLAY (CL) FILL TOPSOIL with some roots over 11.5 feet of brown to dark brown fine SILTY SAND WITH GRAVEL (SM) FILL with occasional LEAN CLAY (CL) lenses and seams.

- Boring 3-18 encountered 6 inches of HMA pavement over 18 inches of brown fine SILTY SAND WITH GRAVEL (SM) FILL crushed stone base course over 3 inches of LEAN CLAY (CL) FILL with few gravel.

- Boring 4-18 encountered 6 inches of HMA pavement over 8 inches of brown fine SILTY SAND WITH GRAVEL (SM) FILL crushed stone base course over 34 inches

of brown fine SILTY SAND WITH GRAVEL (SM) FILL over 42 inches of brown fine POORLY-GRADED GRAVEL (GP) FILL with trace to little sand over 42 inches of brown fine SILTY SAND WITH GRAVEL (SM) FILL.

- Boring 5-18 encountered 4 inches of HMA pavement over 14 inches of brown fine SILTY SAND WITH GRAVEL (SM) FILL crushed stone base course over brown fine SILTY SAND (SM) FILL with fine CLAYEY SAND (SC) and SANDY LEAN CLAY (CL) seams.

Below the fill material, Borings 1-18, 2-18A, and 3-18 through 5-18 encountered a similar native soil strata consisting of light brown fine SILTY SAND WITH GRAVEL AND COBBLES (SM) GLACIAL TILL. We noted that the GLACIAL TILL contained a variable quantity of gravel from trace to some and a variable quantity of cobbles from no to few.

Variations to the native soil strata described above consisted of:

- Boring 1-18 encountered a 2-foot thick stratum of brown fine POORLY-GRADED SAND (SP) at a depth of 20.5 feet.

- Boring 3-18 encountered a 1-foot thick stratum of brown fine POORLY-GRADED SAND (SP) at a depth of 20.0 feet

Please refer to the Soil Boring Records enclosed in Appendix A for a further description of the fill material and native soil strata encountered at the boring locations.

VI. GROUNDWATER

Due to the use of drilling mud to extend the boreholes of Borings 1-18, 3-18, and 5-18, the depth to groundwater could not be measured at completion of the drilling and sampling at these borings. Our drilling crew found the boreholes of Borings 2-18, 2-18A, and 4-18 to be in the following conditions at completion of the drilling and sampling at each of these borings:

- Boring 2-18 was dry at the maximum depth of the boring.

- Borings 2-18A and 4-18 had a water level and the boreholes were caved below the water level.

- Our drilling crew left Boring 2-18A open for 2.5 hours after completion drilling and found the borehole to be caved and wet at that time.

The measured water level depths and respective elevations and measured caved levels and respective elevations for the borings are summarized as follows:

Boring	Ground Surface Elevation (feet)	Water Level			Caved Level		
		Depth (feet-inch)	Elevation (feet)	Comments	Depth (feet-inch)	Elevation (feet)	Comments
2-18A	42.7	41'-3"	1.5	At completion	44'-7"	-1.9	At completion
		—	—	—	34'-0"	8.7	At 2.5 hours after completion
4-18	34.3	36'-0"	-1.7	At completion	43'-0"	-8.7	At completion

The water level measured in the borings performed in 1992 ranged from elevation 9.3 to 14.0 feet.

We expect the groundwater level to fluctuate as influenced by precipitation, snowmelt, surface water runoff, City of Madison municipal well pumping, the lake levels of Lakes Mendota and Monona, and other hydrological and hydrogeological factors. The groundwater level at the time of construction of the subject building may be higher or lower than the groundwater levels encountered on the days that we performed the borings.

VII. LABORATORY AND FIELD TESTS

We performed laboratory tests on a portion of selected split-barrel soil samples to determine the physical properties of the fill material and underlying native soil strata encountered at the boring locations. The laboratory tests on the selected material from the split-barrel soil samples consisted of determining the moisture content (MC), wet and dry densities (γ_w and γ_d), the percentage of soil particles passing the No. 200-mesh sieve (P_{200}), and particle size distribution analysis. In addition to the above tests, we tested some of the cohesive soils for approximate unconfined compressive strength (q_p) using a spring penetrometer.

The field tests consisted of the performance of pressuremeter tests and standard penetration resistance tests (SPT). We performed the SPT during the sampling procedure at each of the boring locations. The SPT is the sum of the number of blows required to drive the split-barrel sampler 12 inches with a 140-pound hammer weight falling 30 inches. The corrected standard penetration resistance {$(N_1)_{60}$-value} is the N-value corrected for hammer efficiency and normalized to an effective overburden pressure at 1-atmosphere.

We performed 8 pressuremeter tests in the boreholes of Borings 1-18, 3-18, and 5-18 at depths ranging from 12.3 to 44.8 feet below existing grade to evaluate the in-situ strength

and compressibility characteristics of the native soil strata encountered at the project site. We used a TEXAM Pressuremeter to perform the pressuremeter tests. The pressuremeter test procedure consists of lowering a cylindrical device (commonly referred to as the probe) into a pre-drilled borehole. At the test depth, we recorded the initial volume and internal pressure of the probe. We then increase the pressure in increments until the native soil reaches a "failure" condition or the membrane in the probe fails. At each pressure increment, we record the increased volume of the probe. We correct the pressure and volume data readings obtained during the tests to account for the atmospheric pressure and pressure and volume calibrations of the probe.

We used the measured stress-strain characteristics and soil failure pressures obtained from the pressuremeter tests to estimate the bearing capacity and settlement of the soil which will be supporting the foundations for the proposed building. We used each of the pressuremeter test results to determine the Pressuremeter (Deformation) Modulus, "E," and the Limit Pressure, "P_L." The Pressuremeter Modulus is representative of the elasticity of the soil and is used to compute the estimated amount of settlement of the soil due to an increase in the loading conditions at the site. The Limit Pressure is related to the shear strength of the soil and is used to compute the ultimate bearing capacity.

We include the laboratory and field test results obtained for this report on the Soil Boring Records, Laboratory Test Result Records (Figures 1 and 2), and Field Test Results Records (Figures 3 through 10), enclosed in Appendix A. We used the results from the Atterberg limits, P_{200}, and particle size distribution analysis tests to confirm or modify the USCS soil identifications in general compliance with USCS classification procedures as defined in ASTM Designation D2487.

The laboratory and field tests suggest the following:

- The granular FILL is in a moist relative moisture condition and in a very loose to medium dense state of relative density.

- The very dark brown to black LEAN CLAY (CL) FILL TOPSOIL is in a moist relative moisture condition and of stiff to very stiff consistency.

- The light brown fine SILTY SAND WITH GRAVEL AND COBBLES (SM) GLACIAL TILL is in a moist to wet relative moisture condition and in a medium dense to very dense state of relative density.

- The brown fine POORLY-GRADED SAND (SP) strata encountered at Borings 1-18 and 3-18 are in a wet relative moisture condition and in a very loose state of relative density.

We used the laboratory and field test results in our evaluation of the fill material and native soil strata encountered at the boring locations to determine soil parameters to use in the design of the foundation system for the Dane County Jail Consolidation Project building addition.

VIII. ANALYSES PROCEDURES, ASSUMPTIONS, & GIVEN INFORMATION

Borings 2-18A and 4-18 encountered very loose to medium dense granular fill material with low to moderate bearing capacity capability to approximately elevation 24 feet. Below this elevation at these two borings and at Borings 1-18, 3-18, and 5-18, the borings encountered medium dense to very dense native GLACIAL TILL with high bearing capacity capability. The very loose to medium dense granular fill material will need to be removed from below the proposed building addition and replaced with engineered fill material as specified below herein.

We understand the preferred method of foundation support is a shallow foundation system consisting of strip and column spread footings. Based on a review of the 1995 structure plans provided by MHI, strip footing of 2 to 4 feet width and square column footings of 6 to 12.5 feet were used for the existing Public Safety Building. Therefore, we performed geotechnical analyses for similarly-sized strip and column spread footing foundations systems using the following procedures, assumptions, and given information.

A. Groundwater Elevation

We used an estimated design groundwater level elevation of 15.0 feet based on the field exploration.

B. Soil Design Parameters

We present the angle of internal friction (φ), unit weight (γ), and cohesion (c) values used in our analyses in enclosed Table 1-1 in Appendix B. We computed the angle of internal friction values using empirical formulas based on the $N1_{60}$-values for each soil stratum. We based the cohesion values on the approximate unconfined compressive strength readings obtained using a spring penetrometer and laboratory unconfined compression strength results. We estimated the density values based on (1) wet density (γ_w) test results of selected representative samples of the various strata encountered by the borings performed, (2) the standard penetration results obtained by the borings performed, and (3) our experience with similar material.

C. Floor Elevations

We understand the top of finished floor slab elevation for the lowest level of the subject structure will match the existing Public Safety Building lowest finished floor elevation of 30.5 feet.

D. Ultimate Bearing Resistance

The ultimate bearing resistance of the soil strata below the subject building is based on the depth of the footing below the lowest ground surface elevation adjacent to the footing, the type and strength of the soil strata below the footing, and the size and type of footing.

We used the standard general bearing capacity equation to compute the ultimate bearing resistance for strip, column, and mat footings. We also used the equations presented in the books *The Pressuremeter and Foundation Engineering* and *The Pressuremeter* to confirm the computed ultimate bearing resistance using the pressuremeter test results.[1&2] We recommend a factor of safety of 3 be applied to the ultimate bearing resistance to compute the allowable bearing resistance.

For our geotechnical analyses we assumed strip footings and square column footings to support the structure. Using the provided plans for the existing Public Safety Building, we used shallow foundation member bottom elevations ranging from approximately 3.5 to 10.0 feet below the top of finished floor slab elevation in our analyses. We recommend a foundation footing bottom elevation of 27.5 feet or lower.

We should be contacted to perform bearing resistance analyses for any foundation member resting above elevation 27.5 feet.

E. Estimated 'Total Settlement' (S_t)

The estimated S_t of a shallow foundation member for the subject building is based on the depth of the shallow foundation member below the lowest ground surface elevation adjacent to the footing, the size and type of shallow foundation member, the type and strength of the soil strata below the shallow foundation member to a

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[1]Baguelin, F., J. F. Jézéquel, and D. H. Shields. *The Pressuremeter and Foundation Engineering.* Aedermannsdorf, Switzerland: Trans Tech Publications, 1978. Print.

[2]Briaud, Jean-Louis. *The Pressuremeter.* Rotterdam: A.A. Balkema, 1992. Print.

depth equal to 3 times the shallow foundation member width, and the design service load for the shallow foundation member.

We used the empirical Hough equation for granular material to compute an estimated S_t for each of the footing sizes presented above. We also used the equations presented in the books *The Pressuremeter and Foundation Engineering* and *The Pressuremeter* to confirm the estimated S_t using the pressuremeter test results.

We used a total shallow footing settlement of less than 1-inch and differential settlement of less than 0.03 inches per foot of horizontal distance between two points of reference, in our geotechnical analyses.

IX. ANALYSES RESULTS

We performed our shallow foundation analyses with the assumption that the existing very loose to medium dense granular fill and native material exposed by the excavations to accommodate the foundation footings would be removed and replaced with compacted crushed stone base course material.

We performed the shallow foundation analyses using the procedures and the given and estimated information as outlined above in Section VIII for the subject structure. We computed the following recommended ultimate and allowable bearing resistances and estimated total settlements for a shallow foundation system consisting of strip footings and column footings for the soil strata encountered by Borings 1-18 through 5-18:

	Bearing Resistance (psf)	
Footing Bottom Elevation	Ultimate	Allowable
27.5 to 25.5 feet	60,000	20,000
25.51 to 23.0 feet	75,000	25,000
less than 23.0 feet	90,000	30,000

X. COMMENTS AND RECOMMENDATIONS

Based on the available information, the subject project site is considered to be a feasible location for the design and construction of the proposed Public Safety building addition in the City of Madison. Due to the presence of very loose to medium dense native and fill

granular soil strata encountered by the soil borings, we recommend that each footing excavation and the floor slab excavation be observed and tested by Soils & Engineering Services, Inc. personnel to confirm the soil support capability of the exposed soils as indicated to be present by the borings and pressuremeter tests performed.

Based on the soil boring information and the laboratory and field test results completed, we offer the following comments and recommendations for the design and construction of the subject project supported on a shallow foundation system consisting of strip and column footings to support the structure.

A. Site Preparation

Site preparations should include removing the existing HMA pavement from the area of the proposed improvements. We expect the selected earthwork contractor can accomplish removal of the surficial materials using normal earth-moving equipment. The HMA pavement encountered was found to be 3 to 6 inches thick. More or less HMA pavement may be encountered in unexplored areas of the proposed improvement.

B. Site Excavation

We recommend that site excavation be performed using a backhoe containing a cleaning bucket instead of a bucket with cutting teeth. A cleaning bucket is a standard bucket equipped with a continuous cutting edge which can be fabricated by bolting or welding a flat steel plate in front of the cutting teeth of a toothed bucket. A cleaning bucket is intended to reduce potential disturbance to the subgrade soil which may occur if a bucket with cutting teeth is used for site excavation purposes. We do not anticipate the need for bedrock excavation for the subject project.

Due to the existing structural and roadway improvements surrounding the subject project site location, sloping of the excavation sidewalls to provide a safe excavation will not be possible. We recommend that a soil retention system be designed for installation outside the proposed building's foundation to provide a safe excavation in which the subject structure can be constructed and to support the existing improvements. Due to the medium dense to very dense GLACIAL TILL soils, which can contain cobbles and boulders, we do not recommend the use of sheet piling as the soil retention system. We recommend the soil retention system consist of solder piles with lagging, soil nail walls, or similar top-down constructed retention system. We recommend the soil retention system be designed by a professional engineer experienced in the design of such systems and licensed by the State of Wisconsin.

The recommended soil retention system could be designed as a permanent or temporary structure. The selection of the type of soil retention system and the distance between it and the proposed below-grade foundation walls for the proposed building addition can impact the design and construction of the below-grade foundation walls for the subject building addition.

1. Foundation Excavations

We recommend the excavation to accommodate the new strip and column, foundation members remove all existing cohesive and granular fill material and any native POORLY-GRADED SAND (SP) from below the foundation members. We recommend the bottom elevation of each strip or column footing be a minimum of 3.5 feet below the lowest adjacent finished floor slab or ground surface elevation. For foundation footings requiring frost protection, we recommend a minimum embedment of 5.0 feet below the lowest adjacent finished ground surface elevation.

Excavations that extend below the proposed bottom of shallow spread footings should extend out from the lower outer edges of the footing 1-foot for every foot of excavation below the bottom of the foundation element.

After completing the excavation to accommodate the new foundation members, we recommend thorough compaction of the exposed granular soil. Thorough compaction of granular excavation surfaces should be performed using a backhoe-mounted, vibratory-plate compactor. Soils & Engineering Services, Inc. personnel should observe the thorough compaction procedure. If the compaction of the granular excavation surface should draw the groundwater upwards, then the compaction effort should be stopped. The granular soil should be compacted to a density of at least 95 percent of the maximum dry density determined for the soil according to ASTM Designation D 1557 for a minimum depth of 24 inches below the excavation bottom. Soils & Engineering Services, Inc. personnel should test the compacted granular soil to verify that the minimum density has been achieved. If the soils exposed by the excavation cannot be compacted, then undercut may be necessary.

After excavating to or below the design subgrade elevation, Soils & Engineering Services should observe and test the thoroughly compacted soil before proceeding with footing construction or placement of crushed stone base course. Dependent upon the soil conditions present at each footing, undercut followed by placement of crushed stone base course as specified below in Section X.E may be necessary to improve the soil support capability of the exposed soils.

After acceptance of the thoroughly compacted soil, construction of the foundation footing can commence where the exposed soil is at the footing subgrade elevation. For excavations that extended below the footing subgrade elevation, we recommend placement of crushed stone base course to raise the grade to footing subgrade elevation followed by foundation footing construction.

2. Slab-On-Grade Floor Excavation

We recommend the excavation to accommodate the slab-on-grade floor extend a minimum of 8 inches below the bottom of the slab-on-grade floor elevation. We recommend granular soil exposed for the slab-on-grade floor be thoroughly compacted.

Thorough compaction of granular excavation surfaces should be performed using a self-propelled or tow-behind vibratory, steel-drum compactor or a backhoe-mounted, vibratory-plate compactor. Soils & Engineering Services, Inc. personnel should observe the thorough compaction procedure. If the thorough compaction of the granular excavation surface should draw the groundwater upwards, then the compaction effort should be stopped. The granular soil should be compacted to a density of at least 95 percent of the maximum dry density determined for the soil according to ASTM Designation D 1557 for a minimum depth of 18 inches below the excavation bottom. Soils & Engineering Services, Inc. personnel should test the compacted granular soil to verify that the minimum density has been achieved before placing compacted granular fill material. If the soils exposed by the excavation cannot be compacted, then additional undercut may be necessary and/or possibly excavation surface stabilization consisting of placement of compacted granular fill material on the excavation surface.

C. Site Filling

We recommend that any material used to raise the grade below the proposed slab-on-grade floor consist of compacted granular fill material as specified below in Section X.D.

We recommend that any material used to raise the grade below the proposed foundation footings consist of compacted crushed stone base course as specified below in Section X.E.

D. Compacted Granular Fill Material

We recommend compacted granular fill material be used to fill any areas that are low in elevation throughout the subject project's development area except below

proposed foundation footings. Compacted crushed stone base course presented in Section X.E should be used to fill any areas that are low in elevation below proposed foundation footings. We recommend the compacted granular fill material meet the following specifications:

Sieve Size	Percent Particles Passing
2½-inch	100
1-inch	85 to 100
¾-inch	70 to 100
No. 4	60 to 100
No. 200	12 or less

We recommend all granular fill material be placed in maximum 10-inch-thick lifts, measured in the loose condition prior to compaction. Each lift should be thoroughly compacted to a density of at least 95 percent of the maximum dry density determined for the granular fill material in accordance with ASTM Designation D1557.

Soils & Engineering Services, Inc. should monitor the compactive effort at regular depths and intervals to verify that the minimum density is achieved, especially during initial placement of the compacted fill material. Any compacted lift that does not meet the specified density should receive additional compactive effort and then be retested until the required density has been achieved. Subsequent lifts should not be placed until the specified minimum density has been achieved on the preceding lift.

E. Compacted Crushed Stone Base Course

We recommend compacted crushed stone base course be used to fill any areas that are low in elevation below proposed foundation footings. We recommend the compacted crushed stone base course meet the requirements presented in Section 305 of the WisDOT *Standard Specifications for Highway and Structure Construction* (SSHSC) for Dense Graded Base Course ¾- or 1¼-inch Gradations.

We recommend all crushed stone base course be placed in maximum 6-inch-thick lifts, measured in the loose condition prior to compaction. Each lift should be thoroughly compacted to a density of at least 95 percent of the maximum dry density determined for the crushed stone base course in accordance with ASTM Designation D1557. Our experience with compacting crushed stone base course

is that the moisture content of the material should be within 1- to 2-percent of the optimum moisture content for the material. We recommend the contractor be prepared to add water to the crushed stone base course to facilitate obtaining the recommended compacted density.

Soils & Engineering Services, Inc. should monitor the compactive effort at regular depths and intervals to verify that the minimum density is achieved, especially during initial placement of the compacted fill material. Any compacted lift that does not meet the specified density should receive additional compactive effort and then be retested until the required density has been achieved. Subsequent lifts should not be placed until the specified minimum density has been achieved on the preceding lift.

F. Foundation Recommendations

After complying with the recommendations of Sections X.A through X.E above, shallow spread footings may be constructed for foundation support of the proposed structure. The bottom of interior footings should be placed a minimum of 3.5 feet below the lowest finished floor slab elevation adjacent the footings. The footings should rest upon 2 feet of thoroughly-compacted native GLACIAL TILL soil or compacted crushed stone base course overlying 2 feet of thoroughly-compacted native GLACIAL TILL soil.

If the above recommendations are implemented, then we recommend the following allowable soil bearing resistances for design of the strip and column footings resting at Elevation 27.5 feet or lower:

Footing Bottom Elevation	Allowable Bearing Resistance (psf)
27.5 to 25.5 feet	20,000
25.51 to 23.0 feet	25,000
less than 23.0 feet	30,000

We estimate that total strip and column footing settlement should be less than 1-inch and differential settlement should be less than 0.03 inches per foot of horizontal distance between two points of reference, if the above recommendations are followed.

To prevent excessively narrow footings, we recommend that wall and isolated spread footings be designed and constructed with minimum dimensions

of 18 and 24 inches, respectively, even if the applied footing bearing pressure is less than the allowable soil bearing pressure.

We recommend that footings and foundation walls include a sufficient quantity of reinforcing steel to reduce the shrinkage effect of the concrete. The steel will also reduce the potential for differential settlement of the proposed structure. We recommend all reinforcing steel be installed with sufficient concrete cover.

G. Slab-On-Grade Floor

We recommend a minimum of 8 inches of free-draining granular fill material be placed below the slab-on-grade floor. Free-draining granular fill material should have a maximum of 8 percent of particles passing the No. 200-mesh sieve, a maximum of 35 percent retained on a 1-inch sieve, and 100 percent of the material passing the 1½-inch sieve. The free-draining fill material should be compacted as described for compacted granular fill material in Section X.D.

H. Foundation Backfill

We recommend the interior and exterior of all foundations for the proposed building be backfilled using compacted granular fill material. The backfill material should be placed and compacted as specified in Section X.D.

I. Basement Floor Slab and Foundation Walls Drainage

We recommend the following provisions be included in the design and construction of the proposed structure:

- The exterior of the below-grade basement foundation walls should be water-proofed.

- A composite drainage medium, such as MiraDrain, HydraWay, TerraDrain, or Amerdrain, should be installed against the exterior of the basement foundation walls.

- Install minimum 6-inch-diameter rigid PVC perforated drain tile adjacent to and around the exterior and interior of the new exterior walls. The bottom of the drain tile should be at or below the bottom of the foundation and basement slab-on-grade floor. It is our intent with this installation to direct any water that may enter the foundation wall backfill or the basement floor aggregate drainage layer to a sump. Connections between the exterior and interior drain tile lines should be made at regular intervals. We recommend interior drain lines at a spacing of 50 feet or closer be included in the

drainage system. Clean-outs as appropriate should be included in the underdrain pipes to be able to flush potential accumulations of fine soil particles that are "washed" from the crushed aggregates.

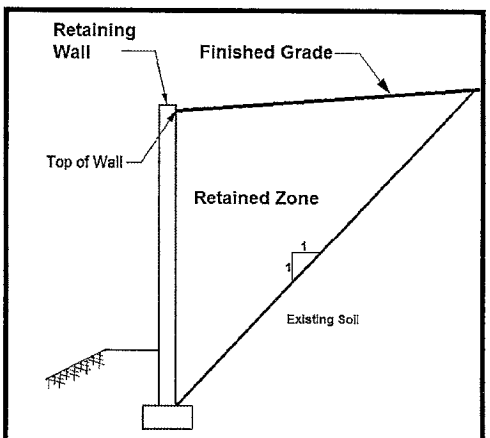
- The drain tile should drain by gravity to a sump, or sumps, equipped with a pump in the basement.

- The existing Public Safety Building plans show installation of a 4-inch-diameter drain tile with filter sock. This existing drain tile should either be tied in to the addition's drain tile, or be left intact to avoid blocking the existing drainage of water. Likewise, the 1995 building plans show under-floor drain tile. The drainage pattern for the under-floor and perimeter drain tile for the existing building should be determined and accounted for in the design of the building addition, to maintain proper drainage of both structures.

J. Lateral Earth Pressure

Below-grade walls and retaining walls should be designed to resist lateral pressure when backfill material is placed against the exterior side of the walls. We recommend the foundation walls be designed as retaining walls. Backfilling against the below-grade walls should not be allowed until the design strength of the concrete is achieved. Also, if the below-grade wall is <u>not</u> designed to act as a cantilever retaining wall, then backfilling should <u>not</u> be performed until lateral restraint is provided at the bottom and top portions of the wall.

Generally, the soils contributing to the lateral earth pressure against a below-grade wall or retaining wall are defined as any material present within a triangular area defined by (1) a line extending up 1-vertical-foot for every 1-horizontal-foot away from the back bottom corner of the below-grade wall or retaining wall, (2) the back side of the below-grade wall or retaining wall, and (3) the proposed finished ground surface elevation behind the wall. Any material within this "retained zone," as depicted in Inset 1 on page 17, contributes to the driving forces against a below-grade wall or retaining wall.



Inset 1: Retaining Wall Retained Zone Figure

The soil parameters needed to determine lateral earth pressure acting against below-grade walls include the density and strength characteristics of the soil that will be retained. The strength properties consist of the angle of internal friction and cohesion. In addition, the

lateral earth pressure coefficient (EPC) for the active, passive, and/or at-rest case are needed to estimate the magnitude of applied lateral pressure.

For walls that are not designed to move, such as below-grade walls that are restrained at the top and bottom portions of the walls, we recommend the at-rest EPC, K_o, be used to calculate lateral earth pressure. The active EPC, K_a, and passive EPC, K_p, should be used for walls that are allowed to move or translate for a sufficient distance to achieve the active or passive state of stress in the soil behind the wall.

Depending upon the finished grades behind and in-front of the walls some soils encountered by the borings could be present within the retained zone, as defined above, behind the proposed walls. Therefore, based on the existing soil strata encountered by the borings, we recommend the estimated values of density, friction angle, cohesion, and lateral EPCs presented in Table 1-1 enclosed in Appendix C be used to compute lateral earth pressure for existing soils present within the retained zone, as defined above, behind a wall.

For areas where new backfill will be present behind the wall within the retained zone, we recommend the following estimated values of density, friction angle, cohesion, and lateral EPCs for materials that could be used to compute lateral earth pressure for new backfill placed behind proposed walls. These recommended parameters are based on compacting the backfill material to the specified minimum density specified above in Section X.D. If a soil type other than those indicated will be used as backfill material, we should be notified so that we can provide values for the selected backfill material.

	Estimated Soil Parameters			EPCs		
Retained Material	Moist Density ($^{lb}/_{ft^3}$)	Friction Angle (degrees)	Cohesion ($^{lb}/_{ft^2}$)	Passive (K_p)	Active (K_a)	At-Rest (K_o)
New compacted granular fill material consisting of fine SILTY SAND (SM) or similar	135	32	0	3.25	0.31	0.47
New compacted granular fill material consisting of fine POORLY-GRADED SAND (SP) or similar	115	30	0	3.00	0.33	0.50

If more than one soil type is present within the retained zone, as defined above, then the wall designer should adjust the lateral EPC used to reflect a composite retained soil, or the wall designer could use the parameters for the retained soil that would result in the highest passive, active, or at-rest lateral pressures imposed on the wall for the entire retained soil height behind the wall.

We recommend proper drainage of water be included in the design of any proposed below-grade wall or retaining wall. For the basement foundation walls, we recommend the use of a composite drainage medium as specified in Section X.I. For retaining walls, a composite drainage medium or a minimum 12-inch-wide vertical drainage layer should be installed directly behind the wall. The vertical drainage layer should extend from 6 inches below the top of the wall to the bottom of the wall. The drainage layer should consist of ½-inch- to 1-inch-size crushed stone particles without "fines." The drainage layer should be separated from the rest of the soil backfill by a woven geotextile such as Mirafi 500X.

To reduce the potential for infiltration of surface water into the soil backfill of the wall, a minimum of 6 inches of soil directly below the finished surface should consist of a semi-impermeable layer such as compacted clay soil or a hard surface pavement. The ground surface should be graded to provide positive drainage away from the wall.

K. Seismic Design

For use in the seismic design of the proposed structure, we used the information from the soil borings and determined the soils beneath the subject project meet the criteria for Site Class D, "stiff soil profile," as presented in the Wisconsin Commercial Building Code. The Wisconsin Commercial Building Code incorporates the 2012/2015 International Building Code (IBC) as part of the building code. The IBC specifies that the soil and bedrock stratification extending to a depth of 100 feet is to be used to determine the seismic site classification for a site. The borings at this site were extended to depths of 48.6 to 49.7 feet.

Please refer to the USGS Design Maps Summary Report enclosed in Appendix B for additional site specific seismic parameters.

L. Effect of Groundwater

We do not expect groundwater to impact the proposed building construction.

M. Effect of Surface Water

During construction activities, surface water due to precipitation, or other sources, which flows into the project construction areas should be promptly removed to reduce potential damage to the subsoils. Any soil loosened or softened due to infiltration of water should be excavated and replaced with compacted granular fill material or crushed stone.

Due to the very dense GLACIAL TILL, free water that accumulates at the lower excavation areas may not readily percolate into the soil. We recommend that the contractor provide a sump area during excavation and construction of the foundations to collect water and pump it out as needed.

N. Cold Weather Construction

Construction during cold weather (late fall, winter and early spring) requires special considerations. The soil which will be supporting footings, floor slabs, and pavement areas should not be frozen at the time of construction. We recommend that a means of preventing the soil from freezing be implemented at the time of excavation, during backfilling operations, or after fill material is placed to the design elevation. To prevent the soil from freezing, various materials are available, such as a thick layer of straw or insulation blankets which should be placed on the soil after excavation to the design grade and prior to the placement of concrete for footings or floor slabs. An alternative method is to provide a heated enclosure for the area under construction.

We recommend that concrete for footings or floor slabs not be placed on frozen soil. If the soil becomes frozen prior to the placement of concrete, either the frozen soil should be excavated and replaced with compacted granular fill material or crushed stone, or a means of thawing the frozen soil should be implemented followed by re-compaction of the bearing soil. The bearing soils should then be observed and tested by Soils & Engineering Services, Inc. to verify the suitability of the soil for support of the concrete. Any forms or reinforcing steel should be warmed prior to the placement of the concrete.

At the time of placement of fresh concrete for footings, walls, or floor slabs, the concrete should be protected against freezing for a minimum of 7 days, and possibly longer depending on the design strength of the concrete. Insulation blankets or heated enclosures should be used to protect the fresh concrete against freezing. The use of concrete forms as the method of protecting fresh concrete is not acceptable. We recommend the procedures presented in American Concrete Institute's (ACI) document titled "Recommended Practices for Cold Weather Concreting" (ACI 306) be used for placing and protecting concrete during the cold weather.

O. Site Grading

The project site area should be graded so that positive surface drainage is provided away from the construction areas. Surface water, if not properly diverted, could produce as many problems as groundwater. Proper surface drainage methods will help minimize moisture accumulations in the subgrade soils.

P. Project Safety

Safety precautions, such as those required by OSHA and the Wisconsin Department of Safety and Professional Services, should be followed throughout the entire construction of the proposed project. They include, but are not limited to, the proper sloping and/or support of excavation sidewalls and adjacent embankments, roadways, access ramps, sidewalks, utility lines, and/or buildings.

XI. CLOSING COMMENTS

Soils & Engineering Services, Inc. prepared this *Geotechnical Exploration and Analyses Report* for the exclusive use of Mead & Hunt, Inc. and Dane County Department of Public Works to aid in the design of the Dane County Jail Consolidation Project located at 114 West Wilson Street in the City of Madison, Dane County, Wisconsin. Changes in the location or design of the proposed structure may warrant changes to our comments and recommendations given herein. Please inform Soils & Engineering Services, Inc. of any changes. Soils & Engineering Services, Inc. should review the final design and specification documents for the subject project to verify that our comments and recommendations are interpreted correctly and implemented in the design of the subject project as we have intended them.

Our comments and recommendations provided herein are based on limited soil boring information and may not represent the soil and/or groundwater conditions which will be encountered at unexplored portions of the project site. We further recommend that Soils & Engineering Services, Inc. be present at the time of site earthwork activities to observe compliance with the design concepts and specifications, and to provide recommendations to modify the design if soil, bedrock, or groundwater conditions differ from those anticipated before construction. It is important that soil composition, soil strength, soil uniformity, soil density, soil bearing pressure, other soil parameters, and degree of compaction required be confirmed and/or determined at the time of construction.

Our comments and recommendations in this *Geotechnical Exploration and Analyses Report* are based on our identification and/or classification and interpretation of the soils and information given on the Soil Boring Records, and may not be based solely on the contents of the driller's or technician's field logs.

Soils & Engineering Services, Inc. recommends that this *Geotechnical Exploration and Analyses Report*, in its entirety, be made available to bidding contractors or subcontractors for information purposes. The Appendices, Soil Boring Records, and/or other attachments referenced in this report should not be separated from the text of this report.

This *Geotechnical Exploration and Analyses Report* does not address real or potential environmental, moisture infiltration, or mold problems. We recommend you engage specialists during the design stage of this project to prevent and solve the problems related to environmental, moisture infiltration, and mold concerns.

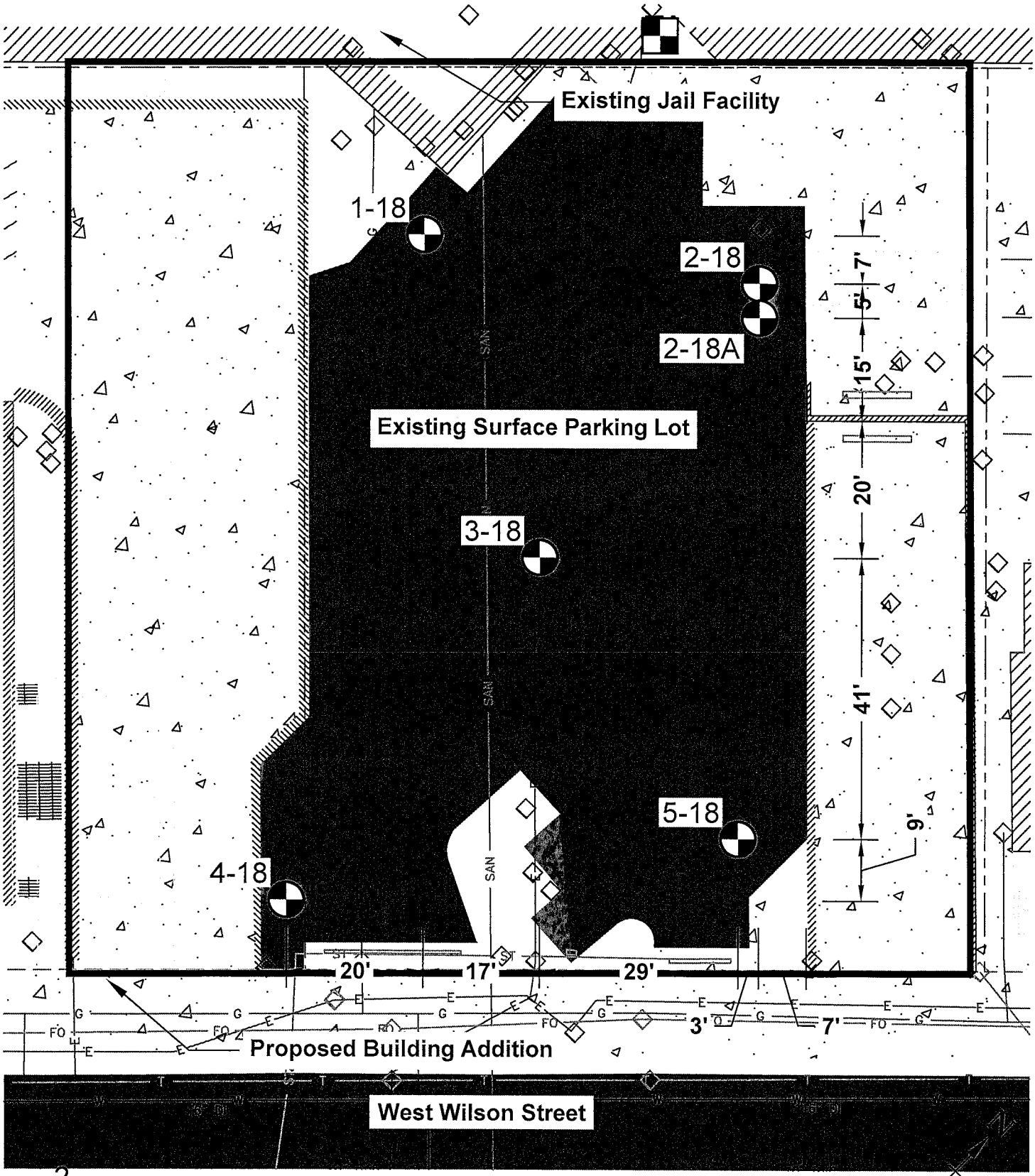
Soils & Engineering Services, Inc. prepared this *Geotechnical Exploration and Analyses Report* for the subject project in accordance with generally accepted geotechnical engineering practices at this time. Soils & Engineering Services, Inc. offers no other expressed or implied warranty. This report should be considered invalid if used for purposes other than those described herein.

Soils & Engineering Services, Inc. will store the soil samples obtained from the geotechnical exploration performed for this project for 60 calendar days after the date of this report. Please advise us if we should extend this period.

Soils & Engineering Services, Inc. respectfully submits this *Geotechnical Exploration and Analyses Report*, dated December 14, 2018, for the Dane County Jail Consolidation Project to **Mead & Hunt, Inc.** and **Dane County Department of Public Works**.

APPENDIX A

Location Sketches, Drawings 13248-1
Soil Boring Records for Borings 1-18, 2-18, and 2-18A through 5-18
Laboratory Test Result Records, Figures 1 and 2
Field Test Results Records, Figures 3 through 10



= Boring 2 (typical)

Benchmark: Elevation 44.0 feet
Top of floor slab

NOT-TO-SCALE

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LOCATION SKETCH
Dane County Jail Consolidation Project
114 West Wilson Street
City of Madison, Dane County, Wisconsin

DRAWING 13248-1

Created on 12/11/2018 Revised on

NOTES

1. The boundary lines between different soil strata, as shown on the Soil Boring Records, are approximate and may be gradual.

2. The drillers' field log contains a description of the soil conditions between samples based on the equipment performance and the soil cuttings. The Soil Boring Records contain the description of the soil conditions as interpreted by a geotechnical engineer and/or a geologist after review of the drillers' field logs and soil samples and/or laboratory test results.

3. We define "Caved Level" as the depth below the existing ground surface at a boring location where the soils have collapsed into the borehole following removal of the drilling tools.

4. We define "Water Level" as the depth below the existing ground surface at a boring location to the level of water in the open borehole at the time indicated unless otherwise defined on the Soil Boring Records.

5. We define "at completion" for a boring as being the time when our drilling crew has completed the removal of all drilling tools from the borehole.

6. The Notes and Legend Record and the Soil Boring Records are a part of the geotechnical report. The geotechnical report should be included in the bidding or reference documents.

RELATIVE PERCENTAGE TERMS

no	0%
trace	<5%
few	5 to <10%
little	10 to <30%
some	30 to < 50%

TEST RESULTS LEGEND

q_p = Penetrometer reading, $^{ton}/_{ft^2}$
MC = Moisture Content, % moisture by weight
γ_w = Wet Density, $^{lb}/_{ft^3}$
γ_d = Dry Density, $^{lb}/_{ft^3}$
P_{200} = % Passing the No. 200-mesh Sieve

RELATIVE MOISTURE TERMS AT TIME OF SAMPLING

Frozen or F = Frozen material
Dry = Dusty, dry to touch, absence of moisture
Moist or M = Damp to touch, no visible water
Wet or W = Visible free water

DRILLING METHODS LEGEND

HSA = Continuous flight hollow-stem augers
Rot = Tri-cone roller bit rotary

N-VALUE LEGEND

OB = On Cobble or Boulder

REMARKS LEGEND

NR = No Recovery
OO = Organic Odor

SAMPLER TYPE LEGEND

Pressuremeter test

2-inch-outside-diameter, split-barrel sampler

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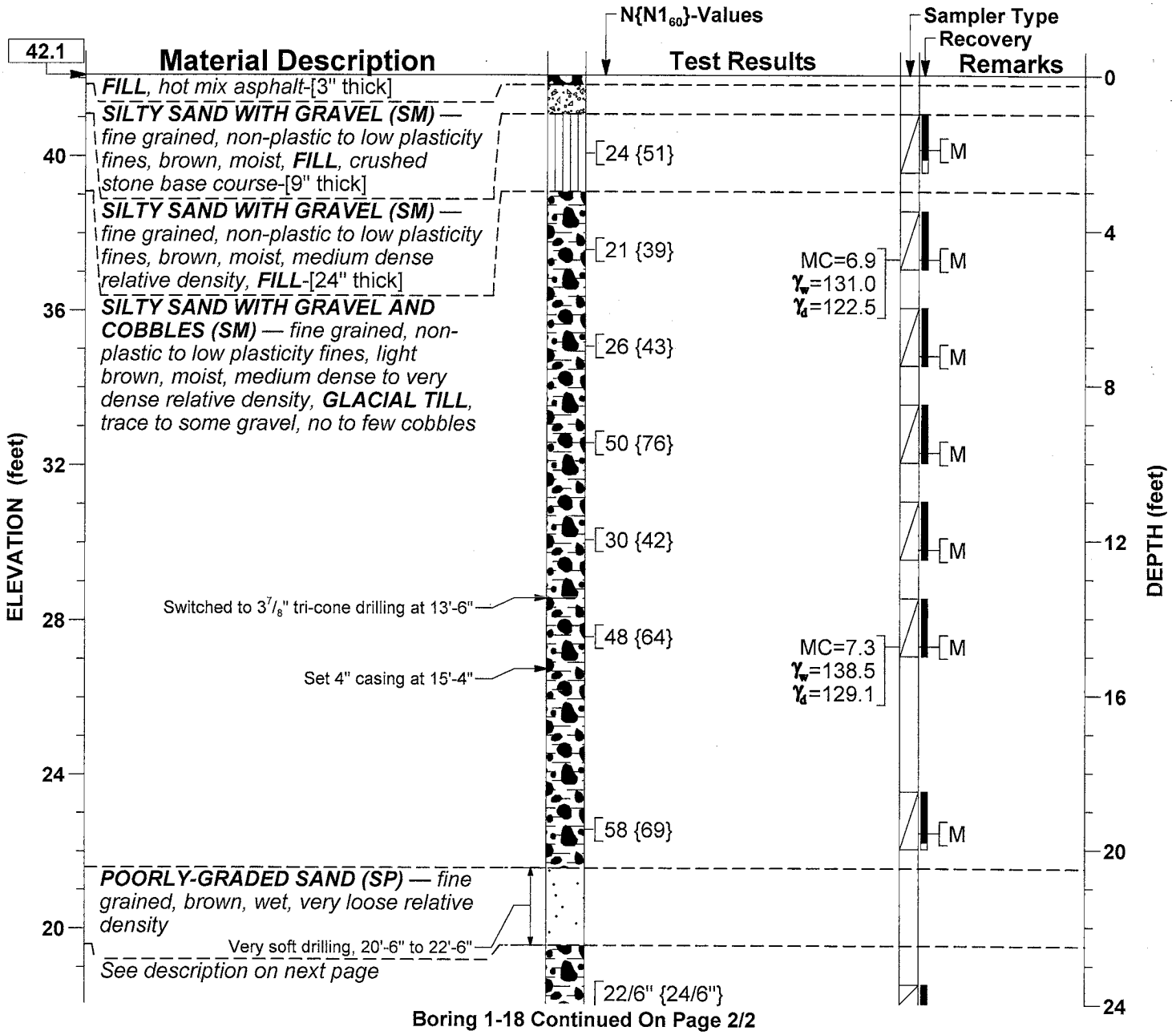
NOTES AND LEGEND RECORD
Dane County Jail Consolidation Project
114 West Wilson Street
City of Madison, Dane County, Wisconsin

13248

General Location:

Boring 1-18

LATITUDE:	LONGITUDE:	COUNTY:	SECTION:	CREW CHIEF:	DRILL RIG:	PAGE:
—	—	Dane	24	SWK	CME 75	1 of 2
NORTHING:	**EASTING:**	**TOWNSHIP:**	**¼:**	**LOG REVIEW:**	**HAMMER TYPE:**	**TOTAL DEPTH:**
—	—	(Madison) 7 N	NW	CMB	Automatic	49'-5"
STATION:	**OFFSET:**	**RANGE:**	**¼ ¼:**	**LOG QC:**	**DATE STARTED:**	**DATE COMPLETED:**
—	—	9 E	NW	CMB	11/12/2018	11/13/2018



Boring 1-18 Continued On Page 2/2

DRILL METHOD	TOOL SIZE	CASING SIZE	DRILL FLUID	DEPTH FROM	DEPTH TO	HOLE DIA
HSA	2 1/4"	—	None	0'-0"	13'-6"	5.6"
Rot	3 7/8"	4.0"	Drilling Mud	13'-6"	15'-4"	4.0"
Rot	3 7/8"	—	Drilling Mud	15'-4"	49'-5"	4.0"

SAMPLING METHOD(S): ASTM D1586

SURFACE PATCH: Cold Mix Asphalt Patching Compound

BACKFILL: Auger Cuttings, Bentonite-Sand Slurry

The Notes and Legend Record is considered a part of this Soil Boring Record.

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SOIL BORING RECORD
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114 West Wilson Street
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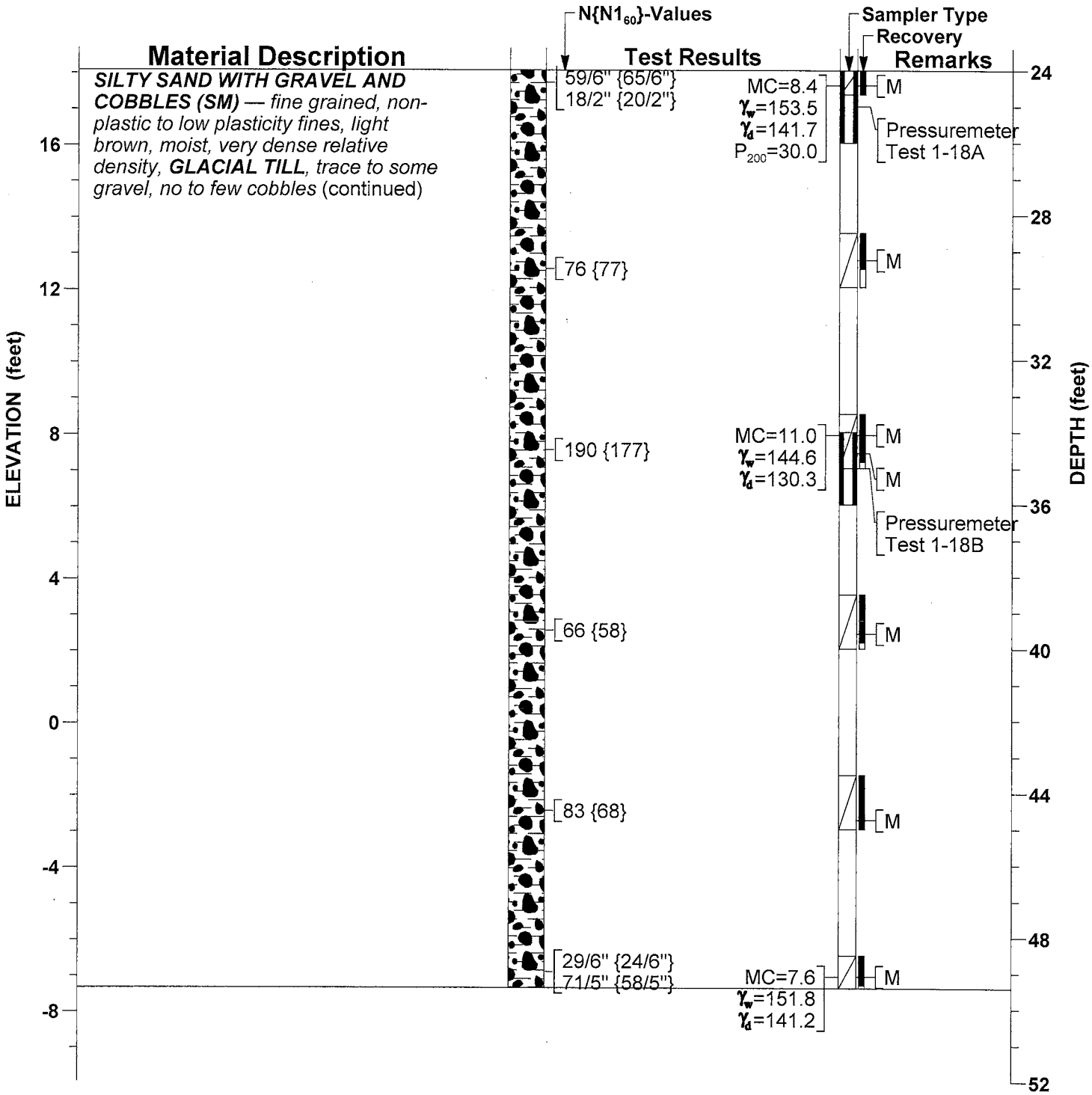

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SOIL BORING RECORD
Dane County Jail Consolidation Project
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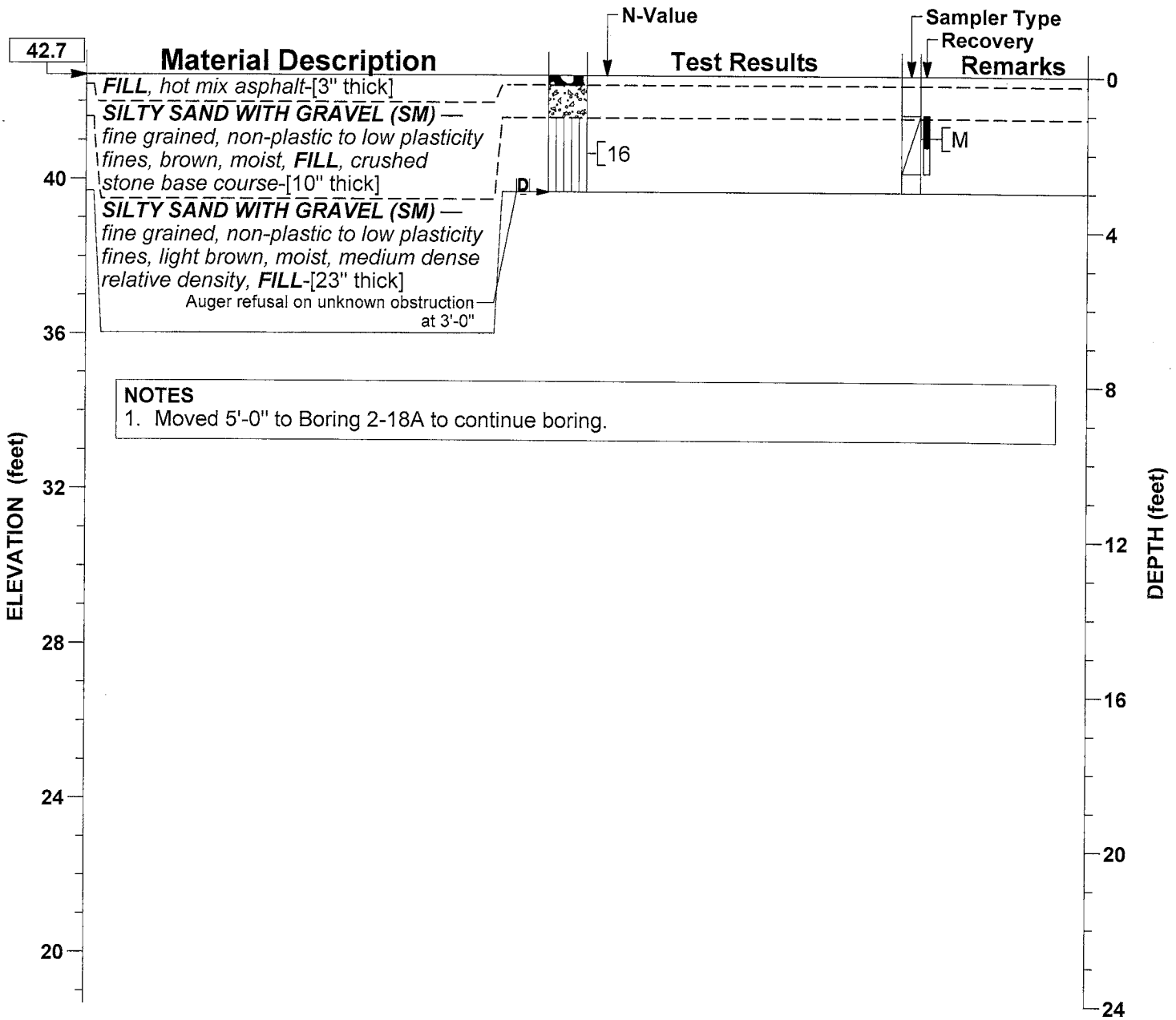
General Location:

Boring 2-18

LATITUDE:	LONGITUDE:	COUNTY:	SECTION:	CREW CHIEF:	DRILL RIG:	PAGE:
—	—	Dane	24	SWK	CME 75	1 of 1
NORTHING:	EASTING:	TOWNSHIP:	¼:	LOG REVIEW:	HAMMER TYPE:	TOTAL DEPTH:
—	—	(Madison) 7 N	NW	CMB	Automatic	3'-0"
STATION:	OFFSET:	RANGE:	¼ ¼:	LOG QC:	DATE STARTED:	DATE COMPLETED:
—	—	9 E	NW	CMB	11/12/2018	11/12/2018



NOTES
1. Moved 5'-0" to Boring 2-18A to continue boring.

WATER LEVEL LEGEND
D 3'-0" Dry at completion

DRILL METHOD	TOOL SIZE	CASING SIZE	DRILL FLUID	DEPTH FROM	DEPTH TO	HOLE DIA
HSA	2¼"	—	None	0'-0"	3'-0"	5.6"

SAMPLING METHOD(S): ASTM D1586

SURFACE PATCH: Cold Mix Asphalt Patching Compound

BACKFILL: Auger Cuttings

The Notes and Legend Record is considered a part of this Soil Boring Record.

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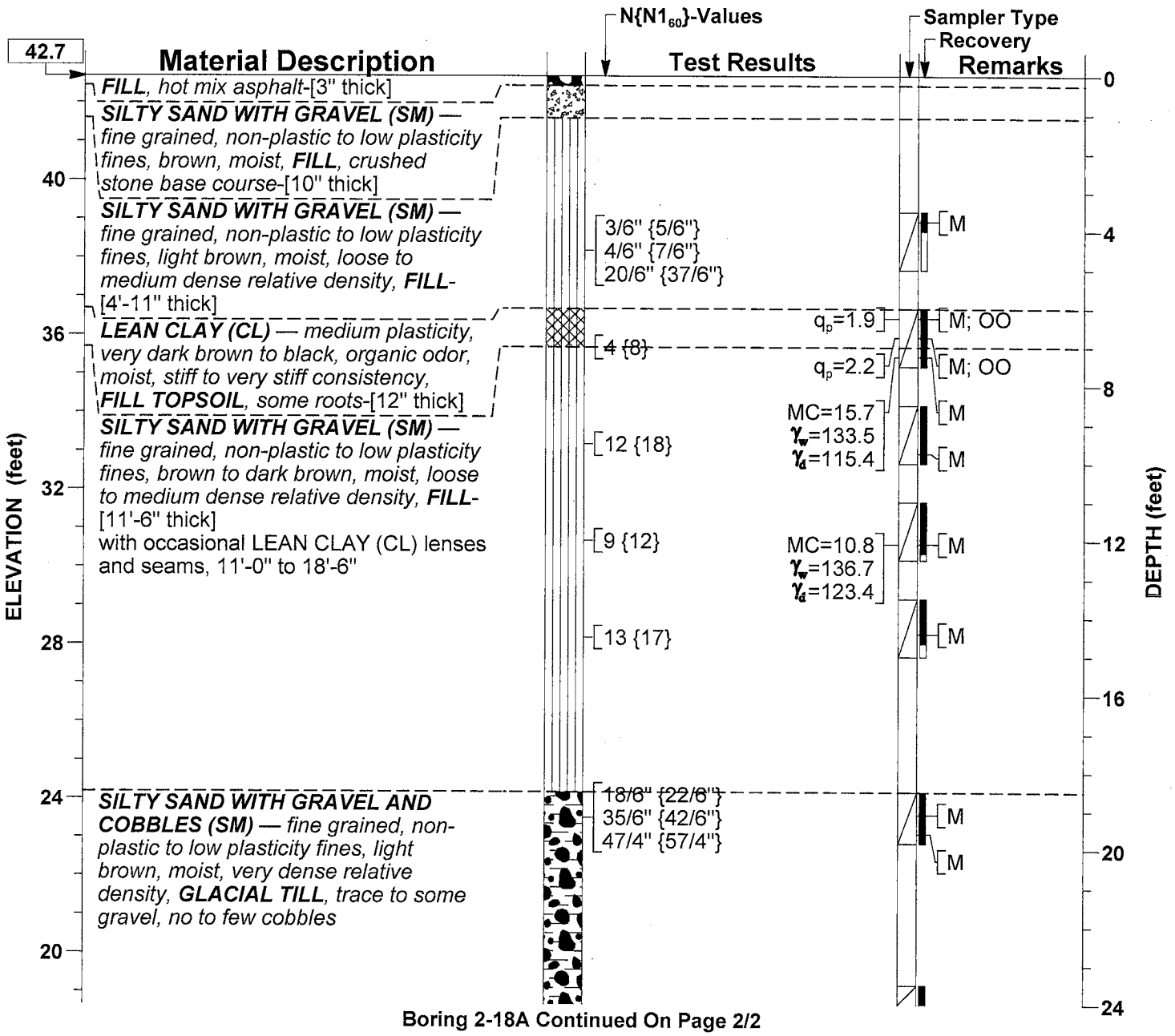
Printed on 12/11/2018

General Location:

Boring 2-18A

LATITUDE:	LONGITUDE:	COUNTY:	SECTION:	CREW CHIEF:	DRILL RIG:	PAGE:
—	—	Dane	24	SWK	CME 75	1 of 2
NORTHING:	EASTING:	TOWNSHIP:	¼:	LOG REVIEW:	HAMMER TYPE:	TOTAL DEPTH:
—	—	(Madison) 7 N	NW	CMB	Automatic	49'-9"
STATION:	OFFSET:	RANGE:	¼ ¼:	LOG QC:	DATE STARTED:	DATE COMPLETED:
—	—	9 E	NW	CMB	11/12/2018	11/12/2018



Boring 2-18A Continued On Page 2/2

DRILL METHOD	TOOL SIZE	CASING SIZE	DRILL FLUID	DEPTH FROM	DEPTH TO	HOLE DIA
HSA	2¼"	—	None	0'-0"	49'-9"	5.6"

SAMPLING METHOD(S): ASTM D1586

SURFACE PATCH: Cold Mix Asphalt Patching Compound

BACKFILL: Auger Cuttings, Bentonite Chips, Caved Soil

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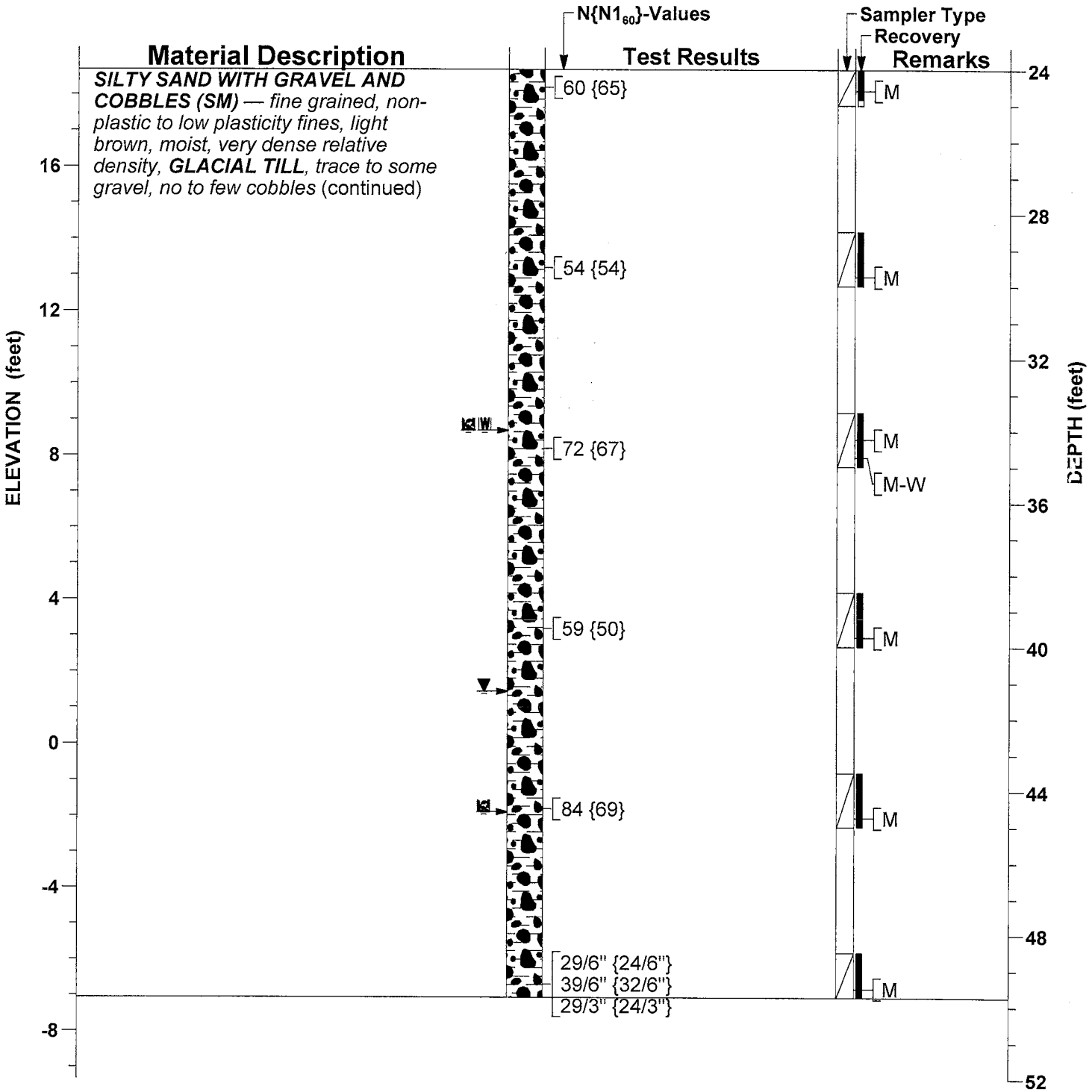

WATER LEVEL LEGEND	OTHER LEVEL LEGEND
W 34'-0" Wet at 2.5 hours after completion	34'-0" Caved at 2.5 hours after completion
▼ 41'-3" at completion	44'-7" Caved at completion

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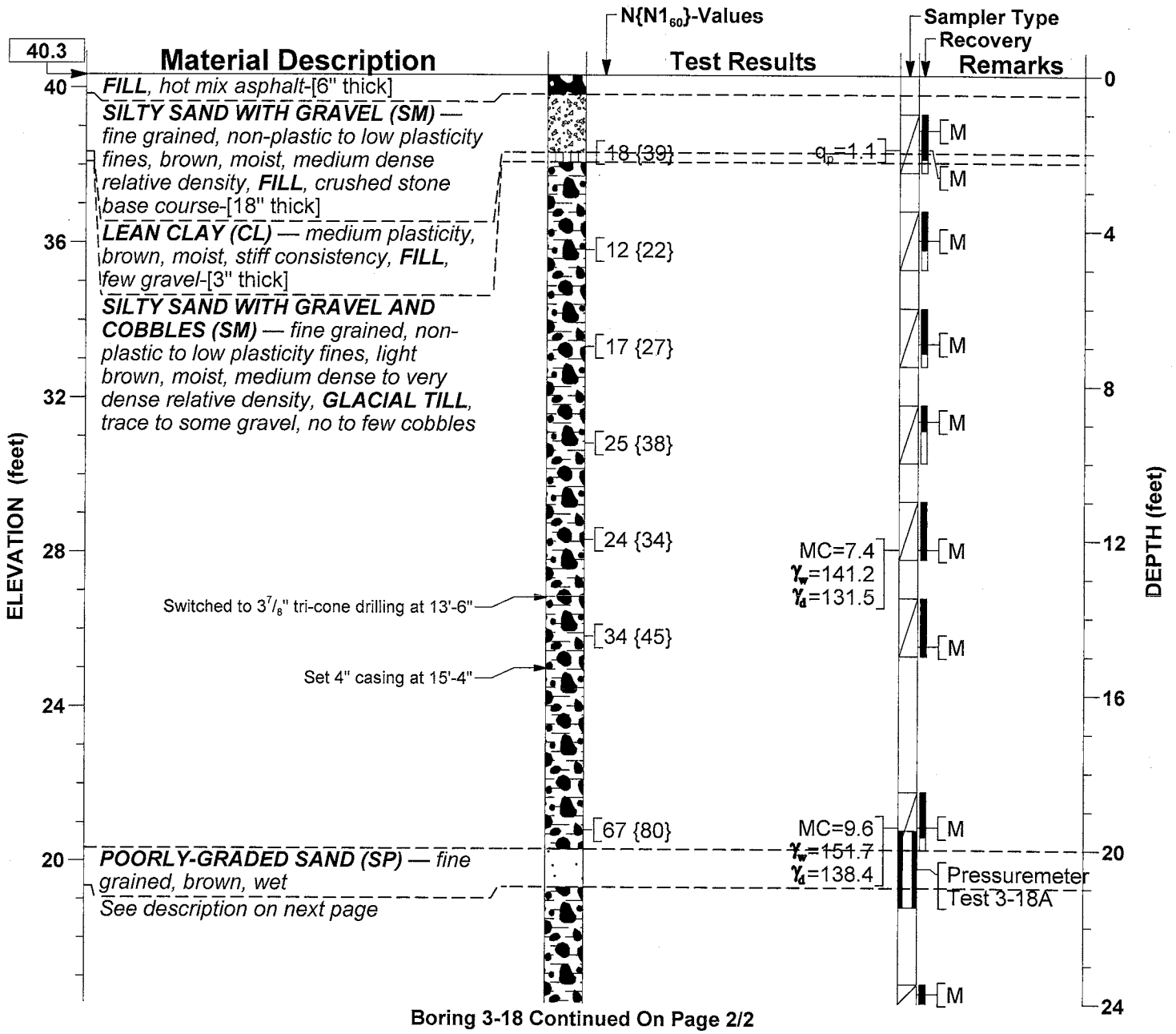
13248

General Location:

Boring 3-18

LATITUDE:	LONGITUDE:	COUNTY:	SECTION:	CREW CHIEF:	DRILL RIG:	PAGE:
—	—	Dane	24	SWK	CME 75	1 of 2
NORTHING:	EASTING:	TOWNSHIP:	¼:	LOG REVIEW:	HAMMER TYPE:	TOTAL DEPTH:
—	—	(Madison) 7 N	NW	CMB	Automatic	49'-8½"
STATION:	OFFSET:	RANGE:	¼ ¼:	LOG QC:	DATE STARTED:	DATE COMPLETED:
—	—	9 E	NW	CMB	11/14/2018	11/16/2018



Boring 3-18 Continued On Page 2/2

DRILL METHOD	TOOL SIZE	CASING SIZE	DRILL FLUID	DEPTH FROM	DEPTH TO	HOLE DIA
HSA	2¼"	—	None	0'-0"	13'-6"	5.6"
Rot	3⅞"	4.0"	Drilling Mud	13'-6"	15'-4"	4.0"
Rot	3⅞"	—	Drilling Mud	15'-4"	49'-8½"	4.0"

SAMPLING METHOD(S): ASTM D1586

SURFACE PATCH: Cold Mix Asphalt Patching Compound

BACKFILL: Auger Cuttings, Bentonite Chips, Bentonite-Sand Slurry

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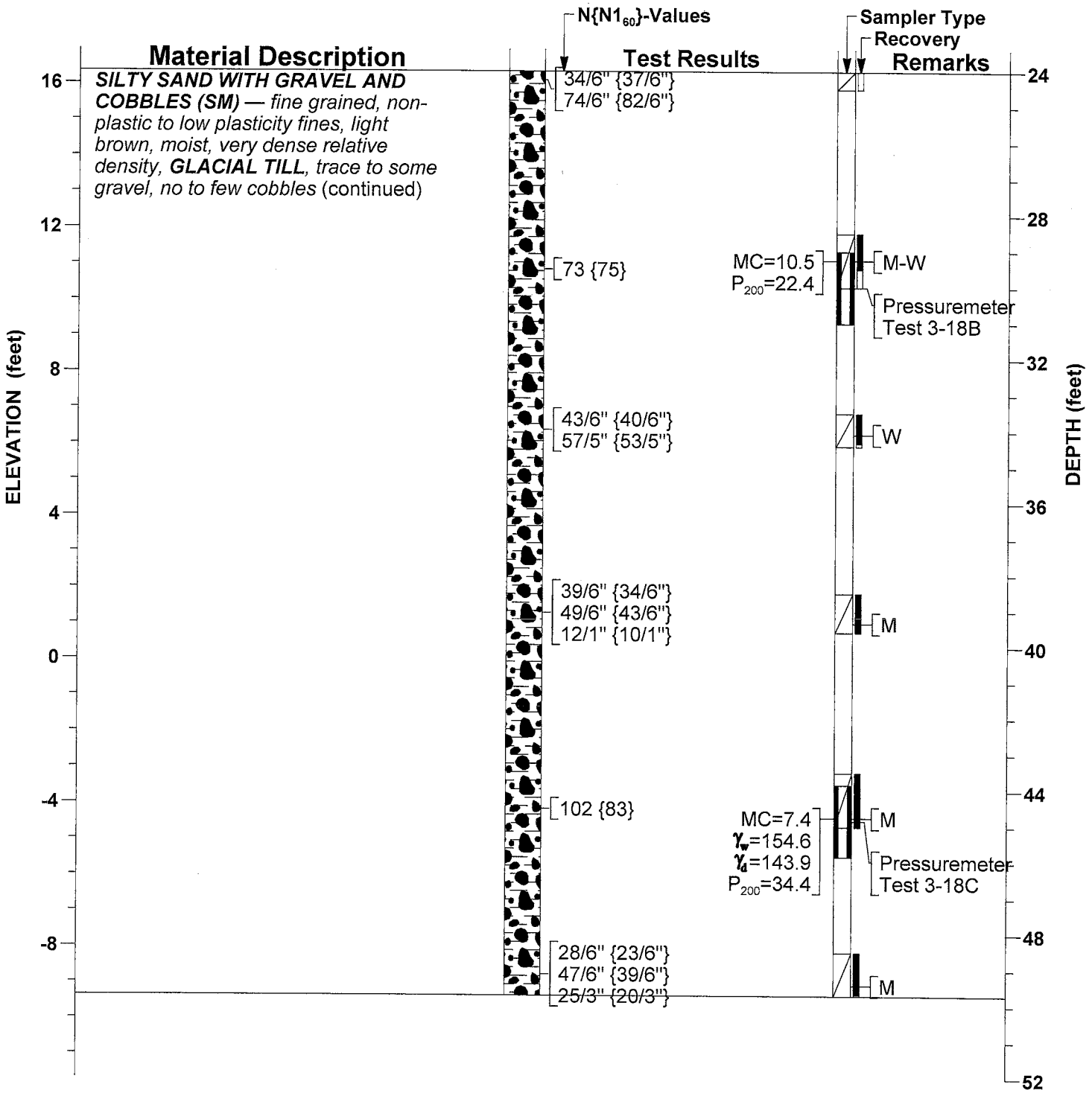

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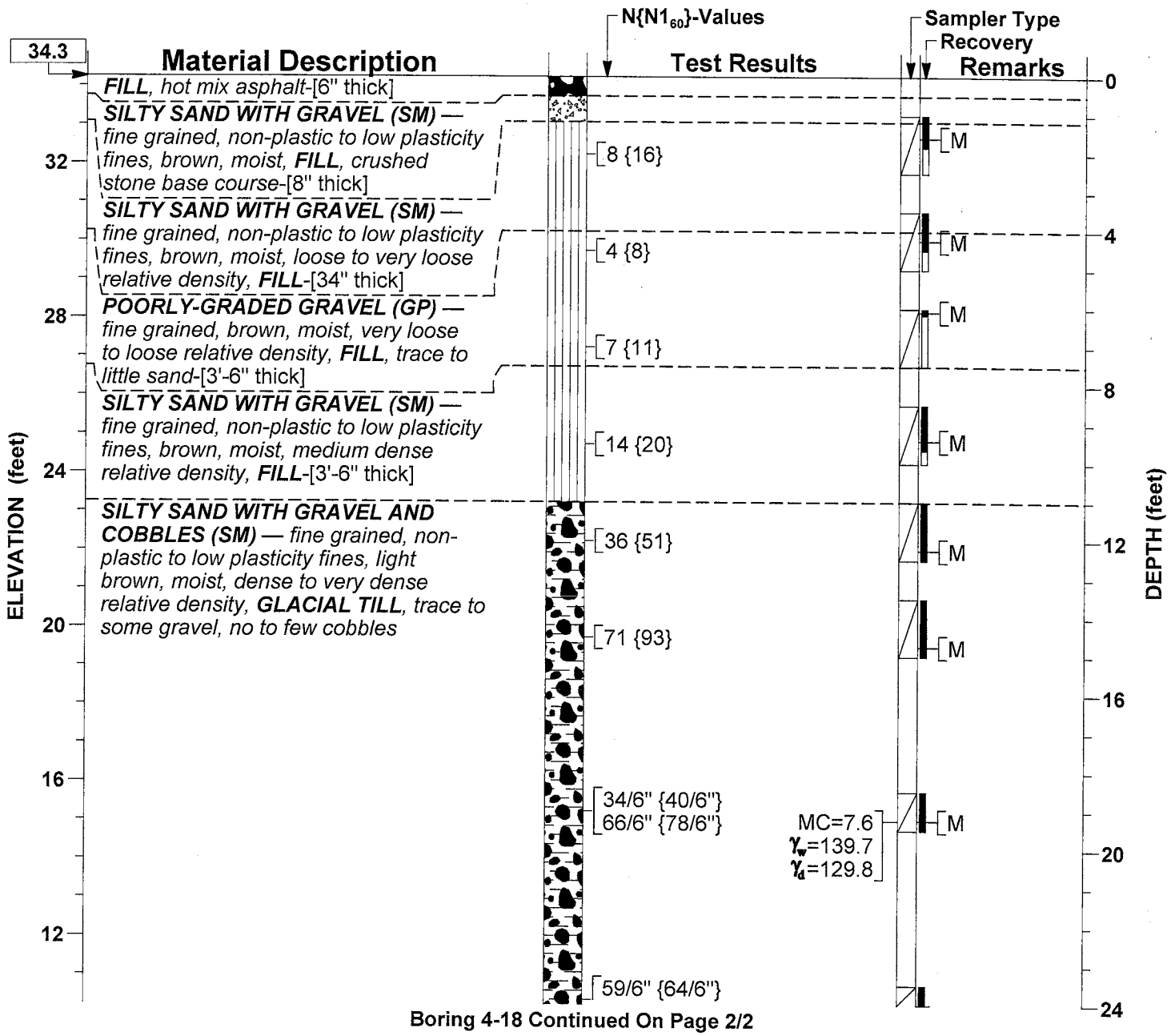
13248

General Location:

Boring 4-18

LATITUDE:	LONGITUDE:	COUNTY:	SECTION:	CREW CHIEF:	DRILL RIG:	PAGE:
—	—	Dane	24	SWK	CME 75	1 of 2
NORTHING:	EASTING:	TOWNSHIP:	¼:	LOG REVIEW:	HAMMER TYPE:	TOTAL DEPTH:
—	—	(Madison) 7 N	NW	CMB	Automatic	48'-11½"
STATION:	OFFSET:	RANGE:	¼ ¼:	LOG QC:	DATE STARTED:	DATE COMPLETED:
—	—	9 E	NW	CMB	11/12/2018	11/12/2018



Boring 4-18 Continued On Page 2/2

DRILL METHOD	TOOL SIZE	CASING SIZE	DRILL FLUID	DEPTH FROM	DEPTH TO	HOLE DIA
HSA	2¼"	—	None	0'-0"	48'-11½"	5.6"

SAMPLING METHOD(S): ASTM D1586

SURFACE PATCH: Cold Mix Asphalt Patching Compound

BACKFILL: Auger Cuttings, Bentonite Chips, Caved Soil

The Notes and Legend Record is considered a part of this Soil Boring Record.

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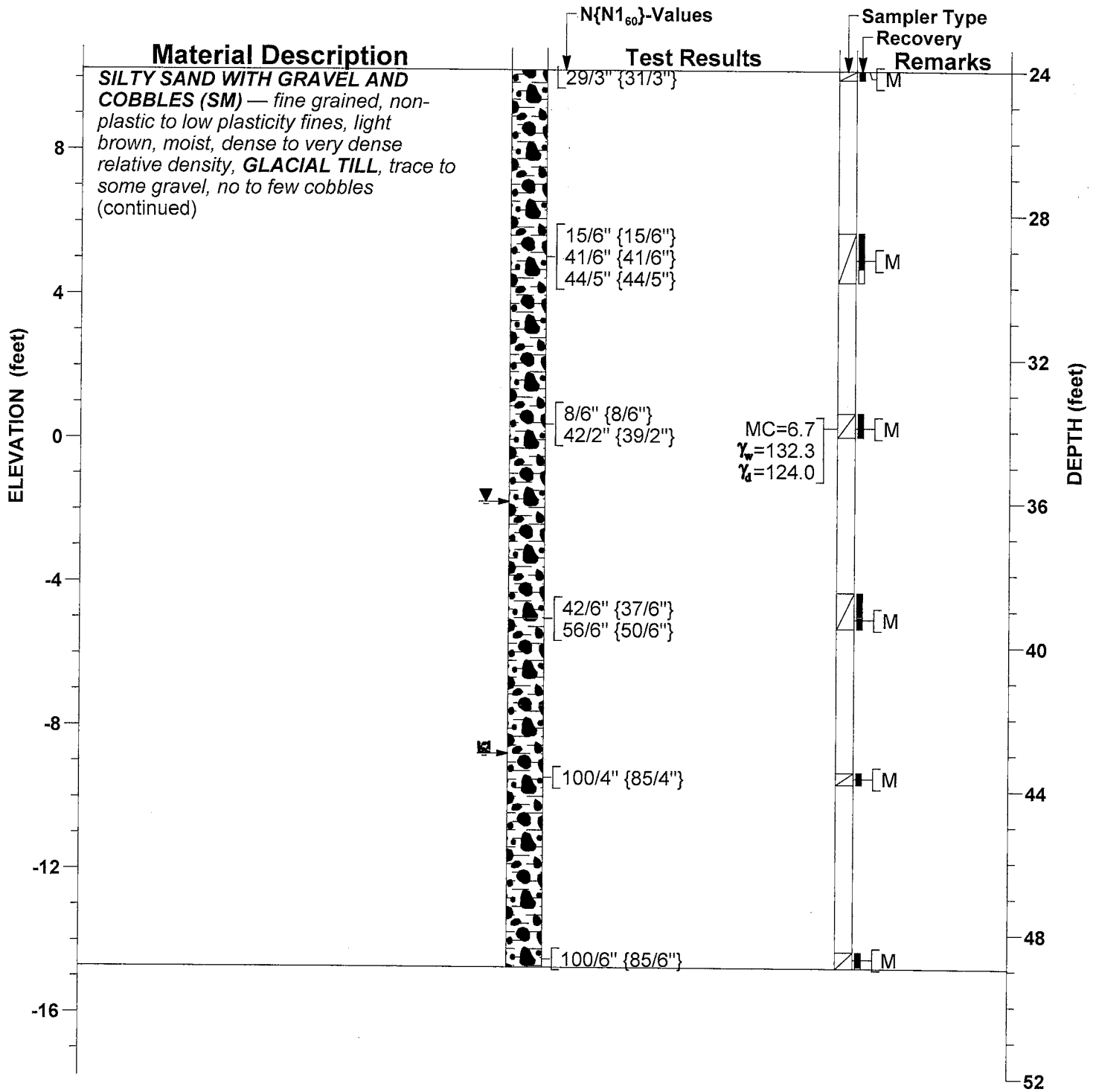

WATER LEVEL LEGEND	OTHER LEVEL LEGEND
▼ 36'-0" at completion	43'-0" Caved at completion

The Notes and Legend Record is considered a part of this Soil Boring Record.

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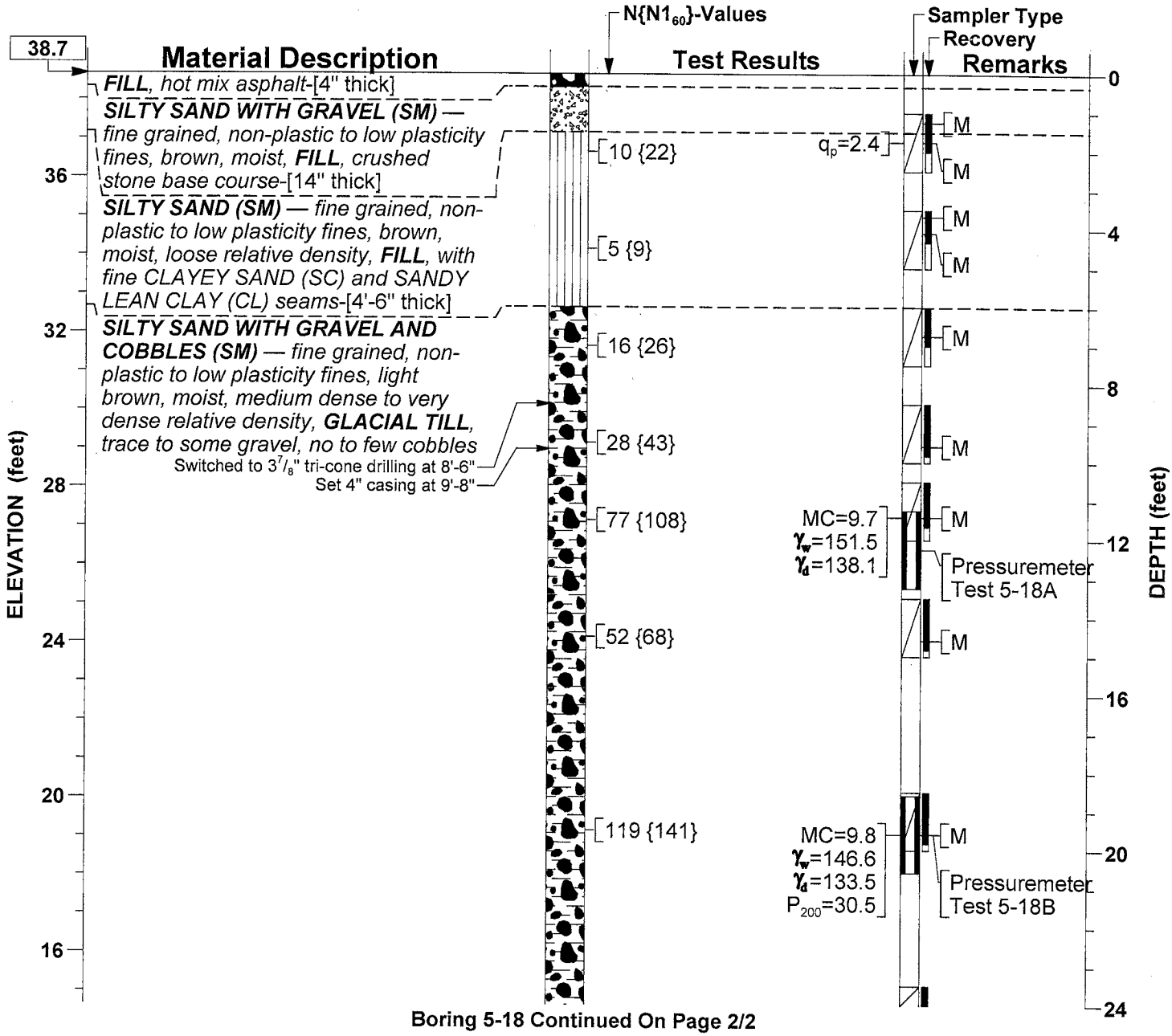
General Location:

Boring 5-18

LATITUDE:	LONGITUDE:	COUNTY:	SECTION:	CREW CHIEF:	DRILL RIG:	PAGE:
—	—	Dane	24	SWK	CME 75	1 of 2
NORTHING:	EASTING:	TOWNSHIP:	¼:	LOG REVIEW:	HAMMER TYPE:	TOTAL DEPTH:
—	—	(Madison) 7 N	NW	CMB	Automatic	48'-7"
STATION:	OFFSET:	RANGE:	¼ ¼:	LOG QC:	DATE STARTED:	DATE COMPLETED:
—	—	9 E	NW	CMB	11/15/2018	11/16/2018



Boring 5-18 Continued On Page 2/2

DRILL METHOD	TOOL SIZE	CASING SIZE	DRILL FLUID	DEPTH FROM	DEPTH TO	HOLE DIA
HSA	2 1/4"	—	None	0'-0"	8'-6"	5.6"
Rot	3 7/8"	4.0"	Drilling Mud	8'-6"	9'-8"	4.0"
Rot	3 7/8"	—	Drilling Mud	9'-8"	48'-7"	4.0"

SAMPLING METHOD(S): ASTM D1586

SURFACE PATCH: Cold Mix Asphalt Patching Compound

BACKFILL: Auger Cuttings, Bentonite Chips, Bentonite-Sand Slurry

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SOIL BORING RECORD
Dane County Jail Consolidation Project
114 West Wilson Street
City of Madison, Dane County, Wisconsin

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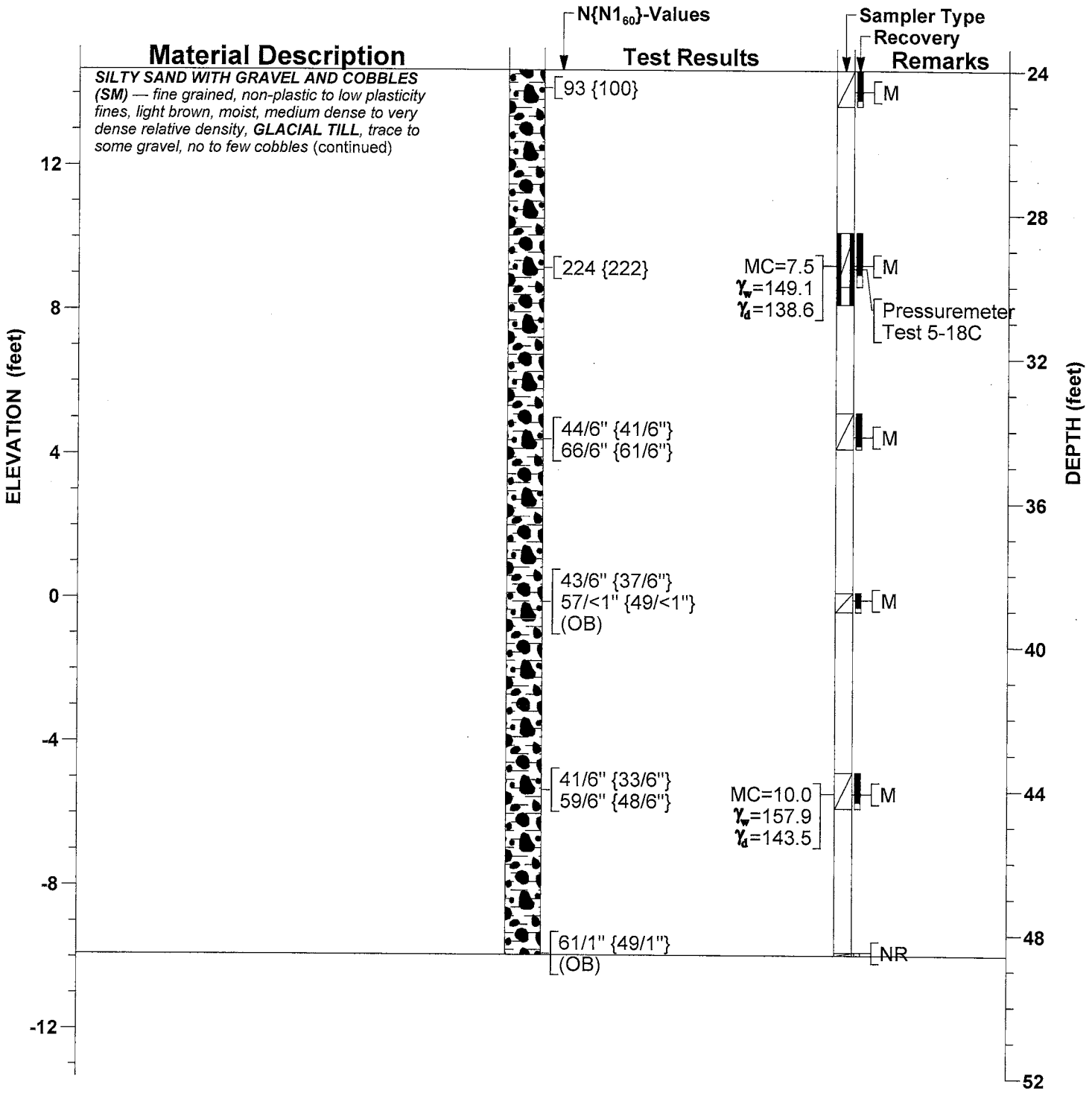

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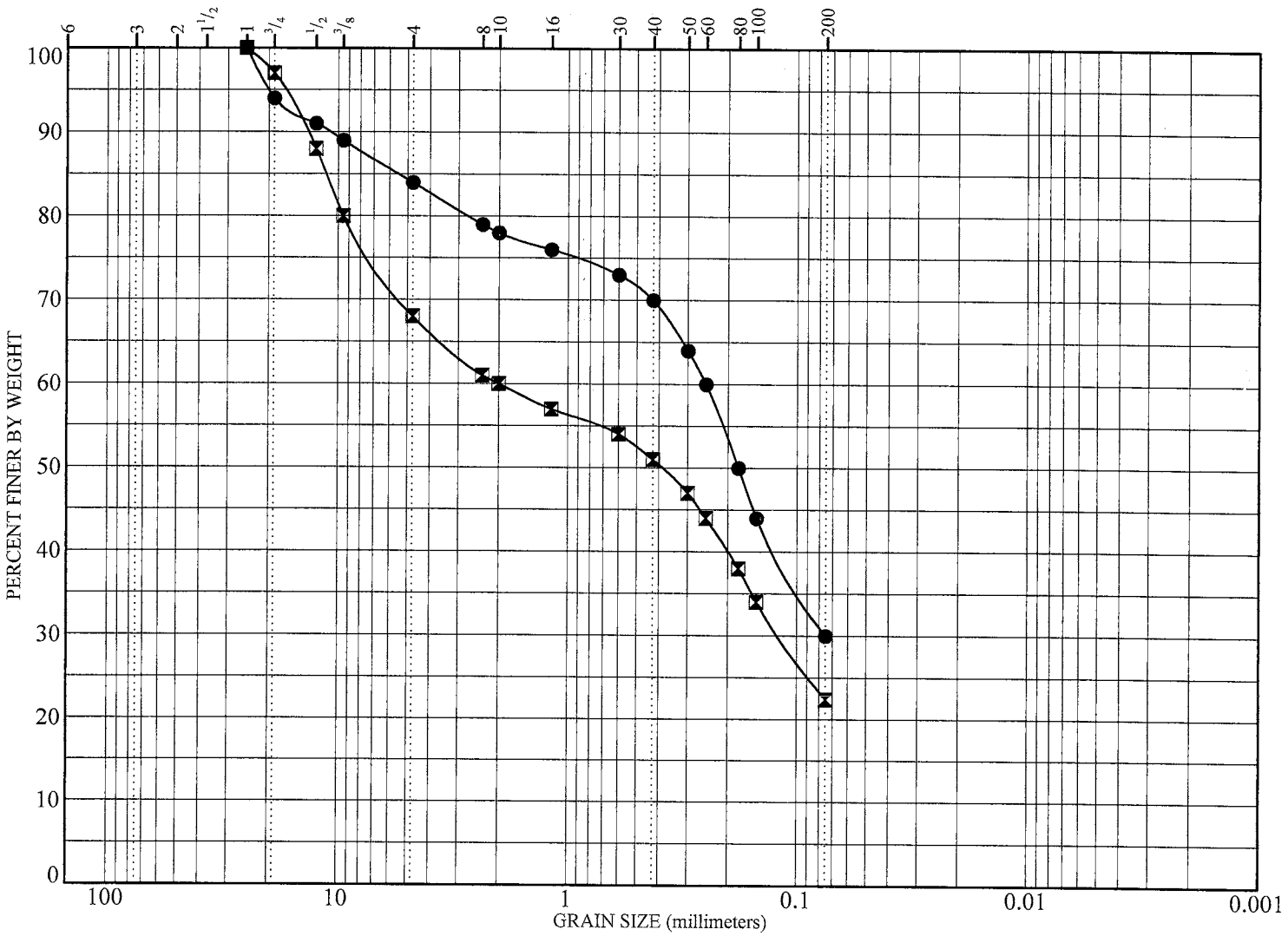
PARTICLE SIZE DISTRIBUTION ANALYSIS REPORT



	COBBLES (%)	GRAVEL (%) coarse	GRAVEL (%) fine	SAND (%) coarse	SAND (%) medium	SAND (%) fine	FINES (%) SILT (%)	FINES (%) CLAY (%)
●	0	16		54			30.0	
⊠	0	32		46			22.4	

Sieve Size	Percent Finer ●	Percent Finer ⊠
1-inch	100	100
3/4-inch	94	97
1/2-inch	91	88
3/8-inch	89	80
#4	84	68
#8	79	61
#10	78	60
#16	76	57
#30	73	54
#40	70	51
#50	64	47
#60	60	44

Sieve Size	Percent Finer ●	Percent Finer ⊠
#80	50	38
#100	44	34
#200	30.0	22.4

	Grain Size (mm) D_{60}	D_{30}	D_{10}	Coefficients C_c	C_u
●	0.25	0.075			
⊠	2.0	0.12			

	Sample Information
●	Boring 1-18, 24'-5" Depth: ***SILTY SAND WITH GRAVEL (SM)*** *— fine grained, non-plastic to low plasticity fines, light brown, moist, very dense relative density,* ***GLACIAL TILL***
⊠	Boring 3-18, 29'-3" Depth: ***SILTY SAND WITH GRAVEL (SM)*** *— fine grained, non-plastic to low plasticity fines, light brown, moist to wet, very dense relative density,* ***GLACIAL TILL***

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LABORATORY TEST RESULT RECORD
Dane County Jail Consolidation Project
114 West Wilson Street
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13248 FIGURE 1

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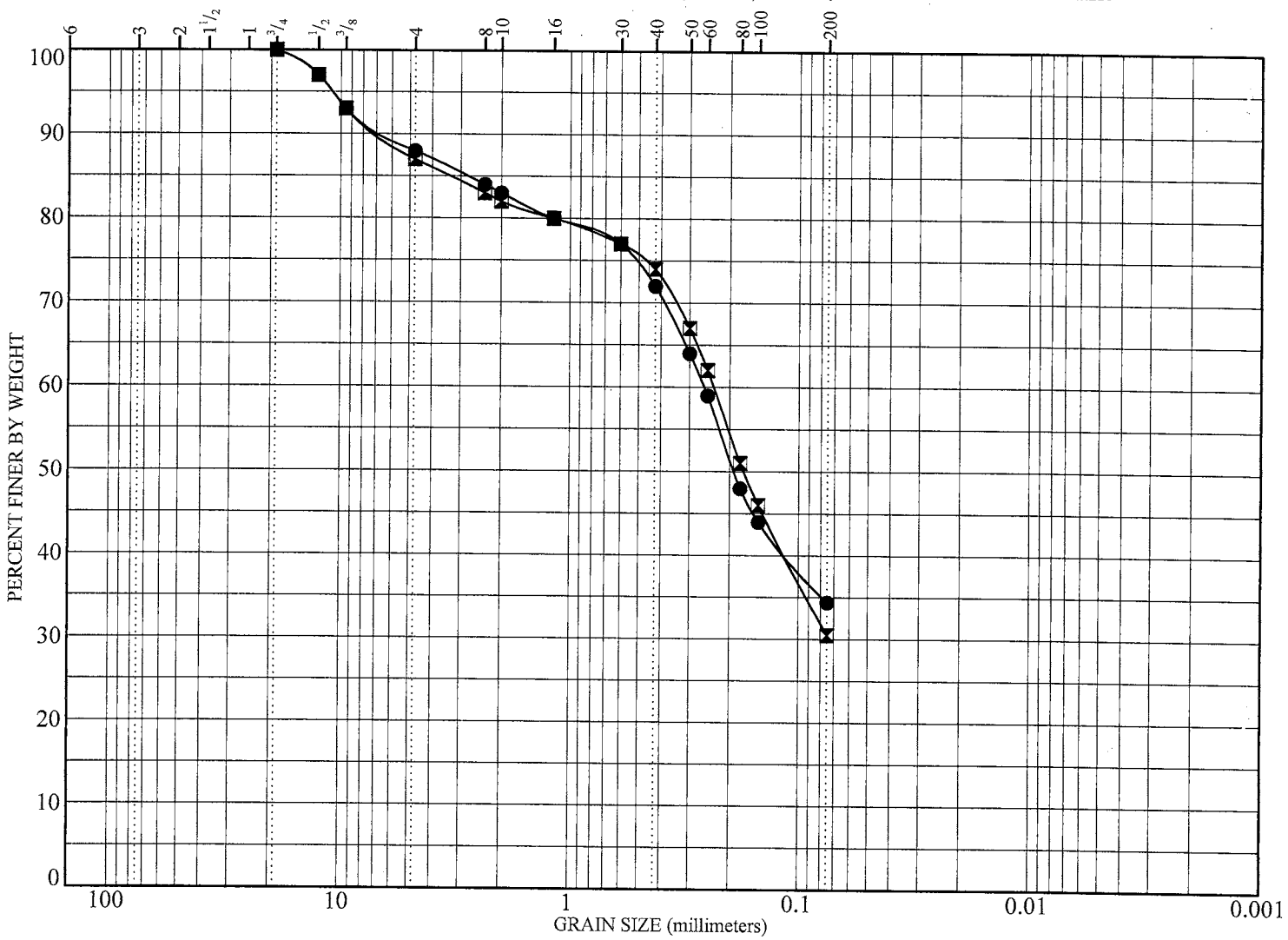
PARTICLE SIZE DISTRIBUTION ANALYSIS REPORT



	COBBLES (%)	GRAVEL (%)		SAND (%)			FINES (%)	
		coarse	fine	coarse	medium	fine	SILT (%)	CLAY (%)
●	0	12		54			34.4	
⊠	0	13		57			30.5	

Sieve Size	Percent Finer ●	Percent Finer ⊠
3/4-inch	100	100
1/2-inch	97	97
3/8-inch	93	93
#4	88	87
#8	84	83
#10	83	82
#16	80	80
#30	77	77
#40	72	74
#50	64	67
#60	59	62
#80	48	51

Sieve Size	Percent Finer ●	Percent Finer ⊠
#100	44	46
#200	34.4	30.5

	Grain Size (mm) D_{60}	D_{30}	D_{10}	Coefficients C_c	C_u
●	0.26				
⊠	0.23				

	Sample Information
●	Boring 3-18, 44'-9" Depth: ***SILTY SAND (SM)*** — *fine to medium grained, non-plastic to low plasticity fines, light brown, moist, very dense relative density,* ***GLACIAL TILL****, little gravel*
⊠	Boring 5-18, 19'-7" Depth: ***SILTY SAND (SM)*** — *fine grained, non-plastic to low plasticity fines, light brown, moist, very dense relative density,* ***GLACIAL TILL****, little gravel*

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13248 FIGURE 2

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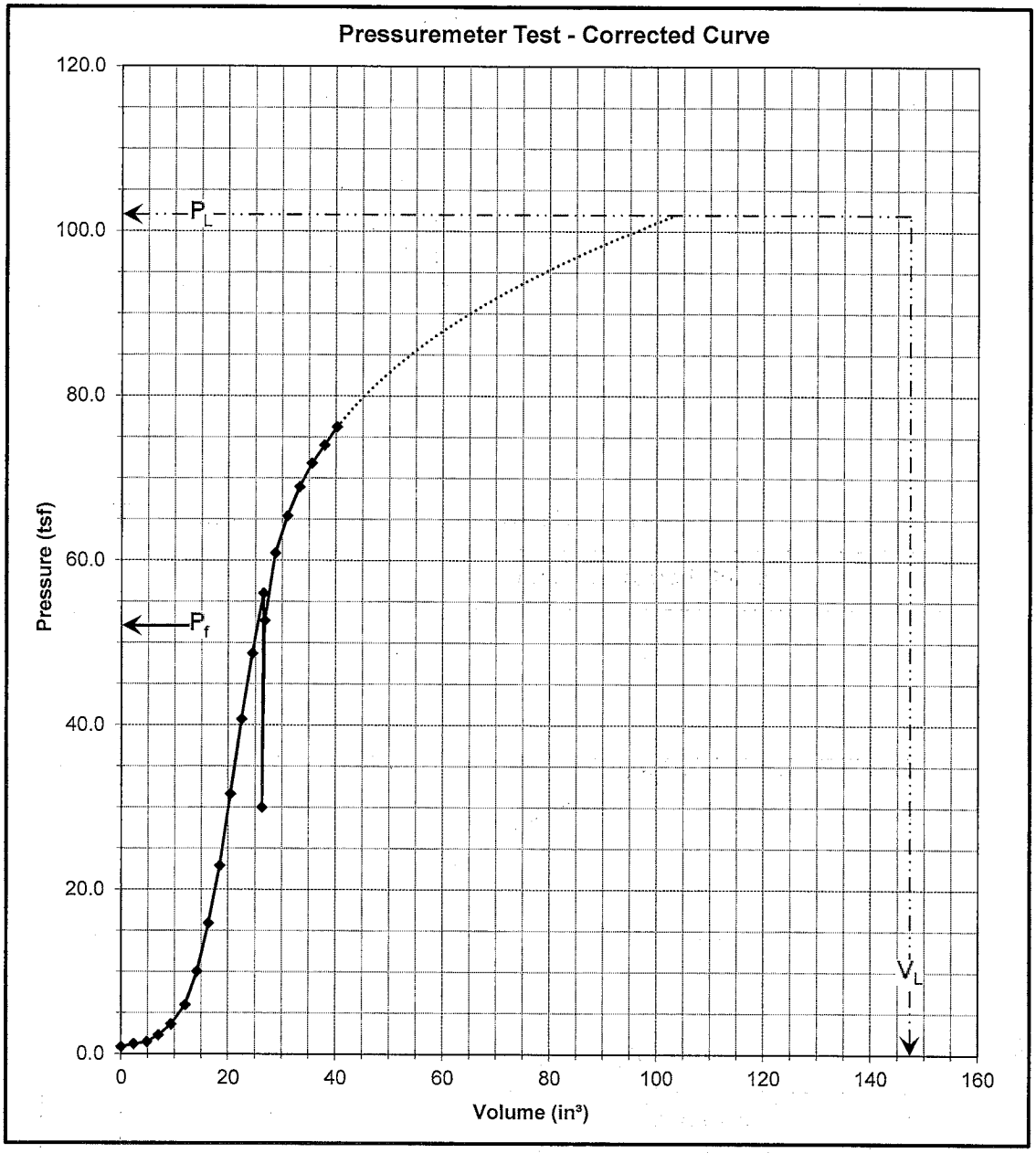
TEXAM Pressuremeter Test Results

Corrected Readings	
Volume (in^3)	Pressure (tsf)
0.0000	0.856
2.422	1.20
4.848	1.46
7.006	2.29
9.379	3.61
11.95	5.93
14.18	10.0
16.34	15.9
18.43	22.9
20.44	31.6
22.43	40.7
24.46	48.7
26.55	56.0
26.28	30.0
26.75	52.7
28.74	60.9
30.96	65.4
33.22	68.9
35.52	71.8
37.85	74.0
40.18	76.2



Boring:	**1-18**	Slotted Casing Used:	**No**	*Poisson's Ratio (ν):	**0.4**
Test Date (mm/dd/yyyy):	**11/13/2018**	Pressuremeter Modulus (E):	**1,540 tsf**	Design Groundwater Elevation:	**15.0 ft**
Test Number:	**1-18A**	Ultimate Pressure (P_L):	**102 tsf**	Design Groundwater Depth:	**27.1 ft**
Test Elevation:	**17.1 ft**	Volume Limit (V_L):	**147.3 in^3**	*Design Groundwater Pressure:	**0 tsf**
Test Depth:	**25.0 ft**	Yield Pressure (P_F):	**52.1 tsf**	*Vertical Overburden Pressure (σ_{OV}):	**0.935 tsf**
Gauge Height Above Ground:	**1.3 ft**	Ratio of E / P_L:	**15**	*Horizontal Overburden Pressure (σ_{OH}):	**0.439 tsf**
Fluid Density (γ):	**1.038 g/cc**	Ratio of P_L / P_F:	**2.0**	*At-Rest Earth Pressure Coefficient (Ko):	**0.47**
Probe Size:	**N**			*Estimated values	

Material Description: **SILTY SAND WITH GRAVEL AND COBBLES (SM) — fine grained, non-plastic to low plasticity fines, light brown, GLACIAL TILL, trace to some gravel, no to few cobbles**

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13248 FIGURE 3

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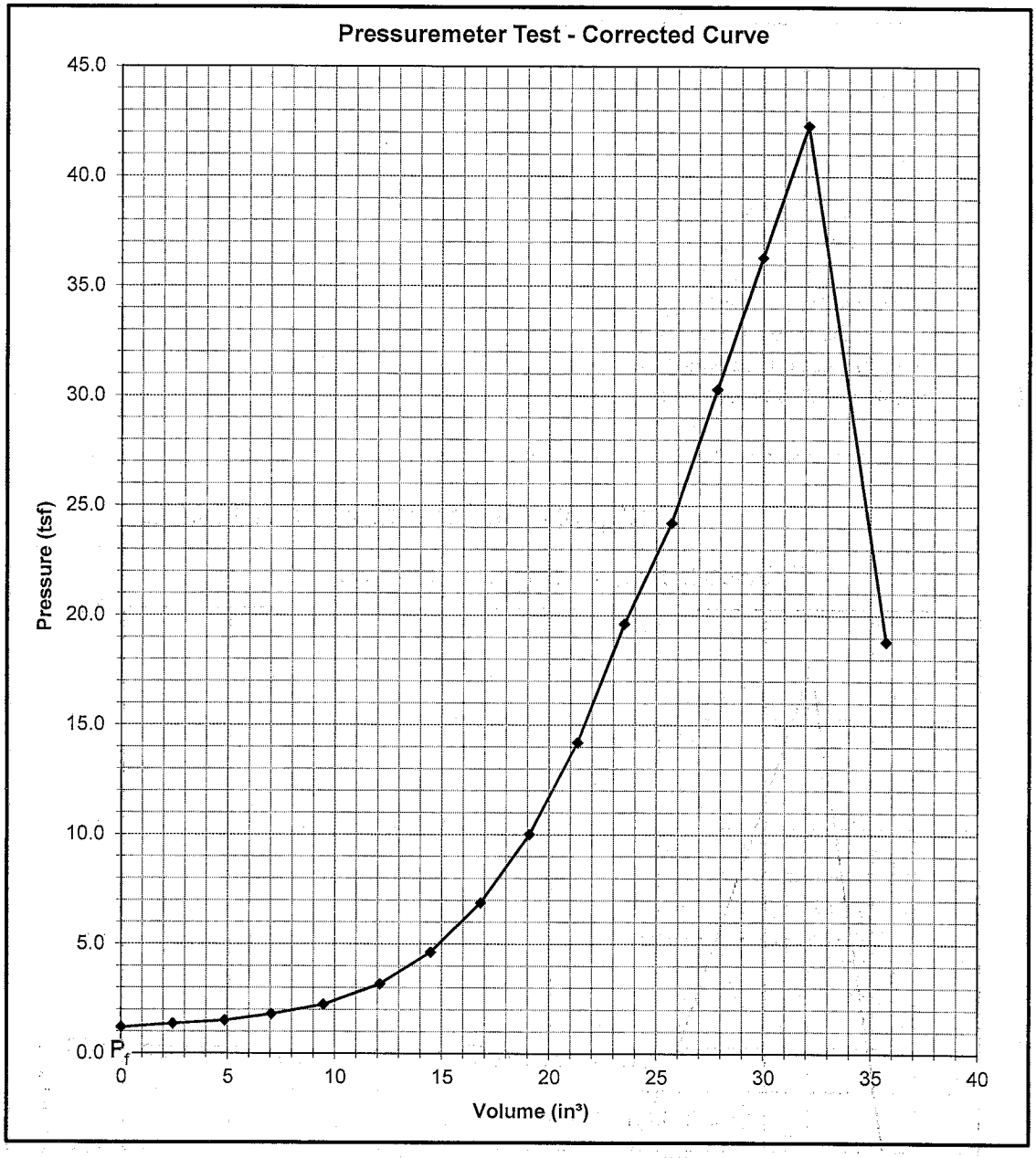
TEXAM Pressuremeter Test Results

Corrected Readings	
Volume (in^3)	Pressure (tsf)
0.0000	1.18
2.431	1.35
4.862	1.49
7.042	1.79
9.465	2.23
12.10	3.17
14.47	4.62
16.80	6.87
19.08	10.0
21.32	14.2
23.49	19.6
25.70	24.2
27.83	30.3
29.98	36.3
32.12	42.3
35.73	18.8



Boring: **1-18**	Slotted Casing Used: **No**	*Poisson's Ratio (ν): **n.a.**
Test Date (mm/dd/yyyy): **11/13/2018**	Pressuremeter Modulus (E): **n.a.**	Design Groundwater Elevation: **15.0 ft**
Test Number: **1-18B**	Ultimate Pressure (P_L): **n.a.**	Design Groundwater Depth: **27.1 ft**
Test Elevation: **7.1 ft**	Volume Limit (V_L): **n.a.**	*Design Groundwater Pressure: **0.246 tsf**
Test Depth: **35.0 ft**	Yield Pressure (P_F): **n.a.**	*Vertical Overburden Pressure (σ_{OV}): **1.38 tsf**
Gauge Height Above Ground: **1.3 ft**	Ratio of E / P_L: **n.a.**	*Horizontal Overburden Pressure (σ_{OH}): **0.648 tsf**
Fluid Density (γ): **1.038 g/cc**	Ratio of P_L / P_F: **n.a.**	*At-Rest Earth Pressure Coefficient (Ko): **0.47**
Probe Size: **N**		*Estimated values

Material Description: **SILTY SAND WITH GRAVEL AND COBBLES (SM) — fine grained, non-plastic to low plasticity fines, light brown, GLACIAL TILL, trace to some gravel, no to few cobbles**

Remarks: **The pressuremeter membrane failed at a pressure of 42.3 tsf.**

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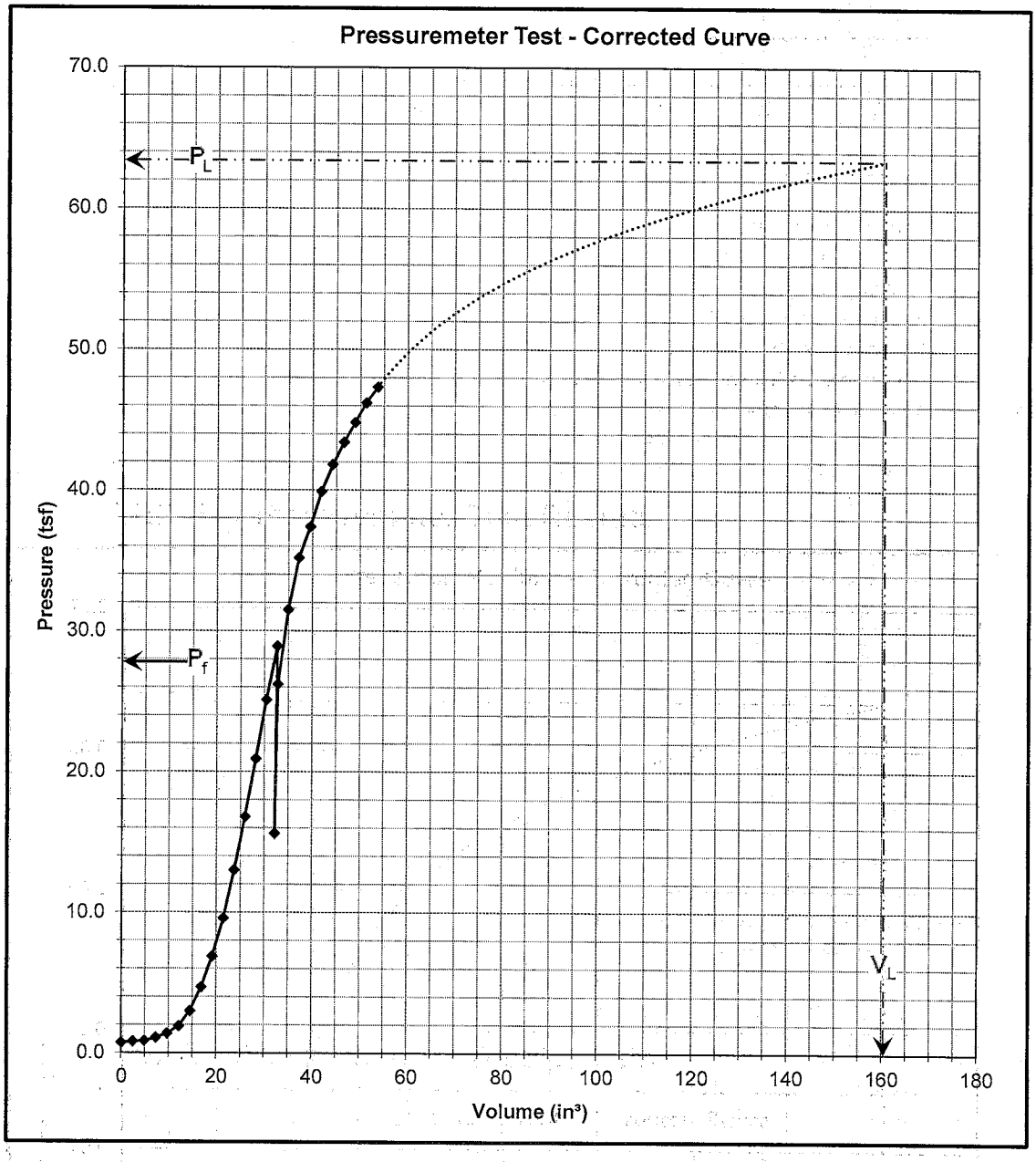
13248 FIGURE 4

TEXAM Pressuremeter Test Results

Corrected Readings	
Volume (in^3)	Pressure (tsf)
0.0000	0.721
2.435	0.794
4.872	0.846
7.298	1.07
9.721	1.36
12.13	1.91
14.52	2.97
16.87	4.68
19.19	6.86
21.49	9.58
23.74	13.0
25.98	16.8
28.21	20.9
30.42	25.1
32.66	28.9
32.17	15.6
32.80	26.2
34.96	31.5
37.20	35.2
39.53	37.4
41.83	39.9
44.18	41.8
46.53	43.4
48.89	44.8
51.26	46.2
53.65	47.3



Boring:	**3-18**	Slotted Casing Used:	**No**	*Poisson's Ratio (ν):	**0.4**
Test Date (mm/dd/yyyy):	**11/14/2018**	Pressuremeter Modulus (E):	**713 tsf**	Design Groundwater Elevation:	**15.0 ft**
Test Number:	**3-18A**	Ultimate Pressure (P_L):	**63.4 tsf**	Design Groundwater Depth:	**25.3 ft**
Test Elevation:	**19.8 ft**	Volume Limit (V_L):	**160.4 in^3**	*Design Groundwater Pressure:	**0 tsf**
Test Depth:	**20.5 ft**	Yield Pressure (P_F):	**27.8 tsf**	*Vertical Overburden Pressure (σ_{OV}):	**0.745 tsf**
Gauge Height Above Ground:	**1.3 ft**	Ratio of E / P_L:	**11**	*Horizontal Overburden Pressure (σ_{OH}):	**0.350 tsf**
Fluid Density (γ):	**1.057 g/cc**	Ratio of P_L / P_F:	**2.3**	*At-Rest Earth Pressure Coefficient (Ko):	**0.47**
Probe Size:	**N**			*Estimated values	

Material Description: **SILTY SAND WITH GRAVEL AND COBBLES (SM) — fine grained, non-plastic to low plasticity fines, light brown, GLACIAL TILL, trace to some gravel, no to few cobbles**

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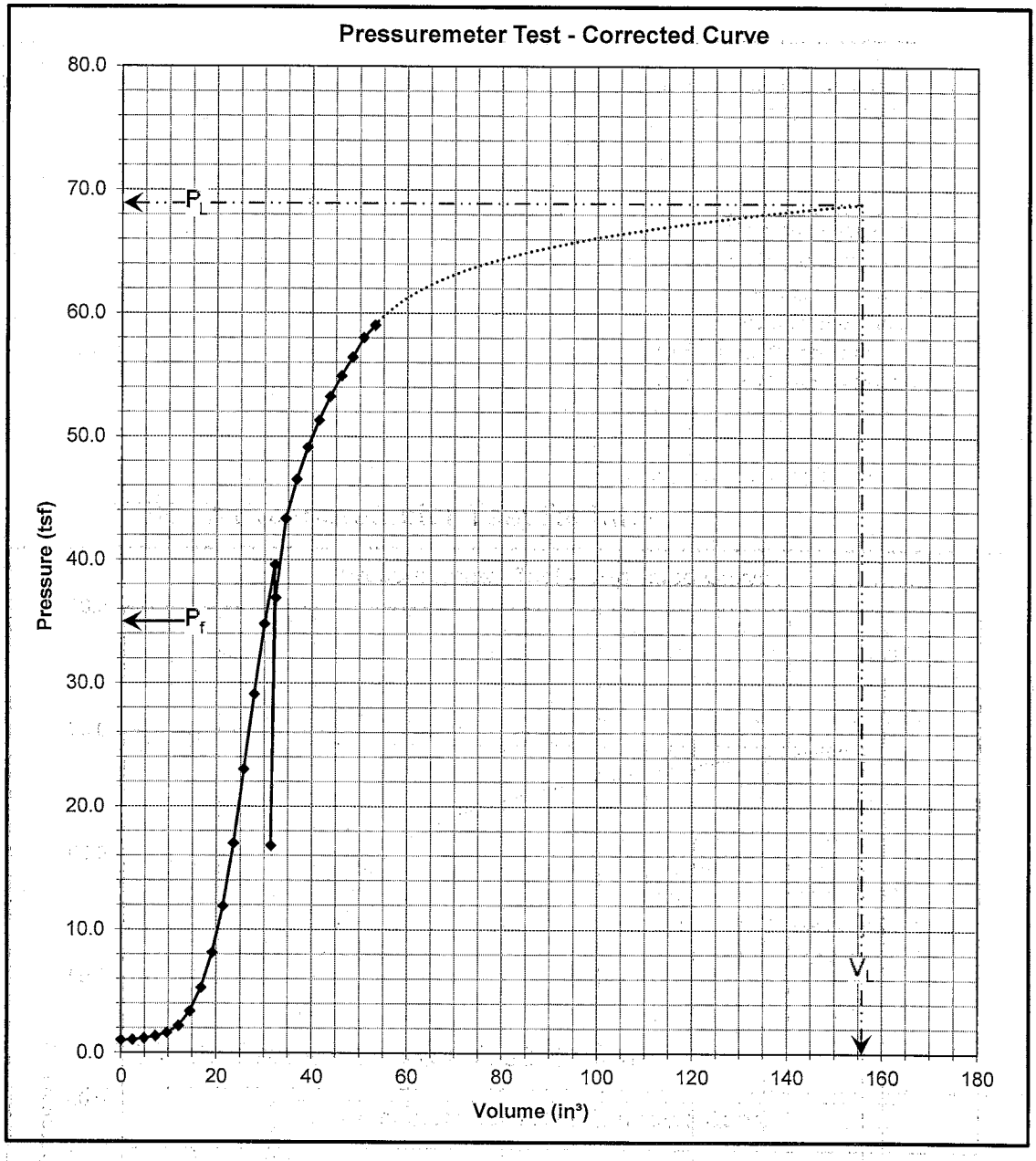
TEXAM Pressuremeter Test Results

Corrected Readings	
Volume (in^3)	Pressure (tsf)
0.0000	1.01
2.437	1.05
4.870	1.17
7.305	1.34
9.727	1.62
12.14	2.18
14.52	3.35
16.86	5.26
19.16	8.12
21.41	11.9
23.59	17.0
25.72	23.0
27.85	29.1
30.00	34.8
32.20	39.6
31.39	16.8
32.33	36.9
34.45	43.3
36.72	46.5
39.04	49.1
41.36	51.3
43.71	53.2
46.06	54.9
48.43	56.4
50.78	58.0
53.18	59.0



Boring:	**3-18**	Slotted Casing Used:	**No**	*Poisson's Ratio (ν):	**0.33**
Test Date (mm/dd/yyyy):	**11/14/2018**	Pressuremeter Modulus (E):	**1,000 tsf**	Design Groundwater Elevation:	**15.0 ft**
Test Number:	**3-18B**	Ultimate Pressure (P_L):	**68.9 tsf**	Design Groundwater Depth:	**25.3 ft**
Test Elevation:	**10.3 ft**	Volume Limit (V_L):	**155.7 in^3**	*Design Groundwater Pressure:	**0.145 tsf**
Test Depth:	**30.0 ft**	Yield Pressure (P_F):	**35.0 tsf**	*Vertical Overburden Pressure (σ_{OV}):	**1.12 tsf**
Gauge Height Above Ground:	**1.3 ft**	Ratio of E / P_L:	**15**	*Horizontal Overburden Pressure (σ_{OH}):	**0.324 tsf**
Fluid Density (γ):	**1.034 g/cc**	Ratio of P_L / P_F:	**2.0**	*At-Rest Earth Pressure Coefficient (Ko):	**0.29**
Probe Size:	**N**			*Estimated values	

Material Description: **SILTY SAND WITH GRAVEL AND COBBLES (SM) — fine grained, non-plastic to low plasticity fines, light brown, GLACIAL TILL, trace to some gravel, no to few cobbles**

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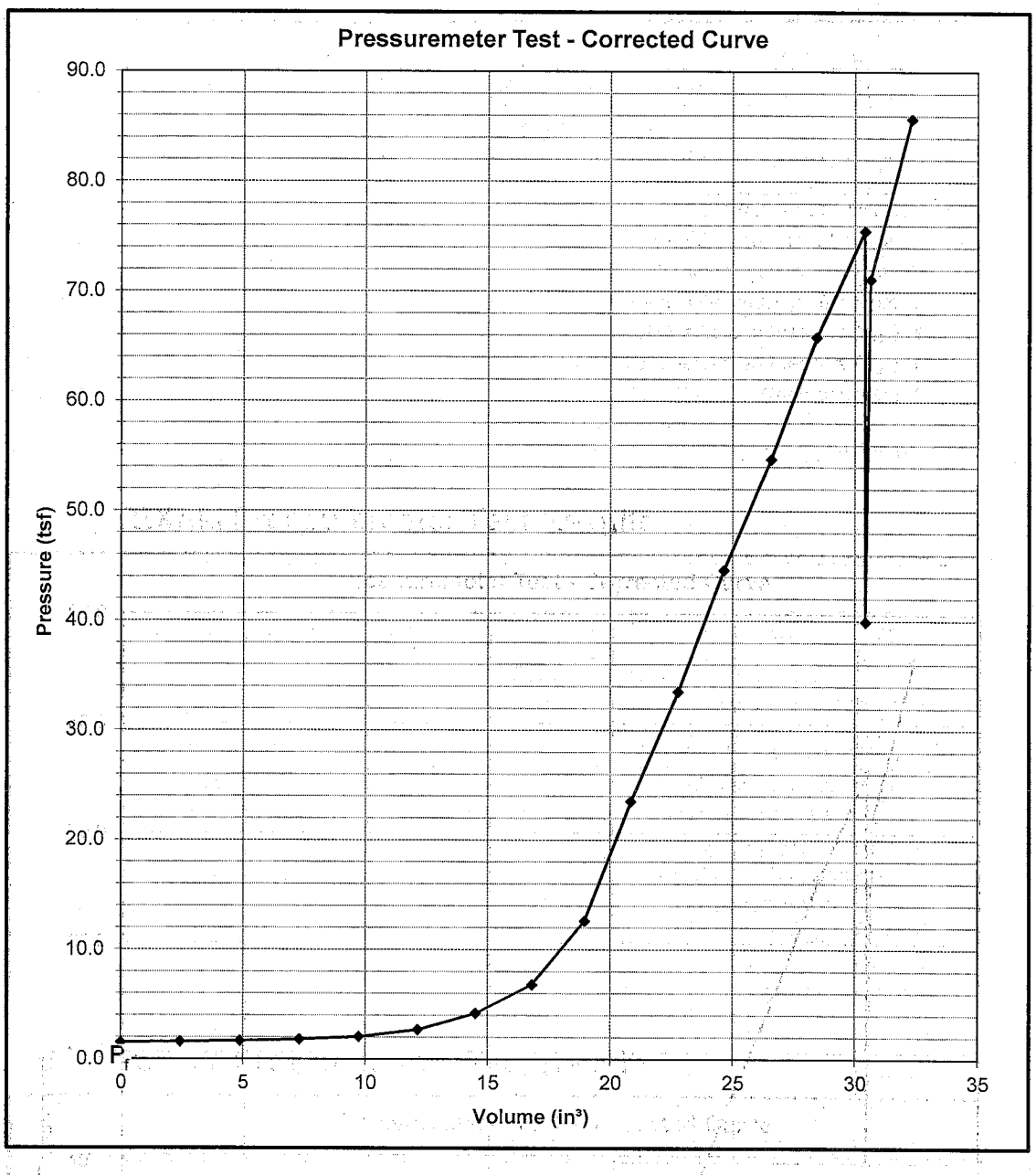
TEXAM Pressuremeter Test Results

Corrected Readings	
Volume (in^3)	Pressure (tsf)
0.0000	1.49
2.435	1.57
4.870	1.65
7.305	1.78
9.733	2.04
12.14	2.68
14.50	4.18
16.81	6.79
18.95	12.6
20.84	23.5
22.77	33.5
24.65	44.6
26.58	54.7
28.44	65.8
30.40	75.5
30.42	39.9
30.63	71.1
32.32	85.7



Boring: **3-18**	Slotted Casing Used: **No**	*Poisson's Ratio (ν): **n.a.**
Test Date (mm/dd/yyyy): **11/14/2018**	Pressuremeter Modulus (E): **n.a.**	Design Groundwater Elevation: **15.0 ft**
Test Number: **3-18C**	Ultimate Pressure (P_L): **n.a.**	Design Groundwater Depth: **25.3 ft**
Test Elevation: **-4.5 ft**	Volume Limit (V_L): **n.a.**	*Design Groundwater Pressure: **0.608 tsf**
Test Depth: **44.8 ft**	Yield Pressure (P_F): **n.a.**	*Vertical Overburden Pressure (σ_{OV}): **1.78 tsf**
Gauge Height Above Ground: **1.3 ft**	Ratio of E / P_L: **n.a.**	*Horizontal Overburden Pressure (σ_{OH}): **0.515 tsf**
Fluid Density (γ): **1.034 g/cc**	Ratio of P_L / P_F: **n.a.**	*At-Rest Earth Pressure Coefficient (Ko): **0.29**
Probe Size: **N**		*Estimated values

Material Description: **SILTY SAND WITH GRAVEL AND COBBLES (SM) — fine grained, non-plastic to low plasticity fines, light brown, GLACIAL TILL, trace to some gravel, no to few cobbles**

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13248 FIGURE 7

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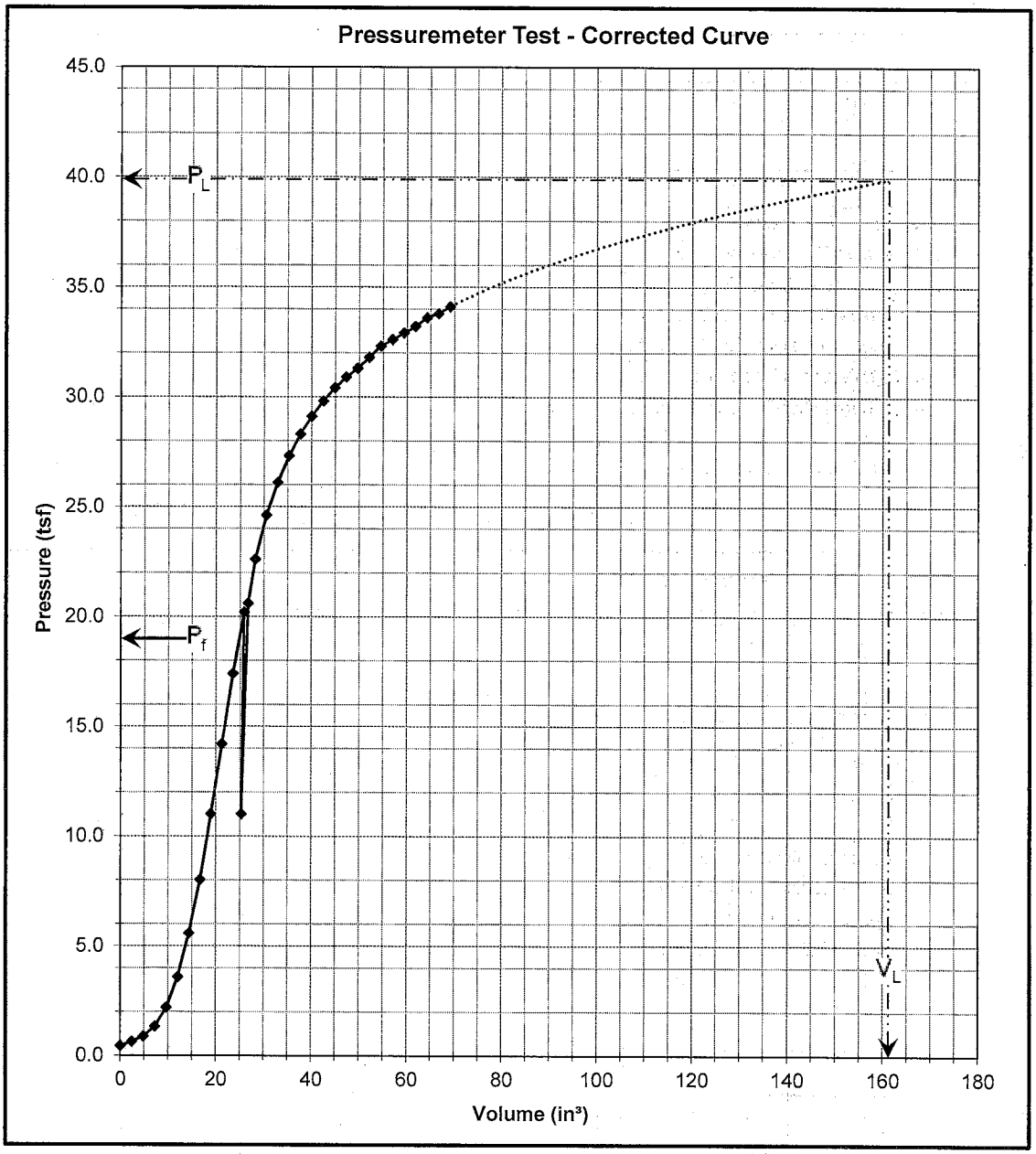
TEXAM Pressuremeter Test Results

Corrected Readings	
Volume (in^3)	Pressure (tsf)
0.0000	0.439
2.429	0.627
4.856	0.867
7.274	1.32
9.666	2.18
12.04	3.57
14.38	5.57
16.70	8.00
18.98	11.0
21.26	14.2
23.54	17.4
25.83	20.2
25.29	11.0
26.67	20.6
28.16	22.6
30.49	24.6
32.86	26.1
35.24	27.3
37.63	28.3
40.03	29.1
42.43	29.8
44.84	30.4
47.26	30.9
49.67	31.3
52.09	31.8
54.51	32.3
56.93	32.6
59.35	32.9
61.76	33.2
64.20	33.6
66.64	33.8
69.08	34.1



Boring:	**5-18**	Slotted Casing Used:	**No**	*Poisson's Ratio (ν):	**0.4**
Test Date (mm/dd/yyyy):	**11/15/2018**	Pressuremeter Modulus (E):	**563 tsf**	Design Groundwater Elevation:	**15.0 ft**
Test Number:	**5-18A**	Ultimate Pressure (P_L):	**39.9 tsf**	Design Groundwater Depth:	**23.7 ft**
Test Elevation:	**26.4 ft**	Volume Limit (V_L):	**161.2 in^3**	*Design Groundwater Pressure:	**0 tsf**
Test Depth:	**12.3 ft**	Yield Pressure (P_F):	**19.0 tsf**	*Vertical Overburden Pressure (σ_{OV}):	**0.456 tsf**
Gauge Height Above Ground:	**1.3 ft**	Ratio of E / P_L:	**14**	*Horizontal Overburden Pressure (σ_{OH}):	**0.132 tsf**
Fluid Density (γ):	**1.034 g/cc**	Ratio of P_L / P_F:	**2.1**	*At-Rest Earth Pressure Coefficient (Ko):	**0.29**
Probe Size:	**N**			*Estimated values	

Material Description: **SILTY SAND WITH GRAVEL AND COBBLES (SM) — fine grained, non-plastic to low plasticity fines, light brown, GLACIAL TILL, trace to some gravel, no to few cobbles**

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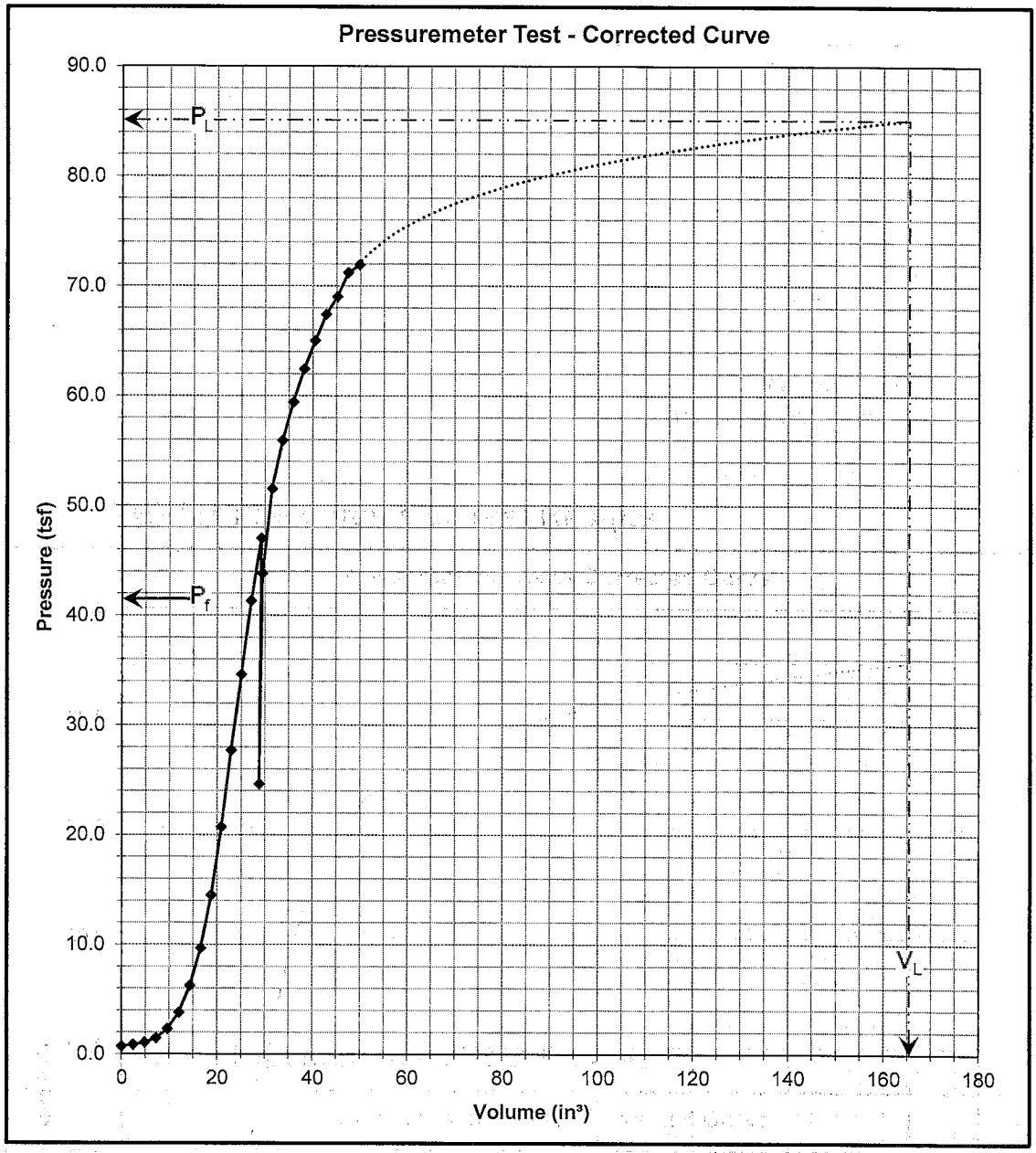
TEXAM Pressuremeter Test Results

Corrected Readings	
Volume (in^3)	Pressure (tsf)
0.0000	0.679
2.430	0.846
4.858	1.05
7.274	1.44
9.672	2.27
12.03	3.78
14.34	6.24
16.60	9.63
18.78	14.5
20.89	20.7
22.95	27.7
25.03	34.6
27.11	41.3
29.24	47.0
28.82	24.6
29.46	43.8
31.44	51.5
33.64	55.9
35.90	59.4
38.17	62.4
40.48	65.0
42.79	67.4
45.14	69.0
47.46	71.2
49.87	71.9



Boring:	**5-18**	Slotted Casing Used:	**No**	*Poisson's Ratio (ν):	**0.4**
Test Date (mm/dd/yyyy):	**11/15/2018**	Pressuremeter Modulus (E):	**1,370 tsf**	Design Groundwater Elevation:	**15.0 ft**
Test Number:	**5-18B**	Ultimate Pressure (P_L):	**85.1 tsf**	Design Groundwater Depth:	**23.7 ft**
Test Elevation:	**19.1 ft**	Volume Limit (V_L):	**165.4 in^3**	*Design Groundwater Pressure:	**0 tsf**
Test Depth:	**19.6 ft**	Yield Pressure (P_F):	**41.5 tsf**	*Vertical Overburden Pressure (σ_{OV}):	**0.780 tsf**
Gauge Height Above Ground:	**1.3 ft**	Ratio of E / P_L:	**16**	*Horizontal Overburden Pressure (σ_{OH}):	**0.226 tsf**
Fluid Density (γ):	**1.032 g/cc**	Ratio of P_L / P_F:	**2.1**	*At-Rest Earth Pressure Coefficient (Ko):	**0.29**
Probe Size:	**N**			*Estimated values	

Material Description: **SILTY SAND WITH GRAVEL AND COBBLES (SM) — fine grained, non-plastic to low plasticity fines, light brown, GLACIAL TILL, trace to some gravel, no to few cobbles**

Soils & Engineering Services, Inc.
1102 STEWART STREET • MADISON, WISCONSIN 53713
Phone: 608-274-7600 • 888-866-SOIL (7645)
Fax: 608-274-7511 • Email: soils@soils.ws
CONSULTING CIVIL ENGINEERS SINCE 1966

FIELD TEST RESULT RECORD
Dane County Jail Consolidation Project
114 West Wilson Street
City of Madison, Dane County, Wisconsin

13248 FIGURE 9

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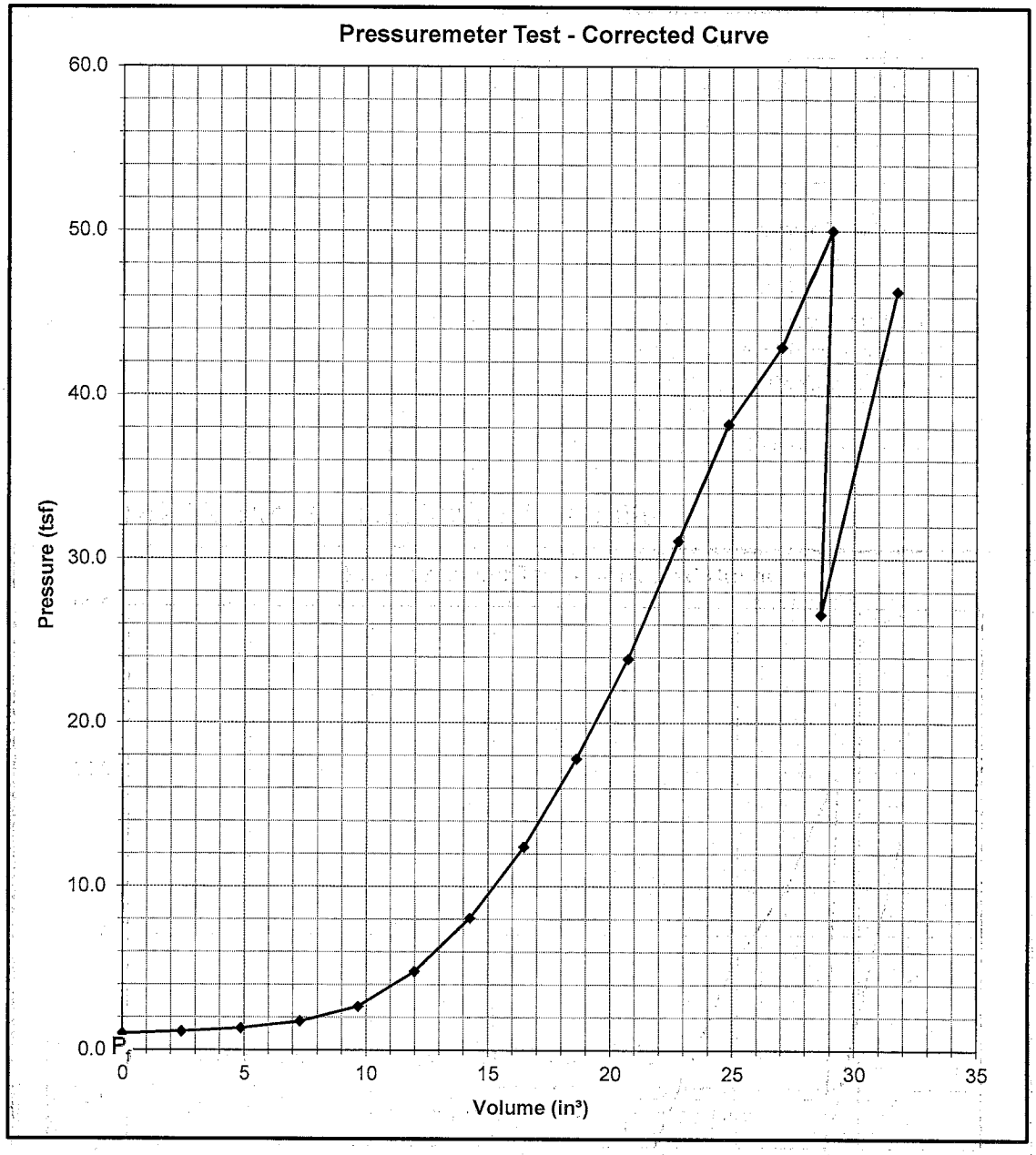
TEXAM Pressuremeter Test Results

Corrected Readings	
Volume (in^3)	Pressure (tsf)
0.0000	0.992
2.432	1.13
4.860	1.33
7.274	1.75
9.666	2.67
11.99	4.80
14.26	8.07
16.47	12.4
18.62	17.8
20.73	23.9
22.79	31.1
24.84	38.2
27.03	42.9
29.10	50.0
28.64	26.6
31.74	46.3



Boring: **5-18**	Slotted Casing Used: **No**	*Poisson's Ratio (ν): **n.a.**
Test Date (mm/dd/yyyy): **11/15/2018**	Pressuremeter Modulus (E): **n.a.**	Design Groundwater Elevation: **15.0 ft**
Test Number: **5-18C**	Ultimate Pressure (P_L): **n.a.**	Design Groundwater Depth: **23.7 ft**
Test Elevation: **9.2 ft**	Volume Limit (V_L): **n.a.**	*Design Groundwater Pressure: **0.182 tsf**
Test Depth: **29.5 ft**	Yield Pressure (P_F): **n.a.**	*Vertical Overburden Pressure (σ_{OV}): **1.22 tsf**
Gauge Height Above Ground: **1.3 ft**	Ratio of E / P_L: **n.a.**	*Horizontal Overburden Pressure (σ_{OH}): **0.354 tsf**
Fluid Density (γ): **1.032 g/cc**	Ratio of P_L / P_F: **n.a.**	*At-Rest Earth Pressure Coefficient (Ko): **0.29**
Probe Size: **N**		*Estimated values

Material Description: **SILTY SAND WITH GRAVEL AND COBBLES (SM) — fine grained, non-plastic to low plasticity fines, light brown, GLACIAL TILL, trace to some gravel, no to few cobbles**

Remarks: **The pressuremeter membrane failed at a pressure of 46.3 tsf.**

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FIELD TEST RESULT RECORD
Dane County Jail Consolidation Project
114 West Wilson Street
City of Madison, Dane County, Wisconsin

13248 FIGURE 10

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APPENDIX B

Recommended Soil Design Parameters, Table 1-1
USGS Design Maps Summary Report

Table 1-1: RECOMMENDED SOIL DESIGN PARAMETERS
Dane County Jail Consolidation Project
114 West Wilson Street
City of Madison, Dane County, Wisconsin

Elevation (feet)	Material Type	Estimated Soil Parameters: Moist Density, γ (pcf)	Angle of Internal Friction, Ø (degrees)	Cohesion, c (psf)	Lateral Earth Pressure Coefficients: Passive (K_p)	Active (K_a)	At-Rest (K_o)
	---------- Boring 1-18 ----------						
42.1 to 41.9	***FILL**, hot mix asphalt*	145.0	---	---	---	---	---
41.9 to 41.1	***SILTY SAND WITH GRAVEL (SM)** — fine grained, non-plastic to low plasticity fines, brown, moist, **FILL**, crushed stone base course*	135.0	37	0	4.02	0.25	0.40
41.1 to 39.1	***SILTY SAND WITH GRAVEL (SM)** — fine grained, non-plastic to low plasticity fines, brown, moist, medium dense relative density, **FILL***	135.0	41	0	4.81	0.21	0.34
39.1 to 34.1	***SILTY SAND WITH GRAVEL AND COBBLES (SM)** — fine grained, non-plastic to low plasticity fines, light brown, moist, medium dense to very dense relative density, **GLACIAL TILL**, trace to some gravel, no to few cobbles*	132.0	38	0	4.20	0.24	0.38
34.1 to 31.6		139.0	45	0	5.83	0.17	0.29
31.6 to 30.5		132.0	39	0	4.40	0.23	0.37
30.5 to 29.1		132.0	39	0	4.40	0.23	0.37
29.1 to 27.0		139.0	44	0	5.55	0.18	0.31
27.0 to 25.1		139.0	44	0	5.55	0.18	0.31
25.1 to 21.6		151.0	45	0	5.83	0.17	0.29
21.6 to 19.6	***POORLY-GRADED SAND (SP)** — fine grained, brown, wet, very loose relative density*	110.0	30	0	3.00	0.33	0.50
19.6 to 15.0	***SILTY SAND WITH GRAVEL AND COBBLES (SM)** — fine grained, non-plastic to low plasticity fines, light brown, moist, very dense relative density, **GLACIAL TILL**, trace to some gravel, no to few cobbles*	151.0	45	0	5.83	0.17	0.29
15.0 to 4.6		151.0	45	0	5.83	0.17	0.29
4.6 to -0.4		151.0	43	0	5.29	0.19	0.32
-0.4 to -7.3		151.0	45	0	5.83	0.17	0.29
	End of Boring 1-18 @ Elevation -7.3 feet						

Table Notes
1. The Moist Density, Angle of Internal Friction, and Cohesion soil design values are considered estimates based on the soil strata encountered at the indicated boring.
2. The Lateral Earth Pressure Coefficients values are computed using the provided estimated Angle of Internal Friction for each soil stratum for the indicated boring.

Table Abbreviations and Symbols
pcf = pounds per cubic foot. psf = pounds per square foot.

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Table 1-1: RECOMMENDED SOIL DESIGN PARAMETERS
Dane County Jail Consolidation Project
114 West Wilson Street
City of Madison, Dane County, Wisconsin

Elevation (feet)	Material Type	Estimated Soil Parameters: Moist Density, γ (pcf)	Angle of Internal Friction, Ø (degrees)	Cohesion, c (psf)	Lateral Earth Pressure Coefficients: Passive (K_p)	Active (K_a)	At-Rest (K_o)
	---------- Boring 2-18A ----------						
42.7 to 42.5	***FILL**, hot mix asphalt*	145.0	---	---	---	---	---
42.5 to 41.6	***SILTY SAND WITH GRAVEL (SM)** — fine grained, non-plastic to low plasticity fines, brown, moist, **FILL**, crushed stone base course*	135.0	37	0	4.02	0.25	0.40
41.6 to 36.7	***SILTY SAND WITH GRAVEL (SM)** — fine grained, non-plastic to low plasticity fines, light brown, moist, loose to medium dense relative density, **FILL***	135.0	31	0	3.12	0.32	0.48
36.7 to 35.7	***LEAN CLAY (CL)** — medium plasticity, very dark brown to black, organic odor, moist, stiff to very stiff consistency, **FILL TOPSOIL**, some roots*	135.0	0	1000	1.00	1.00	1.00
35.7 to 34.7	***SILTY SAND WITH GRAVEL (SM)** — fine grained, non-plastic to low plasticity fines, brown to dark brown, moist, loose to medium dense relative density, **FILL***	135.0	29	0	2.88	0.35	0.52
34.7 to 30.5		135.0	31	0	3.12	0.32	0.48
30.5 to 27.5		135.0	31	0	3.12	0.32	0.48
27.5 to 24.2		135.0	31	0	3.12	0.32	0.48
24.2 to 20.7	***SILTY SAND WITH GRAVEL AND COBBLES (SM)** — fine grained, non-plastic to low plasticity fines, light brown, moist, very dense relative density, **GLACIAL TILL**, trace to some gravel, no to few cobbles*	151.0	45	0	5.83	0.17	0.29
20.7 to 15.0		151.0	44	0	5.55	0.18	0.31
15.0 to 6.2		151.0	43	0	5.29	0.19	0.32
6.2 to 0.7		151.0	41	0	4.81	0.21	0.34
0.7 to -7.1		151.0	45	0	5.83	0.17	0.29
	End of Boring 2-18A @ Elevation -7.1 feet						

Table Notes
1. The Moist Density, Angle of Internal Friction, and Cohesion soil design values are considered estimates based on the soil strata encountered at the indicated boring.
2. The Lateral Earth Pressure Coefficients values are computed using the provided estimated Angle of Internal Friction for each soil stratum for the indicated boring.

Table Abbreviations and Symbols
pcf = pounds per cubic foot. psf = pounds per square foot.

Table 1-1: RECOMMENDED SOIL DESIGN PARAMETERS
Dane County Jail Consolidation Project
114 West Wilson Street
City of Madison, Dane County, Wisconsin

Elevation (feet)	Material Type	Estimated Soil Parameters			Lateral Earth Pressure Coefficients		
		Moist Density, γ (pcf)	Angle of Internal Friction, Ø (degrees)	Cohesion, c (psf)	Passive (K_p)	Active (K_a)	At-Rest (K_o)
	---------- Boring 3-18 ----------						
40.3 to 39.8	***FILL**, hot mix asphalt*	145.0	---	---	---	---	---
39.8 to 38.3	***SILTY SAND WITH GRAVEL (SM)** — fine grained, non-plastic to low plasticity fines, brown, moist, medium dense relative density, **FILL**, crushed stone base course*	135.0	37	0	4.02	0.25	0.40
38.3 to 38.1	***LEAN CLAY (CL)** — medium plasticity, brown, moist, stiff consistency, **FILL**, few gravel*	135.0	0	1000	1.00	1.00	1.00
38.1 to 32.3	***SILTY SAND WITH GRAVEL AND COBBLES (SM)** — fine grained, non-plastic to low plasticity fines, light brown, moist, medium dense to very dense relative density, **GLACIAL TILL**, trace to some gravel, no to few cobbles*	132.0	34	0	3.54	0.28	0.44
32.3 to 30.5		132.0	37	0	4.02	0.25	0.40
30.5 to 27.5		132.0	37	0	4.02	0.25	0.40
27.5 to 23.3		132.0	40	0	4.60	0.22	0.36
23.3 to 20.3		132.0	45	0	5.83	0.17	0.29
20.3 to 19.3	***POORLY-GRADED SAND (SP)** — fine grained, brown, wet*	110.0	30	0	3.00	0.33	0.50
19.3 to 15.0	***SILTY SAND WITH GRAVEL AND COBBLES (SM)** — fine grained, non-plastic to low plasticity fines, light brown, moist, very dense relative density, **GLACIAL TILL**, trace to some gravel, no to few cobbles*	151.0	45	0	5.83	0.17	0.29
15.0 to 8.3		151.0	45	0	5.83	0.17	0.29
8.3 to -0.7		151.0	45	0	5.83	0.17	0.29
-0.7 to -8.8		151.0	45	0	5.83	0.17	0.29
	End of Boring 3-18 @ Elevation -9.4 feet						

Table Notes
1. The Moist Density, Angle of Internal Friction, and Cohesion soil design values are considered estimates based on the soil strata encountered at the indicated boring.
2. The Lateral Earth Pressure Coefficients values are computed using the provided estimated Angle of Internal Friction for each soil stratum for the indicated boring.

Table Abbreviations and Symbols
pcf = pounds per cubic foot. psf = pounds per square foot.

Table 1-1: RECOMMENDED SOIL DESIGN PARAMETERS
Dane County Jail Consolidation Project
114 West Wilson Street
City of Madison, Dane County, Wisconsin

Elevation (feet)	Material Type	Estimated Soil Parameters			Lateral Earth Pressure Coefficients		
		Moist Density, γ (pcf)	Angle of Internal Friction, Ø (degrees)	Cohesion, c (psf)	Passive (K_p)	Active (K_a)	At-Rest (K_o)
	---------- Boring 4-18 ----------						
34.3 to 33.8	***FILL**, hot mix asphalt*	145.0	---	---	---	---	---
33.8 to 33.1	***SILTY SAND WITH GRAVEL (SM)** — fine grained, non-plastic to low plasticity fines, brown, moist, **FILL**, crushed stone base course*	135.0	37	0	4.02	0.25	0.40
33.1 to 30.6	***SILTY SAND WITH GRAVEL (SM)** — fine grained, non-plastic to low plasticity fines, brown, moist, loose to very loose relative density, **FILL***	135.0	32	0	3.25	0.31	0.47
30.6 to 30.3		135.0	32	0	3.25	0.31	0.47
30.3 to 27.6	***POORLY-GRADED GRAVEL (GP)** — fine grained, brown, moist, very loose to loose relative density, **FILL**, trace to little sand*	135.0	30	0	3.00	0.33	0.50
27.6 to 26.8		135.0	30	0	3.00	0.33	0.50
26.8 to 23.3	***SILTY SAND WITH GRAVEL (SM)** — fine grained, non-plastic to low plasticity fines, brown, moist, medium dense relative density, **FILL***	135.0	33	0	3.39	0.29	0.46
23.3 to 21.3	***SILTY SAND WITH GRAVEL AND COBBLES (SM)** — fine grained, non-plastic to low plasticity fines, light brown, moist, dense to very dense relative density, **GLACIAL TILL**, trace to some gravel, no to few cobbles*	139.0	41	0	4.81	0.21	0.34
21.3 to 15.1		151.0	45	0	5.83	0.17	0.29
15.1 to 2.3		151.0	45	0	5.83	0.17	0.29
2.3 to -2.7		132.0	45	0	5.83	0.17	0.29
-2.7 to -14.7		151.0	45	0	5.83	0.17	0.29
	End of Boring 4-18 @ Elevation -14.7 feet						

Table Notes
1. The Moist Density, Angle of Internal Friction, and Cohesion soil design values are considered estimates based on the soil strata encountered at the indicated boring.
2. The Lateral Earth Pressure Coefficients values are computed using the provided estimated Angle of Internal Friction for each soil stratum for the indicated boring.

Table Abbreviations and Symbols
pcf = pounds per cubic foot. psf = pounds per square foot.

Table 1-1: RECOMMENDED SOIL DESIGN PARAMETERS
Dane County Jail Consolidation Project
114 West Wilson Street
City of Madison, Dane County, Wisconsin

Elevation (feet)	Material Type	Estimated Soil Parameters			Lateral Earth Pressure Coefficients		
		Moist Density, γ (pcf)	Angle of Internal Friction, Ø (degrees)	Cohesion, c (psf)	Passive (K_p)	Active (K_a)	At-Rest (K_o)
	---------- Boring 5-18 ----------						
38.7 to 38.4	***FILL**, hot mix asphalt*	145.0	---	---	---	---	---
38.4 to 37.2	***SILTY SAND WITH GRAVEL (SM)** — fine grained, non-plastic to low plasticity fines, brown, moist, **FILL**, crushed stone base course*	135.0	37	0	4.02	0.25	0.40
37.2 to 32.7	***SILTY SAND (SM)** — fine grained, non-plastic to low plasticity fines, brown, moist, loose relative density, **FILL**, with fine CLAYEY SAND (SC) and SANDY LEAN CLAY (CL) seams*	135.0	31	0	3.12	0.32	0.48
32.7 to 30.5	***SILTY SAND WITH GRAVEL AND COBBLES (SM)** — fine grained, non-plastic to low plasticity fines, light brown, moist, medium dense to very dense relative density, **GLACIAL TILL**, trace to some gravel, no to few cobbles*	132.0	35	0	3.69	0.27	0.43
30.5 to 28.2		132.0	39	0	4.40	0.23	0.37
28.2 to 27.5		151.0	45	0	5.83	0.17	0.29
27.5 to 21.7		151.0	45	0	5.83	0.17	0.29
21.7 to 15.0		151.0	45	0	5.83	0.17	0.29
15.0 to 7.0		151.0	45	0	5.83	0.17	0.29
7.0 to -1.0		151.0	45	0	5.83	0.17	0.29
-1.0 to -9.9		151.0	45	0	5.83	0.17	0.29
	End of Boring 5-18 @ Elevation -9.9 feet						

Table Notes
1. The Moist Density, Angle of Internal Friction, and Cohesion soil design values are considered estimates based on the soil strata encountered at the indicated boring.
2. The Lateral Earth Pressure Coefficients values are computed using the provided estimated Angle of Internal Friction for each soil stratum for the indicated boring.

Table Abbreviations and Symbols
pcf = pounds per cubic foot. psf = pounds per square foot.

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USGS Design Maps Summary Report

User–Specified Input

Report Title Dane County Jail Consolidation Project, 114 W Wilson Street, Madison, Dane County, WI

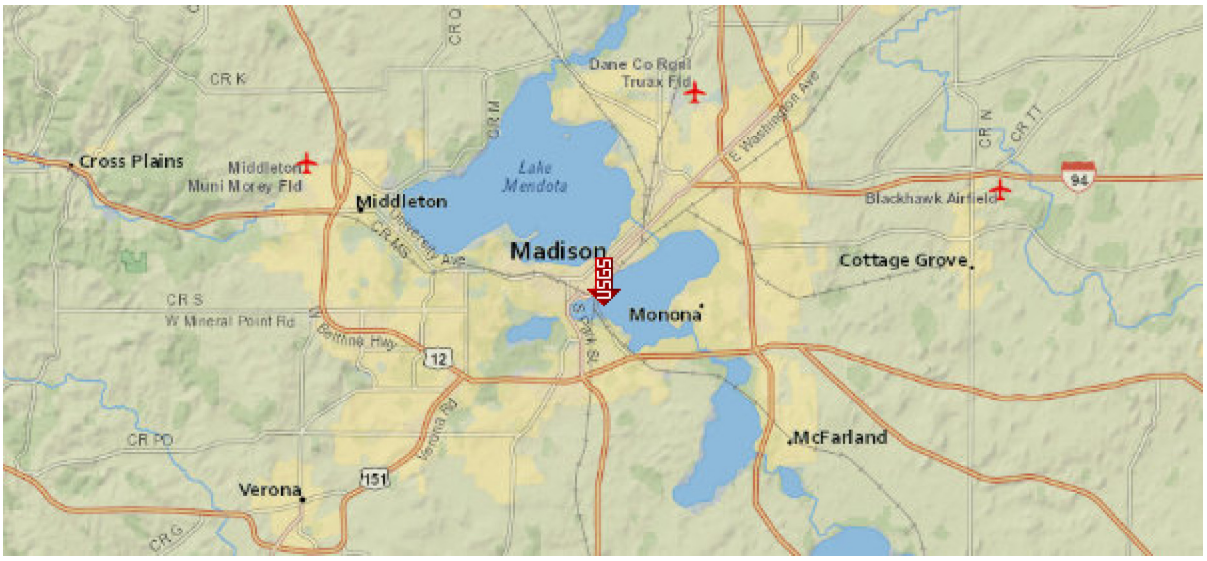
Tue December 11, 2018 21:30:14 UTC

Building Code Reference Document 2012/2015 International Building Code
(which utilizes USGS hazard data available in 2008)

Site Coordinates 43.07146°N, 89.38324°W

Site Soil Classification Site Class D – "Stiff Soil"

Risk Category I/II/III



USGS–Provided Output

S_S =	0.085 g	S_{MS} =	0.135 g	S_{DS} =	0.090 g
S_1 =	0.046 g	S_{M1} =	0.110 g	S_{D1} =	0.073 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.