

BID OF \_\_\_\_\_

**2017**

**PROPOSAL, CONTRACT, BOND AND SPECIFICATIONS**

**FOR**

**MADISON WATER UTILITY  
VEHICLE STORAGE BUILDING IMPROVMENTS  
115 S. PATERSON STREET**

**VOLUME 1 OF 2  
CONTRACT NO. 7823**

**PROJECT NO. 10442**

**MUNIS NO. 10442-86-140:53310**

**IN**

**MADISON, DANE COUNTY, WISCONSIN**

AWARDED BY THE COMMON COUNCIL  
MADISON, WISCONSIN ON \_\_\_\_\_

CITY ENGINEERING DIVISION  
1600 EMIL STREET  
MADISON, WISCONSIN 53713

<https://bidexpress.com/login>



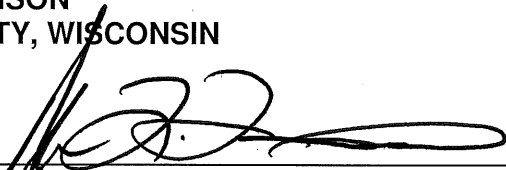
**MADISON WATER UTILITY  
VEHICLE STORAGE BUILDING IMPROVMENTS  
115 S. PATERSON STREET  
CONTRACT NO. 7823**

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This Proposal, and Agreement have  
been prepared by:

**CITY ENGINEERING DIVISION  
CITY OF MADISON  
MADISON, DANE COUNTY, WISCONSIN**

  
Al Larson, P.E., BCEE, Principal Engineer Water

*10/17/16*

RFP:



**CIVIL ENGINEER**

Mead & Hunt, Inc.  
2440 Deming Way  
Middleton, WI 53562  
Tel: 608.273.6390 Fax: 608.273.6391



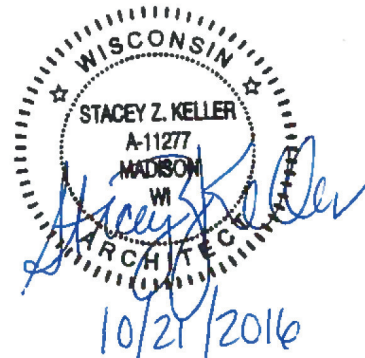
**STRUCTURAL ENGINEER**

GRAEF  
5126 West Terrace Drive  
Madison, WI 53718  
Tel: 608-242-1550



**ARCHITECT**

Mead & Hunt, Inc.  
2440 Deming Way  
Middleton, WI 53562  
Tel: 608.273.6390 Fax: 608.273.6391



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**FIRE PROTECTION ENGINEER**

Mead & Hunt, Inc.  
2440 Deming Way  
Middleton, WI 53562  
Tel: 608.273.6390 Fax: 608.273.6391

NOT APPLICABLE

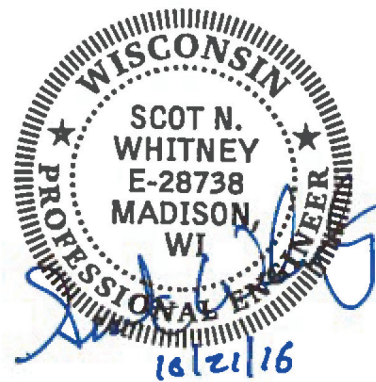
**PLUMBING ENGINEER**

Mead & Hunt, Inc.  
2440 Deming Way  
Middleton, WI 53562  
Tel: 608.273.6390 Fax: 608.273.6391



**MECHANICAL ENGINEER**

Mead & Hunt, Inc.  
2440 Deming Way  
Middleton, WI 53562  
Tel: 608.273.6390 Fax: 608.273.6391



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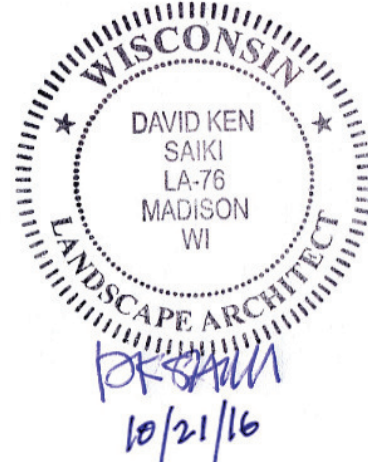
**ELECTRICAL ENGINEER**

Mead & Hunt, Inc.  
2440 Deming Way  
Middleton, WI 53562  
Tel: 608.273.6390 Fax: 608.273.6391



**LANDSCAPE ARCHITECT**

Ken Saiki Design  
303 S. Paterson Street, Suite 1  
Madison, WI 53703  
Tel: 608.251.3600 Fax: 608.251.2330



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## SECTION A: ADVERTISEMENT FOR BIDS AND INSTRUCTIONS TO BIDDERS

### REQUEST FOR BID FOR PUBLIC WORKS CONSTRUCTION CITY OF MADISON, WISCONSIN

#### A BEST VALUE CONTRACTING MUNICIPALITY

PROJECT NAME:	MADISON WATER UTILITY <b>VEHICLE STORAGE BUILDING IMPROVMENTS</b> 115 S. PATERSON STREET
CONTRACT NO.:	7823
SBE GOAL	11%
BID BOND	5%
PRE BID ON-SITE WALK-THRU (1:00 P.M.)	November 2, 2016
PRE BID MEETING (1:00 P.M.)	November 11, 2016
PREQUALIFICATION APPLICATION DUE (1:00 P.M.)	November 11, 2016
BID SUBMISSION (1:00 P.M.)	November 18, 2016
BID OPEN (1:30 P.M.)	November 18, 2016
PUBLISHED IN WSJ	10/21, 10/28, 11/4 & 11/11/2016

**PRE BID ON SITE WALK-THRU:** Representatives of the design team and the City of Madison Water Utility will be present to discuss the requirements of the project and allow contractors to review the existing conditions of the site. This meeting is not required to bid, but is highly recommended. This meeting will take place at 115 S. Paterson Street, Madison, Wisconsin. Enter the property from the E. Main Street entrance driveways.

**PRE BID MEETING:** Representatives of the Affirmative Action Department will be present to discuss the Small Business Enterprise requirements at 1600 Emil Street, Madison Wisconsin.

**PREQUALIFICATION APPLICATION:** Forms are available on our website, [www.cityofmadison.com/business/pw/forms.cfm](http://www.cityofmadison.com/business/pw/forms.cfm). If not currently prequalified in the categories listed in Section A, an amendment to your Prequalification will need to be submitted prior to the same due date. Postmark is not applicable.

**INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS:** The Bidder shall review the Bidding Documents and shall report to the Architect errors, inconsistencies or ambiguities discovered. Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to the architect at least seven days prior to the date for receipt of Bids. Interpretations, corrections and changes of the Bidding Documents will be made by Addendum; any other manner will not be binding. Architect: Mead & Hunt, Stacey Z. Keller, AIA, 2440 Deming Way, Middleton, WI 53562, [stacey.keller@meadhunt.com](mailto:stacey.keller@meadhunt.com).

**BIDS TO BE SUBMITTED** by hand to 1600 EMIL ST., MADISON, WI 53713 or online at [www.bidexpress.com](http://www.bidexpress.com).

THE BID OPENING is at 1600 EMIL ST., MADISON, WI 53713.

#### STANDARD SPECIFICATIONS

The City of Madison's Standard Specifications for Public Works Construction - 2016 Edition, as supplemented and amended from time to time, forms a part of these contract documents as if attached hereto.

These standard specifications are available on the City of Madison Public Works website, [www.cityofmadison.com/Business/PW/specs.cfm](http://www.cityofmadison.com/Business/PW/specs.cfm).

The Contractor shall review these Specifications prior to preparation of proposals for the work to be done under this contract, with specific attention to Article 102, "BIDDING REQUIREMENTS AND CONDITIONS" and Article 103, "AWARD AND EXECUTION OF THE CONTRACT." For the convenience of the bidder, below are highlights of three subsections of the specifications.

#### SECTION 102.1: PRE-QUALIFICATION OF BIDDERS

In accordance with Wisconsin State Statutes 66.0901 (2) and (3), all bidders must submit to the Board of Public Works proof of responsibility on forms furnished by the City. The City requires that all bidders be qualified on a biennial basis.

Bidders must present satisfactory evidence that they have been regularly engaged in the type of work specified herein and they are fully prepared with necessary capital, materials, machinery and supervisory personnel to conduct the work to be contracted for to the satisfaction of the City. All bidders must be pre-qualified by the Board of Public Works for the type of construction on which they are bidding prior to the opening of the bid.

In accordance with Section 39.02(9)(a)l. of the General Ordinances, all bidders shall submit in writing to the Affirmative Action Division Manager of the City of Madison, a Certificate of Compliance or an Affirmative Action Plan at the same time or prior to the submission of the proof of responsibility forms.

The bidder shall be disqualified if the bidder fails to or refuses to, prior to opening of the bid, submit a Certificate of compliance, Affirmative Action Plan or Affirmative Action Data Update, as applicable, as defined by Section 39.02 of the General Ordinances (entitled Affirmative Action) and as required by Section 102.11 of the Standard Specifications.

#### SECTION 102.4 PROPOSAL

No bid will be accepted that does not contain an adequate or reasonable price for each and every item named in the Schedule of Unit Prices.

A lump sum bid for the work in accordance with the plans and specifications is required. The lump sum bid must be the same as the total amounts bid for the various items and it shall be inserted in the space provided.

All papers bound with or attached to the proposal form are considered a part thereof and must not be detached or altered when the proposal is submitted. The plans, specifications and other documents designated in the proposal form will be considered a part of the proposal whether attached or not.

A proposal submitted by an individual shall be signed by the bidder or by a duly authorized agent. A proposal submitted by a partnership shall be signed by a member/partner or by a duly authorized agent thereof. A proposal submitted by a corporation shall be signed by an authorized officer or duly authorized registered agent of such corporation, and the proposal shall show the name of the State under the laws of which such corporation was chartered. The required signatures shall in all cases appear in the space provided thereof on the proposal.

Each proposal shall be placed, together with the proposal guaranty, in a sealed envelope, so marked as to indicate name of project, the contract number or option to which it applies, and the name and address of the Contractor or submitted electronically through Bid Express ([www.bidexpress.com](http://www.bidexpress.com)). Proposals will be accepted at the location, the time and the date designated in the advertisement. Proposals received after the time and date designated will be returned to the bidder unopened.

The Bidder shall execute the Disclosure of Ownership form. REFER TO SECTION F.

#### SECTION 102.5: BID DEPOSIT (PROPOSAL GUARANTY)

All bids, sealed or electronic, must be accompanied with a Bid Bond equal to at least 5% of the bid or a Certificate of Annual/Biennial Bid Bond or certified check, payable to the City Treasurer. Bid deposit of the

successful bidders shall be returned within forty-eight (48) hours following execution of the contract and bond as required.

#### PREVAILING WAGE RATES

Prevailing Wage Rates may be required and are attached in Section J of the contract. See Special Provisions to determine applicability.

#### MINOR DISCREPENCIES

Bidder is responsible for submitting all forms necessary for the City to determine compliance with State and City bidding requirements. Notwithstanding any language to the contrary contained herein, the City may exercise its discretion to allow bidders to correct or supplement submissions after bid opening, if the minor discrepancy, bid irregularity or omission is insignificant and not one related to price, quality, quantity, time of completion or performance of the contract.

**Bidders for this Contract(s) must be Pre-Qualified for at least one of the following type(s) of construction denoted by an**

Building Demolition

- 101  Asbestos Removal
- 120  House Mover

- 110  Building Demolition

Street, Utility and Site Construction

- 201  Asphalt Paving
- 205  Blasting
- 210  Boring/Pipe Jacking
- 215  Concrete Paving
- 220  Con. Sidewalk/Curb & Gutter/Misc. Flat Work
- 221  Concrete Bases and Other Concrete Work
- 222  Concrete Removal
- 225  Dredging
- 230  Fencing
- 235  Fiber Optic Cable/Conduit Installation
- 240  Grading and Earthwork
- 241  Horizontal Saw Cutting of Sidewalk
- 242  Infrared Seamless Patching
- 245  Landscaping, Maintenance
- 250  Landscaping, Site and Street
- 251  Parking Ramp Maintenance
- 252  Pavement Marking
- 255  Pavement Sealcoating and Crack Sealing
- 260  Petroleum Above/Below Ground Storage Tank Removal/Installation
- 262  Playground Installer
- 265  Retaining Walls, Precast Modular Units

- 270  Retaining Walls, Reinforced Concrete
- 275  Sanitary, Storm Sewer and Water Main Construction
- 276  Sawcutting
- 280  Sewer Lateral Drain Cleaning/Internal TV Insp.
- 285  Sewer Lining
- 290  Sewer Pipe Bursting
- 295  Soil Borings
- 300  Soil Nailing
- 305  Storm & Sanitary Sewer Laterals & Water Svc.
- 310  Street Construction
- 315  Street Lighting
- 318  Tennis Court Resurfacing
- 320  Traffic Signals
- 325  Traffic Signing & Marking
- 332  Tree pruning/removal
- 333  Tree, pesticide treatment of
- 335  Trucking
- 340  Utility Transmission Lines including Natural Gas, Electrical & Communications
- 399  Other \_\_\_\_\_

Bridge Construction

- 501  Bridge Construction and/or Repair

Building Construction

- 401  Floor Covering (including carpet, ceramic tile installation, rubber, VCT)
- 402  Building Automation Systems
- 403  Concrete
- 404  Doors and Windows
- 405  Electrical - Power, Lighting & Communications
- 410  Elevator - Lifts
- 412  Fire Suppression
- 413  Furnishings - Furniture and Window Treatments
- 415  General Building Construction, Equal or Less than \$250,000
- 420  General Building Construction, \$250,000 to \$1,500,000
- 425  General Building Construction, Over \$1,500,000
- 428  Glass and/or Glazing
- 429  Hazardous Material Removal
- 430  Heating, Ventilating and Air Conditioning (HVAC)
- 433  Insulation - Thermal
- 435  Masonry/Tuck pointing

- 437  Metals
- 440  Painting and Wallcovering
- 445  Plumbing
- 450  Pump Repair
- 455  Pump Systems
- 460  Roofing and Moisture Protection
- 464  Tower Crane Operator
- 461  Solar Photovoltaic/Hot Water Systems
- 465  Soil/Groundwater Remediation
- 466  Warning Sirens
- 470  Water Supply Elevated Tanks
- 475  Water Supply Wells
- 480  Wood, Plastics & Composites - Structural & Architectural
- 499  Other \_\_\_\_\_

State of Wisconsin Certifications

- 1  Class 5 Blaster - Blasting Operations and Activities 2500 feet and closer to inhabited buildings for quarries, open pits and road cuts.
- 2  Class 6 Blaster - Blasting Operations and Activities 2500 feet and closer to inhabited buildings for trenches, site excavations, basements, underwater demolition, underground excavations, or structures 15 feet or less in height.
- 3  Class 7 Blaster - Blasting Operations and Activities for structures greater than 15 ' in height, bridges, towers, and any of the objects or purposes listed as "Class 5 Blaster or Class 6 Blaster".
- 4  Petroleum Above/Below Ground Storage Tank Removal and Installation (Attach copies of State Certifications.)
- 5  Hazardous Material Removal (Contractor to be certified for asbestos and lead abatement per the Wisconsin Department of Health Services, Asbestos and Lead Section (A&LS).) See the following link for application: [www.dhs.wisconsin.gov/Asbestos/Cert](http://www.dhs.wisconsin.gov/Asbestos/Cert). State of Wisconsin Performance of Asbestos Abatement Certificate must be attached.
- 6  Certification number as a Certified Arborist or Certified Tree Worker as administered by the International Society of Arboriculture
- 7  Pesticide application (Certification for Commercial Applicator For Hire with the certification in the category of turf and landscape (3.0) and possess a current license issued by the DATCP)
- 8  State of Wisconsin Master Plumbers License.

## SECTION B: PROPOSAL

Please refer to the  
Bid Express Website  
at <https://bidexpress.com>  
look up contract number  
and go to  
Section B: Proposal Page

You can access all City of Madison bid solicitations for FREE at [www.bidexpress.com](http://www.bidexpress.com)

Click on the “Register for Free” button and follow the instructions to register your company and yourself. You will be asked for a payment subscription preference, since you may wish to bid online someday. Simply choose the method to pay on a ‘per bid’ basis. This requires no payment until / unless you actually bid online. You can also choose the monthly subscription plan at this time. You will, however, be asked to provide payment information. Remember, you can change your preference at anytime. You will then be able to complete your free registration and have full access to the site. Your free access does not require completion of the ‘Digital ID’ process, so you will have instant access for viewing and downloading. To be prepared in case you ever do wish to bid online, you may wish to establish your digital ID also, since you cannot bid without a Digital ID.

If you have any problems with the free registration process, you can call the bidexpress help team, toll free at 1-888-352-2439 (option 1, option1).





## **SECTION C: SMALL BUSINESS ENTERPRISE**

### **Instructions to Bidders City of Madison SBE Program Information**

#### **2 Small Business Enterprise (SBE) Program Information**

##### **2.1 Policy and Goal**

The City of Madison reaffirms its policy of nondiscrimination in the conduct of City business by maintaining a procurement process which remains open to all who have the potential and ability to sell goods and services to the City. It is the policy of the City of Madison to allow Small Business Enterprises (SBE) maximum feasible opportunity to participate in City of Madison contracting. The bidder acknowledges that its bid has been submitted in accordance with the SBE program and is for the public's protection and welfare.

Please refer to the "ADVERTISEMENT FOR BIDS" for the goal for the utilization of SBEs on this project. SBEs may participate as subcontractors, vendors and/or suppliers, which provide a commercially useful function. The dollar value for SBE suppliers or 'materials only' vendors shall be discounted to 60% for purposes of meeting SBE goals.

A bidder which achieves or exceeds the SBE goal will be in compliance with the SBE requirements of this project. In the event that the bidder is unable to achieve the SBE goal, the bidder must demonstrate that a good faith effort to do so was made. Failure to either achieve the goal or demonstrate a good faith effort to do so will be grounds for the bidder being deemed a non-responsible contractor ineligible for award of this contract.

A bidder may count towards its attainment of the SBE goal only those expenditures to SBEs that perform a commercially useful function. For purposes of evaluating a bidder's responsiveness to the attainment of the SBE goal, the contract participation by an SBE is based on the percentage of the total base bid proposed by the Contractor. The total base bid price is inclusive of all addenda.

Work performed by an SBE firm in a particular transaction can be counted toward the goal only if it involves a commercially useful function. That is, in light of industry practices and other relevant considerations, does the SBE firm have a necessary and useful role in the transaction, of a kind for which there is a market outside the context of the SBE Program, or is the firm's role a superfluous step added in an attempt to obtain credit towards goals? If, in the judgment of the Affirmative Action Division, the SBE firm will not perform a commercially useful function in the transaction, no credit towards goals will be awarded.

The question of whether a firm is performing a commercially useful function is completely separate from the question of whether the firm is an eligible SBE. A firm is eligible if it meets the definitional criteria and ownership and control requirements, as set forth in the City of Madison's SBE Program.

If the City of Madison determines that the SBE firm is performing a commercially useful function, then the City of Madison must then decide what that function is. If the commercially useful function is that of an SBE vendor / supplier that regularly transacts business with the respective product, then the City of Madison will count 60% of the value of the product supplied toward SBE goals.

To be counted, the SBE vendor / supplier must be engaged in selling the product in question to the public. This is important in distinguishing an SBE vendor / supplier, which has a regular trade with a variety of customers, from a firm which performs supplier-like functions on an ad hoc basis or for only one or two contractors with whom it has a special relationship.

A supplier of bulk goods may qualify as an eligible SBE vendor / supplier if it either maintains an inventory or owns or operates distribution equipment. With respect to the distribution equipment; e.g., a fleet of trucks, the term "operates" is intended to cover a situation in which the supplier leases the equipment on a regular basis for its entire business. It is not intended to cover a situation in which the firm simply provides drivers for trucks owned or leased by another party; e.g., a prime contractor, or leases such a party's trucks on an ad hoc basis for a specific job.

If the commercially useful function being performed is not that of a qualified SBE vendor / supplier, but rather that of delivery of products, obtaining bonding or insurance, procurement of personnel, acting as a broker or manufacturer's representative in the procurement of supplies, facilities, or materials, etc., only the fees or commissions will apply towards the goal.

For example, a business that simply transfers title of a product from manufacturer to ultimate purchaser; e. g., a sales representative who re-invoices a steel product from the steel company to the Contractor, or a firm that puts a product into a container for delivery would not be considered a qualified SBE vendor / supplier. The Contractor would not receive credit based on a percentage of the cost of the product for working with such firms.

Concerning the use of services that help the Contractor obtain needed supplies, personnel, materials or equipment to perform a contract: only the fee received by the service provider will be counted toward the goal. For example, use of a SBE sales representative or distributor for a steel company, if performing a commercially useful function at all, would entitle the Contractor receiving the steel to count only the fee paid to the representative or distributor toward the goal. This provision would also govern fees for professional and other services obtained expressly and solely to perform work relating to a specific contract.

Concerning transportation or delivery services: if an SBE trucking company picks up a product from a manufacturer or a qualified vendor / supplier and delivers the product to the Contractor, the commercially useful function it is performing is not that of a supplier, but simply that of a transporter of goods. Unless the trucking company is itself the manufacturer or a qualified vendor / supplier in the product, credit cannot be given based on a percentage of the cost of the product. Rather, credit would be allowed for the cost of the transportation service.

The City is aware that the rule's language does not explicitly mention every kind of business that may contribute work on this project. In administering these programs, the City would, on a case-by-case basis, determine the appropriate counting formula to apply in a particular situation.

## **2.2 Contract Compliance**

Questions concerning the SBE Program shall be directed to the Contract Compliance Officer of the City of Madison Department of Civil Rights, Affirmative Action Division, 210 Martin Luther King, Jr. Blvd., Room 523, Madison, WI 53703; telephone (608) 266-4910.

## 2.3 Certification of SBE by City of Madison

The Affirmative Action Division maintains a directory of SBEs which are currently certified as such by the City of Madison. Contact the Contract Compliance Officer as indicated in Section 2.2 to receive a copy of the SBE Directory or you may access the SBE Directory online at [www.cityofmadison.com/dcr/aaTBDDir.cfm](http://www.cityofmadison.com/dcr/aaTBDDir.cfm).

All contractors, subcontractors, vendors and suppliers seeking SBE status must complete and submit the **Targeted Business Certification Application** to the City of Madison Affirmative Action Division by the time and date established for receipt of bids. A copy of the Targeted Business Certification Application is available by contacting the Contract Compliance Officer at the address and telephone indicated in Section 2.2 or you may access the Targeted Business Certification Application online at [www.cityofmadison.com/dcr/aaTBDDir.cfm](http://www.cityofmadison.com/dcr/aaTBDDir.cfm). Submittal of the Targeted Business Certification Application by the time specified does not guarantee that the applicant will be certified as a SBE eligible to be utilized towards meeting the SBE goal for this project.

## 2.4 Small Business Enterprise Compliance Report

### 2.4.1 Good Faith Efforts

Bidders shall take all necessary affirmative steps to assure that SBEs are utilized when possible and that the established SBE goal for this project is achieved. A contractor who self performs a portion of the work, and is pre-qualified to perform that category of work, may subcontract that portion of the work, but shall not be required to do so. When a bidder is unable to achieve the established SBE goal, the bidder must demonstrate that a good faith effort to do so was made. Such a good faith effort should include the following:

- 2.4.1.1 Attendance at the pre-bid meeting.
- 2.4.1.2 Using the City of Madison's directory of certified SBEs to identify SBEs from which to solicit bids.
- 2.4.1.3 Assuring that SBEs are solicited whenever they are potential sources.
- 2.4.1.4 Referring prospective SBEs to the City of Madison Affirmative Action Division for certification.
- 2.4.1.5 Dividing total project requirements into smaller tasks and/or quantities, where economically feasible, to permit maximum feasible SBE participation.
- 2.4.1.6 Establishing delivery schedules, where requirements permit, which will encourage participation by SBEs.
- 2.4.1.7 Providing SBEs with specific information regarding the work to be performed.
- 2.4.1.8 Contacting SBEs in advance of the deadline to allow such businesses sufficient time to prepare a bid.
- 2.4.1.9 Utilizing the bid of a qualified and competent SBE when the bid of such a business is deemed reasonable (i.e. 5% above the lowest bidder), although not necessarily low.
- 2.4.1.10 Contacting SBEs which submit a bid, to inquire about the details of the bid and confirm that the scope of the work was interpreted as intended.
- 2.4.1.11 Completion of Cover Page (page C-6), Summary Sheet (page C-7) and SBE Contact Reports (pages C-8 and C9) if applicable.

## 2.4.2 Reporting SBE Utilization and Good Faith Efforts

The Small Business Enterprise Compliance Report is to be submitted by the bidder with the bid: This report is due by the specified bid closing time and date. Bids submitted without a completed SBE Compliance Report as outlined below may be deemed non-responsible and the bidder ineligible for award of this contract. Notwithstanding any language to the contrary contained herein, the City may exercise its discretion to allow bidders to correct or supplement submissions after bid opening, if the minor discrepancy, bid irregularity or omission is insignificant and not one related to price, quality, quantity, time of completion, performance of the contract, or percentage of SBE utilization.

2.4.2.1 If the Bidder meets or exceeds the goal established for SBE utilization, the Small Business Enterprise Compliance Report shall consist of the following:

- 2.4.2.1.1 **Cover Page**, Page C-6; and
- 2.4.2.1.2 **Summary Sheet**, C-7.

2.4.2.2 If the bidder does not meet the goal established for SBE utilization, the Small Business Enterprise Compliance Report shall consist of the following:

- 2.4.2.2.1 **Cover Page**, Page C-6;
- 2.4.2.2.2 **Summary Sheet**, C-7; and
- 2.4.2.2.3 **SBE Contact Report**, C-8 and C-9. (A separate Contact Report must be completed for each applicable SBE which is not utilized.)

## 2.5 Appeal Procedure

A bidder which does not achieve the established goal and is found non-responsible for failure to demonstrate a good faith effort to achieve such goal and subsequently denied eligibility for award of contract may appeal that decision to the Small Business Enterprises Appeals Committee. All appeals shall be made in writing, and shall be delivered to and received by the City Engineer no later than 4:30 PM on the third business day following the bidder's receipt of the written notification of ineligibility by the Affirmative Action Division Manager. Postmark not acceptable. The notice of appeal shall state the basis for the appeal of the decision of the Affirmative Action Division Manager. The Appeal shall take place in accordance with Madison General Ordinance 33.54.

## 2.6 SBE Requirements After Award of the Contract

The successful bidder shall identify SBE subcontractors, suppliers and vendors on the subcontractor list in accordance with the specifications. The Contractor shall submit a detailed explanation of any variances between the listing of SBE subcontractors, vendors and/or suppliers on the subcontractor list and the Contractor's SBE Compliance Report for SBE participation.

No change in SBE subcontractors, vendors and/or suppliers from those SBEs indicated in the SBE Compliance Report will be allowed without prior approval from the Engineer and the Affirmative Action Division. The contractor shall submit in writing to the City of Madison Affirmative Action Division a request to change any SBE citing specific reasons which necessitate such a change. The Affirmative Action Division will use a general test of reasonableness in approving or rejecting the contractor's request for change. If the request is approved, the Contractor will make every effort to utilize another SBE if available.

The City will monitor the project to ensure that the actual percentage commitment to SBE firms is carried out.

## **2.7 SBE Definition and Eligibility Guidelines**

A Small Business Enterprise is a business concern awarded certification by the City of Madison. For the purposes of this program a Small Business Enterprise is defined as:

- A. An independent business operated under a single management. The business may not be a subsidiary of any other business and the stock or ownership may not be held by any individual or any business operating in the same or a similar field. In determining whether an entity qualifies as a SBE, the City shall consider all factors relevant to being an independent business including, but not limited to, the date the business was established, adequacy of its resources for the work in which it proposes to involve itself, the degree to which financial, equipment leasing and other relationships exist with other ineligible firms in the same or similar lines of work. SBE owner(s) shall enjoy the customary incidents of ownership and shall share in the risks and profits commensurate with their enjoyment interests, as demonstrated by an examination of the substance rather than form or arrangements that may be reflected in its ownership documents.
- B. A business that has averaged no more than \$4.0 million in annual gross receipts over the prior three year period and the principal owner(s) do not have a personal net worth in excess of \$1.32 million.

Firm and/or individuals that submit fraudulent documents/testimony may be barred from doing business with the City and/or forfeit existing contracts.

SBE certification is valid for one (1) year unless revoked.

**MADISON WATER UTILITY  
VEHICLE STORAGE BUILDING IMPROVMENTS  
115 S. PATERSON STREET  
CONTRACT NO. 7823**

**Small Business Enterprise Compliance Report**

**This information may be submitted electronically through  
Bid Express or submitted with bid in sealed envelope.**

**Cover Sheet**

Prime Bidder Information

Company: \_\_\_\_\_

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

Telephone Number: \_\_\_\_\_ Fax Number: \_\_\_\_\_

Contact Person/Title: \_\_\_\_\_

Prime Bidder Certification

I, \_\_\_\_\_, \_\_\_\_\_ of  
Name Title  
\_\_\_\_\_ certify that the information  
Company

contained in this SBE Compliance Report is true and correct to the best of my knowledge and belief.

\_\_\_\_\_  
Witness' Signature

\_\_\_\_\_  
Bidder's Signature

\_\_\_\_\_  
Date

**MADISON WATER UTILITY  
VEHICLE STORAGE BUILDING IMPROVMENTS  
115 S. PATERSON STREET  
CONTRACT NO. 7823**

**Small Business Enterprise Compliance Report**

**Summary Sheet**

SBE Subcontractors Who Are NOT Suppliers

Name(s) of SBEs Utilized	Type of Work	% of Total Bid Amount
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
<b>Subtotal SBE who are NOT suppliers:</b>		_____ %

SBE Subcontractors Who Are Suppliers

Name(s) of SBEs Utilized	Type of Work	% of Total Bid Amount
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
<b>Subtotal Contractors who are suppliers:</b>	_____ % x 0.6 = _____	% (discounted to 60%)
<b>Total Percentage of SBE Utilization:</b>	_____ %.	

**MADISON WATER UTILITY  
VEHICLE STORAGE BUILDING IMPROVMENTS  
115 S. PATERSON STREET  
CONTRACT NO. 7823**

**Small Business Enterprise Compliance Report**

**SBE Contact Report**

Submit separate copy of this form for each SBE which you are not able to utilize towards meeting the SBE goal for this project. Attach separate sheets if necessary.

SBE Information

Company: \_\_\_\_\_

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

Telephone Number: \_\_\_\_\_

Contact Person/Title: \_\_\_\_\_

1. Outline below all efforts to solicit a bid from the above SBE. Include date, means of contact, who from your company made this contact and the result.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. Describe the information provided to the aforementioned SBE regarding the scope of work for which he/she was to provide a bid.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Is this the same scope of work on which the subcontractor you intend to utilize based his/her bid?

Yes     No

3. Did this SBE submit a bid?     Yes     No

4. Is the General Contractor pre-qualified to self-perform this category of work?

Yes     No



5. If you responded "Yes" to Question 3, please check the items below which apply and provide the requested detail. If you responded "No" to Question 3, please skip ahead to item 6 below.

The SBE listed above is unavailable for work on this project for the following reasons. Provide specific detail for this conclusion.

---

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The SBE listed above is unqualified for work on this project. Provide specific details for this conclusion.

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The SBE listed above provided a price that was unreasonable (i.e. more than 5% above the lowest bidder). Provide specific detail for this conclusion including the SBE's price and the price of the subcontractor you intend to utilize.

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A contract with the SBE listed above may constitute a breach of the bidder's collective bargaining agreements. Provide specific detail for this conclusion including, but not limited to, correspondence from the SBE indicating it will not sign a project labor agreement and/or correspondence from the applicable trade union indicating a project labor agreement will not be allowed at the time of project bidding.

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Other; please specify reason(s) other than listed above which made it impossible for you to utilize this SBE on this project.

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6. Describe any other good faith efforts:

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## SECTION D: SPECIAL PROVISIONS

### MADISON WATER UTILITY VEHICLE STORAGE BUILDING IMPROVMENTS 115 S. PATERSON STREET CONTRACT NO. 7823

It is the intent of these Special Provisions to set forth the final contractual intent as to the matter involved and shall prevail over the Standard Specifications and plans whenever in conflict therewith. In order that comparisons between the Special Provisions can be readily made, the numbering system for the Special Provisions is equivalent to that of the Specifications.

Whenever in these Specifications the term "Standard Specifications" appears, it shall be taken to refer to the City of Madison Standard Specifications for Public Works Construction and Supplements thereto.

#### **SECTION 102.9: BIDDER'S UNDERSTANDING**

Tax Exempt Status: Effective with all contracts executed after January 1, 2016, the sales price from the sale, storage, use or other consumption of tangible personal property that is used in conjunction with a public works improvement for a tax exempt entity (including the City of Madison), is exempt from State sales tax. Said property must become a component of the project owned by the tax exempt entity and includes: any building; shelter; parking lot; parking garage; athletic field; storm sewer; water supply system; or sewerage and waste water treatment facility, but does not include a highway, street or road.

The contractor shall ensure that the exemption for sales and use tax available under Wis. Stat. Sec. 77.54(9m) applies where available. The contractor shall provide all necessary documentation as required by the State of Wisconsin and the City of Madison to comply with this exemption.

#### **SECTION 102.10: PREVAILING WAGE**

For this project, payment of prevailing wages (white sheet) shall be required unless the box indicating prevailing wages are not required is checked below.

Prevailing wages shall not be required when this box is checked.

If prevailing wages (white sheets) are required, the wages and benefits paid on the contract shall not be less than those specified in the Prevailing Wage Determination included with these contract documents for the following types of work:

- Building or Heavy Construction
- Sewer, Water, or Tunnel Construction
- Local Street or Miscellaneous Paving Construction
- Residential or Agricultural Construction

When multiple boxes are checked, worker's wages may vary according to the type and area of work performed. It is the responsibility of the Contractor to determine and apply the appropriate wage rate for the specific work assigned.

#### **SECTION 102.12: BEST VALUE CONTRACTING**

This Contract shall be considered a Best Value Contract if the Contractor's bid is equal to or greater than \$56,500 for a single trade contract; or equal to or greater than \$277,000 for a multi-trade contract pursuant to MGO 33.07(7).

**SECTION 102.14**

**BAN THE BOX – ARREST AND CRIMINAL BACKGROUND CHECKS**  
**(SEC. 39.08, MGO)**

This provision applies to all prime contractors on contracts entered into on or after January 1, 2016, and all subcontractors who are required to meet prequalification requirements under MGO 33.07(7)(l), MGO as of the first time they seek or renew pre-qualification status on or after January 1, 2016. The City will monitor compliance of subcontractors through the pre-qualification process.

- A. Definitions.** For purposes of this section, “Arrest and Conviction Record” includes, but is not limited to, information indicating that a person has been questioned, apprehended, taken into custody or detention, held for investigation, arrested, charged with, indicted or tried for any felony, misdemeanor or other offense pursuant to any law enforcement or military authority.

“Conviction record” includes, but is not limited to, information indicating that a person has been convicted of a felony, misdemeanor or other offense, placed on probation, fined, imprisoned or paroled pursuant to any law enforcement or military authority.

“Background Check” means the process of checking an applicant’s arrest and conviction record, through any means.

- B. Requirements.** For the duration of this Contract, the Contractor shall:

1. Remove from all job application forms any questions, check boxes, or other inquiries regarding an applicant’s arrest and conviction record, as defined herein.
2. Refrain from asking an applicant in any manner about their arrest or conviction record until after conditional offer of employment is made to the applicant in question.
3. Refrain from conducting a formal or informal background check or making any other inquiry using any privately or publicly available means of obtaining the arrest or conviction record of an applicant until after a conditional offer of employment is made to the applicant in question.
4. Make information about this ordinance available to applicants and existing employees, and post notices in prominent locations at the workplace with information about the ordinance and complaint procedure using language provided by the City.
5. Comply with all other provisions of Sec. 39.08, MGO.

- C. Exemptions:** This section shall not apply when:

1. Hiring for a position where certain convictions or violations are a bar to employment in that position under applicable law, or
2. Hiring a position for which information about criminal or arrest record, or a background check is required by law to be performed at a time or in a manner that would otherwise be prohibited by this ordinance, including a licensed trade or profession where the licensing authority explicitly authorizes or requires the inquiry in question.

To be exempt, Contractor has the burden of demonstrating that there is an applicable law or regulation that requires the hiring practice in question, if so, the contractor is exempt from all of the requirements of this ordinance for the position(s) in question.

**Engineering Special Provisions**

**Madison Water Utility**  
**Vehicle Storage Building Improvements**

**115 S. Paterson Street**

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Mead & Hunt, Inc.  
3235300-131021.02

**Contract No. 7823**

*Prepared for:*

**Madison Water Utility**  
**Madison, Wisconsin**

*Prepared by:*



**October 21, 2016**

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NOT APPLICABLE

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NOT APPLICABLE

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NOT APPLICABLE

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NOT APPLICABLE



## **VOLUME 2 OF 2**

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NOT APPLICABLE

**END OF SECTION 000110**

## **DOCUMENT 000115 - LIST OF DRAWING SHEETS**

### **PART 1 - GENERAL**

#### **1.1 LIST OF DRAWINGS**

- A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled City of Madison Water Utility Vehicle Storage Renovation and Material Storage Building, dated October 21, 2016 as modified by subsequent Addenda and Contract modifications.
- B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:
1. G-001 COVER SHEET
  2. G-002 CONSTRUCTION PHASING PLAN
  3. G-101 PHASE 1 & 2 - PLANS
  4. C-021 EXISTING SITE PLAN
  5. C-041 SITE REMOVALS PLAN
  6. C-101 SITE IMPROVEMENTS PLAN
  7. C-121 EROSION CONTROL PLAN
  8. C-122 GRADING PLAN
  9. C-123 FENCE WALL ELEVATIONS
  10. C-141 SITE UTILITY PLAN
  11. C-501 SITE IMPROVEMENT DETAILS
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  18. S-002 GENERAL NOTES
  19. S-101 VEHICLE STORAGE BUILDING FLOOR PLAN
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  24. S-401 VEHICLE STORAGE ENLARGED PLANS
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  35. A-102 VEHICLE STORAGE ROOF PLAN AND DETAILS
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37. A-211 MATERIAL STORAGE EXTERIOR ELEVATIONS
38. A-301 BUILDING SECTIONS / WALL SECTIONS / DETAILS
39. A-311 MATERIAL STORAGE BUILDING & WALL SECTIONS
40. A-401 VEHICLE STORAGE ENLARGED PLAN
41. A-501 DETAILS
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43. A-601 ARCHITECTURAL SCHEDULES
44. F-001 FIRE PROTECTION NOTES, SYMBOLS & ABBREVIATIONS
45. F-101 FLOOR PLAN - FIRE PROTECTION
46. P-001 PLUMBING NOTES, SYMBOLS & ABBREVIATIONS
47. PD-100 UNDERGROUND DRAIN AND VENT PLUMBING DEMOLITION PLAN
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49. PD-131 FIRST FLOOR PLAN - SUPPLY DEMOLITION
50. P-100 UNDERGROUND DRAIN & VENT PLUMBING PLAN
51. P-131 SUPPLY PLUMBING PLAN - FIRST FLOOR PLAN
52. P-501 PLUMBING DETAILS
53. P-502 PLUMBING DETAILS
54. P-601 PLUMBING SCHEDULES
55. M-001 MECHANICAL NOTES & SYMBOLS
56. MD101 HVAC DEMOLITION FLOOR PLAN
57. MD131 MECHANICAL DEMOLITION FLOOR PLAN
58. M-101 HVAC NEW FLOOR PLAN
59. M-131 MECHANICAL NEW FLOOR PLAN
60. M-301 HVAC SECTIONS
61. M-401 HVAC ENLARGED PLANS
62. M-501 MECHANICAL HVAC DETAILS
63. M-502 HVAC DETAILS
64. M-601 MECHANICAL HVAC SCHEDULES
65. M-602 MECHANICAL HVAC SCHEDULES
66. M-603 MECHANICAL HVAC SCHEDULES
67. E-001 NOTES, SYMBOLS & ABBREVIATIONS
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70. E-102 MATERIAL STORAGE BUILDING FLOOR PLAN
71. E-401 ENLARGED PLANS
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73. E-601 SCHEDULES
74. E-602 SCHEDULES
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79. T-101 VEHICLE STORAGE BUILDING FLOOR PLAN
80. T-401 ENLARGED PLANS
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82. T-601 SCHEDULES
83. T-701 ONE-LINE DIAGRAMS

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF DOCUMENT 000115**

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## **DOCUMENT 003126 - EXISTING HAZARDOUS MATERIAL INFORMATION**

### **PART 1 - GENERAL**

#### **1.1 EXISTING HAZARDOUS MATERIAL INFORMATION**

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. An existing Contaminated Media Memorandum, and materials management plan for each site of the project, prepared by SCS, dated June 25, 2015, is available for viewing as appended to this document..
- C. Related Requirements:
  - 1. Document 003132 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.

### **PART 2 - PRODUCTS (Not Used)**

### **PART 3 - EXECUTION (Not Used)**

**END OF DOCUMENT 003126**

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## SCS ENGINEERS

October 7, 2016  
File No. 25215045.00

### MEMORANDUM

TO: Anne Anderson, Mead & Hunt  
FROM: Tony Kollasch  
SUBJECT: Waste Disposal Update

At your request, we checked on the status of the two waste disposal profiles established with Waste Management for disposal of contaminated soil to be generated during construction work for the Madison Water Utility Vehicle Maintenance facility at 115 S. Paterson Street. The profile information is provided on the attached Waste Manifests.

Per our September 29, 2016 communication with Brad Vanderkin of Waste Management, we understand Waste Management should be able to extend the profiles into 2017 with a certification statement to be provided by the City verifying that nothing has changed on the site related to potential environmental concerns and that the supplied analytical is still representative of the material to be disposed. The two profiles are for the shallow fill material and the deeper native material, which are both impacted by petroleum and other volatile contaminants in some locations.

Mr. Vanderkin indicated that the tipping costs for disposal of both profiles will be \$19/ton. This is \$1 more than the costs that were originally approved by Waste Management in 2015.

Attachments: Fill Manifest #BIO123620WI  
Native Soil Manifest #BIO123621WI

TJK/jsn/RL

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# NON-HAZARDOUS MANIFEST

<b>NON-HAZARDOUS MANIFEST</b>		1. Generator's US EPA ID No.	Manifest Doc No.	2. Page 1 of	
3. Generator's Mailing Address: CITY OF MADISON WATER UTILITY 115 S. PATTERSON STREET MADISON, WI 53718		Generator's Site Address (if different from mailing): CITY OF MADISON WATER UTILITY 115 S. PATTERSON STREET MADISON, WI 53718 DANE COUNTY		A. Manifest Number	<b>T 419480</b>
4. Generator's Phone 608-288-4655				B. State Generator's ID	
5. Transporter 1 Company Name		6. US EPA ID Number		C. State Transporter's ID	
				D. Transporter's Phone	
7. Transporter 2 Company Name		8. US EPA ID Number		E. State Transporter's ID	
				F. Transporter's Phone	
9. Designated Facility Name and Site Address Madison Prairie		10. US EPA ID Number		G. State Facility ID	
				H. State Facility Phone	
GENERATOR'S CERTIFICATE	11. Description of Waste Materials		11. Generator's <input type="checkbox"/> Total Quantity <input type="checkbox"/> U.S. Metric		I. Misc. Comments
	a. Petroleum Contaminated Soil				
	WM Profile # <b>BIO123620WI</b>				
	b.				
	WM Profile #				
	c.				
WM Profile #					
d.					
WM Profile #					
J. Additional Descriptions for Materials Listed Above		K. Disposal Location			
		Cell		LAW#	
		Grid			
13. Special Handling Instructions and Additional Information					
Tony Koraszki / 608-234-2890					
Purchase Order #		EMERGENCY CONTACT / PHONE NO.:			
15. GENERATOR'S CERTIFICATE:					
I hereby certify that the above-described materials are not hazardous wastes as defined by CFR Part 261 or any applicable state law, have been fully and accurately described, classified and packaged and are in proper condition for transportation according to applicable regulations.					
Printed Name		Signature "On behalf of"		Month	Day
					Year
17. Transporter 1 Acknowledgment of Receipt of Materials					
Printed Name		Signature		Month	Day
					Year
18. Transporter 2 Acknowledgment of Receipt of Materials					
Printed Name		Signature		Month	Day
					Year
19. Certificate of Final Treatment/Disposal					
I certify, on behalf of the above listed treatment facility, that to the best of my knowledge, the above described waste was managed in compliance with all applicable laws, regulations, permits and licenses on the dates listed above.					
20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest.					
Printed Name		Signature		Month	Day
					Year

White- TREATMENT, STORAGE, DISPOSAL FACILITY COPY      Blue- GENERATOR #2 COPY      Yellow- GENERATOR #1 COPY  
 Pink- FACILITY USE ONLY      Green- TRANSPORTER #1 COPY



# NON-HAZARDOUS MANIFEST

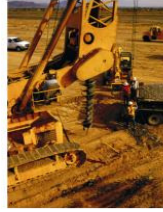
<b>NON-HAZARDOUS MANIFEST</b>		1. Generator's US EPA ID No.	Manifest Doc No	2. Page 1 of		
3. Generator's Mailing Address: CITY OF MADISON WATER UTILITY 115 S. PATTERSON STREET MADISON, WI 53718		Generator's Site Address, if different than mailing: 115 S. PATTERSON STREET MADISON, WI 53718 DANE COUNTY		A. Manifest Number <b>WMNA T 419563</b>		
4. Generator's Phone 608-266-4658				B. State Generator's ID		
5. Transporter 1 Company Name		6. US EPA ID Number		C. State Transporter's ID		
7. Transporter 2 Company Name		8. US EPA ID Number		D. Transporter's Phone		
9. Designated Facility Name and Site Address Madison Prairie		10. US EPA ID Number		E. State Transporter's ID		
				F. Transporter's Phone		
				G. State Facility ID		
				H. State Facility Phone		
G F N E R A T O R	11. Description of Waste Materials		12. Containers No. Type	13. Total Quantity	14. Unit Weight	15. Misc. Comments
	a. Petroleum Contaminated Soil					
	WM Profile # b. BIO123621WI					
	WM Profile # c.					
	WM Profile # d.					
	WM Profile # e.					
J. Additional Descriptions for Materials Listed Above			K. Disposal Location			
			Cell 55d		Level	
15. Special Handling Instructions and Additional Information						
Tony Kolasch/ 608-234-2830						
Purchase Order #		EMERGENCY CONTACT / PHONE NO.:				
16. GENERATOR'S CERTIFICATE						
I hereby certify that the above-described materials are not hazardous wastes as defined by CFR Part 261 or any applicable state law, have been fully and accurately described, classified and packaged and are in proper condition for transportation according to applicable regulations.						
Printed Name		Signature "On behalf of"		Month	Day Year	
17. Transporter 1 Acknowledgement of Receipt of Materials						
Printed Name		Signature		Month	Day Year	
18. Transporter 2 Acknowledgement of Receipt of Materials						
Printed Name		Signature		Month	Day Year	
19. Certificate of Final Treatment/Disposal						
I certify, on behalf of the above listed treatment facility, that to the best of my knowledge, the above-described waste was managed in compliance with all applicable laws, regulations, permits and licenses on the dates listed above.						
20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest.						
Printed Name		Signature		Month	Day Year	

White- TREATMENT, STORAGE, DISPOSAL FACILITY COPY  
Pink- FACILITY USE ONLY

Blue- GENERATOR #2 COPY  
Gold- TRANSPORTER #1 COPY

Yellow- GENERATOR #1 COPY

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## Materials Management Plan

### **Madison Water Utility**

### **Vehicle and Material Storage Facility Redevelopment**

**115 South Paterson Street  
Madison, Wisconsin**

Prepared for:

### **City of Madison Water Utility**

110 South Paterson Street  
Madison, Wisconsin 53704

Prepared by:

### **SCS ENGINEERS**

2830 Dairy Drive  
Madison, Wisconsin 53718-6751  
(608) 224-2830

June 2015  
File No. 25215045.00

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## 1.0 INTRODUCTION

This Material Management Plan (Plan) provides guidance for the management of contaminated soil and groundwater during the redevelopment of the City of Madison Water Utility Vehicle and Material Storage Facility. The facility is located at 115 South Paterson Street in Madison, Wisconsin (**Figure 1** and **Figure 2**). Proposed construction activities include building demolition, pavement and utility removal, building and parking lot construction, and construction of an underground storm water treatment system.

## 2.0 BACKGROUND INFORMATION

### 2.1 SITE GEOLOGY

Geotechnical borings were advanced at the site in November 2005. Borings logs from the geotechnical investigation document brown, orange, gray, and black fill material containing cinders, ash, glass, silt, sand, and gravel extending to a depth of approximately 6 feet below ground surface (bgs). The boring logs show underlying gray colored clay extending beyond 20 feet bgs and underlain by dense brown sand to at least 40 feet bgs.

Soil and groundwater contamination were identified at the site during environmental sampling activities conducted in March 2015. This work was performed to evaluate the need for material management during future construction activities. The March 2015 sampling included installation of soil borings at locations shown on **Figure 1**. Groundwater was encountered at approximately 8 feet bgs during the March 2015 investigation; however, this depth is based on measurements made soon after drilling and may not reflect the actual water table elevation. Groundwater at nearby environmental cleanup sites has been documented at depths as shallow as approximately 3 feet bgs.

### 2.2 SOIL ANALYTICAL RESULTS

Soil analytical results are summarized in **Tables 1** through **3**. Laboratory analytical reports are included in **Appendix 1**. Soil analytical results confirm the presence of volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), and metals at concentrations greater than NR 720 residual contaminant levels (RCLs). Arsenic and lead are the only metals detected at concentrations greater than industrial direct contact RCLs. Several PAH concentrations exceed industrial direct contact RCLs. However, soil samples with metals that exceed both WDNR's Background Threshold Values (BTVs) and NR 720 RCLs, and samples with PAHs in excess of NR 720 RCLs appear to be limited to those collected within the zone of industrial fill.

Other than naphthalene, benzene is the only VOC detected in excess of a groundwater pathway RCL for samples collected above the assumed water table elevation of 8 feet bgs. Benzene concentrations for soil samples GP6 (2.5-5 feet bgs), GP7 (0-2.5 feet bgs), and GP9 (0-2.5 feet bgs) exceed the groundwater pathway RCL (5.1 micrograms per kilogram [ $\mu\text{g}/\text{kg}$ ]), but not the non-industrial direct contact RCL (1,490  $\mu\text{g}/\text{kg}$ ). The GP7 and GP9 soil benzene results are



flagged by the laboratory as estimated concentrations between the laboratory limit of detection (LOD) and limit of quantitation (LOQ), and should therefore be considered approximate.

The only chlorinated volatile organic compound (CVOC) detected in soil is tetrachloroethylene (PCE) for soil sample GP10 (7.5-10 feet bgs). This sample was collected from a depth below the assumed water table elevation. The GP10 PCE concentration (661  $\mu\text{g}/\text{kg}$ ) exceeds the groundwater pathway RCL (4.5  $\mu\text{g}/\text{kg}$ ), but is less than the non-industrial direct contact RCL (30,700  $\mu\text{g}/\text{kg}$ ). The result was flagged by the laboratory as an estimated concentration between the laboratory LOD and LOQ, and should therefore be considered approximate.

## 2.3 GROUNDWATER ANALYTICAL RESULTS

Groundwater samples were collected from borings GP2, GP3, GP5, GP8, and GP10 and analyzed for VOCs. Analytical results are summarized in **Table 4**. Laboratory analytical reports are included in **Appendix 1**. Only petroleum VOCs were detected in the samples. CVOCs were not detected in groundwater, and no VOCs were detected in the sample from boring GP5. Only benzene, ethylbenzene, trimethylbenzenes, and naphthalene concentrations for the GP10 groundwater sample exceed NR 140 enforcement standards (ESs).

## 3.0 PROPOSED DEVELOPMENT

Planned site redevelopment activities include demolishing the paint shop building and removing its foundation, constructing a new storage building, and installing a below-grade storm water system. Soils will be excavated in areas of known soil and groundwater contamination. Existing and proposed site features are shown on **Figure 2**.

## 4.0 MATERIALS MANAGEMENT

The site development plan calls for soil excavation related to demolition, building foundation and utility work, and construction of a subsurface storm water management structure, to a maximum cut depth of approximately 14 feet bgs. Related materials management activities are summarized below.

### 4.1 SOIL MANAGEMENT

In general, soils to be excavated as part of the redevelopment will be taken off site for landfill disposal. Contaminated soil will be transported to an approved landfill by a licensed hauler. Native soils, which show no signs of contamination, may be reused on site or reused on another site.

SCS Engineers (SCS) has identified Waste Management's Madison Prairie Landfill as the most likely landfill to be used in this project. Waste Management has reviewed the site soil data and requested lead Toxicity Characteristic Leaching Procedure (TCLP) testing of the fill material before they will accept this material for disposal.

The TCLP analysis will determine if the lead concentrations in the fill material are hazardous. If the results show the lead as hazardous, pre-treatment or disposal at a hazardous waste facility (other than Waste Management Mad Prairie) will be necessary. SCS collected the TCLP laboratory samples on June 24, 2015, and anticipates results by July 1, 2015. For the purposes of this MMP, it is assumed the industrial fill will pass the TCLP tests and will not be considered a hazardous waste.

Three classes of soil have been identified for management during construction at the site. Definitions of the material classes and a brief outline of the management approach for each are provided in the table below. More detailed information on the identification, management, and reuse of these materials is presented in the following sections.

	<b>Description</b>	<b>Soil Management Approach</b>
Class I Soil - "General Fill"	Unsaturated or saturated soil and non-native fill materials, consisting of gravel, silt, sand, and clay with cinders, ash, glass or other debris. May have petroleum odors and extend to depth of approximately 6 feet.	Class I soil to be excavated will be dewatered as necessary and removed from the site for disposal at an approved landfill. If temporarily stockpiled on site, soil should be placed on plastic tarps and covered.
Class II Soil - "VOC- Contaminated Native Soil"	Unsaturated or saturated native soil with evidence of VOC contamination based on field observations and/or previous analytical data.	Class II soil will be dewatered as needed, excavated and disposed at an approved landfill. If temporarily stockpiled on site, soil should be placed on plastic tarps and covered.
Class III Soil - "Native Soil"	Generally saturated soil containing no evidence of VOC contamination based on field observations and/or previous analytical data.	Class III soil will be reused on site if structurally suitable or taken off site for reuse.

### **Class I Soil Management**

Class I soils are non-native gravel, silt, sand, and clay with varying amounts of cinders, ash, and glass from an unknown source. Class I soils may have petroleum odors. Excavated Class I soils will be transported by a licensed hauler to an approved landfill for disposal. If temporarily stockpiled on site, soil should be placed on plastic tarps and covered.

Class I soils will be identified using existing analytical data, by field screening with a photoionization detector (PID) for analysis of VOCs, or by field observations such as color or odor. Unexcavated Class I soils will remain in place on the site after redevelopment. If necessary, remaining Class I soils will be capped, and a cap maintenance plan will be provided to the Wisconsin Department of Natural Resources (WDNR).

## **Class II Soil Management**

Class II soils are described as native clay soil that has been impacted by historical VOC releases. If excavated, Class II soils will be transported to an approved landfill for disposal. Class II soils will be identified using existing analytical data, field screening with a PID, or field observations such as color or odor. If temporarily stockpiled on site, soil should be placed on plastic tarps and covered.

Unexcavated Class II soils will remain in place on the site. If necessary, remaining Class II soils will be capped, and a cap maintenance plan will be provided to the WDNR.

## **Class III Soil Management**

Based on construction plans, it is unlikely that Class III soils will be excavated. Class III soils are native soils below or outside the limits of Class I and II soils and do not show signs of fill or VOC contamination. If structurally suitable, Class III soil can be reused on or off site.

Class III soils will be identified in the field using existing analytical information and field screening techniques such as a PID, odor, or color.

## **4.2 GROUNDWATER MANAGEMENT**

The excavation contractor will likely need to dewater to below the proposed excavation depth of 14 feet during some construction activities. Groundwater at the site indicated the presence of petroleum VOCs. Based on soil results, water may also be impacted by PAHs and metals. The excavation contractor will need to obtain approval to discharge water to either the storm sewer or sanitary sewer, whichever is appropriate. Additional testing may be required for the permitting.

## **4.3 VAPOR MANAGEMENT**

Vapor issues during construction will be managed by limiting the amount of contaminated soil exposed at one time and using temporary covers (plastic sheeting, tarps, etc.) as necessary to limit the amount of volatilization.

VOCs were detected in soil and groundwater; however, site redevelopment does not include construction of occupied space so vapor barriers or ventilation systems are not planned. Based on investigation findings it does not appear that identified VOCs present a vapor intrusion risk for the existing building.

## **5.0 UNUSUAL CONDITIONS**

The contractor will inform its earthwork subcontractors of the possibility of other unknown sources of contamination on the site. If any tanks, unusual odors, staining, fluids, or piping are found, work will stop in that area, the contractor will notify the owner of the conditions, and SCS or another designated environmental consultant will inspect the site to assess the situation.

If contaminated material is encountered that is significantly different than what has been previously identified, it will be evaluated by an environmental professional.

## 6.0 ROLES AND RESPONSIBILITIES DURING CONSTRUCTION

The following roles and responsibilities have been identified for the project:

### **Owner or Construction Manager/Owner's Agent**

- Performs overall project scheduling and retains civil engineer/architect, environmental consultants, and contractor.

### **Civil Engineer/Architect**

- Develops plans and specifications for project earthwork incorporating the requirements of the soil and groundwater management plan.

### **Environmental Consultant**

- Provides on-site observation and documentation during management of Class I, Class II, and Class III materials.
- Provides field screening to classify soils.
- Manages special or unanticipated environmental conditions encountered during construction.

### **Contractor**

- Performs earthwork in accordance with the project construction plans and specifications.
- Obtain soil profile approval for landfill disposal if a landfill other than Waste Management's Madison Prairie Landfill is required. We assume above-noted June 24, 2015, soil samples pass lead TCLP testing and all waste is considered non-hazardous.
- Complete dewatering activities in accordance with erosion control and general discharge permit specifications, including required sampling and reporting.

- Obtain all appropriate discharge permits for any discharge to the storm sewer or sanitary sewer.

## 7.0 REPORTING

Upon completion of all activities, SCS will provide a written report and documentation of the activities and disposal methods to the WDNR. The documentation will include a description and documentation of a cap and cap maintenance plan, as necessary.

## **TABLES**

- 1 Soil Analytical Results Summary – VOCs
- 2 Soil Analytical Results Summary – PAHs
- 3 Soil Analytical Results Summary – Metals
- 4 Groundwater Analytical Results Summary – VOCs

**Table 1. Soil Analytical Results Summary - VOCs**  
**Madison Water Utility Vehicle and Material Storage, 115 S. Paterson St., Madison / SCS Engineers Project #25215045.00**  
(Results are in µg/kg, except where noted otherwise)

Sample	Date	Depth (feet)	PID (ppm)	Lab Notes	Benzene	Ethylbenzene	Toluene	Xylenes	1,2,4-TMB	1,3,5-TMB	1,2,4- & 1,3,5-TMB Combined	MTBE	Other VOCs
GP-1 S2	3/11/2015	2.5-5	0.0	(1)	<25.0	<25.0	<25.0	<75.0	<25.0	<25.0	<50.0	<25.0	Naphthalene 56.7 J
GP-2 S2	3/11/2015	2.5-5	0.4	(1)	<25.0	<0.25	<0.25	<75.0	<25.0	<25.0	<50.0	<25.0	ND
GP-2 S4*	3/11/2015	7.5-10	0.4	(1)	<25.0	<25.0	<25.0	<75.0	<25.0	<25.0	<50.0	<25.0	ND
GP-3 S1	3/11/2015	0-2.5	0.6	(1)	<25	<25.0	<25.0	<75.0	<25.0	<25.0	<50.0	<25.0	Naphthalene 54.1 J
GP-3 S4*	3/11/2015	7.5-10	25.8	(1)	<25.0	<25.0	<25.0	<75.0	<25.0	<25.0	<50.0	<25.0	ND
GP-3 S5*	3/11/2015	10-12	572.8	(1)	<25.0	<25.0	<25.0	<75.0	<25.0	<25.0	<50.0	<25.0	sec-Butylbenzene 58.2 J
GP-4 S1	3/11/2015	0-2.5	0.3	(1)	<25.0	<25.0	66.5	122 J	43.3 J	<25.0	43.3	<25.0	Naphthalene 100 J
GP-4 S4*	3/11/2015	7.5-10	919.7	(1)	<25.0	331	<25.0	97.1 J	145	<25.0	145	<25.0	n-Butylbenzene 631 sec-Butylbenzene 305 Isopropylbenzene 495 p-Isopropyltoluene 564 Naphthalene 992 n-Propylbenzene 945
GP-5 S1	3/11/2015	0-2.5	0.4	(1)	<25.0	<25.0	<25.0	<75.0	<25.0	<25.0	<50.0	<25.0	ND
GP-5 S3	3/11/2015	5-7.5	0.4	(1)	<25.0	<25.0	<25.0	<75.0	<25.0	<25.0	<50.0	<25.0	ND
GP-5 S5*	3/11/2015	10-12	0.0	(1)	<25.0	<25.0	<25.0	<75.0	<25.0	<25.0	<50.0	<25.0	ND
GP-6 S2	3/11/2015	2.5-5	1.9	(2)	178	81.8 J	324	404	190	78.4 J	268.4	<25.0	Naphthalene 2,090 Styrene 72.7 J
GP-7 S1	3/11/2015	0-2.5	3.4	(1)	65.5 J	126	354	776	397	165	562	<25.0	n-Butylbenzene 71.4 J Isopropylbenzene 32.2 J Naphthalene 259 J n-Propylbenzene 71.6 J
GP-8 S2	3/11/2015	2.5-5	0.9	(1)	<25.0	<25.0	169	248	77.2	36.4 J	113.6	<25.0	Naphthalene 106 J
GP-8 S3	3/11/2015	5-7.5	46.8	(1)	<25.0	<25.0	<25.0	<75.0	<25.0	<25.0	<50.0	<25.0	ND
GP-9 S1	3/11/2015	0-2.5	1.0	(2)	28.5 J	62.1 J	155	392	156	58.1 J	214.1	<25.0	n-Butylbenzene 37.0 J Naphthalene 180 J
GP-10 S2	3/11/2015	2.5-5	46.2	(2)	<25.0	40.8 J	160	297	106	66.4 J	172.4	<25.0	Naphthalene 341

**Table 1. Soil Analytical Results Summary - VOCs**  
**Madison Water Utility Vehicle and Material Storage, 115 S. Paterson St., Madison / SCS Engineers Project #25215045.00**  
 (Results are in µg/kg, except where noted otherwise)

Sample	Date	Depth (feet)	PID (ppm)	Lab Notes	Benzene	Ethylbenzene	Toluene	Xylenes	1,2,4-TMB	1,3,5-TMB	1,2,4- & 1,3,5-TMB Combined	MTBE	Other VOCs
GP-10 S4*	3/11/2015	7.5-10	1,400	(2)	<500	<b><u>9,820</u></b>	<500	<b><u>11,500</u></b>	43,100	<500	<b><u>43,100</u></b>	<500	n-Butylbenzene 3,800 sec-Butylbenzene 1,700 Isopropylbenzene 3,860 p-Isopropyltoluene 3,760 Naphthalene <b><u>18,800</u></b> n-Propylbenzene 6,550 Tetrachloroethene <b><u>661</u></b> J
NR 720 Groundwater Pathway RCLs with a Wisconsin-Default Dilution Factor of 2					5.1	1,570	1,107.20	3,940	(a)		1,382.10	27	Naphthalene 658.2 Styrene 220 Tetrachloroethene 4.5
NR 720 Non-Industrial Direct Contact RCLs					1,490	7,470	818,000	258,000	89,800	182,000	182,000	59,400	Naphthalene 5,150 Styrene 867,000 Tetrachloroethene 30,700
NR 720 Industrial Direct Contact RCLs					7,410	37,000	818,000	258,000	219,000	182,000	182,000	293,000	Naphthalene 26,000 Styrene 867,000 Tetrachloroethene 153,000

Abbreviations:

µg/kg = micrograms per kilogram or parts per billion (ppb)  
 -- = Not Applicable  
 RCL = Residual Contaminant Level  
 NA = Not Analyzed

mg/kg - milligrams per kilogram or parts per million (ppm)  
 MTBE = Methyl-tert-butyl ether  
 TMB = Trimethylbenzene  
 ND = Not Detected

VOCs = Volatile Organic Compounds  
 NE = Not Established

Notes:

**Bold+underlined** values exceed an NR 720 RCL, as of January 2015.  
 (a) NR 720 Groundwater Pathway RCLs for 1,2,4 and 1,3,5 Trimethylbenzene Combined = 1,382.1  
 \*Sample collected at or below assumed water table (8 feet below ground surface).

Laboratory Notes/Qualifiers:

J - Estimated concentration at or above the Limit of Detection and below the Limit of Quantitation.  
 (1) Non-detect results are reported on a wet weight basis. Bromoform - Analyte recovery in the laboratory control sample (LCS) was below QC limits. Results may be biased low.  
 (2) Non-detect results are reported on a wet weight basis.

Created by: LMH Date: 3/23/2015  
 Last revision by: LMH Date: 3/23/2015  
 Checked by: JSN Date: 3/24/2015

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**Table 2. Soil Analytical Results Summary - PAHs**  
**Madison Water Utility Vehicle and Material Storage, 115 S. Paterson St., Madison / SCS Engineers Project #25215045.00**  
 (Results are in µg/kg, except where noted otherwise)

Sample	Date	Depth (feet)	Lab Notes	Acenaph-thene	Acenaph-thylene	Anthracene	Benzo(a) anthracene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Benzo(a) pyrene	Benzo(ghi) perylene	Chrysene	Dibenz(a,h) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd) pyrene	1-Methyl-naphthalene	2-Methyl-naphthalene	Naphthalene	Phenanthrene	Pyrene
GP-1 S2	3/11/2015	2.5-5	--	<9.7	<8.6	28.9	106	<b>225</b>	92.7	<b>318</b>	407	136	<b>214</b>	200	<9.7 L2	<b>213</b>	<9.7	<9.7	11.7 J	64.1	166
GP-2 S2	3/11/2015	2.5-5	--	<9.8	16.6 J	77.5	<b>168</b>	134	139	<b>178</b>	91.4	<b>209</b>	<b>35.0</b>	254	20.6 L2	68.0	<9.8	<9.8	<9.8	172	275
GP-2 S4*	3/11/2015	7.5-10	--	<10	<8.9	<10.4	<6.9	<10	<11.0	<7.1	<7.6	<9.2	<7.3	<10	<10 L2	<7.6	<10	<10	<10	<10	<10
GP-3 S1	3/11/2015	0-2.5	--	<b>74.2 J</b>	127	433	<b>815</b>	<b>951</b>	835	<b>942</b>	595	<b>907</b>	<b>180</b>	1,510	110 L2	<b>527</b>	<45.9	<45.9	63.0 J	1,050	1,580
GP-3 S4*	3/11/2015	7.5-10	--	<9.7	<8.7	<10.0	<6.7	<9.7	<10.7	<6.9	<7.4	<8.9	<7.1	<9.7	<9.7 L2	<7.4	<9.7	<9.7	<9.7	<9.7	<9.7
GP-3 S5*	3/11/2015	10-12	--	<10	<8.9	<10.3	<6.9	<10	<11.0	<7.1	<7.6	<9.2	<7.3	<10	<10 L2	<7.6	54.2	31.7	<10	<10	<10
GP-4 S1	3/11/2015	0-2.5	--	<9.2	10.4 J	14.0 J	24.0	26.3	30.5	<b>22.6</b>	16.9 J	36.7	<6.7	42.7	<9.2 L2	11.6 J	24.9	39.6	37.6	38.5	40.2
GP-4 S4*	3/11/2015	7.5-10	--	<10.1	<9.0	<10.5	<7.0	<10.1	<11.2	<7.2	<7.7	<9.3	<7.4	13.9 J	<10.1 L2	<7.7	191	496	447	17.7 J	10.3 J
GP-5 S1	3/11/2015	0-2.5	--	<8.8	<7.9	<9.1	26.9	23.5	23.8	<b>22.3</b>	13.5 J	33.7	<6.5	73.2	<8.8 L2	9.4 J	<8.8	<8.8	<8.8	31.6	65.3
GP-5 S3	3/11/2015	5-7.5	--	<11.3	<10.1	<11.7	16.4 J	21.7 J	19.2 J	<b>17.9 J</b>	12.4 J	25.6	<8.3	39.2	<11.3 L2	8.7 J	<11.3	<11.3	<11.3	20.0 J	34.9
GP-5 S5*	3/11/2015	10-12	--	<9.9	<8.9	<10.3	<6.9	<9.9	<11.0	<7.1	<7.6	<9.2	<7.3	<9.9	<9.9 L2	<7.5	<9.9	<9.9	<9.9	<9.9	<9.9
GP-6 S2	3/11/2015	2.5-5	--	<66.6	1,240	859	<b>1,360</b>	<b>1,520</b>	1,390	<b>1,930</b>	1,120	<b>1,680</b>	<b>338</b>	1,820	103 J, L2	<b>993</b>	340	605	<b>1,590</b>	701	2,110
GP-7 S1	3/11/2015	0-2.5	--	<40.2	489	324	<b>844</b>	<b>859</b>	947	<b>1,000</b>	540	<b>824</b>	<b>181</b>	1,260	<40.2 L2	<b>523</b>	212	409	538	587	1,330
GP-8 S2	3/11/2015	2.5-5	--	<9.6	94.2	115	<b>356</b>	<b>570</b>	430	<b>436</b>	319	<b>435</b>	<b>111</b>	529	10.0 J, L2	<b>298</b>	47.8	92.5	254	187	586
GP-8 S3	3/11/2015	5-7.5	--	<10.5	<9.4	<10.9	<7.3	<10.5	<11.6	<7.5	<8.0	<9.7	<7.7	<10.5	<10.5 L2	<8.0	<10.5	<10.5	<10.5	<10.5	<10.5
GP-9 S1	3/11/2015	0-2.5	--	20.1 J	186	162	<b>502</b>	<b>524</b>	558	<b>624</b>	281	<b>550</b>	<b>102</b>	731	24.6 J, L2	<b>289</b>	63.4	114	129	314	902
GP-10 S2	3/11/2015	2.5-5	--	<429	1,650	4,110	<b>12,100</b>	<b>13,300</b>	<b>13,300</b>	<b>15,300</b>	13,700	<b>13,900</b>	<b>4,050</b>	18,800	449 J	<b>11,300</b>	<429	<429	<b>895</b>	7,230	16,100
GP-10 S4*	3/11/2015	7.5-10	--	<102	<90.9	<105	<70.5	<102	<112	<72.7	<77.4	<94.0	<74.6	<102	<102	<77.2	953	3,090	<b>5,720</b>	<102	128 J
NR 720 Groundwater Pathway RCLs with a Wisconsin-Default Dilution Factor of 2				NE	NE	197,727.3	NE	479.3	NE	470	NE	144.6	NE	88,877.8	14,802.7	NE	NE	NE	658.2	NE	54,132.2
NR 720 Non-Industrial Direct Contact RCLs				3,440,000	NE	17,200,000	148	148	1,480	15	NE	14,800	15	2,290,000	2,290,000	148	15,600	229,000	5,150	NE	1,720,000
NR 720 Industrial Direct Contact RCLs				33,000,000	NE	100,000,000	2,110	2,110	21,100	211	NE	211,000	211	22,000,000	22,000,000	2,110	53,100	2,200,000	26,000	NE	16,500,000

Abbreviations:  
 µg/kg = micrograms per kilogram or parts per billion (ppb)  
 PAHs = Polynuclear Aromatic Hydrocarbons  
 -- = Not Applicable  
 RCL = Residual Contaminant Level  
 NE = Not Established  
 WDNR = Wisconsin Department of Natural Resources

Notes:  
**Bold+underlined** values meet or exceed an NR 720 RCL, as of January 2015.  
 \*Sample collected at or below assumed water table (8 feet below ground surface).

Laboratory Notes/Qualifiers:  
 J - Estimated concentration at or above the Limit of Detection (LOD) and below the Limit of Quantitation (LOQ).  
 L2 - Analyte recovery in the laboratory control sample (LCS) was below QC limits. Results may be biased low.

Created by: LMH Date: 3/23/2015  
 Last revision by: LMH Date: 3/23/2015  
 Checked by: JSN Date: 3/23/2015

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**Table 3. Soil Analytical Results Summary - Metals**  
**Madison Water Utility Vehicle and Material Storage, 115 S. Paterson St., Madison / SCS Engineers Project #25215045.00**  
 (Results are in mg/kg)

Sample	Date	Depth (feet)	Lab Notes	Arsenic	Barium	Cadmium	Chromium (Total)	Lead	Mercury	Selenium	Silver
GP-1 S2	3/11/2015	2.5-5	--	<b><u>2.3</u></b>	34.8	0.14 J	7.3	<b><u>29.9</u></b>	<b><u>0.22</u></b>	<0.82	<0.30
GP-2 S2	3/11/2015	2.5-5	--	<b><u>1.6</u></b> J	29.4	0.077 J	8.0	16.6	0.12	<0.82	<0.30
GP-2 S4	3/11/2015	7.5-10	--	<b><u>5.8</u></b>	40.2	<0.071	12.5	3.4	0.006 J	<0.83	<0.30
GP-3 S1	3/11/2015	0-2.5	(1)	<b><u>5.0</u></b> J	144	<b><u>1.5</u></b>	8.9	<b><u>137</u></b>	0.083	<0.73	<b>0.30</b> J
GP-3 S4	3/11/2015	2.5-5	--	<b><u>15.7</u></b>	44.8	0.089 J	13.4	5.6	0.009	<0.85	<b>0.44</b> J
GP-3 S5	3/11/2015	10-12	--	<b><u>4.1</u></b>	66.4	0.10 J	17.8	6.8	0.010	<0.80	<b>0.38</b> J
GP-4 S1	3/11/2015	0-2.5	--	<b><u>6.7</u></b>	42.1	0.48	8.3	<b><u>46.3</u></b>	0.053	<0.71	<b>0.38</b> J
GP-4 S4	3/11/2015	7.5-10	--	<b><u>5.0</u></b>	55.1	<0.079	14.1	5.2	0.009	<0.92	<0.33
GP-5 S1	3/11/2015	0-2.5	(1)	<b><u>5.9</u></b> J	21.5	0.29 J	6.2	12.4	0.019	<0.79	<0.29
GP-5 S3	3/11/2015	5-7.5	--	<b><u>4.1</u></b>	86.5	0.24 J	22.6	14.7	0.060	<1.0	<b>0.48</b> J
GP-5 S5	3/11/2015	10-12	--	<b><u>1.5</u></b> J	7.0	<0.070	3.9	1.2	<0.0031	<0.82	<0.29
GP-6 S2	3/11/2015	2.5-5	--	<b><u>23.7</u></b>	<b><u>1,920</u></b>	<b><u>1.1</u></b>	69.7	<b><u>835</u></b>	<b><u>0.36</u></b>	<1.1	<b>0.83</b> J
GP-7 S1	3/11/2015	0-2.5	--	<b><u>10.6</u></b>	81.6	<b><u>1.2</u></b>	14.4	<b><u>248</u></b>	0.064	<0.86	<b>0.47</b> J
GP-8 S2	3/11/2015	2.5-5	--	<b><u>8.3</u></b>	118	<b><u>2.0</u></b>	13.1	<b><u>395</u></b>	<b><u>0.29</u></b>	<0.87	<b>0.60</b> J
GP-8 S3	3/11/2015	5-7.5	--	<b><u>2.6</u></b>	87.4	<0.075	22.2	7.5	0.021	<0.88	<0.32
GP-9 S1	3/11/2015	0-2.5	--	<b><u>5.1</u></b>	61.5	0.34 J	11.5	<b><u>59.8</u></b>	<b><u>0.23</u></b>	<0.78	<b>0.57</b> J
GP-10 S2	3/11/2015	2.5-5	--	<b><u>9.5</u></b>	126	0.45 J	14.2	<b><u>457</u></b>	<b><u>0.24</u></b>	<0.94	<b>0.69</b> J
GP-10 S4	3/11/2015	7.5-10	--	<b><u>3.6</u></b>	59.3	0.081 J	14.5	6.5	0.011	<0.80	<b>0.36</b> J
NR 720 Groundwater Pathway RCLs with a Wisconsin-Default Dilution Factor of 2				0.584	164.8	0.752	360,000	27	0.208	0.52	0.85
NR 720 Non-Industrial Direct Contact RCLs				0.613	15,300	70	NE <sup>1</sup>	400	3.13	391	391
NR 720 Industrial Direct Contact RCLs				2.39	100,000	799	NE <sup>1</sup>	800	3.13	5,110	5,110
Background Threshold Value <sup>2</sup>				8	364	1	44	52	NE	NE	NE

**Table 3. Soil Analytical Results Summary - Metals**  
**Madison Water Utility Vehicle and Material Storage, 115 S. Paterson St., Madison / SCS Engineers Project #25215045.00**

Abbreviations:

mg/kg - milligrams per kilogram or parts per million (ppm)

-- = Not Applicable

NA = Not Analyzed

NE = No Standard Established

Notes:

**Bold+underlined** values exceed NR 720 RCLs, as of January 2015.

<sup>1</sup> Chromium Direct Contact Standards: III Non-Industrial Direct Contact RCL = 100,000 mg/kg; Industrial Direct Contact RCL = 100,000 mg/kg

VI Non-Industrial Direct Contact RCL = 0.293 mg/kg; Industrial Direct Contact RCL = 5.58 mg/kg

<sup>2</sup> Background threshold values are non-outlier trace element maximum levels in Wisconsin surface soils from the USGS Report at: <http://pubs.usgs.gov/sir/2011/5202>, as listed in the WDNR RR Program's RCL spreadsheet at: <http://dnr.wi.gov/topic/Brownfields/professionals.html>.

Laboratory Notes/Qualifiers:

J - Estimated concentration at or above the Limit of Detection and below the Limit of Quantitation.

(1) Arsenic - Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.

Created by: LMH Date: 3/23/2015

Last revision by: LMH Date: 3/23/2015

Checked by: JSN Date: 3/23/2015

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**Table 4. Groundwater Analytical Results Summary - VOCs**  
**Madison Water Utility Vehicle and Material Storage, 115 S. Paterson St., Madison / SCS Engineers Project #25215045.00**  
 (Results are in µg/L)

Sample	Date	Lab Notes	DRO	GRO	Benzene	Ethylbenzene	Toluene	Xylenes	TMBs	MTBE	Other VOCs	
GP-2	3/11/2015	--	NA	NA	<0.50	<0.50	<b>0.57</b> J	<1.5	<1.00	<0.17	ND	
GP-3	3/11/2015	(1)	NA	NA	<0.50	<0.50	<b>1.0</b>	<1.5	<b>0.74</b> J	<0.17	n-Butylbenzene	5.0
											sec-Butylbenzene	8.9
											tert-Butylbenzene	0.53 J
											Isopropylbenzene	3.2
											n-Propylbenzene	8.5
GP-5	3/11/2015	--	NA	NA	<0.50	<0.50	<0.50	<1.5	<1.00	<0.17	ND	
GP-8	3/11/2015	--	NA	NA	<0.50	<0.50	<0.50	<1.5	<1.00	<0.17	Isopropylbenzene	0.17 J
GP-10	3/11/2015	(1)	NA	NA	<b>174</b>	<b>1,380</b>	147	<b>1,740</b>	<b>2,130</b>	<3.5	n-Butylbenzene	106
											sec-Butylbenzene	47.6 J
											Chloroethane	8.7 J
											Isopropylbenzene	199
											Naphthalene	<b>1,530</b>
											n-Propylbenzene	326
NR 140 Enforcement Standards (ESs)			NE	NE	5	700	800	2,000	480	60	Chloroethane	400
											Naphthalene	100
NR 140 Preventive Action Limits (PALs)			NE	NE	0.5	140	160	400	96	12	Chloroethane	80
											Naphthalene	10

Abbreviations:

µg/L = micrograms per liter or parts per billion (ppb)

TMBs = 1,2,4- and 1,3,5-trimethylbenzenes

-- = Not Applicable

VOCs = Volatile Organic Compounds

MTBE = Methyl-tert-butyl ether

ND = Not Detected

NE = No Standard Established

Notes:

NR 140 ESs - Wisconsin Administrative Code (WAC), Chapter NR 140.10 Table 1 - Public Health Groundwater Quality Standards.

NR 140 PALs - WAC, Chapter NR 140.10 Table 1 - Public Health Groundwater Quality Standards.

**Bold+underlined** values meet or exceed NR 140 enforcement standards.

*Italic+underlined* values meet or exceed NR 140 preventive action limits.

**Table 4. Groundwater Analytical Results Summary - VOCs**  
**Madison Water Utility Vehicle and Material Storage, 115 S. Paterson St., Madison / SCS Engineers Project #25215045.00**

Laboratory Notes/Qualifiers:

J - Estimated concentration at or above the Limit of Detection and below the Limit of Quantitation.

(1) Surrogate 4-Bromofluorobenzene (S) - Results are from sample aliquot taken from VOA vial with headspace (air bubble greater than 6 mm diameter).

Created by: LMH Date: 3/23/2015

Last revision by: LMH Date: 3/23/2015

Checked by: JSN Date: 3/24/2015

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## **FIGURES**

- 1 Site Location
- 2 Site Plan



# Figure 1 - Site Location



### Legend

- Open Site (ongoing cleanup)
- Closed Site (completed cleanup)
- Rivers and Streams
- Open Water
- Cities
- Villages

Site

0.2      0      Distance / 2      0.2      Miles

1: 5,664

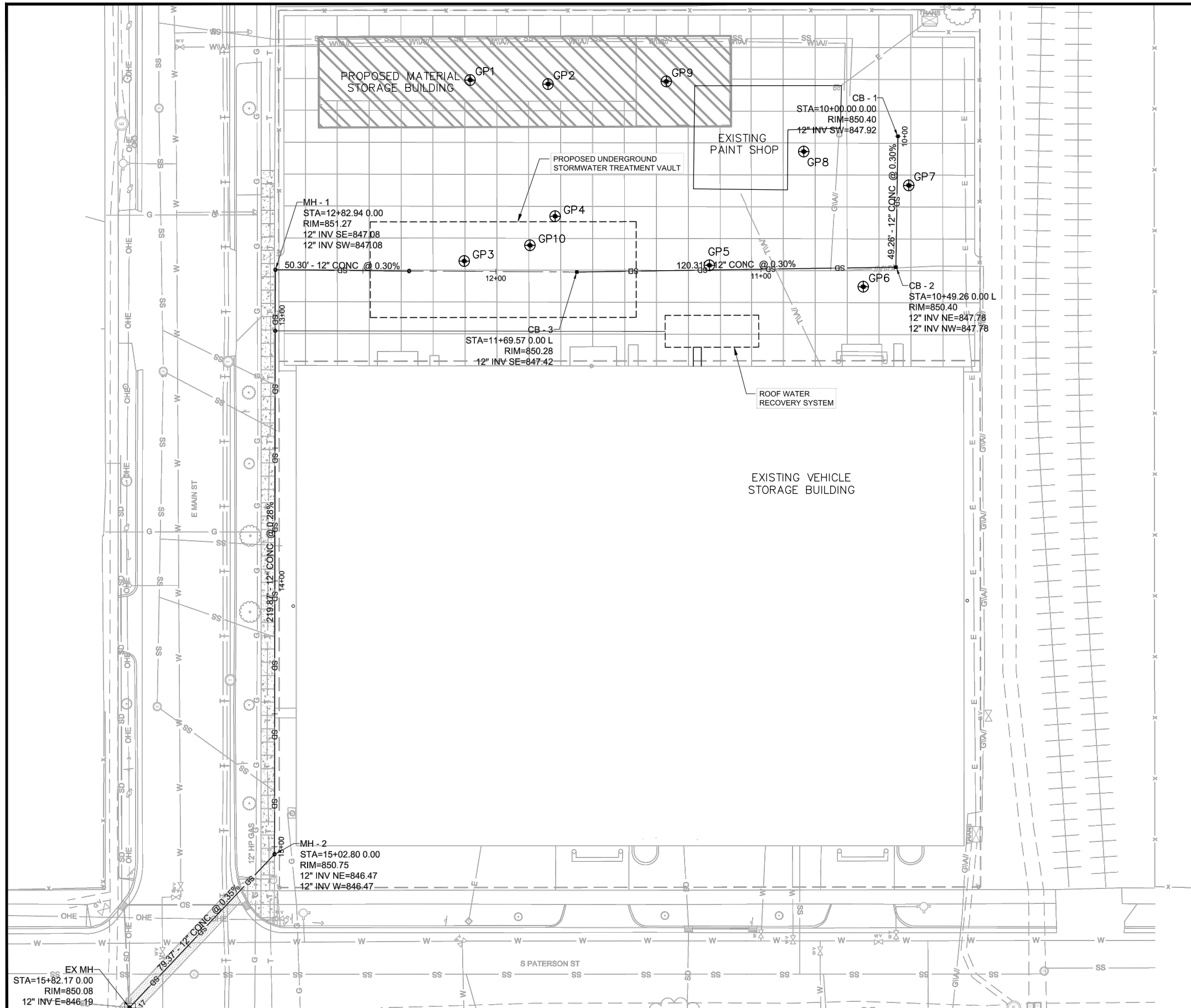


NAD\_1983\_HARN\_Wisconsin\_TM

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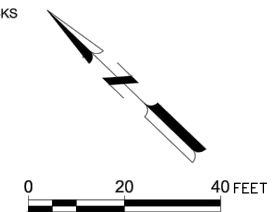
Note: Not all sites are mapped.

### Notes



**LEGEND:**

- STORM INLET, CURB
- STORM INLET, ROUND
- STORM INLET, SQUARE
- STORM FLARED END SECTION
- STORM SEWER MANHOLE
- STORM WATER QUALITY MANHOLE
- BOLLARD
- CONTROL POINT
- DOWNSPOUT
- ELECTRICAL TRANSFORMER BOX
- ELECTRICAL SERVICE PANEL
- ELECTRICAL HANDHOLE/PULLBOX
- FIRE HYDRANT
- FLAGPOLE
- GAS METER
- GAS VALVE
- INLET, CURB
- INLET, ROUND
- INLET, SQUARE
- IRON PIN
- LIGHT POLE (SINGLE)
- MANHOLE, ELECTRIC
- MANHOLE, SANITARY SEWER
- MANHOLE, STORM SEWER
- MANHOLE, TELECOMMUNICATIONS
- MARKER, CABLE
- POWER POLE
- SIGN (SINGLE POST)
- SOIL BORING
- TREE, DECIDUOUS
- WATER VALVE
- WATER METER
- WATER SHUTOFF
- MONITORING WELL
- G — GAS
- OHE — ELECTRIC, OVERHEAD
- E — ELECTRIC, UNDERGROUND
- - - - - XXX.X  
- - - - - XXX.X
- X — FENCE
- o — HANDRAIL
- SS — SANITARY SEWER
- SD — STORM SEWER / ROOF DRAIN
- T — TELEPHONE
- TV — TV CABLE
- W — WATER
- RAILROAD TRACKS



PROJECT NO.	25215045.00	DRAWN BY:	AHB	<b>SCS ENGINEERS</b> 2830 DAIRY DRIVE MADISON, WI 53718-6751 PHONE: (608) 224-2830	CLIENT MEAD & HUNT 2440 DEMING WAY MIDDLETON, WI 53562	SITE MADISON WATER UTILITY VEHICLE AND MATERIAL STORAGE 115 SOUTH PATERSON STREET MADISON, WISCONSIN	FIGURE 2
DRAWN:	03/18/15	CHECKED BY:	REL				
REVISED:	03/19/15	APPROVED BY:	REL 05/20/15				

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## **APPENDIX 1**

Laboratory Analytical Reports

March 23, 2015

Rob Langdon  
SCS ENGINEERS  
2830 Dairy Drive  
Madison, WI 53718

RE: Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

Dear Rob Langdon:

Enclosed are the analytical results for sample(s) received by the laboratory on March 12, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Tod Noltemeyer for  
Dan Milewsky  
dan.milewsky@pacelabs.com  
Project Manager

Enclosures



## REPORT OF LABORATORY ANALYSIS

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## CERTIFICATIONS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

---

### Green Bay Certification IDs

1241 Bellevue Street, Green Bay, WI 54302

Florida/NELAP Certification #: E87948

Illinois Certification #: 200050

Kentucky Certification #: 82

Louisiana Certification #: 04168

Minnesota Certification #: 055-999-334

North Dakota Certification #: R-150

South Carolina Certification #: 83006001

Texas Certification #: T104704529-14-1

US Dept of Agriculture #: S-76505

Wisconsin Certification #: 405132750

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## REPORT OF LABORATORY ANALYSIS

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## SAMPLE SUMMARY

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Lab ID	Sample ID	Matrix	Date Collected	Date Received
40111561001	GP-1 S2	Solid	03/11/15 08:45	03/12/15 08:30
40111561002	GP-2 S2	Solid	03/11/15 09:30	03/12/15 08:30
40111561003	GP-2 S4	Solid	03/11/15 09:35	03/12/15 08:30
40111561004	GP-3 S1	Solid	03/11/15 10:00	03/12/15 08:30
40111561005	GP-3 S4	Solid	03/11/15 10:00	03/12/15 08:30
40111561006	GP-3 S5	Solid	03/11/15 10:15	03/12/15 08:30
40111561007	GP-4 S1	Solid	03/11/15 12:30	03/12/15 08:30
40111561008	GP-4 S4	Solid	03/11/15 12:30	03/12/15 08:30
40111561009	GP-5 S1	Solid	03/11/15 11:10	03/12/15 08:30
40111561010	GP-5 S5	Solid	03/11/15 11:10	03/12/15 08:30
40111561011	GP-5 S3	Solid	03/11/15 11:00	03/12/15 08:30
40111561012	GP-8 S2	Solid	03/11/15 13:30	03/12/15 08:30
40111561013	GP-8 S3	Solid	03/11/15 13:30	03/12/15 08:30
40111561014	GP-7 S1	Solid	03/11/15 13:15	03/12/15 08:30
40111561015	GP-5	Water	03/11/15 00:00	03/12/15 08:30
40111561016	GP-6 S2	Solid	03/11/15 14:00	03/12/15 08:30
40111561017	GP-9 S1	Solid	03/11/15 14:30	03/12/15 08:30
40111561018	GP-10 S2	Solid	03/11/15 15:00	03/12/15 08:30
40111561019	GP-10 S4	Solid	03/11/15 15:00	03/12/15 08:30
40111561020	GP-10	Water	03/11/15 15:00	03/12/15 08:30
40111561021	GP-3	Water	03/11/15 00:00	03/12/15 08:30
40111561022	GP-2	Water	03/11/15 00:00	03/12/15 08:30
40111561023	GP-8	Water	03/11/15 00:00	03/12/15 08:30

## REPORT OF LABORATORY ANALYSIS

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### SAMPLE ANALYTE COUNT

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
40111561001	GP-1 S2	EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	ARO	20	PASI-G
		EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	SKW	1	PASI-G
40111561002	GP-2 S2	EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	ARO	20	PASI-G
		EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	SKW	1	PASI-G
40111561003	GP-2 S4	EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	ARO	20	PASI-G
		EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	SKW	1	PASI-G
40111561004	GP-3 S1	EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	ARO	20	PASI-G
		EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	SKW	1	PASI-G
40111561005	GP-3 S4	EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	ARO	20	PASI-G
		EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	SKW	1	PASI-G
40111561006	GP-3 S5	EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	ARO	20	PASI-G
		EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	SKW	1	PASI-G
40111561007	GP-4 S1	EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	ARO	20	PASI-G
		EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	SKW	1	PASI-G
40111561008	GP-4 S4	EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G

### REPORT OF LABORATORY ANALYSIS

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### SAMPLE ANALYTE COUNT

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
40111561009	GP-5 S1	EPA 8270 by SIM	ARO	20	PASI-G
		EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	SKW	1	PASI-G
		EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	ARO	20	PASI-G
40111561010	GP-5 S5	EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	SKW	1	PASI-G
		EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	ARO	20	PASI-G
		EPA 8260	SMT	63	PASI-G
40111561011	GP-5 S3	ASTM D2974-87	MAV	1	PASI-G
		EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	ARO	20	PASI-G
		EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	MAV	1	PASI-G
40111561012	GP-8 S2	EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	ARO	20	PASI-G
		EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	MAV	1	PASI-G
		EPA 6010	DLB	7	PASI-G
40111561013	GP-8 S3	EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	ARO	20	PASI-G
		EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	MAV	1	PASI-G
		EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
40111561014	GP-7 S1	EPA 8270 by SIM	ARO	20	PASI-G
		EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	MAV	1	PASI-G
		EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	ARO	20	PASI-G
40111561015	GP-5	EPA 8260	LAP	63	PASI-G
		ASTM D2974-87	MAV	1	PASI-G
40111561016	GP-6 S2	EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	ARO	20	PASI-G

### REPORT OF LABORATORY ANALYSIS

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### SAMPLE ANALYTE COUNT

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
40111561017	GP-9 S1	EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	MAV	1	PASI-G
		EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	ARO	20	PASI-G
40111561018	GP-10 S2	EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	MAV	1	PASI-G
		EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	RJN	20	PASI-G
40111561019	GP-10 S4	EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	MAV	1	PASI-G
		EPA 6010	DLB	7	PASI-G
		EPA 7471	AJT	1	PASI-G
		EPA 8270 by SIM	RJN	20	PASI-G
40111561020	GP-10	EPA 8260	SMT	63	PASI-G
		ASTM D2974-87	MAV	1	PASI-G
		EPA 8260	LAP	63	PASI-G
40111561021	GP-3	EPA 8260	LAP	63	PASI-G
40111561022	GP-2	EPA 8260	LAP	63	PASI-G
40111561023	GP-8	EPA 8260	LAP	63	PASI-G

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### SUMMARY OF DETECTION

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Lab Sample ID	Client Sample ID	Result	Units	Report Limit	Analyzed	Qualifiers
Method	Parameters					
<b>40111561001</b>	<b>GP-1 S2</b>					
EPA 6010	Arsenic	2.3	mg/kg	2.1	03/17/15 19:44	
EPA 6010	Barium	34.8	mg/kg	0.53	03/17/15 19:44	
EPA 6010	Cadmium	0.14J	mg/kg	0.53	03/17/15 19:44	
EPA 6010	Chromium	7.3	mg/kg	0.53	03/17/15 19:44	
EPA 6010	Lead	29.9	mg/kg	1.1	03/17/15 19:44	
EPA 7471	Mercury	0.22	mg/kg	0.0077	03/16/15 15:03	
EPA 8270 by SIM	Anthracene	28.9	ug/kg	19.3	03/13/15 14:41	
EPA 8270 by SIM	Benzo(a)anthracene	106	ug/kg	19.3	03/13/15 14:41	
EPA 8270 by SIM	Benzo(a)pyrene	318	ug/kg	19.3	03/13/15 14:41	
EPA 8270 by SIM	Benzo(b)fluoranthene	225	ug/kg	19.3	03/13/15 14:41	
EPA 8270 by SIM	Benzo(g,h,i)perylene	407	ug/kg	19.3	03/13/15 14:41	
EPA 8270 by SIM	Benzo(k)fluoranthene	92.7	ug/kg	19.3	03/13/15 14:41	
EPA 8270 by SIM	Chrysene	136	ug/kg	19.3	03/13/15 14:41	
EPA 8270 by SIM	Dibenz(a,h)anthracene	214	ug/kg	19.3	03/13/15 14:41	
EPA 8270 by SIM	Fluoranthene	200	ug/kg	19.3	03/13/15 14:41	
EPA 8270 by SIM	Indeno(1,2,3-cd)pyrene	213	ug/kg	19.3	03/13/15 14:41	
EPA 8270 by SIM	Naphthalene	11.7J	ug/kg	19.3	03/13/15 14:41	
EPA 8270 by SIM	Phenanthrene	64.1	ug/kg	19.3	03/13/15 14:41	
EPA 8270 by SIM	Pyrene	166	ug/kg	19.3	03/13/15 14:41	
EPA 8260	Naphthalene	56.7J	ug/kg	290	03/13/15 12:50	
ASTM D2974-87	Percent Moisture	13.7	%	0.10	03/16/15 11:25	
<b>40111561002</b>	<b>GP-2 S2</b>					
EPA 6010	Arsenic	1.6J	mg/kg	2.1	03/17/15 19:47	
EPA 6010	Barium	29.4	mg/kg	0.53	03/17/15 19:47	
EPA 6010	Cadmium	0.077J	mg/kg	0.53	03/17/15 19:47	
EPA 6010	Chromium	8.0	mg/kg	0.53	03/17/15 19:47	
EPA 6010	Lead	16.6	mg/kg	1.1	03/17/15 19:47	
EPA 7471	Mercury	0.12	mg/kg	0.0062	03/16/15 15:10	
EPA 8270 by SIM	Acenaphthylene	16.6J	ug/kg	19.5	03/13/15 14:58	
EPA 8270 by SIM	Anthracene	77.5	ug/kg	19.5	03/13/15 14:58	
EPA 8270 by SIM	Benzo(a)anthracene	168	ug/kg	19.5	03/13/15 14:58	
EPA 8270 by SIM	Benzo(a)pyrene	178	ug/kg	19.5	03/13/15 14:58	
EPA 8270 by SIM	Benzo(b)fluoranthene	134	ug/kg	19.5	03/13/15 14:58	
EPA 8270 by SIM	Benzo(g,h,i)perylene	91.4	ug/kg	19.5	03/13/15 14:58	
EPA 8270 by SIM	Benzo(k)fluoranthene	139	ug/kg	19.5	03/13/15 14:58	
EPA 8270 by SIM	Chrysene	209	ug/kg	19.5	03/13/15 14:58	
EPA 8270 by SIM	Dibenz(a,h)anthracene	35.0	ug/kg	19.5	03/13/15 14:58	
EPA 8270 by SIM	Fluoranthene	254	ug/kg	19.5	03/13/15 14:58	
EPA 8270 by SIM	Fluorene	20.6	ug/kg	19.5	03/13/15 14:58	L2
EPA 8270 by SIM	Indeno(1,2,3-cd)pyrene	68.0	ug/kg	19.5	03/13/15 14:58	
EPA 8270 by SIM	Phenanthrene	172	ug/kg	19.5	03/13/15 14:58	
EPA 8270 by SIM	Pyrene	275	ug/kg	19.5	03/13/15 14:58	
ASTM D2974-87	Percent Moisture	14.7	%	0.10	03/16/15 11:25	
<b>40111561003</b>	<b>GP-2 S4</b>					
EPA 6010	Arsenic	5.8	mg/kg	2.1	03/17/15 19:49	
EPA 6010	Barium	40.2	mg/kg	0.54	03/17/15 19:49	

### REPORT OF LABORATORY ANALYSIS

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### SUMMARY OF DETECTION

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Lab Sample ID Method	Client Sample ID Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
<b>40111561003</b>	<b>GP-2 S4</b>					
EPA 6010	Chromium	12.5	mg/kg	0.54	03/17/15 19:49	
EPA 6010	Lead	3.4	mg/kg	1.1	03/17/15 19:49	
EPA 7471	Mercury	0.0062J	mg/kg	0.0074	03/16/15 15:13	
ASTM D2974-87	Percent Moisture	16.5	%	0.10	03/16/15 11:25	
<b>40111561004</b>	<b>GP-3 S1</b>					
EPA 6010	Arsenic	5.0J	mg/kg	9.5	03/17/15 19:52	D3
EPA 6010	Barium	144	mg/kg	0.47	03/17/15 19:54	
EPA 6010	Cadmium	1.5	mg/kg	0.47	03/17/15 19:54	
EPA 6010	Chromium	8.9	mg/kg	0.47	03/17/15 19:54	
EPA 6010	Lead	137	mg/kg	0.95	03/17/15 19:54	
EPA 6010	Silver	0.30J	mg/kg	0.95	03/17/15 19:54	
EPA 7471	Mercury	0.083	mg/kg	0.0068	03/16/15 15:15	
EPA 8270 by SIM	Acenaphthene	74.2J	ug/kg	91.8	03/13/15 16:25	
EPA 8270 by SIM	Acenaphthylene	127	ug/kg	91.8	03/13/15 16:25	
EPA 8270 by SIM	Anthracene	433	ug/kg	91.8	03/13/15 16:25	
EPA 8270 by SIM	Benzo(a)anthracene	815	ug/kg	91.8	03/13/15 16:25	
EPA 8270 by SIM	Benzo(a)pyrene	942	ug/kg	91.8	03/13/15 16:25	
EPA 8270 by SIM	Benzo(b)fluoranthene	951	ug/kg	91.8	03/13/15 16:25	
EPA 8270 by SIM	Benzo(g,h,i)perylene	595	ug/kg	91.8	03/13/15 16:25	
EPA 8270 by SIM	Benzo(k)fluoranthene	835	ug/kg	91.8	03/13/15 16:25	
EPA 8270 by SIM	Chrysene	907	ug/kg	91.8	03/13/15 16:25	
EPA 8270 by SIM	Dibenz(a,h)anthracene	180	ug/kg	91.8	03/13/15 16:25	
EPA 8270 by SIM	Fluoranthene	1510	ug/kg	91.8	03/13/15 16:25	
EPA 8270 by SIM	Fluorene	110	ug/kg	91.8	03/13/15 16:25	L2
EPA 8270 by SIM	Indeno(1,2,3-cd)pyrene	527	ug/kg	91.8	03/13/15 16:25	
EPA 8270 by SIM	Naphthalene	63.0J	ug/kg	91.8	03/13/15 16:25	
EPA 8270 by SIM	Phenanthrene	1050	ug/kg	91.8	03/13/15 16:25	
EPA 8270 by SIM	Pyrene	1580	ug/kg	91.8	03/13/15 16:25	
EPA 8260	Naphthalene	54.1J	ug/kg	275	03/13/15 13:58	
ASTM D2974-87	Percent Moisture	9.2	%	0.10	03/16/15 11:26	
<b>40111561005</b>	<b>GP-3 S4</b>					
EPA 6010	Arsenic	15.7	mg/kg	2.2	03/17/15 19:56	
EPA 6010	Barium	44.8	mg/kg	0.55	03/17/15 19:56	
EPA 6010	Cadmium	0.089J	mg/kg	0.55	03/17/15 19:56	
EPA 6010	Chromium	13.4	mg/kg	0.55	03/17/15 19:56	
EPA 6010	Lead	5.6	mg/kg	1.1	03/17/15 19:56	
EPA 6010	Silver	0.44J	mg/kg	1.1	03/17/15 19:56	
EPA 7471	Mercury	0.0093	mg/kg	0.0074	03/16/15 15:17	
ASTM D2974-87	Percent Moisture	13.9	%	0.10	03/16/15 11:26	
<b>40111561006</b>	<b>GP-3 S5</b>					
EPA 6010	Arsenic	4.1	mg/kg	2.1	03/17/15 19:59	
EPA 6010	Barium	66.4	mg/kg	0.52	03/17/15 19:59	
EPA 6010	Cadmium	0.10J	mg/kg	0.52	03/17/15 19:59	
EPA 6010	Chromium	17.8	mg/kg	0.52	03/17/15 19:59	
EPA 6010	Lead	6.8	mg/kg	1.0	03/17/15 19:59	
EPA 6010	Silver	0.38J	mg/kg	1.0	03/17/15 19:59	

### REPORT OF LABORATORY ANALYSIS

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### SUMMARY OF DETECTION

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Lab Sample ID	Client Sample ID	Result	Units	Report Limit	Analyzed	Qualifiers
Method	Parameters					
<b>40111561006</b>	<b>GP-3 S5</b>					
EPA 7471	Mercury	0.010	mg/kg	0.0063	03/16/15 15:20	
EPA 8270 by SIM	1-Methylnaphthalene	54.2	ug/kg	19.9	03/13/15 12:57	
EPA 8270 by SIM	2-Methylnaphthalene	31.7	ug/kg	19.9	03/13/15 12:57	
EPA 8260	sec-Butylbenzene	58.2J	ug/kg	71.7	03/13/15 14:43	
ASTM D2974-87	Percent Moisture	16.3	%	0.10	03/16/15 11:26	
<b>40111561007</b>	<b>GP-4 S1</b>					
EPA 6010	Arsenic	6.7	mg/kg	1.9	03/17/15 20:05	
EPA 6010	Barium	42.1	mg/kg	0.46	03/17/15 20:05	
EPA 6010	Cadmium	0.48	mg/kg	0.46	03/17/15 20:05	
EPA 6010	Chromium	8.3	mg/kg	0.46	03/17/15 20:05	
EPA 6010	Lead	46.3	mg/kg	0.93	03/17/15 20:05	
EPA 6010	Silver	0.38J	mg/kg	0.93	03/17/15 20:05	
EPA 7471	Mercury	0.053	mg/kg	0.0073	03/16/15 15:27	
EPA 8270 by SIM	Acenaphthylene	10.4J	ug/kg	18.3	03/13/15 14:07	
EPA 8270 by SIM	Anthracene	14.0J	ug/kg	18.3	03/13/15 14:07	
EPA 8270 by SIM	Benzo(a)anthracene	24.0	ug/kg	18.3	03/13/15 14:07	
EPA 8270 by SIM	Benzo(a)pyrene	22.6	ug/kg	18.3	03/13/15 14:07	
EPA 8270 by SIM	Benzo(b)fluoranthene	26.3	ug/kg	18.3	03/13/15 14:07	
EPA 8270 by SIM	Benzo(g,h,i)perylene	16.9J	ug/kg	18.3	03/13/15 14:07	
EPA 8270 by SIM	Benzo(k)fluoranthene	30.5	ug/kg	18.3	03/13/15 14:07	
EPA 8270 by SIM	Chrysene	36.7	ug/kg	18.3	03/13/15 14:07	
EPA 8270 by SIM	Fluoranthene	42.7	ug/kg	18.3	03/13/15 14:07	
EPA 8270 by SIM	Indeno(1,2,3-cd)pyrene	11.6J	ug/kg	18.3	03/13/15 14:07	
EPA 8270 by SIM	1-Methylnaphthalene	24.9	ug/kg	18.3	03/13/15 14:07	
EPA 8270 by SIM	2-Methylnaphthalene	39.6	ug/kg	18.3	03/13/15 14:07	
EPA 8270 by SIM	Naphthalene	37.6	ug/kg	18.3	03/13/15 14:07	
EPA 8270 by SIM	Phenanthrene	38.5	ug/kg	18.3	03/13/15 14:07	
EPA 8270 by SIM	Pyrene	40.2	ug/kg	18.3	03/13/15 14:07	
EPA 8260	Naphthalene	100J	ug/kg	275	03/13/15 15:06	
EPA 8260	Toluene	66.5	ug/kg	65.9	03/13/15 15:06	
EPA 8260	1,2,4-Trimethylbenzene	43.3J	ug/kg	65.9	03/13/15 15:06	
EPA 8260	Xylene (Total)	122J	ug/kg	198	03/13/15 15:06	
ASTM D2974-87	Percent Moisture	9.0	%	0.10	03/16/15 11:26	
<b>40111561008</b>	<b>GP-4 S4</b>					
EPA 6010	Arsenic	5.0	mg/kg	2.4	03/17/15 20:08	
EPA 6010	Barium	55.1	mg/kg	0.60	03/17/15 20:08	
EPA 6010	Chromium	14.1	mg/kg	0.60	03/17/15 20:08	
EPA 6010	Lead	5.2	mg/kg	1.2	03/17/15 20:08	
EPA 7471	Mercury	0.0087	mg/kg	0.0070	03/16/15 15:29	
EPA 8270 by SIM	Fluoranthene	13.9J	ug/kg	20.2	03/13/15 13:15	
EPA 8270 by SIM	1-Methylnaphthalene	191	ug/kg	20.2	03/13/15 13:15	
EPA 8270 by SIM	2-Methylnaphthalene	496	ug/kg	20.2	03/13/15 13:15	
EPA 8270 by SIM	Naphthalene	447	ug/kg	20.2	03/13/15 13:15	
EPA 8270 by SIM	Phenanthrene	17.7J	ug/kg	20.2	03/13/15 13:15	
EPA 8270 by SIM	Pyrene	10.3J	ug/kg	20.2	03/13/15 13:15	
EPA 8260	n-Butylbenzene	631	ug/kg	72.8	03/13/15 18:07	

### REPORT OF LABORATORY ANALYSIS

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### SUMMARY OF DETECTION

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

Lab Sample ID	Client Sample ID	Result	Units	Report Limit	Analyzed	Qualifiers
Method	Parameters					
<b>40111561008</b>	<b>GP-4 S4</b>					
EPA 8260	sec-Butylbenzene	305	ug/kg	72.8	03/13/15 18:07	
EPA 8260	Ethylbenzene	331	ug/kg	72.8	03/13/15 18:07	
EPA 8260	Isopropylbenzene (Cumene)	495	ug/kg	72.8	03/13/15 18:07	
EPA 8260	p-Isopropyltoluene	564	ug/kg	72.8	03/13/15 18:07	
EPA 8260	Naphthalene	992	ug/kg	303	03/13/15 18:07	
EPA 8260	n-Propylbenzene	945	ug/kg	72.8	03/13/15 18:07	
EPA 8260	1,2,4-Trimethylbenzene	145	ug/kg	72.8	03/13/15 18:07	
EPA 8260	Xylene (Total)	97.1J	ug/kg	218	03/13/15 18:07	
ASTM D2974-87	Percent Moisture	17.5	%	0.10	03/16/15 11:26	
<b>40111561009</b>	<b>GP-5 S1</b>					
EPA 6010	Arsenic	5.9J	mg/kg	10.3	03/17/15 20:10	D3
EPA 6010	Barium	21.5	mg/kg	0.51	03/17/15 20:12	
EPA 6010	Cadmium	0.29J	mg/kg	0.51	03/17/15 20:12	
EPA 6010	Chromium	6.2	mg/kg	0.51	03/17/15 20:12	
EPA 6010	Lead	12.4	mg/kg	1.0	03/17/15 20:12	
EPA 7471	Mercury	0.019	mg/kg	0.0056	03/16/15 15:31	
EPA 8270 by SIM	Benzo(a)anthracene	26.9	ug/kg	17.6	03/13/15 15:33	
EPA 8270 by SIM	Benzo(a)pyrene	22.3	ug/kg	17.6	03/13/15 15:33	
EPA 8270 by SIM	Benzo(b)fluoranthene	23.5	ug/kg	17.6	03/13/15 15:33	
EPA 8270 by SIM	Benzo(g,h,i)perylene	13.5J	ug/kg	17.6	03/13/15 15:33	
EPA 8270 by SIM	Benzo(k)fluoranthene	23.8	ug/kg	17.6	03/13/15 15:33	
EPA 8270 by SIM	Chrysene	33.7	ug/kg	17.6	03/13/15 15:33	
EPA 8270 by SIM	Fluoranthene	73.2	ug/kg	17.6	03/13/15 15:33	
EPA 8270 by SIM	Indeno(1,2,3-cd)pyrene	9.4J	ug/kg	17.6	03/13/15 15:33	
EPA 8270 by SIM	Phenanthrene	31.6	ug/kg	17.6	03/13/15 15:33	
EPA 8270 by SIM	Pyrene	65.3	ug/kg	17.6	03/13/15 15:33	
ASTM D2974-87	Percent Moisture	5.2	%	0.10	03/16/15 13:05	
<b>40111561010</b>	<b>GP-5 S5</b>					
EPA 6010	Arsenic	1.5J	mg/kg	2.1	03/17/15 20:15	
EPA 6010	Barium	7.0	mg/kg	0.53	03/17/15 20:15	
EPA 6010	Chromium	3.9	mg/kg	0.53	03/17/15 20:15	
EPA 6010	Lead	1.2	mg/kg	1.1	03/17/15 20:15	
ASTM D2974-87	Percent Moisture	16.1	%	0.10	03/16/15 15:01	
<b>40111561011</b>	<b>GP-5 S3</b>					
EPA 6010	Arsenic	4.1	mg/kg	2.6	03/17/15 20:17	
EPA 6010	Barium	86.5	mg/kg	0.66	03/17/15 20:17	
EPA 6010	Cadmium	0.24J	mg/kg	0.66	03/17/15 20:17	
EPA 6010	Chromium	22.6	mg/kg	0.66	03/17/15 20:17	
EPA 6010	Lead	14.7	mg/kg	1.3	03/17/15 20:17	
EPA 6010	Silver	0.48J	mg/kg	1.3	03/17/15 20:17	
EPA 7471	Mercury	0.060	mg/kg	0.0078	03/16/15 15:36	
EPA 8270 by SIM	Benzo(a)anthracene	16.4J	ug/kg	22.6	03/13/15 15:50	
EPA 8270 by SIM	Benzo(a)pyrene	17.9J	ug/kg	22.6	03/13/15 15:50	
EPA 8270 by SIM	Benzo(b)fluoranthene	21.7J	ug/kg	22.6	03/13/15 15:50	
EPA 8270 by SIM	Benzo(g,h,i)perylene	12.4J	ug/kg	22.6	03/13/15 15:50	
EPA 8270 by SIM	Benzo(k)fluoranthene	19.2J	ug/kg	22.6	03/13/15 15:50	

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### SUMMARY OF DETECTION

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

Lab Sample ID Method	Client Sample ID Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
<b>40111561011</b>	<b>GP-5 S3</b>					
EPA 8270 by SIM	Chrysene	25.6	ug/kg	22.6	03/13/15 15:50	
EPA 8270 by SIM	Fluoranthene	39.2	ug/kg	22.6	03/13/15 15:50	
EPA 8270 by SIM	Indeno(1,2,3-cd)pyrene	8.7J	ug/kg	22.6	03/13/15 15:50	
EPA 8270 by SIM	Phenanthrene	20.0J	ug/kg	22.6	03/13/15 15:50	
EPA 8270 by SIM	Pyrene	34.9	ug/kg	22.6	03/13/15 15:50	
ASTM D2974-87	Percent Moisture	26.1	%	0.10	03/16/15 15:01	
<b>40111561012</b>	<b>GP-8 S2</b>					
EPA 6010	Arsenic	8.3	mg/kg	2.3	03/17/15 20:19	
EPA 6010	Barium	118	mg/kg	0.56	03/17/15 20:19	
EPA 6010	Cadmium	2.0	mg/kg	0.56	03/17/15 20:19	
EPA 6010	Chromium	13.1	mg/kg	0.56	03/17/15 20:19	
EPA 6010	Lead	395	mg/kg	1.1	03/17/15 20:19	
EPA 6010	Silver	0.60J	mg/kg	1.1	03/17/15 20:19	
EPA 7471	Mercury	0.29	mg/kg	0.0062	03/16/15 15:38	
EPA 8270 by SIM	Acenaphthylene	94.2	ug/kg	19.3	03/13/15 16:07	
EPA 8270 by SIM	Anthracene	115	ug/kg	19.3	03/13/15 16:07	
EPA 8270 by SIM	Benzo(a)anthracene	356	ug/kg	19.3	03/13/15 16:07	
EPA 8270 by SIM	Benzo(a)pyrene	436	ug/kg	19.3	03/13/15 16:07	
EPA 8270 by SIM	Benzo(b)fluoranthene	570	ug/kg	19.3	03/13/15 16:07	
EPA 8270 by SIM	Benzo(g,h,i)perylene	319	ug/kg	19.3	03/13/15 16:07	
EPA 8270 by SIM	Benzo(k)fluoranthene	430	ug/kg	19.3	03/13/15 16:07	
EPA 8270 by SIM	Chrysene	435	ug/kg	19.3	03/13/15 16:07	
EPA 8270 by SIM	Dibenz(a,h)anthracene	111	ug/kg	19.3	03/13/15 16:07	
EPA 8270 by SIM	Fluoranthene	529	ug/kg	19.3	03/13/15 16:07	
EPA 8270 by SIM	Fluorene	10.0J	ug/kg	19.3	03/13/15 16:07	L2
EPA 8270 by SIM	Indeno(1,2,3-cd)pyrene	298	ug/kg	19.3	03/13/15 16:07	
EPA 8270 by SIM	1-Methylnaphthalene	47.8	ug/kg	19.3	03/13/15 16:07	
EPA 8270 by SIM	2-Methylnaphthalene	92.5	ug/kg	19.3	03/13/15 16:07	
EPA 8270 by SIM	Naphthalene	254	ug/kg	19.3	03/13/15 16:07	
EPA 8270 by SIM	Phenanthrene	187	ug/kg	19.3	03/13/15 16:07	
EPA 8270 by SIM	Pyrene	586	ug/kg	19.3	03/13/15 16:07	
EPA 8260	Naphthalene	106J	ug/kg	289	03/13/15 16:36	
EPA 8260	Toluene	169	ug/kg	69.4	03/13/15 16:36	
EPA 8260	1,2,4-Trimethylbenzene	77.2	ug/kg	69.4	03/13/15 16:36	
EPA 8260	1,3,5-Trimethylbenzene	36.4J	ug/kg	69.4	03/13/15 16:36	
EPA 8260	Xylene (Total)	248	ug/kg	208	03/13/15 16:36	
ASTM D2974-87	Percent Moisture	13.6	%	0.10	03/16/15 15:01	
<b>40111561013</b>	<b>GP-8 S3</b>					
EPA 6010	Arsenic	2.6	mg/kg	2.3	03/17/15 20:22	
EPA 6010	Barium	87.4	mg/kg	0.57	03/17/15 20:22	
EPA 6010	Chromium	22.2	mg/kg	0.57	03/17/15 20:22	
EPA 6010	Lead	7.5	mg/kg	1.1	03/17/15 20:22	
EPA 7471	Mercury	0.021	mg/kg	0.0064	03/16/15 15:40	
ASTM D2974-87	Percent Moisture	20.7	%	0.10	03/16/15 15:01	
<b>40111561014</b>	<b>GP-7 S1</b>					
EPA 6010	Arsenic	10.6	mg/kg	2.2	03/17/15 20:24	

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### SUMMARY OF DETECTION

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

Lab Sample ID	Client Sample ID	Result	Units	Report Limit	Analyzed	Qualifiers
Method	Parameters					
<b>40111561014</b>	<b>GP-7 S1</b>					
EPA 6010	Barium	81.6	mg/kg	0.56	03/17/15 20:24	
EPA 6010	Cadmium	1.2	mg/kg	0.56	03/17/15 20:24	
EPA 6010	Chromium	14.4	mg/kg	0.56	03/17/15 20:24	
EPA 6010	Lead	248	mg/kg	1.1	03/17/15 20:24	
EPA 6010	Silver	0.47J	mg/kg	1.1	03/17/15 20:24	
EPA 7471	Mercury	0.064	mg/kg	0.0080	03/16/15 15:43	
EPA 8270 by SIM	Acenaphthylene	489	ug/kg	80.4	03/13/15 16:42	
EPA 8270 by SIM	Anthracene	324	ug/kg	80.4	03/13/15 16:42	
EPA 8270 by SIM	Benzo(a)anthracene	844	ug/kg	80.4	03/13/15 16:42	
EPA 8270 by SIM	Benzo(a)pyrene	1000	ug/kg	80.4	03/13/15 16:42	
EPA 8270 by SIM	Benzo(b)fluoranthene	859	ug/kg	80.4	03/13/15 16:42	
EPA 8270 by SIM	Benzo(g,h,i)perylene	540	ug/kg	80.4	03/13/15 16:42	
EPA 8270 by SIM	Benzo(k)fluoranthene	947	ug/kg	80.4	03/13/15 16:42	
EPA 8270 by SIM	Chrysene	824	ug/kg	80.4	03/13/15 16:42	
EPA 8270 by SIM	Dibenz(a,h)anthracene	181	ug/kg	80.4	03/13/15 16:42	
EPA 8270 by SIM	Fluoranthene	1260	ug/kg	80.4	03/13/15 16:42	
EPA 8270 by SIM	Indeno(1,2,3-cd)pyrene	523	ug/kg	80.4	03/13/15 16:42	
EPA 8270 by SIM	1-Methylnaphthalene	212	ug/kg	80.4	03/13/15 16:42	
EPA 8270 by SIM	2-Methylnaphthalene	409	ug/kg	80.4	03/13/15 16:42	
EPA 8270 by SIM	Naphthalene	538	ug/kg	80.4	03/13/15 16:42	
EPA 8270 by SIM	Phenanthrene	587	ug/kg	80.4	03/13/15 16:42	
EPA 8270 by SIM	Pyrene	1330	ug/kg	80.4	03/13/15 16:42	
EPA 8260	Benzene	65.5J	ug/kg	72.4	03/13/15 17:22	
EPA 8260	n-Butylbenzene	71.4J	ug/kg	72.4	03/13/15 17:22	
EPA 8260	Ethylbenzene	126	ug/kg	72.4	03/13/15 17:22	
EPA 8260	Isopropylbenzene (Cumene)	32.2J	ug/kg	72.4	03/13/15 17:22	
EPA 8260	Naphthalene	259J	ug/kg	302	03/13/15 17:22	
EPA 8260	n-Propylbenzene	71.6J	ug/kg	72.4	03/13/15 17:22	
EPA 8260	Toluene	354	ug/kg	72.4	03/13/15 17:22	
EPA 8260	1,2,4-Trimethylbenzene	397	ug/kg	72.4	03/13/15 17:22	
EPA 8260	1,3,5-Trimethylbenzene	165	ug/kg	72.4	03/13/15 17:22	
EPA 8260	Xylene (Total)	776	ug/kg	217	03/13/15 17:22	
ASTM D2974-87	Percent Moisture	17.1	%	0.10	03/16/15 15:01	
<b>40111561016</b>	<b>GP-6 S2</b>					
EPA 6010	Arsenic	23.7	mg/kg	2.8	03/17/15 20:26	
EPA 6010	Barium	1920	mg/kg	0.69	03/17/15 20:26	
EPA 6010	Cadmium	1.1	mg/kg	0.69	03/17/15 20:26	
EPA 6010	Chromium	69.7	mg/kg	0.69	03/17/15 20:26	
EPA 6010	Lead	835	mg/kg	1.4	03/17/15 20:26	
EPA 6010	Silver	0.83J	mg/kg	1.4	03/17/15 20:26	
EPA 7471	Mercury	0.36	mg/kg	0.0094	03/16/15 15:45	
EPA 8270 by SIM	Acenaphthylene	1240	ug/kg	133	03/13/15 16:59	
EPA 8270 by SIM	Anthracene	859	ug/kg	133	03/13/15 16:59	
EPA 8270 by SIM	Benzo(a)anthracene	1360	ug/kg	133	03/13/15 16:59	
EPA 8270 by SIM	Benzo(a)pyrene	1930	ug/kg	133	03/13/15 16:59	
EPA 8270 by SIM	Benzo(b)fluoranthene	1520	ug/kg	133	03/13/15 16:59	
EPA 8270 by SIM	Benzo(g,h,i)perylene	1120	ug/kg	133	03/13/15 16:59	

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### SUMMARY OF DETECTION

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Lab Sample ID	Client Sample ID	Result	Units	Report Limit	Analyzed	Qualifiers
Method	Parameters					
<b>40111561016</b>	<b>GP-6 S2</b>					
EPA 8270 by SIM	Benzo(k)fluoranthene	1390	ug/kg	133	03/13/15 16:59	
EPA 8270 by SIM	Chrysene	1680	ug/kg	133	03/13/15 16:59	
EPA 8270 by SIM	Dibenz(a,h)anthracene	338	ug/kg	133	03/13/15 16:59	
EPA 8270 by SIM	Fluoranthene	1820	ug/kg	133	03/13/15 16:59	
EPA 8270 by SIM	Fluorene	103J	ug/kg	133	03/13/15 16:59	L2
EPA 8270 by SIM	Indeno(1,2,3-cd)pyrene	993	ug/kg	133	03/13/15 16:59	
EPA 8270 by SIM	1-Methylnaphthalene	340	ug/kg	133	03/13/15 16:59	
EPA 8270 by SIM	2-Methylnaphthalene	605	ug/kg	133	03/13/15 16:59	
EPA 8270 by SIM	Naphthalene	1590	ug/kg	133	03/13/15 16:59	
EPA 8270 by SIM	Phenanthrene	701	ug/kg	133	03/13/15 16:59	
EPA 8270 by SIM	Pyrene	2110	ug/kg	133	03/13/15 16:59	
EPA 8260	Benzene	178	ug/kg	95.9	03/16/15 11:50	
EPA 8260	Ethylbenzene	81.8J	ug/kg	95.9	03/16/15 11:50	
EPA 8260	Naphthalene	2090	ug/kg	399	03/16/15 11:50	
EPA 8260	Styrene	72.7J	ug/kg	95.9	03/16/15 11:50	
EPA 8260	Toluene	324	ug/kg	95.9	03/16/15 11:50	
EPA 8260	1,2,4-Trimethylbenzene	190	ug/kg	95.9	03/16/15 11:50	
EPA 8260	1,3,5-Trimethylbenzene	78.4J	ug/kg	95.9	03/16/15 11:50	
EPA 8260	Xylene (Total)	404	ug/kg	288	03/16/15 11:50	
ASTM D2974-87	Percent Moisture	37.4	%	0.10	03/16/15 15:01	
<b>40111561017</b>	<b>GP-9 S1</b>					
EPA 6010	Arsenic	5.1	mg/kg	2.0	03/17/15 20:33	
EPA 6010	Barium	61.5	mg/kg	0.51	03/17/15 20:33	
EPA 6010	Cadmium	0.34J	mg/kg	0.51	03/17/15 20:33	
EPA 6010	Chromium	11.5	mg/kg	0.51	03/17/15 20:33	
EPA 6010	Lead	59.8	mg/kg	1.0	03/17/15 20:33	
EPA 6010	Silver	0.57J	mg/kg	1.0	03/17/15 20:33	
EPA 7471	Mercury	0.23	mg/kg	0.0073	03/16/15 15:47	
EPA 8270 by SIM	Acenaphthene	20.1J	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	Acenaphthylene	186	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	Anthracene	162	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	Benzo(a)anthracene	502	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	Benzo(a)pyrene	624	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	Benzo(b)fluoranthene	524	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	Benzo(g,h,i)perylene	281	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	Benzo(k)fluoranthene	558	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	Chrysene	550	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	Dibenz(a,h)anthracene	102	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	Fluoranthene	731	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	Fluorene	24.6J	ug/kg	37.4	03/13/15 17:16	L2
EPA 8270 by SIM	Indeno(1,2,3-cd)pyrene	289	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	1-Methylnaphthalene	63.4	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	2-Methylnaphthalene	114	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	Naphthalene	129	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	Phenanthrene	314	ug/kg	37.4	03/13/15 17:16	
EPA 8270 by SIM	Pyrene	902	ug/kg	37.4	03/13/15 17:16	
EPA 8260	Benzene	28.5J	ug/kg	67.3	03/16/15 12:12	

### REPORT OF LABORATORY ANALYSIS

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### SUMMARY OF DETECTION

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Lab Sample ID	Client Sample ID	Result	Units	Report Limit	Analyzed	Qualifiers
Method	Parameters					
<b>40111561017</b>	<b>GP-9 S1</b>					
EPA 8260	n-Butylbenzene	37.0J	ug/kg	67.3	03/16/15 12:12	
EPA 8260	Ethylbenzene	62.1J	ug/kg	67.3	03/16/15 12:12	
EPA 8260	Naphthalene	180J	ug/kg	281	03/16/15 12:12	
EPA 8260	Toluene	155	ug/kg	67.3	03/16/15 12:12	
EPA 8260	1,2,4-Trimethylbenzene	156	ug/kg	67.3	03/16/15 12:12	
EPA 8260	1,3,5-Trimethylbenzene	58.1J	ug/kg	67.3	03/16/15 12:12	
EPA 8260	Xylene (Total)	392	ug/kg	202	03/16/15 12:12	
ASTM D2974-87	Percent Moisture	10.9	%	0.10	03/16/15 15:02	
<b>40111561018</b>	<b>GP-10 S2</b>					
EPA 6010	Arsenic	9.5	mg/kg	2.4	03/17/15 20:35	
EPA 6010	Barium	126	mg/kg	0.61	03/17/15 20:35	
EPA 6010	Cadmium	0.45J	mg/kg	0.61	03/17/15 20:35	
EPA 6010	Chromium	14.2	mg/kg	0.61	03/17/15 20:35	
EPA 6010	Lead	457	mg/kg	1.2	03/17/15 20:35	
EPA 6010	Silver	0.69J	mg/kg	1.2	03/17/15 20:35	
EPA 7471	Mercury	0.24	mg/kg	0.0074	03/16/15 15:54	
EPA 8270 by SIM	Acenaphthylene	1650	ug/kg	858	03/20/15 11:03	
EPA 8270 by SIM	Anthracene	4110	ug/kg	858	03/20/15 11:03	
EPA 8270 by SIM	Benzo(a)anthracene	12100	ug/kg	858	03/20/15 11:03	
EPA 8270 by SIM	Benzo(a)pyrene	15300	ug/kg	858	03/20/15 11:03	
EPA 8270 by SIM	Benzo(b)fluoranthene	13300	ug/kg	858	03/20/15 11:03	
EPA 8270 by SIM	Benzo(g,h,i)perylene	13700	ug/kg	858	03/20/15 11:03	
EPA 8270 by SIM	Benzo(k)fluoranthene	13300	ug/kg	858	03/20/15 11:03	
EPA 8270 by SIM	Chrysene	13900	ug/kg	858	03/20/15 11:03	
EPA 8270 by SIM	Dibenz(a,h)anthracene	4050	ug/kg	858	03/20/15 11:03	
EPA 8270 by SIM	Fluoranthene	18800	ug/kg	858	03/20/15 11:03	
EPA 8270 by SIM	Fluorene	449J	ug/kg	858	03/20/15 11:03	
EPA 8270 by SIM	Indeno(1,2,3-cd)pyrene	11300	ug/kg	858	03/20/15 11:03	
EPA 8270 by SIM	Naphthalene	895	ug/kg	858	03/20/15 11:03	
EPA 8270 by SIM	Phenanthrene	7230	ug/kg	858	03/20/15 11:03	
EPA 8270 by SIM	Pyrene	16100	ug/kg	858	03/20/15 11:03	
EPA 8260	Ethylbenzene	40.8J	ug/kg	77.2	03/16/15 12:35	
EPA 8260	Naphthalene	341	ug/kg	322	03/16/15 12:35	
EPA 8260	Toluene	160	ug/kg	77.2	03/16/15 12:35	
EPA 8260	1,2,4-Trimethylbenzene	106	ug/kg	77.2	03/16/15 12:35	
EPA 8260	1,3,5-Trimethylbenzene	66.4J	ug/kg	77.2	03/16/15 12:35	
EPA 8260	Xylene (Total)	297	ug/kg	232	03/16/15 12:35	
ASTM D2974-87	Percent Moisture	22.3	%	0.10	03/16/15 15:02	
<b>40111561019</b>	<b>GP-10 S4</b>					
EPA 6010	Arsenic	3.6	mg/kg	2.1	03/17/15 20:37	
EPA 6010	Barium	59.3	mg/kg	0.52	03/17/15 20:37	
EPA 6010	Cadmium	0.081J	mg/kg	0.52	03/17/15 20:37	
EPA 6010	Chromium	14.5	mg/kg	0.52	03/17/15 20:37	
EPA 6010	Lead	6.5	mg/kg	1.0	03/17/15 20:37	
EPA 6010	Silver	0.36J	mg/kg	1.0	03/17/15 20:37	
EPA 7471	Mercury	0.011	mg/kg	0.0067	03/16/15 15:57	

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### SUMMARY OF DETECTION

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Lab Sample ID Method	Client Sample ID Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
<b>40111561019</b>	<b>GP-10 S4</b>					
EPA 8270 by SIM	1-Methylnaphthalene	953	ug/kg	203	03/20/15 12:46	
EPA 8270 by SIM	2-Methylnaphthalene	3090	ug/kg	203	03/20/15 12:46	
EPA 8270 by SIM	Naphthalene	5720	ug/kg	203	03/20/15 12:46	
EPA 8270 by SIM	Pyrene	128J	ug/kg	203	03/20/15 12:46	
EPA 8260	n-Butylbenzene	3800	ug/kg	1460	03/16/15 19:46	
EPA 8260	sec-Butylbenzene	1700	ug/kg	1460	03/16/15 19:46	
EPA 8260	Ethylbenzene	9820	ug/kg	1460	03/16/15 19:46	
EPA 8260	Isopropylbenzene (Cumene)	3860	ug/kg	1460	03/16/15 19:46	
EPA 8260	p-Isopropyltoluene	3760	ug/kg	1460	03/16/15 19:46	
EPA 8260	Naphthalene	18800	ug/kg	6100	03/16/15 19:46	
EPA 8260	n-Propylbenzene	6550	ug/kg	1460	03/16/15 19:46	
EPA 8260	Tetrachloroethene	661J	ug/kg	1460	03/16/15 19:46	
EPA 8260	1,2,4-Trimethylbenzene	43100	ug/kg	1460	03/16/15 19:46	
EPA 8260	Xylene (Total)	11500	ug/kg	4390	03/16/15 19:46	
ASTM D2974-87	Percent Moisture	18.0	%	0.10	03/16/15 15:02	
<b>40111561020</b>	<b>GP-10</b>					
EPA 8260	Benzene	174	ug/L	20.0	03/13/15 18:29	
EPA 8260	n-Butylbenzene	106	ug/L	20.0	03/13/15 18:29	
EPA 8260	sec-Butylbenzene	47.6J	ug/L	100	03/13/15 18:29	
EPA 8260	Chloroethane	8.7J	ug/L	20.0	03/13/15 18:29	
EPA 8260	Ethylbenzene	1380	ug/L	20.0	03/13/15 18:29	
EPA 8260	Isopropylbenzene (Cumene)	199	ug/L	20.0	03/13/15 18:29	
EPA 8260	Naphthalene	1530	ug/L	100	03/13/15 18:29	
EPA 8260	n-Propylbenzene	326	ug/L	20.0	03/13/15 18:29	
EPA 8260	Toluene	147	ug/L	20.0	03/13/15 18:29	
EPA 8260	1,2,4-Trimethylbenzene	2130	ug/L	20.0	03/13/15 18:29	
EPA 8260	Xylene (Total)	1740	ug/L	60.0	03/13/15 18:29	
<b>40111561021</b>	<b>GP-3</b>					
EPA 8260	n-Butylbenzene	5.0	ug/L	1.0	03/13/15 18:07	
EPA 8260	sec-Butylbenzene	8.9	ug/L	5.0	03/13/15 18:07	
EPA 8260	tert-Butylbenzene	0.53J	ug/L	1.0	03/13/15 18:07	
EPA 8260	Isopropylbenzene (Cumene)	3.2	ug/L	1.0	03/13/15 18:07	
EPA 8260	n-Propylbenzene	8.5	ug/L	1.0	03/13/15 18:07	
EPA 8260	Toluene	1.0	ug/L	1.0	03/13/15 18:07	
EPA 8260	1,2,4-Trimethylbenzene	0.74J	ug/L	1.0	03/13/15 18:07	
<b>40111561022</b>	<b>GP-2</b>					
EPA 8260	Toluene	0.57J	ug/L	1.0	03/13/15 15:38	
<b>40111561023</b>	<b>GP-8</b>					
EPA 8260	Isopropylbenzene (Cumene)	0.17J	ug/L	1.0	03/13/15 16:01	

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Sample: GP-1 S2 Lab ID: 40111561001 Collected: 03/11/15 08:45 Received: 03/12/15 08:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b>									
Analytical Method: EPA 6010 Preparation Method: EPA 3050									
Arsenic	2.3	mg/kg	2.1	0.68	1	03/16/15 07:20	03/17/15 19:44	7440-38-2	
Barium	34.8	mg/kg	0.53	0.13	1	03/16/15 07:20	03/17/15 19:44	7440-39-3	
Cadmium	0.14J	mg/kg	0.53	0.071	1	03/16/15 07:20	03/17/15 19:44	7440-43-9	
Chromium	7.3	mg/kg	0.53	0.21	1	03/16/15 07:20	03/17/15 19:44	7440-47-3	
Lead	29.9	mg/kg	1.1	0.46	1	03/16/15 07:20	03/17/15 19:44	7439-92-1	
Selenium	<0.82	mg/kg	2.1	0.82	1	03/16/15 07:20	03/17/15 19:44	7782-49-2	
Silver	<0.30	mg/kg	1.1	0.30	1	03/16/15 07:20	03/17/15 19:44	7440-22-4	
<b>7471 Mercury</b>									
Analytical Method: EPA 7471 Preparation Method: EPA 7471									
Mercury	0.22	mg/kg	0.0077	0.0038	1	03/13/15 12:05	03/16/15 15:03	7439-97-6	
<b>8270 MSSV PAH by SIM</b>									
Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546									
Acenaphthene	<9.7	ug/kg	19.3	9.7	1	03/13/15 08:18	03/13/15 14:41	83-32-9	
Acenaphthylene	<8.6	ug/kg	19.3	8.6	1	03/13/15 08:18	03/13/15 14:41	208-96-8	
Anthracene	28.9	ug/kg	19.3	10.0	1	03/13/15 08:18	03/13/15 14:41	120-12-7	
Benzo(a)anthracene	106	ug/kg	19.3	6.7	1	03/13/15 08:18	03/13/15 14:41	56-55-3	
Benzo(a)pyrene	318	ug/kg	19.3	6.9	1	03/13/15 08:18	03/13/15 14:41	50-32-8	
Benzo(b)fluoranthene	225	ug/kg	19.3	9.7	1	03/13/15 08:18	03/13/15 14:41	205-99-2	
Benzo(g,h,i)perylene	407	ug/kg	19.3	7.4	1	03/13/15 08:18	03/13/15 14:41	191-24-2	
Benzo(k)fluoranthene	92.7	ug/kg	19.3	10.7	1	03/13/15 08:18	03/13/15 14:41	207-08-9	
Chrysene	136	ug/kg	19.3	8.9	1	03/13/15 08:18	03/13/15 14:41	218-01-9	
Dibenz(a,h)anthracene	214	ug/kg	19.3	7.1	1	03/13/15 08:18	03/13/15 14:41	53-70-3	
Fluoranthene	200	ug/kg	19.3	9.7	1	03/13/15 08:18	03/13/15 14:41	206-44-0	
Fluorene	<9.7	ug/kg	19.3	9.7	1	03/13/15 08:18	03/13/15 14:41	86-73-7	L2
Indeno(1,2,3-cd)pyrene	213	ug/kg	19.3	7.3	1	03/13/15 08:18	03/13/15 14:41	193-39-5	
1-Methylnaphthalene	<9.7	ug/kg	19.3	9.7	1	03/13/15 08:18	03/13/15 14:41	90-12-0	
2-Methylnaphthalene	<9.7	ug/kg	19.3	9.7	1	03/13/15 08:18	03/13/15 14:41	91-57-6	
Naphthalene	11.7J	ug/kg	19.3	9.7	1	03/13/15 08:18	03/13/15 14:41	91-20-3	
Phenanthrene	64.1	ug/kg	19.3	9.7	1	03/13/15 08:18	03/13/15 14:41	85-01-8	
Pyrene	166	ug/kg	19.3	9.7	1	03/13/15 08:18	03/13/15 14:41	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	62	%	39-130		1	03/13/15 08:18	03/13/15 14:41	321-60-8	
Terphenyl-d14 (S)	71	%	37-130		1	03/13/15 08:18	03/13/15 14:41	1718-51-0	
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Benzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	71-43-2	W
Bromobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	108-86-1	W
Bromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	74-97-5	W
Bromodichloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	75-27-4	W
Bromoform	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	75-25-2	L2,W
Bromomethane	<69.9	ug/kg	250	69.9	1	03/13/15 07:30	03/13/15 12:50	74-83-9	W
n-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	104-51-8	W
sec-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	135-98-8	W
tert-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	98-06-6	W
Carbon tetrachloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	56-23-5	W

### REPORT OF LABORATORY ANALYSIS

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

**Sample: GP-1 S2**      **Lab ID: 40111561001**      Collected: 03/11/15 08:45      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260    Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/13/15 07:30	03/13/15 12:50	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/13/15 07:30	03/13/15 12:50	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/13/15 07:30	03/13/15 12:50	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	108-20-3	W
Ethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	100-41-4	W
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	87-68-3	W
Isopropylbenzene (Cumene)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	98-82-8	W
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	1634-04-4	W
Naphthalene	56.7J	ug/kg	290	46.4	1	03/13/15 07:30	03/13/15 12:50	91-20-3	W
n-Propylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	103-65-1	W
Styrene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	127-18-4	W
Toluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	108-88-3	W
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/13/15 07:30	03/13/15 12:50	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	75-69-4	W

### REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-1 S2**      **Lab ID: 40111561001**      Collected: 03/11/15 08:45      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	96-18-4	W
1,2,4-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	95-63-6	W
1,3,5-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	108-67-8	W
Vinyl chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 12:50	75-01-4	W
Xylene (Total)	<75.0	ug/kg	180	75.0	1	03/13/15 07:30	03/13/15 12:50	1330-20-7	W
<b>Surrogates</b>									
Dibromofluoromethane (S)	110	%	37-152		1	03/13/15 07:30	03/13/15 12:50	1868-53-7	
Toluene-d8 (S)	112	%	38-154		1	03/13/15 07:30	03/13/15 12:50	2037-26-5	
4-Bromofluorobenzene (S)	101	%	39-139		1	03/13/15 07:30	03/13/15 12:50	460-00-4	
<b>Percent Moisture</b>									
Analytical Method: ASTM D2974-87									
Percent Moisture	13.7	%	0.10	0.10	1		03/16/15 11:25		

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-2 S2**      **Lab ID: 40111561002**      Collected: 03/11/15 09:30      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b> Analytical Method: EPA 6010      Preparation Method: EPA 3050									
Arsenic	<b>1.6J</b>	mg/kg	2.1	0.68	1	03/16/15 07:20	03/17/15 19:47	7440-38-2	
Barium	<b>29.4</b>	mg/kg	0.53	0.13	1	03/16/15 07:20	03/17/15 19:47	7440-39-3	
Cadmium	<b>0.077J</b>	mg/kg	0.53	0.071	1	03/16/15 07:20	03/17/15 19:47	7440-43-9	
Chromium	<b>8.0</b>	mg/kg	0.53	0.21	1	03/16/15 07:20	03/17/15 19:47	7440-47-3	
Lead	<b>16.6</b>	mg/kg	1.1	0.46	1	03/16/15 07:20	03/17/15 19:47	7439-92-1	
Selenium	<b>&lt;0.82</b>	mg/kg	2.1	0.82	1	03/16/15 07:20	03/17/15 19:47	7782-49-2	
Silver	<b>&lt;0.30</b>	mg/kg	1.1	0.30	1	03/16/15 07:20	03/17/15 19:47	7440-22-4	
<b>7471 Mercury</b> Analytical Method: EPA 7471      Preparation Method: EPA 7471									
Mercury	<b>0.12</b>	mg/kg	0.0062	0.0031	1	03/13/15 12:05	03/16/15 15:10	7439-97-6	
<b>8270 MSSV PAH by SIM</b> Analytical Method: EPA 8270 by SIM      Preparation Method: EPA 3546									
Acenaphthene	<b>&lt;9.8</b>	ug/kg	19.5	9.8	1	03/13/15 08:18	03/13/15 14:58	83-32-9	
Acenaphthylene	<b>16.6J</b>	ug/kg	19.5	8.7	1	03/13/15 08:18	03/13/15 14:58	208-96-8	
Anthracene	<b>77.5</b>	ug/kg	19.5	10.1	1	03/13/15 08:18	03/13/15 14:58	120-12-7	
Benzo(a)anthracene	<b>168</b>	ug/kg	19.5	6.8	1	03/13/15 08:18	03/13/15 14:58	56-55-3	
Benzo(a)pyrene	<b>178</b>	ug/kg	19.5	7.0	1	03/13/15 08:18	03/13/15 14:58	50-32-8	
Benzo(b)fluoranthene	<b>134</b>	ug/kg	19.5	9.8	1	03/13/15 08:18	03/13/15 14:58	205-99-2	
Benzo(g,h,i)perylene	<b>91.4</b>	ug/kg	19.5	7.4	1	03/13/15 08:18	03/13/15 14:58	191-24-2	
Benzo(k)fluoranthene	<b>139</b>	ug/kg	19.5	10.8	1	03/13/15 08:18	03/13/15 14:58	207-08-9	
Chrysene	<b>209</b>	ug/kg	19.5	9.0	1	03/13/15 08:18	03/13/15 14:58	218-01-9	
Dibenz(a,h)anthracene	<b>35.0</b>	ug/kg	19.5	7.2	1	03/13/15 08:18	03/13/15 14:58	53-70-3	
Fluoranthene	<b>254</b>	ug/kg	19.5	9.8	1	03/13/15 08:18	03/13/15 14:58	206-44-0	
Fluorene	<b>20.6</b>	ug/kg	19.5	9.8	1	03/13/15 08:18	03/13/15 14:58	86-73-7	L2
Indeno(1,2,3-cd)pyrene	<b>68.0</b>	ug/kg	19.5	7.4	1	03/13/15 08:18	03/13/15 14:58	193-39-5	
1-Methylnaphthalene	<b>&lt;9.8</b>	ug/kg	19.5	9.8	1	03/13/15 08:18	03/13/15 14:58	90-12-0	
2-Methylnaphthalene	<b>&lt;9.8</b>	ug/kg	19.5	9.8	1	03/13/15 08:18	03/13/15 14:58	91-57-6	
Naphthalene	<b>&lt;9.8</b>	ug/kg	19.5	9.8	1	03/13/15 08:18	03/13/15 14:58	91-20-3	
Phenanthrene	<b>172</b>	ug/kg	19.5	9.8	1	03/13/15 08:18	03/13/15 14:58	85-01-8	
Pyrene	<b>275</b>	ug/kg	19.5	9.8	1	03/13/15 08:18	03/13/15 14:58	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	58	%	39-130		1	03/13/15 08:18	03/13/15 14:58	321-60-8	
Terphenyl-d14 (S)	64	%	37-130		1	03/13/15 08:18	03/13/15 14:58	1718-51-0	
<b>8260 MSV Med Level Normal List</b> Analytical Method: EPA 8260      Preparation Method: EPA 5035/5030B									
Benzene	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	71-43-2	W
Bromobenzene	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	108-86-1	W
Bromochloromethane	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	74-97-5	W
Bromodichloromethane	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	75-27-4	W
Bromoform	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	75-25-2	L2,W
Bromomethane	<b>&lt;69.9</b>	ug/kg	250	69.9	1	03/13/15 07:30	03/13/15 13:13	74-83-9	W
n-Butylbenzene	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	104-51-8	W
sec-Butylbenzene	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	135-98-8	W
tert-Butylbenzene	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	98-06-6	W
Carbon tetrachloride	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	56-23-5	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Sample: GP-2 S2 Lab ID: 40111561002 Collected: 03/11/15 09:30 Received: 03/12/15 08:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/13/15 07:30	03/13/15 13:13	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/13/15 07:30	03/13/15 13:13	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/13/15 07:30	03/13/15 13:13	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	108-20-3	W
Ethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	100-41-4	W
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	87-68-3	W
Isopropylbenzene (Cumene)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	98-82-8	W
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	1634-04-4	W
Naphthalene	<40.0	ug/kg	250	40.0	1	03/13/15 07:30	03/13/15 13:13	91-20-3	W
n-Propylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	103-65-1	W
Styrene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	127-18-4	W
Toluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	108-88-3	W
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/13/15 07:30	03/13/15 13:13	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	75-69-4	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-2 S2**      **Lab ID: 40111561002**      Collected: 03/11/15 09:30      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	96-18-4	W
1,2,4-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	95-63-6	W
1,3,5-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	108-67-8	W
Vinyl chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:13	75-01-4	W
Xylene (Total)	<75.0	ug/kg	180	75.0	1	03/13/15 07:30	03/13/15 13:13	1330-20-7	W
<b>Surrogates</b>									
Dibromofluoromethane (S)	107	%	37-152		1	03/13/15 07:30	03/13/15 13:13	1868-53-7	
Toluene-d8 (S)	108	%	38-154		1	03/13/15 07:30	03/13/15 13:13	2037-26-5	
4-Bromofluorobenzene (S)	101	%	39-139		1	03/13/15 07:30	03/13/15 13:13	460-00-4	
<b>Percent Moisture</b>									
Analytical Method: ASTM D2974-87									
Percent Moisture	14.7	%	0.10	0.10	1		03/16/15 11:25		

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-2 S4**      **Lab ID: 40111561003**      Collected: 03/11/15 09:35      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b>									
Analytical Method: EPA 6010 Preparation Method: EPA 3050									
Arsenic	5.8	mg/kg	2.1	0.68	1	03/16/15 07:20	03/17/15 19:49	7440-38-2	
Barium	40.2	mg/kg	0.54	0.13	1	03/16/15 07:20	03/17/15 19:49	7440-39-3	
Cadmium	<0.071	mg/kg	0.54	0.071	1	03/16/15 07:20	03/17/15 19:49	7440-43-9	
Chromium	12.5	mg/kg	0.54	0.21	1	03/16/15 07:20	03/17/15 19:49	7440-47-3	
Lead	3.4	mg/kg	1.1	0.46	1	03/16/15 07:20	03/17/15 19:49	7439-92-1	
Selenium	<0.83	mg/kg	2.1	0.83	1	03/16/15 07:20	03/17/15 19:49	7782-49-2	
Silver	<0.30	mg/kg	1.1	0.30	1	03/16/15 07:20	03/17/15 19:49	7440-22-4	
<b>7471 Mercury</b>									
Analytical Method: EPA 7471 Preparation Method: EPA 7471									
Mercury	0.0062J	mg/kg	0.0074	0.0037	1	03/13/15 12:05	03/16/15 15:13	7439-97-6	
<b>8270 MSSV PAH by SIM</b>									
Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546									
Acenaphthene	<10	ug/kg	20.0	10	1	03/13/15 08:18	03/13/15 12:23	83-32-9	
Acenaphthylene	<8.9	ug/kg	20.0	8.9	1	03/13/15 08:18	03/13/15 12:23	208-96-8	
Anthracene	<10.4	ug/kg	20.0	10.4	1	03/13/15 08:18	03/13/15 12:23	120-12-7	
Benzo(a)anthracene	<6.9	ug/kg	20.0	6.9	1	03/13/15 08:18	03/13/15 12:23	56-55-3	
Benzo(a)pyrene	<7.1	ug/kg	20.0	7.1	1	03/13/15 08:18	03/13/15 12:23	50-32-8	
Benzo(b)fluoranthene	<10	ug/kg	20.0	10	1	03/13/15 08:18	03/13/15 12:23	205-99-2	
Benzo(g,h,i)perylene	<7.6	ug/kg	20.0	7.6	1	03/13/15 08:18	03/13/15 12:23	191-24-2	
Benzo(k)fluoranthene	<11.0	ug/kg	20.0	11.0	1	03/13/15 08:18	03/13/15 12:23	207-08-9	
Chrysene	<9.2	ug/kg	20.0	9.2	1	03/13/15 08:18	03/13/15 12:23	218-01-9	
Dibenz(a,h)anthracene	<7.3	ug/kg	20.0	7.3	1	03/13/15 08:18	03/13/15 12:23	53-70-3	
Fluoranthene	<10	ug/kg	20.0	10	1	03/13/15 08:18	03/13/15 12:23	206-44-0	
Fluorene	<10	ug/kg	20.0	10	1	03/13/15 08:18	03/13/15 12:23	86-73-7	L2
Indeno(1,2,3-cd)pyrene	<7.6	ug/kg	20.0	7.6	1	03/13/15 08:18	03/13/15 12:23	193-39-5	
1-Methylnaphthalene	<10	ug/kg	20.0	10	1	03/13/15 08:18	03/13/15 12:23	90-12-0	
2-Methylnaphthalene	<10	ug/kg	20.0	10	1	03/13/15 08:18	03/13/15 12:23	91-57-6	
Naphthalene	<10	ug/kg	20.0	10	1	03/13/15 08:18	03/13/15 12:23	91-20-3	
Phenanthrene	<10	ug/kg	20.0	10	1	03/13/15 08:18	03/13/15 12:23	85-01-8	
Pyrene	<10	ug/kg	20.0	10	1	03/13/15 08:18	03/13/15 12:23	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	70	%	39-130		1	03/13/15 08:18	03/13/15 12:23	321-60-8	
Terphenyl-d14 (S)	91	%	37-130		1	03/13/15 08:18	03/13/15 12:23	1718-51-0	
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Benzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	71-43-2	W
Bromobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	108-86-1	W
Bromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	74-97-5	W
Bromodichloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	75-27-4	W
Bromoform	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	75-25-2	L2,W
Bromomethane	<69.9	ug/kg	250	69.9	1	03/13/15 07:30	03/13/15 13:35	74-83-9	W
n-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	104-51-8	W
sec-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	135-98-8	W
tert-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	98-06-6	W
Carbon tetrachloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	56-23-5	W

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-2 S4**      **Lab ID: 40111561003**      Collected: 03/11/15 09:35      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260    Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/13/15 07:30	03/13/15 13:35	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/13/15 07:30	03/13/15 13:35	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/13/15 07:30	03/13/15 13:35	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	108-20-3	W
Ethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	100-41-4	W
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	87-68-3	W
Isopropylbenzene (Cumene)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	98-82-8	W
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	1634-04-4	W
Naphthalene	<40.0	ug/kg	250	40.0	1	03/13/15 07:30	03/13/15 13:35	91-20-3	W
n-Propylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	103-65-1	W
Styrene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	127-18-4	W
Toluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	108-88-3	W
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/13/15 07:30	03/13/15 13:35	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	75-69-4	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-2 S4**      **Lab ID: 40111561003**      Collected: 03/11/15 09:35      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	96-18-4	W
1,2,4-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	95-63-6	W
1,3,5-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	108-67-8	W
Vinyl chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:35	75-01-4	W
Xylene (Total)	<75.0	ug/kg	180	75.0	1	03/13/15 07:30	03/13/15 13:35	1330-20-7	W
<b>Surrogates</b>									
Dibromofluoromethane (S)	114	%	37-152		1	03/13/15 07:30	03/13/15 13:35	1868-53-7	
Toluene-d8 (S)	121	%	38-154		1	03/13/15 07:30	03/13/15 13:35	2037-26-5	
4-Bromofluorobenzene (S)	109	%	39-139		1	03/13/15 07:30	03/13/15 13:35	460-00-4	
<b>Percent Moisture</b>									
Analytical Method: ASTM D2974-87									
Percent Moisture	<b>16.5</b>	%	0.10	0.10	1		03/16/15 11:25		

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample:** GP-3 S1      **Lab ID:** 40111561004      Collected: 03/11/15 10:00      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b>									
Analytical Method: EPA 6010 Preparation Method: EPA 3050									
Arsenic	5.0J	mg/kg	9.5	3.0	5	03/16/15 07:20	03/17/15 19:52	7440-38-2	D3
Barium	144	mg/kg	0.47	0.11	1	03/16/15 07:20	03/17/15 19:54	7440-39-3	
Cadmium	1.5	mg/kg	0.47	0.063	1	03/16/15 07:20	03/17/15 19:54	7440-43-9	
Chromium	8.9	mg/kg	0.47	0.18	1	03/16/15 07:20	03/17/15 19:54	7440-47-3	
Lead	137	mg/kg	0.95	0.41	1	03/16/15 07:20	03/17/15 19:54	7439-92-1	
Selenium	<0.73	mg/kg	1.9	0.73	1	03/16/15 07:20	03/17/15 19:54	7782-49-2	
Silver	0.30J	mg/kg	0.95	0.26	1	03/16/15 07:20	03/17/15 19:54	7440-22-4	
<b>7471 Mercury</b>									
Analytical Method: EPA 7471 Preparation Method: EPA 7471									
Mercury	0.083	mg/kg	0.0068	0.0034	1	03/13/15 12:05	03/16/15 15:15	7439-97-6	
<b>8270 MSSV PAH by SIM</b>									
Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546									
Acenaphthene	74.2J	ug/kg	91.8	45.9	5	03/13/15 08:18	03/13/15 16:25	83-32-9	
Acenaphthylene	127	ug/kg	91.8	41.1	5	03/13/15 08:18	03/13/15 16:25	208-96-8	
Anthracene	433	ug/kg	91.8	47.6	5	03/13/15 08:18	03/13/15 16:25	120-12-7	
Benzo(a)anthracene	815	ug/kg	91.8	31.8	5	03/13/15 08:18	03/13/15 16:25	56-55-3	
Benzo(a)pyrene	942	ug/kg	91.8	32.8	5	03/13/15 08:18	03/13/15 16:25	50-32-8	
Benzo(b)fluoranthene	951	ug/kg	91.8	45.9	5	03/13/15 08:18	03/13/15 16:25	205-99-2	
Benzo(g,h,i)perylene	595	ug/kg	91.8	35.0	5	03/13/15 08:18	03/13/15 16:25	191-24-2	
Benzo(k)fluoranthene	835	ug/kg	91.8	50.8	5	03/13/15 08:18	03/13/15 16:25	207-08-9	
Chrysene	907	ug/kg	91.8	42.5	5	03/13/15 08:18	03/13/15 16:25	218-01-9	
Dibenz(a,h)anthracene	180	ug/kg	91.8	33.7	5	03/13/15 08:18	03/13/15 16:25	53-70-3	
Fluoranthene	1510	ug/kg	91.8	45.9	5	03/13/15 08:18	03/13/15 16:25	206-44-0	
Fluorene	110	ug/kg	91.8	45.9	5	03/13/15 08:18	03/13/15 16:25	86-73-7	L2
Indeno(1,2,3-cd)pyrene	527	ug/kg	91.8	34.9	5	03/13/15 08:18	03/13/15 16:25	193-39-5	
1-Methylnaphthalene	<45.9	ug/kg	91.8	45.9	5	03/13/15 08:18	03/13/15 16:25	90-12-0	
2-Methylnaphthalene	<45.9	ug/kg	91.8	45.9	5	03/13/15 08:18	03/13/15 16:25	91-57-6	
Naphthalene	63.0J	ug/kg	91.8	45.9	5	03/13/15 08:18	03/13/15 16:25	91-20-3	
Phenanthrene	1050	ug/kg	91.8	45.9	5	03/13/15 08:18	03/13/15 16:25	85-01-8	
Pyrene	1580	ug/kg	91.8	45.9	5	03/13/15 08:18	03/13/15 16:25	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	52	%	39-130		5	03/13/15 08:18	03/13/15 16:25	321-60-8	
Terphenyl-d14 (S)	63	%	37-130		5	03/13/15 08:18	03/13/15 16:25	1718-51-0	
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Benzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	71-43-2	W
Bromobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	108-86-1	W
Bromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	74-97-5	W
Bromodichloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	75-27-4	W
Bromoform	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	75-25-2	L2,W
Bromomethane	<69.9	ug/kg	250	69.9	1	03/13/15 07:30	03/13/15 13:58	74-83-9	W
n-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	104-51-8	W
sec-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	135-98-8	W
tert-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	98-06-6	W
Carbon tetrachloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	56-23-5	W

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-3 S1**      **Lab ID: 40111561004**      Collected: 03/11/15 10:00      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260    Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/13/15 07:30	03/13/15 13:58	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/13/15 07:30	03/13/15 13:58	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/13/15 07:30	03/13/15 13:58	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	108-20-3	W
Ethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	100-41-4	W
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	87-68-3	W
Isopropylbenzene (Cumene)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	98-82-8	W
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	1634-04-4	W
Naphthalene	54.1J	ug/kg	275	44.1	1	03/13/15 07:30	03/13/15 13:58	91-20-3	W
n-Propylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	103-65-1	W
Styrene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	127-18-4	W
Toluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	108-88-3	W
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/13/15 07:30	03/13/15 13:58	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	75-69-4	W

### REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-3 S1**      **Lab ID: 40111561004**      Collected: 03/11/15 10:00      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	96-18-4	W
1,2,4-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	95-63-6	W
1,3,5-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	108-67-8	W
Vinyl chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 13:58	75-01-4	W
Xylene (Total)	<75.0	ug/kg	180	75.0	1	03/13/15 07:30	03/13/15 13:58	1330-20-7	W
<b>Surrogates</b>									
Dibromofluoromethane (S)	131	%	37-152		1	03/13/15 07:30	03/13/15 13:58	1868-53-7	
Toluene-d8 (S)	134	%	38-154		1	03/13/15 07:30	03/13/15 13:58	2037-26-5	
4-Bromofluorobenzene (S)	116	%	39-139		1	03/13/15 07:30	03/13/15 13:58	460-00-4	
<b>Percent Moisture</b>		Analytical Method: ASTM D2974-87							
Percent Moisture	9.2	%	0.10	0.10	1		03/16/15 11:26		

## REPORT OF LABORATORY ANALYSIS

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-3 S4**      **Lab ID: 40111561005**      Collected: 03/11/15 10:00      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b>									
Analytical Method: EPA 6010 Preparation Method: EPA 3050									
Arsenic	15.7	mg/kg	2.2	0.70	1	03/16/15 07:20	03/17/15 19:56	7440-38-2	
Barium	44.8	mg/kg	0.55	0.13	1	03/16/15 07:20	03/17/15 19:56	7440-39-3	
Cadmium	0.089J	mg/kg	0.55	0.073	1	03/16/15 07:20	03/17/15 19:56	7440-43-9	
Chromium	13.4	mg/kg	0.55	0.21	1	03/16/15 07:20	03/17/15 19:56	7440-47-3	
Lead	5.6	mg/kg	1.1	0.48	1	03/16/15 07:20	03/17/15 19:56	7439-92-1	
Selenium	<0.85	mg/kg	2.2	0.85	1	03/16/15 07:20	03/17/15 19:56	7782-49-2	
Silver	0.44J	mg/kg	1.1	0.31	1	03/16/15 07:20	03/17/15 19:56	7440-22-4	
<b>7471 Mercury</b>									
Analytical Method: EPA 7471 Preparation Method: EPA 7471									
Mercury	0.0093	mg/kg	0.0074	0.0037	1	03/13/15 12:05	03/16/15 15:17	7439-97-6	
<b>8270 MSSV PAH by SIM</b>									
Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546									
Acenaphthene	<9.7	ug/kg	19.4	9.7	1	03/13/15 08:18	03/13/15 12:40	83-32-9	
Acenaphthylene	<8.7	ug/kg	19.4	8.7	1	03/13/15 08:18	03/13/15 12:40	208-96-8	
Anthracene	<10.0	ug/kg	19.4	10.0	1	03/13/15 08:18	03/13/15 12:40	120-12-7	
Benzo(a)anthracene	<6.7	ug/kg	19.4	6.7	1	03/13/15 08:18	03/13/15 12:40	56-55-3	
Benzo(a)pyrene	<6.9	ug/kg	19.4	6.9	1	03/13/15 08:18	03/13/15 12:40	50-32-8	
Benzo(b)fluoranthene	<9.7	ug/kg	19.4	9.7	1	03/13/15 08:18	03/13/15 12:40	205-99-2	
Benzo(g,h,i)perylene	<7.4	ug/kg	19.4	7.4	1	03/13/15 08:18	03/13/15 12:40	191-24-2	
Benzo(k)fluoranthene	<10.7	ug/kg	19.4	10.7	1	03/13/15 08:18	03/13/15 12:40	207-08-9	
Chrysene	<8.9	ug/kg	19.4	8.9	1	03/13/15 08:18	03/13/15 12:40	218-01-9	
Dibenz(a,h)anthracene	<7.1	ug/kg	19.4	7.1	1	03/13/15 08:18	03/13/15 12:40	53-70-3	
Fluoranthene	<9.7	ug/kg	19.4	9.7	1	03/13/15 08:18	03/13/15 12:40	206-44-0	
Fluorene	<9.7	ug/kg	19.4	9.7	1	03/13/15 08:18	03/13/15 12:40	86-73-7	L2
Indeno(1,2,3-cd)pyrene	<7.4	ug/kg	19.4	7.4	1	03/13/15 08:18	03/13/15 12:40	193-39-5	
1-Methylnaphthalene	<9.7	ug/kg	19.4	9.7	1	03/13/15 08:18	03/13/15 12:40	90-12-0	
2-Methylnaphthalene	<9.7	ug/kg	19.4	9.7	1	03/13/15 08:18	03/13/15 12:40	91-57-6	
Naphthalene	<9.7	ug/kg	19.4	9.7	1	03/13/15 08:18	03/13/15 12:40	91-20-3	
Phenanthrene	<9.7	ug/kg	19.4	9.7	1	03/13/15 08:18	03/13/15 12:40	85-01-8	
Pyrene	<9.7	ug/kg	19.4	9.7	1	03/13/15 08:18	03/13/15 12:40	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	65	%	39-130		1	03/13/15 08:18	03/13/15 12:40	321-60-8	
Terphenyl-d14 (S)	80	%	37-130		1	03/13/15 08:18	03/13/15 12:40	1718-51-0	
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Benzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	71-43-2	W
Bromobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	108-86-1	W
Bromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	74-97-5	W
Bromodichloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	75-27-4	W
Bromoform	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	75-25-2	L2,W
Bromomethane	<69.9	ug/kg	250	69.9	1	03/13/15 07:30	03/13/15 14:21	74-83-9	W
n-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	104-51-8	W
sec-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	135-98-8	W
tert-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	98-06-6	W
Carbon tetrachloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	56-23-5	W

### REPORT OF LABORATORY ANALYSIS

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-3 S4**      **Lab ID: 40111561005**      Collected: 03/11/15 10:00      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260    Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/13/15 07:30	03/13/15 14:21	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/13/15 07:30	03/13/15 14:21	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/13/15 07:30	03/13/15 14:21	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	108-20-3	W
Ethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	100-41-4	W
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	87-68-3	W
Isopropylbenzene (Cumene)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	98-82-8	W
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	1634-04-4	W
Naphthalene	<40.0	ug/kg	250	40.0	1	03/13/15 07:30	03/13/15 14:21	91-20-3	W
n-Propylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	103-65-1	W
Styrene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	127-18-4	W
Toluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	108-88-3	W
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/13/15 07:30	03/13/15 14:21	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	75-69-4	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-3 S4**      **Lab ID: 40111561005**      Collected: 03/11/15 10:00      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	96-18-4	W
1,2,4-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	95-63-6	W
1,3,5-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	108-67-8	W
Vinyl chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:21	75-01-4	W
Xylene (Total)	<75.0	ug/kg	180	75.0	1	03/13/15 07:30	03/13/15 14:21	1330-20-7	W
<b>Surrogates</b>									
Dibromofluoromethane (S)	90	%	37-152		1	03/13/15 07:30	03/13/15 14:21	1868-53-7	
Toluene-d8 (S)	96	%	38-154		1	03/13/15 07:30	03/13/15 14:21	2037-26-5	
4-Bromofluorobenzene (S)	86	%	39-139		1	03/13/15 07:30	03/13/15 14:21	460-00-4	
<b>Percent Moisture</b>									
Analytical Method: ASTM D2974-87									
Percent Moisture	<b>13.9</b>	%	0.10	0.10	1		03/16/15 11:26		

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-3 S5**      **Lab ID: 40111561006**      Collected: 03/11/15 10:15      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b>									
Analytical Method: EPA 6010 Preparation Method: EPA 3050									
Arsenic	4.1	mg/kg	2.1	0.66	1	03/16/15 07:20	03/17/15 19:59	7440-38-2	
Barium	66.4	mg/kg	0.52	0.12	1	03/16/15 07:20	03/17/15 19:59	7440-39-3	
Cadmium	0.10J	mg/kg	0.52	0.069	1	03/16/15 07:20	03/17/15 19:59	7440-43-9	
Chromium	17.8	mg/kg	0.52	0.20	1	03/16/15 07:20	03/17/15 19:59	7440-47-3	
Lead	6.8	mg/kg	1.0	0.45	1	03/16/15 07:20	03/17/15 19:59	7439-92-1	
Selenium	<0.80	mg/kg	2.1	0.80	1	03/16/15 07:20	03/17/15 19:59	7782-49-2	
Silver	0.38J	mg/kg	1.0	0.29	1	03/16/15 07:20	03/17/15 19:59	7440-22-4	
<b>7471 Mercury</b>									
Analytical Method: EPA 7471 Preparation Method: EPA 7471									
Mercury	0.010	mg/kg	0.0063	0.0032	1	03/13/15 12:05	03/16/15 15:20	7439-97-6	
<b>8270 MSSV PAH by SIM</b>									
Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546									
Acenaphthene	<10	ug/kg	19.9	10	1	03/13/15 08:18	03/13/15 12:57	83-32-9	
Acenaphthylene	<8.9	ug/kg	19.9	8.9	1	03/13/15 08:18	03/13/15 12:57	208-96-8	
Anthracene	<10.3	ug/kg	19.9	10.3	1	03/13/15 08:18	03/13/15 12:57	120-12-7	
Benzo(a)anthracene	<6.9	ug/kg	19.9	6.9	1	03/13/15 08:18	03/13/15 12:57	56-55-3	
Benzo(a)pyrene	<7.1	ug/kg	19.9	7.1	1	03/13/15 08:18	03/13/15 12:57	50-32-8	
Benzo(b)fluoranthene	<10	ug/kg	19.9	10	1	03/13/15 08:18	03/13/15 12:57	205-99-2	
Benzo(g,h,i)perylene	<7.6	ug/kg	19.9	7.6	1	03/13/15 08:18	03/13/15 12:57	191-24-2	
Benzo(k)fluoranthene	<11.0	ug/kg	19.9	11.0	1	03/13/15 08:18	03/13/15 12:57	207-08-9	
Chrysene	<9.2	ug/kg	19.9	9.2	1	03/13/15 08:18	03/13/15 12:57	218-01-9	
Dibenz(a,h)anthracene	<7.3	ug/kg	19.9	7.3	1	03/13/15 08:18	03/13/15 12:57	53-70-3	
Fluoranthene	<10	ug/kg	19.9	10	1	03/13/15 08:18	03/13/15 12:57	206-44-0	
Fluorene	<10	ug/kg	19.9	10	1	03/13/15 08:18	03/13/15 12:57	86-73-7	L2
Indeno(1,2,3-cd)pyrene	<7.6	ug/kg	19.9	7.6	1	03/13/15 08:18	03/13/15 12:57	193-39-5	
1-Methylnaphthalene	54.2	ug/kg	19.9	10	1	03/13/15 08:18	03/13/15 12:57	90-12-0	
2-Methylnaphthalene	31.7	ug/kg	19.9	10	1	03/13/15 08:18	03/13/15 12:57	91-57-6	
Naphthalene	<10	ug/kg	19.9	10	1	03/13/15 08:18	03/13/15 12:57	91-20-3	
Phenanthrene	<10	ug/kg	19.9	10	1	03/13/15 08:18	03/13/15 12:57	85-01-8	
Pyrene	<10	ug/kg	19.9	10	1	03/13/15 08:18	03/13/15 12:57	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	54	%	39-130		1	03/13/15 08:18	03/13/15 12:57	321-60-8	
Terphenyl-d14 (S)	87	%	37-130		1	03/13/15 08:18	03/13/15 12:57	1718-51-0	
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Benzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	71-43-2	W
Bromobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	108-86-1	W
Bromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	74-97-5	W
Bromodichloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	75-27-4	W
Bromoform	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	75-25-2	L2,W
Bromomethane	<69.9	ug/kg	250	69.9	1	03/13/15 07:30	03/13/15 14:43	74-83-9	W
n-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	104-51-8	W
sec-Butylbenzene	58.2J	ug/kg	71.7	29.9	1	03/13/15 07:30	03/13/15 14:43	135-98-8	
tert-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	98-06-6	W
Carbon tetrachloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	56-23-5	W

## REPORT OF LABORATORY ANALYSIS

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-3 S5**      **Lab ID: 40111561006**      Collected: 03/11/15 10:15      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260    Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/13/15 07:30	03/13/15 14:43	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/13/15 07:30	03/13/15 14:43	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/13/15 07:30	03/13/15 14:43	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	108-20-3	W
Ethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	100-41-4	W
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	87-68-3	W
Isopropylbenzene (Cumene)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	98-82-8	W
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	1634-04-4	W
Naphthalene	<40.0	ug/kg	250	40.0	1	03/13/15 07:30	03/13/15 14:43	91-20-3	W
n-Propylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	103-65-1	W
Styrene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	127-18-4	W
Toluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	108-88-3	W
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/13/15 07:30	03/13/15 14:43	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	75-69-4	W

### REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-3 S5**      **Lab ID: 40111561006**      Collected: 03/11/15 10:15      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	96-18-4	W
1,2,4-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	95-63-6	W
1,3,5-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	108-67-8	W
Vinyl chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 14:43	75-01-4	W
Xylene (Total)	<75.0	ug/kg	180	75.0	1	03/13/15 07:30	03/13/15 14:43	1330-20-7	W
<b>Surrogates</b>									
Dibromofluoromethane (S)	99	%	37-152		1	03/13/15 07:30	03/13/15 14:43	1868-53-7	
Toluene-d8 (S)	105	%	38-154		1	03/13/15 07:30	03/13/15 14:43	2037-26-5	
4-Bromofluorobenzene (S)	94	%	39-139		1	03/13/15 07:30	03/13/15 14:43	460-00-4	
<b>Percent Moisture</b>		Analytical Method: ASTM D2974-87							
Percent Moisture	<b>16.3</b>	%	0.10	0.10	1		03/16/15 11:26		

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Sample: GP-4 S1 Lab ID: 40111561007 Collected: 03/11/15 12:30 Received: 03/12/15 08:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b>									
Analytical Method: EPA 6010 Preparation Method: EPA 3050									
Arsenic	6.7	mg/kg	1.9	0.59	1	03/16/15 07:20	03/17/15 20:05	7440-38-2	
Barium	42.1	mg/kg	0.46	0.11	1	03/16/15 07:20	03/17/15 20:05	7440-39-3	
Cadmium	0.48	mg/kg	0.46	0.061	1	03/16/15 07:20	03/17/15 20:05	7440-43-9	
Chromium	8.3	mg/kg	0.46	0.18	1	03/16/15 07:20	03/17/15 20:05	7440-47-3	
Lead	46.3	mg/kg	0.93	0.40	1	03/16/15 07:20	03/17/15 20:05	7439-92-1	
Selenium	<0.71	mg/kg	1.9	0.71	1	03/16/15 07:20	03/17/15 20:05	7782-49-2	
Silver	0.38J	mg/kg	0.93	0.26	1	03/16/15 07:20	03/17/15 20:05	7440-22-4	
<b>7471 Mercury</b>									
Analytical Method: EPA 7471 Preparation Method: EPA 7471									
Mercury	0.053	mg/kg	0.0073	0.0037	1	03/13/15 12:05	03/16/15 15:27	7439-97-6	
<b>8270 MSSV PAH by SIM</b>									
Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546									
Acenaphthene	<9.2	ug/kg	18.3	9.2	1	03/13/15 08:18	03/13/15 14:07	83-32-9	
Acenaphthylene	10.4J	ug/kg	18.3	8.2	1	03/13/15 08:18	03/13/15 14:07	208-96-8	
Anthracene	14.0J	ug/kg	18.3	9.5	1	03/13/15 08:18	03/13/15 14:07	120-12-7	
Benzo(a)anthracene	24.0	ug/kg	18.3	6.3	1	03/13/15 08:18	03/13/15 14:07	56-55-3	
Benzo(a)pyrene	22.6	ug/kg	18.3	6.5	1	03/13/15 08:18	03/13/15 14:07	50-32-8	
Benzo(b)fluoranthene	26.3	ug/kg	18.3	9.2	1	03/13/15 08:18	03/13/15 14:07	205-99-2	
Benzo(g,h,i)perylene	16.9J	ug/kg	18.3	7.0	1	03/13/15 08:18	03/13/15 14:07	191-24-2	
Benzo(k)fluoranthene	30.5	ug/kg	18.3	10.1	1	03/13/15 08:18	03/13/15 14:07	207-08-9	
Chrysene	36.7	ug/kg	18.3	8.5	1	03/13/15 08:18	03/13/15 14:07	218-01-9	
Dibenz(a,h)anthracene	<6.7	ug/kg	18.3	6.7	1	03/13/15 08:18	03/13/15 14:07	53-70-3	
Fluoranthene	42.7	ug/kg	18.3	9.2	1	03/13/15 08:18	03/13/15 14:07	206-44-0	
Fluorene	<9.2	ug/kg	18.3	9.2	1	03/13/15 08:18	03/13/15 14:07	86-73-7	L2
Indeno(1,2,3-cd)pyrene	11.6J	ug/kg	18.3	7.0	1	03/13/15 08:18	03/13/15 14:07	193-39-5	
1-Methylnaphthalene	24.9	ug/kg	18.3	9.2	1	03/13/15 08:18	03/13/15 14:07	90-12-0	
2-Methylnaphthalene	39.6	ug/kg	18.3	9.2	1	03/13/15 08:18	03/13/15 14:07	91-57-6	
Naphthalene	37.6	ug/kg	18.3	9.2	1	03/13/15 08:18	03/13/15 14:07	91-20-3	
Phenanthrene	38.5	ug/kg	18.3	9.2	1	03/13/15 08:18	03/13/15 14:07	85-01-8	
Pyrene	40.2	ug/kg	18.3	9.2	1	03/13/15 08:18	03/13/15 14:07	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	61	%	39-130		1	03/13/15 08:18	03/13/15 14:07	321-60-8	
Terphenyl-d14 (S)	71	%	37-130		1	03/13/15 08:18	03/13/15 14:07	1718-51-0	
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Benzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	71-43-2	W
Bromobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	108-86-1	W
Bromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	74-97-5	W
Bromodichloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	75-27-4	W
Bromoform	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	75-25-2	L2,W
Bromomethane	<69.9	ug/kg	250	69.9	1	03/13/15 07:30	03/13/15 15:06	74-83-9	W
n-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	104-51-8	W
sec-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	135-98-8	W
tert-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	98-06-6	W
Carbon tetrachloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	56-23-5	W

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Sample: GP-4 S1 Lab ID: 40111561007 Collected: 03/11/15 12:30 Received: 03/12/15 08:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/13/15 07:30	03/13/15 15:06	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/13/15 07:30	03/13/15 15:06	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/13/15 07:30	03/13/15 15:06	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	108-20-3	W
Ethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	100-41-4	W
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	87-68-3	W
Isopropylbenzene (Cumene)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	98-82-8	W
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	1634-04-4	W
Naphthalene	100J	ug/kg	275	44.0	1	03/13/15 07:30	03/13/15 15:06	91-20-3	
n-Propylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	103-65-1	W
Styrene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	127-18-4	W
Toluene	66.5	ug/kg	65.9	27.5	1	03/13/15 07:30	03/13/15 15:06	108-88-3	
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/13/15 07:30	03/13/15 15:06	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	75-69-4	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-4 S1**      **Lab ID: 40111561007**      Collected: 03/11/15 12:30      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	96-18-4	W
1,2,4-Trimethylbenzene	<b>43.3J</b>	ug/kg	65.9	27.5	1	03/13/15 07:30	03/13/15 15:06	95-63-6	
1,3,5-Trimethylbenzene	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	108-67-8	W
Vinyl chloride	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:06	75-01-4	W
Xylene (Total)	<b>122J</b>	ug/kg	198	82.4	1	03/13/15 07:30	03/13/15 15:06	1330-20-7	
<b>Surrogates</b>									
Dibromofluoromethane (S)	98	%	37-152		1	03/13/15 07:30	03/13/15 15:06	1868-53-7	
Toluene-d8 (S)	105	%	38-154		1	03/13/15 07:30	03/13/15 15:06	2037-26-5	
4-Bromofluorobenzene (S)	95	%	39-139		1	03/13/15 07:30	03/13/15 15:06	460-00-4	
<b>Percent Moisture</b>		Analytical Method: ASTM D2974-87							
Percent Moisture	<b>9.0</b>	%	0.10	0.10	1		03/16/15 11:26		

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-4 S4**      **Lab ID: 40111561008**      Collected: 03/11/15 12:30      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b>									
Analytical Method: EPA 6010 Preparation Method: EPA 3050									
Arsenic	5.0	mg/kg	2.4	0.76	1	03/16/15 07:20	03/17/15 20:08	7440-38-2	
Barium	55.1	mg/kg	0.60	0.14	1	03/16/15 07:20	03/17/15 20:08	7440-39-3	
Cadmium	<0.079	mg/kg	0.60	0.079	1	03/16/15 07:20	03/17/15 20:08	7440-43-9	
Chromium	14.1	mg/kg	0.60	0.23	1	03/16/15 07:20	03/17/15 20:08	7440-47-3	
Lead	5.2	mg/kg	1.2	0.51	1	03/16/15 07:20	03/17/15 20:08	7439-92-1	
Selenium	<0.92	mg/kg	2.4	0.92	1	03/16/15 07:20	03/17/15 20:08	7782-49-2	
Silver	<0.33	mg/kg	1.2	0.33	1	03/16/15 07:20	03/17/15 20:08	7440-22-4	
<b>7471 Mercury</b>									
Analytical Method: EPA 7471 Preparation Method: EPA 7471									
Mercury	0.0087	mg/kg	0.0070	0.0035	1	03/13/15 12:05	03/16/15 15:29	7439-97-6	
<b>8270 MSSV PAH by SIM</b>									
Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546									
Acenaphthene	<10.1	ug/kg	20.2	10.1	1	03/13/15 08:18	03/13/15 13:15	83-32-9	
Acenaphthylene	<9.0	ug/kg	20.2	9.0	1	03/13/15 08:18	03/13/15 13:15	208-96-8	
Anthracene	<10.5	ug/kg	20.2	10.5	1	03/13/15 08:18	03/13/15 13:15	120-12-7	
Benzo(a)anthracene	<7.0	ug/kg	20.2	7.0	1	03/13/15 08:18	03/13/15 13:15	56-55-3	
Benzo(a)pyrene	<7.2	ug/kg	20.2	7.2	1	03/13/15 08:18	03/13/15 13:15	50-32-8	
Benzo(b)fluoranthene	<10.1	ug/kg	20.2	10.1	1	03/13/15 08:18	03/13/15 13:15	205-99-2	
Benzo(g,h,i)perylene	<7.7	ug/kg	20.2	7.7	1	03/13/15 08:18	03/13/15 13:15	191-24-2	
Benzo(k)fluoranthene	<11.2	ug/kg	20.2	11.2	1	03/13/15 08:18	03/13/15 13:15	207-08-9	
Chrysene	<9.3	ug/kg	20.2	9.3	1	03/13/15 08:18	03/13/15 13:15	218-01-9	
Dibenz(a,h)anthracene	<7.4	ug/kg	20.2	7.4	1	03/13/15 08:18	03/13/15 13:15	53-70-3	
Fluoranthene	13.9J	ug/kg	20.2	10.1	1	03/13/15 08:18	03/13/15 13:15	206-44-0	
Fluorene	<10.1	ug/kg	20.2	10.1	1	03/13/15 08:18	03/13/15 13:15	86-73-7	L2
Indeno(1,2,3-cd)pyrene	<7.7	ug/kg	20.2	7.7	1	03/13/15 08:18	03/13/15 13:15	193-39-5	
1-Methylnaphthalene	191	ug/kg	20.2	10.1	1	03/13/15 08:18	03/13/15 13:15	90-12-0	
2-Methylnaphthalene	496	ug/kg	20.2	10.1	1	03/13/15 08:18	03/13/15 13:15	91-57-6	
Naphthalene	447	ug/kg	20.2	10.1	1	03/13/15 08:18	03/13/15 13:15	91-20-3	
Phenanthrene	17.7J	ug/kg	20.2	10.1	1	03/13/15 08:18	03/13/15 13:15	85-01-8	
Pyrene	10.3J	ug/kg	20.2	10.1	1	03/13/15 08:18	03/13/15 13:15	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	58	%	39-130		1	03/13/15 08:18	03/13/15 13:15	321-60-8	
Terphenyl-d14 (S)	67	%	37-130		1	03/13/15 08:18	03/13/15 13:15	1718-51-0	
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Benzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	71-43-2	W
Bromobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	108-86-1	W
Bromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	74-97-5	W
Bromodichloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	75-27-4	W
Bromoform	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	75-25-2	L2,W
Bromomethane	<69.9	ug/kg	250	69.9	1	03/13/15 07:30	03/13/15 18:07	74-83-9	W
n-Butylbenzene	631	ug/kg	72.8	30.3	1	03/13/15 07:30	03/13/15 18:07	104-51-8	
sec-Butylbenzene	305	ug/kg	72.8	30.3	1	03/13/15 07:30	03/13/15 18:07	135-98-8	
tert-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	98-06-6	W
Carbon tetrachloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	56-23-5	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Sample: **GP-4 S4** Lab ID: **40111561008** Collected: 03/11/15 12:30 Received: 03/12/15 08:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/13/15 07:30	03/13/15 18:07	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/13/15 07:30	03/13/15 18:07	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/13/15 07:30	03/13/15 18:07	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	108-20-3	W
Ethylbenzene	331	ug/kg	72.8	30.3	1	03/13/15 07:30	03/13/15 18:07	100-41-4	
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	87-68-3	W
Isopropylbenzene (Cumene)	495	ug/kg	72.8	30.3	1	03/13/15 07:30	03/13/15 18:07	98-82-8	
p-Isopropyltoluene	564	ug/kg	72.8	30.3	1	03/13/15 07:30	03/13/15 18:07	99-87-6	
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	1634-04-4	W
Naphthalene	992	ug/kg	303	48.6	1	03/13/15 07:30	03/13/15 18:07	91-20-3	
n-Propylbenzene	945	ug/kg	72.8	30.3	1	03/13/15 07:30	03/13/15 18:07	103-65-1	
Styrene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	127-18-4	W
Toluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	108-88-3	W
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/13/15 07:30	03/13/15 18:07	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	75-69-4	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-4 S4**      **Lab ID: 40111561008**      Collected: 03/11/15 12:30      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260    Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	96-18-4	W
1,2,4-Trimethylbenzene	145	ug/kg	72.8	30.3	1	03/13/15 07:30	03/13/15 18:07	95-63-6	
1,3,5-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	108-67-8	W
Vinyl chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 18:07	75-01-4	W
Xylene (Total)	97.1J	ug/kg	218	90.9	1	03/13/15 07:30	03/13/15 18:07	1330-20-7	
<b>Surrogates</b>									
Dibromofluoromethane (S)	88	%	37-152		1	03/13/15 07:30	03/13/15 18:07	1868-53-7	
Toluene-d8 (S)	102	%	38-154		1	03/13/15 07:30	03/13/15 18:07	2037-26-5	
4-Bromofluorobenzene (S)	99	%	39-139		1	03/13/15 07:30	03/13/15 18:07	460-00-4	
<b>Percent Moisture</b>		Analytical Method: ASTM D2974-87							
Percent Moisture	17.5	%	0.10	0.10	1		03/16/15 11:26		

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-5 S1**      **Lab ID: 40111561009**      Collected: 03/11/15 11:10      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b>									
Analytical Method: EPA 6010 Preparation Method: EPA 3050									
Arsenic	<b>5.9J</b>	mg/kg	10.3	3.3	5	03/16/15 07:20	03/17/15 20:10	7440-38-2	D3
Barium	<b>21.5</b>	mg/kg	0.51	0.12	1	03/16/15 07:20	03/17/15 20:12	7440-39-3	
Cadmium	<b>0.29J</b>	mg/kg	0.51	0.068	1	03/16/15 07:20	03/17/15 20:12	7440-43-9	
Chromium	<b>6.2</b>	mg/kg	0.51	0.20	1	03/16/15 07:20	03/17/15 20:12	7440-47-3	
Lead	<b>12.4</b>	mg/kg	1.0	0.44	1	03/16/15 07:20	03/17/15 20:12	7439-92-1	
Selenium	<b>&lt;0.79</b>	mg/kg	2.1	0.79	1	03/16/15 07:20	03/17/15 20:12	7782-49-2	
Silver	<b>&lt;0.29</b>	mg/kg	1.0	0.29	1	03/16/15 07:20	03/17/15 20:12	7440-22-4	
<b>7471 Mercury</b>									
Analytical Method: EPA 7471 Preparation Method: EPA 7471									
Mercury	<b>0.019</b>	mg/kg	0.0056	0.0028	1	03/13/15 12:05	03/16/15 15:31	7439-97-6	
<b>8270 MSSV PAH by SIM</b>									
Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546									
Acenaphthene	<b>&lt;8.8</b>	ug/kg	17.6	8.8	1	03/13/15 08:18	03/13/15 15:33	83-32-9	
Acenaphthylene	<b>&lt;7.9</b>	ug/kg	17.6	7.9	1	03/13/15 08:18	03/13/15 15:33	208-96-8	
Anthracene	<b>&lt;9.1</b>	ug/kg	17.6	9.1	1	03/13/15 08:18	03/13/15 15:33	120-12-7	
Benzo(a)anthracene	<b>26.9</b>	ug/kg	17.6	6.1	1	03/13/15 08:18	03/13/15 15:33	56-55-3	
Benzo(a)pyrene	<b>22.3</b>	ug/kg	17.6	6.3	1	03/13/15 08:18	03/13/15 15:33	50-32-8	
Benzo(b)fluoranthene	<b>23.5</b>	ug/kg	17.6	8.8	1	03/13/15 08:18	03/13/15 15:33	205-99-2	
Benzo(g,h,i)perylene	<b>13.5J</b>	ug/kg	17.6	6.7	1	03/13/15 08:18	03/13/15 15:33	191-24-2	
Benzo(k)fluoranthene	<b>23.8</b>	ug/kg	17.6	9.7	1	03/13/15 08:18	03/13/15 15:33	207-08-9	
Chrysene	<b>33.7</b>	ug/kg	17.6	8.1	1	03/13/15 08:18	03/13/15 15:33	218-01-9	
Dibenz(a,h)anthracene	<b>&lt;6.5</b>	ug/kg	17.6	6.5	1	03/13/15 08:18	03/13/15 15:33	53-70-3	
Fluoranthene	<b>73.2</b>	ug/kg	17.6	8.8	1	03/13/15 08:18	03/13/15 15:33	206-44-0	
Fluorene	<b>&lt;8.8</b>	ug/kg	17.6	8.8	1	03/13/15 08:18	03/13/15 15:33	86-73-7	L2
Indeno(1,2,3-cd)pyrene	<b>9.4J</b>	ug/kg	17.6	6.7	1	03/13/15 08:18	03/13/15 15:33	193-39-5	
1-Methylnaphthalene	<b>&lt;8.8</b>	ug/kg	17.6	8.8	1	03/13/15 08:18	03/13/15 15:33	90-12-0	
2-Methylnaphthalene	<b>&lt;8.8</b>	ug/kg	17.6	8.8	1	03/13/15 08:18	03/13/15 15:33	91-57-6	
Naphthalene	<b>&lt;8.8</b>	ug/kg	17.6	8.8	1	03/13/15 08:18	03/13/15 15:33	91-20-3	
Phenanthrene	<b>31.6</b>	ug/kg	17.6	8.8	1	03/13/15 08:18	03/13/15 15:33	85-01-8	
Pyrene	<b>65.3</b>	ug/kg	17.6	8.8	1	03/13/15 08:18	03/13/15 15:33	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	57	%	39-130		1	03/13/15 08:18	03/13/15 15:33	321-60-8	
Terphenyl-d14 (S)	75	%	37-130		1	03/13/15 08:18	03/13/15 15:33	1718-51-0	
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Benzene	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	71-43-2	W
Bromobenzene	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	108-86-1	W
Bromochloromethane	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	74-97-5	W
Bromodichloromethane	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	75-27-4	W
Bromoform	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	75-25-2	L2,W
Bromomethane	<b>&lt;69.9</b>	ug/kg	250	69.9	1	03/13/15 07:30	03/13/15 15:28	74-83-9	W
n-Butylbenzene	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	104-51-8	W
sec-Butylbenzene	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	135-98-8	W
tert-Butylbenzene	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	98-06-6	W
Carbon tetrachloride	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	56-23-5	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Sample: GP-5 S1 Lab ID: 40111561009 Collected: 03/11/15 11:10 Received: 03/12/15 08:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/13/15 07:30	03/13/15 15:28	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/13/15 07:30	03/13/15 15:28	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/13/15 07:30	03/13/15 15:28	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	108-20-3	W
Ethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	100-41-4	W
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	87-68-3	W
Isopropylbenzene (Cumene)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	98-82-8	W
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	1634-04-4	W
Naphthalene	<40.0	ug/kg	250	40.0	1	03/13/15 07:30	03/13/15 15:28	91-20-3	W
n-Propylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	103-65-1	W
Styrene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	127-18-4	W
Toluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	108-88-3	W
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/13/15 07:30	03/13/15 15:28	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	75-69-4	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-5 S1**      **Lab ID: 40111561009**      Collected: 03/11/15 11:10      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	96-18-4	W
1,2,4-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	95-63-6	W
1,3,5-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	108-67-8	W
Vinyl chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:28	75-01-4	W
Xylene (Total)	<75.0	ug/kg	180	75.0	1	03/13/15 07:30	03/13/15 15:28	1330-20-7	W
<b>Surrogates</b>									
Dibromofluoromethane (S)	101	%	37-152		1	03/13/15 07:30	03/13/15 15:28	1868-53-7	
Toluene-d8 (S)	112	%	38-154		1	03/13/15 07:30	03/13/15 15:28	2037-26-5	
4-Bromofluorobenzene (S)	102	%	39-139		1	03/13/15 07:30	03/13/15 15:28	460-00-4	
<b>Percent Moisture</b>									
Analytical Method: ASTM D2974-87									
Percent Moisture	5.2	%	0.10	0.10	1		03/16/15 13:05		

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-5 S5**      **Lab ID: 40111561010**      Collected: 03/11/15 11:10      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b>									
Analytical Method: EPA 6010 Preparation Method: EPA 3050									
Arsenic	1.5J	mg/kg	2.1	0.67	1	03/16/15 07:20	03/17/15 20:15	7440-38-2	
Barium	7.0	mg/kg	0.53	0.13	1	03/16/15 07:20	03/17/15 20:15	7440-39-3	
Cadmium	<0.070	mg/kg	0.53	0.070	1	03/16/15 07:20	03/17/15 20:15	7440-43-9	
Chromium	3.9	mg/kg	0.53	0.21	1	03/16/15 07:20	03/17/15 20:15	7440-47-3	
Lead	1.2	mg/kg	1.1	0.46	1	03/16/15 07:20	03/17/15 20:15	7439-92-1	
Selenium	<0.82	mg/kg	2.1	0.82	1	03/16/15 07:20	03/17/15 20:15	7782-49-2	
Silver	<0.29	mg/kg	1.1	0.29	1	03/16/15 07:20	03/17/15 20:15	7440-22-4	
<b>7471 Mercury</b>									
Analytical Method: EPA 7471 Preparation Method: EPA 7471									
Mercury	<0.0031	mg/kg	0.0063	0.0031	1	03/13/15 12:05	03/16/15 15:33	7439-97-6	
<b>8270 MSSV PAH by SIM</b>									
Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546									
Acenaphthene	<9.9	ug/kg	19.9	9.9	1	03/13/15 08:18	03/13/15 13:32	83-32-9	
Acenaphthylene	<8.9	ug/kg	19.9	8.9	1	03/13/15 08:18	03/13/15 13:32	208-96-8	
Anthracene	<10.3	ug/kg	19.9	10.3	1	03/13/15 08:18	03/13/15 13:32	120-12-7	
Benzo(a)anthracene	<6.9	ug/kg	19.9	6.9	1	03/13/15 08:18	03/13/15 13:32	56-55-3	
Benzo(a)pyrene	<7.1	ug/kg	19.9	7.1	1	03/13/15 08:18	03/13/15 13:32	50-32-8	
Benzo(b)fluoranthene	<9.9	ug/kg	19.9	9.9	1	03/13/15 08:18	03/13/15 13:32	205-99-2	
Benzo(g,h,i)perylene	<7.6	ug/kg	19.9	7.6	1	03/13/15 08:18	03/13/15 13:32	191-24-2	
Benzo(k)fluoranthene	<11.0	ug/kg	19.9	11.0	1	03/13/15 08:18	03/13/15 13:32	207-08-9	
Chrysene	<9.2	ug/kg	19.9	9.2	1	03/13/15 08:18	03/13/15 13:32	218-01-9	
Dibenz(a,h)anthracene	<7.3	ug/kg	19.9	7.3	1	03/13/15 08:18	03/13/15 13:32	53-70-3	
Fluoranthene	<9.9	ug/kg	19.9	9.9	1	03/13/15 08:18	03/13/15 13:32	206-44-0	
Fluorene	<9.9	ug/kg	19.9	9.9	1	03/13/15 08:18	03/13/15 13:32	86-73-7	L2
Indeno(1,2,3-cd)pyrene	<7.5	ug/kg	19.9	7.5	1	03/13/15 08:18	03/13/15 13:32	193-39-5	
1-Methylnaphthalene	<9.9	ug/kg	19.9	9.9	1	03/13/15 08:18	03/13/15 13:32	90-12-0	
2-Methylnaphthalene	<9.9	ug/kg	19.9	9.9	1	03/13/15 08:18	03/13/15 13:32	91-57-6	
Naphthalene	<9.9	ug/kg	19.9	9.9	1	03/13/15 08:18	03/13/15 13:32	91-20-3	
Phenanthrene	<9.9	ug/kg	19.9	9.9	1	03/13/15 08:18	03/13/15 13:32	85-01-8	
Pyrene	<9.9	ug/kg	19.9	9.9	1	03/13/15 08:18	03/13/15 13:32	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	49	%	39-130		1	03/13/15 08:18	03/13/15 13:32	321-60-8	
Terphenyl-d14 (S)	38	%	37-130		1	03/13/15 08:18	03/13/15 13:32	1718-51-0	
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Benzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	71-43-2	W
Bromobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	108-86-1	W
Bromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	74-97-5	W
Bromodichloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	75-27-4	W
Bromoform	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	75-25-2	L2,W
Bromomethane	<69.9	ug/kg	250	69.9	1	03/13/15 07:30	03/13/15 15:51	74-83-9	W
n-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	104-51-8	W
sec-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	135-98-8	W
tert-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	98-06-6	W
Carbon tetrachloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	56-23-5	W

### REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

Sample: GP-5 S5 Lab ID: 40111561010 Collected: 03/11/15 11:10 Received: 03/12/15 08:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/13/15 07:30	03/13/15 15:51	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/13/15 07:30	03/13/15 15:51	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/13/15 07:30	03/13/15 15:51	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	108-20-3	W
Ethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	100-41-4	W
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	87-68-3	W
Isopropylbenzene (Cumene)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	98-82-8	W
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	1634-04-4	W
Naphthalene	<40.0	ug/kg	250	40.0	1	03/13/15 07:30	03/13/15 15:51	91-20-3	W
n-Propylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	103-65-1	W
Styrene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	127-18-4	W
Toluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	108-88-3	W
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/13/15 07:30	03/13/15 15:51	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	75-69-4	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-5 S5**      **Lab ID: 40111561010**      Collected: 03/11/15 11:10      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	96-18-4	W
1,2,4-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	95-63-6	W
1,3,5-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	108-67-8	W
Vinyl chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 15:51	75-01-4	W
Xylene (Total)	<75.0	ug/kg	180	75.0	1	03/13/15 07:30	03/13/15 15:51	1330-20-7	W
<b>Surrogates</b>									
Dibromofluoromethane (S)	91	%	37-152		1	03/13/15 07:30	03/13/15 15:51	1868-53-7	
Toluene-d8 (S)	96	%	38-154		1	03/13/15 07:30	03/13/15 15:51	2037-26-5	
4-Bromofluorobenzene (S)	84	%	39-139		1	03/13/15 07:30	03/13/15 15:51	460-00-4	
<b>Percent Moisture</b>		Analytical Method: ASTM D2974-87							
Percent Moisture	16.1	%	0.10	0.10	1		03/16/15 15:01		

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-5 S3**      **Lab ID: 40111561011**      Collected: 03/11/15 11:00      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b>									
Analytical Method: EPA 6010 Preparation Method: EPA 3050									
Arsenic	4.1	mg/kg	2.6	0.84	1	03/16/15 07:20	03/17/15 20:17	7440-38-2	
Barium	86.5	mg/kg	0.66	0.16	1	03/16/15 07:20	03/17/15 20:17	7440-39-3	
Cadmium	0.24J	mg/kg	0.66	0.087	1	03/16/15 07:20	03/17/15 20:17	7440-43-9	
Chromium	22.6	mg/kg	0.66	0.25	1	03/16/15 07:20	03/17/15 20:17	7440-47-3	
Lead	14.7	mg/kg	1.3	0.57	1	03/16/15 07:20	03/17/15 20:17	7439-92-1	
Selenium	<1.0	mg/kg	2.6	1.0	1	03/16/15 07:20	03/17/15 20:17	7782-49-2	
Silver	0.48J	mg/kg	1.3	0.37	1	03/16/15 07:20	03/17/15 20:17	7440-22-4	
<b>7471 Mercury</b>									
Analytical Method: EPA 7471 Preparation Method: EPA 7471									
Mercury	0.060	mg/kg	0.0078	0.0039	1	03/13/15 12:05	03/16/15 15:36	7439-97-6	
<b>8270 MSSV PAH by SIM</b>									
Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546									
Acenaphthene	<11.3	ug/kg	22.6	11.3	1	03/13/15 08:18	03/13/15 15:50	83-32-9	
Acenaphthylene	<10.1	ug/kg	22.6	10.1	1	03/13/15 08:18	03/13/15 15:50	208-96-8	
Anthracene	<11.7	ug/kg	22.6	11.7	1	03/13/15 08:18	03/13/15 15:50	120-12-7	
Benzo(a)anthracene	16.4J	ug/kg	22.6	7.8	1	03/13/15 08:18	03/13/15 15:50	56-55-3	
Benzo(a)pyrene	17.9J	ug/kg	22.6	8.1	1	03/13/15 08:18	03/13/15 15:50	50-32-8	
Benzo(b)fluoranthene	21.7J	ug/kg	22.6	11.3	1	03/13/15 08:18	03/13/15 15:50	205-99-2	
Benzo(g,h,i)perylene	12.4J	ug/kg	22.6	8.6	1	03/13/15 08:18	03/13/15 15:50	191-24-2	
Benzo(k)fluoranthene	19.2J	ug/kg	22.6	12.5	1	03/13/15 08:18	03/13/15 15:50	207-08-9	
Chrysene	25.6	ug/kg	22.6	10.4	1	03/13/15 08:18	03/13/15 15:50	218-01-9	
Dibenz(a,h)anthracene	<8.3	ug/kg	22.6	8.3	1	03/13/15 08:18	03/13/15 15:50	53-70-3	
Fluoranthene	39.2	ug/kg	22.6	11.3	1	03/13/15 08:18	03/13/15 15:50	206-44-0	
Fluorene	<11.3	ug/kg	22.6	11.3	1	03/13/15 08:18	03/13/15 15:50	86-73-7	L2
Indeno(1,2,3-cd)pyrene	8.7J	ug/kg	22.6	8.6	1	03/13/15 08:18	03/13/15 15:50	193-39-5	
1-Methylnaphthalene	<11.3	ug/kg	22.6	11.3	1	03/13/15 08:18	03/13/15 15:50	90-12-0	
2-Methylnaphthalene	<11.3	ug/kg	22.6	11.3	1	03/13/15 08:18	03/13/15 15:50	91-57-6	
Naphthalene	<11.3	ug/kg	22.6	11.3	1	03/13/15 08:18	03/13/15 15:50	91-20-3	
Phenanthrene	20.0J	ug/kg	22.6	11.3	1	03/13/15 08:18	03/13/15 15:50	85-01-8	
Pyrene	34.9	ug/kg	22.6	11.3	1	03/13/15 08:18	03/13/15 15:50	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	58	%	39-130		1	03/13/15 08:18	03/13/15 15:50	321-60-8	
Terphenyl-d14 (S)	68	%	37-130		1	03/13/15 08:18	03/13/15 15:50	1718-51-0	
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Benzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	71-43-2	W
Bromobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	108-86-1	W
Bromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	74-97-5	W
Bromodichloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	75-27-4	W
Bromoform	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	75-25-2	L2,W
Bromomethane	<69.9	ug/kg	250	69.9	1	03/13/15 07:30	03/13/15 16:14	74-83-9	W
n-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	104-51-8	W
sec-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	135-98-8	W
tert-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	98-06-6	W
Carbon tetrachloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	56-23-5	W

## REPORT OF LABORATORY ANALYSIS

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

**Sample: GP-5 S3**      **Lab ID: 40111561011**      Collected: 03/11/15 11:00      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260    Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/13/15 07:30	03/13/15 16:14	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/13/15 07:30	03/13/15 16:14	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/13/15 07:30	03/13/15 16:14	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	108-20-3	W
Ethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	100-41-4	W
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	87-68-3	W
Isopropylbenzene (Cumene)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	98-82-8	W
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	1634-04-4	W
Naphthalene	<40.0	ug/kg	250	40.0	1	03/13/15 07:30	03/13/15 16:14	91-20-3	W
n-Propylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	103-65-1	W
Styrene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	127-18-4	W
Toluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	108-88-3	W
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/13/15 07:30	03/13/15 16:14	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	75-69-4	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-5 S3**      **Lab ID: 40111561011**      Collected: 03/11/15 11:00      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	96-18-4	W
1,2,4-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	95-63-6	W
1,3,5-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	108-67-8	W
Vinyl chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:14	75-01-4	W
Xylene (Total)	<75.0	ug/kg	180	75.0	1	03/13/15 07:30	03/13/15 16:14	1330-20-7	W
<b>Surrogates</b>									
Dibromofluoromethane (S)	96	%	37-152		1	03/13/15 07:30	03/13/15 16:14	1868-53-7	
Toluene-d8 (S)	103	%	38-154		1	03/13/15 07:30	03/13/15 16:14	2037-26-5	
4-Bromofluorobenzene (S)	87	%	39-139		1	03/13/15 07:30	03/13/15 16:14	460-00-4	
<b>Percent Moisture</b>									
Analytical Method: ASTM D2974-87									
Percent Moisture	26.1	%	0.10	0.10	1		03/16/15 15:01		

## REPORT OF LABORATORY ANALYSIS

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-8 S2**      **Lab ID: 40111561012**      Collected: 03/11/15 13:30      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b> Analytical Method: EPA 6010      Preparation Method: EPA 3050									
Arsenic	8.3	mg/kg	2.3	0.72	1	03/16/15 07:20	03/17/15 20:19	7440-38-2	
Barium	118	mg/kg	0.56	0.13	1	03/16/15 07:20	03/17/15 20:19	7440-39-3	
Cadmium	2.0	mg/kg	0.56	0.074	1	03/16/15 07:20	03/17/15 20:19	7440-43-9	
Chromium	13.1	mg/kg	0.56	0.22	1	03/16/15 07:20	03/17/15 20:19	7440-47-3	
Lead	395	mg/kg	1.1	0.48	1	03/16/15 07:20	03/17/15 20:19	7439-92-1	
Selenium	<0.87	mg/kg	2.3	0.87	1	03/16/15 07:20	03/17/15 20:19	7782-49-2	
Silver	0.60J	mg/kg	1.1	0.31	1	03/16/15 07:20	03/17/15 20:19	7440-22-4	
<b>7471 Mercury</b> Analytical Method: EPA 7471      Preparation Method: EPA 7471									
Mercury	0.29	mg/kg	0.0062	0.0031	1	03/13/15 12:05	03/16/15 15:38	7439-97-6	
<b>8270 MSSV PAH by SIM</b> Analytical Method: EPA 8270 by SIM      Preparation Method: EPA 3546									
Acenaphthene	<9.6	ug/kg	19.3	9.6	1	03/13/15 08:18	03/13/15 16:07	83-32-9	
Acenaphthylene	94.2	ug/kg	19.3	8.6	1	03/13/15 08:18	03/13/15 16:07	208-96-8	
Anthracene	115	ug/kg	19.3	10	1	03/13/15 08:18	03/13/15 16:07	120-12-7	
Benzo(a)anthracene	356	ug/kg	19.3	6.7	1	03/13/15 08:18	03/13/15 16:07	56-55-3	
Benzo(a)pyrene	436	ug/kg	19.3	6.9	1	03/13/15 08:18	03/13/15 16:07	50-32-8	
Benzo(b)fluoranthene	570	ug/kg	19.3	9.6	1	03/13/15 08:18	03/13/15 16:07	205-99-2	
Benzo(g,h,i)perylene	319	ug/kg	19.3	7.3	1	03/13/15 08:18	03/13/15 16:07	191-24-2	
Benzo(k)fluoranthene	430	ug/kg	19.3	10.7	1	03/13/15 08:18	03/13/15 16:07	207-08-9	
Chrysene	435	ug/kg	19.3	8.9	1	03/13/15 08:18	03/13/15 16:07	218-01-9	
Dibenz(a,h)anthracene	111	ug/kg	19.3	7.1	1	03/13/15 08:18	03/13/15 16:07	53-70-3	
Fluoranthene	529	ug/kg	19.3	9.6	1	03/13/15 08:18	03/13/15 16:07	206-44-0	
Fluorene	10.0J	ug/kg	19.3	9.6	1	03/13/15 08:18	03/13/15 16:07	86-73-7	L2
Indeno(1,2,3-cd)pyrene	298	ug/kg	19.3	7.3	1	03/13/15 08:18	03/13/15 16:07	193-39-5	
1-Methylnaphthalene	47.8	ug/kg	19.3	9.6	1	03/13/15 08:18	03/13/15 16:07	90-12-0	
2-Methylnaphthalene	92.5	ug/kg	19.3	9.6	1	03/13/15 08:18	03/13/15 16:07	91-57-6	
Naphthalene	254	ug/kg	19.3	9.6	1	03/13/15 08:18	03/13/15 16:07	91-20-3	
Phenanthrene	187	ug/kg	19.3	9.6	1	03/13/15 08:18	03/13/15 16:07	85-01-8	
Pyrene	586	ug/kg	19.3	9.6	1	03/13/15 08:18	03/13/15 16:07	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	52	%	39-130		1	03/13/15 08:18	03/13/15 16:07	321-60-8	
Terphenyl-d14 (S)	58	%	37-130		1	03/13/15 08:18	03/13/15 16:07	1718-51-0	
<b>8260 MSV Med Level Normal List</b> Analytical Method: EPA 8260      Preparation Method: EPA 5035/5030B									
Benzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	71-43-2	W
Bromobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	108-86-1	W
Bromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	74-97-5	W
Bromodichloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	75-27-4	W
Bromoform	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	75-25-2	L2,W
Bromomethane	<69.9	ug/kg	250	69.9	1	03/13/15 07:30	03/13/15 16:36	74-83-9	W
n-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	104-51-8	W
sec-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	135-98-8	W
tert-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	98-06-6	W
Carbon tetrachloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	56-23-5	W

### REPORT OF LABORATORY ANALYSIS

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

**Sample: GP-8 S2**      **Lab ID: 40111561012**      Collected: 03/11/15 13:30      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260    Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/13/15 07:30	03/13/15 16:36	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/13/15 07:30	03/13/15 16:36	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/13/15 07:30	03/13/15 16:36	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	108-20-3	W
Ethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	100-41-4	W
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	87-68-3	W
Isopropylbenzene (Cumene)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	98-82-8	W
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	1634-04-4	W
Naphthalene	106J	ug/kg	289	46.3	1	03/13/15 07:30	03/13/15 16:36	91-20-3	
n-Propylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	103-65-1	W
Styrene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	127-18-4	W
Toluene	169	ug/kg	69.4	28.9	1	03/13/15 07:30	03/13/15 16:36	108-88-3	
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/13/15 07:30	03/13/15 16:36	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	75-69-4	W

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-8 S2**      **Lab ID: 40111561012**      Collected: 03/11/15 13:30      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	96-18-4	W
1,2,4-Trimethylbenzene	<b>77.2</b>	ug/kg	69.4	28.9	1	03/13/15 07:30	03/13/15 16:36	95-63-6	
1,3,5-Trimethylbenzene	<b>36.4J</b>	ug/kg	69.4	28.9	1	03/13/15 07:30	03/13/15 16:36	108-67-8	
Vinyl chloride	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:36	75-01-4	W
Xylene (Total)	<b>248</b>	ug/kg	208	86.8	1	03/13/15 07:30	03/13/15 16:36	1330-20-7	
<b>Surrogates</b>									
Dibromofluoromethane (S)	103	%	37-152		1	03/13/15 07:30	03/13/15 16:36	1868-53-7	
Toluene-d8 (S)	107	%	38-154		1	03/13/15 07:30	03/13/15 16:36	2037-26-5	
4-Bromofluorobenzene (S)	95	%	39-139		1	03/13/15 07:30	03/13/15 16:36	460-00-4	
<b>Percent Moisture</b>		Analytical Method: ASTM D2974-87							
Percent Moisture	<b>13.6</b>	%	0.10	0.10	1		03/16/15 15:01		

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-8 S3**      **Lab ID: 40111561013**      Collected: 03/11/15 13:30      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b> Analytical Method: EPA 6010      Preparation Method: EPA 3050									
Arsenic	2.6	mg/kg	2.3	0.73	1	03/16/15 07:20	03/17/15 20:22	7440-38-2	
Barium	87.4	mg/kg	0.57	0.14	1	03/16/15 07:20	03/17/15 20:22	7440-39-3	
Cadmium	<0.075	mg/kg	0.57	0.075	1	03/16/15 07:20	03/17/15 20:22	7440-43-9	
Chromium	22.2	mg/kg	0.57	0.22	1	03/16/15 07:20	03/17/15 20:22	7440-47-3	
Lead	7.5	mg/kg	1.1	0.49	1	03/16/15 07:20	03/17/15 20:22	7439-92-1	
Selenium	<0.88	mg/kg	2.3	0.88	1	03/16/15 07:20	03/17/15 20:22	7782-49-2	
Silver	<0.32	mg/kg	1.1	0.32	1	03/16/15 07:20	03/17/15 20:22	7440-22-4	
<b>7471 Mercury</b> Analytical Method: EPA 7471      Preparation Method: EPA 7471									
Mercury	0.021	mg/kg	0.0064	0.0032	1	03/13/15 12:05	03/16/15 15:40	7439-97-6	
<b>8270 MSSV PAH by SIM</b> Analytical Method: EPA 8270 by SIM      Preparation Method: EPA 3546									
Acenaphthene	<10.5	ug/kg	21.0	10.5	1	03/13/15 08:18	03/13/15 13:49	83-32-9	
Acenaphthylene	<9.4	ug/kg	21.0	9.4	1	03/13/15 08:18	03/13/15 13:49	208-96-8	
Anthracene	<10.9	ug/kg	21.0	10.9	1	03/13/15 08:18	03/13/15 13:49	120-12-7	
Benzo(a)anthracene	<7.3	ug/kg	21.0	7.3	1	03/13/15 08:18	03/13/15 13:49	56-55-3	
Benzo(a)pyrene	<7.5	ug/kg	21.0	7.5	1	03/13/15 08:18	03/13/15 13:49	50-32-8	
Benzo(b)fluoranthene	<10.5	ug/kg	21.0	10.5	1	03/13/15 08:18	03/13/15 13:49	205-99-2	
Benzo(g,h,i)perylene	<8.0	ug/kg	21.0	8.0	1	03/13/15 08:18	03/13/15 13:49	191-24-2	
Benzo(k)fluoranthene	<11.6	ug/kg	21.0	11.6	1	03/13/15 08:18	03/13/15 13:49	207-08-9	
Chrysene	<9.7	ug/kg	21.0	9.7	1	03/13/15 08:18	03/13/15 13:49	218-01-9	
Dibenz(a,h)anthracene	<7.7	ug/kg	21.0	7.7	1	03/13/15 08:18	03/13/15 13:49	53-70-3	
Fluoranthene	<10.5	ug/kg	21.0	10.5	1	03/13/15 08:18	03/13/15 13:49	206-44-0	
Fluorene	<10.5	ug/kg	21.0	10.5	1	03/13/15 08:18	03/13/15 13:49	86-73-7	L2
Indeno(1,2,3-cd)pyrene	<8.0	ug/kg	21.0	8.0	1	03/13/15 08:18	03/13/15 13:49	193-39-5	
1-Methylnaphthalene	<10.5	ug/kg	21.0	10.5	1	03/13/15 08:18	03/13/15 13:49	90-12-0	
2-Methylnaphthalene	<10.5	ug/kg	21.0	10.5	1	03/13/15 08:18	03/13/15 13:49	91-57-6	
Naphthalene	<10.5	ug/kg	21.0	10.5	1	03/13/15 08:18	03/13/15 13:49	91-20-3	
Phenanthrene	<10.5	ug/kg	21.0	10.5	1	03/13/15 08:18	03/13/15 13:49	85-01-8	
Pyrene	<10.5	ug/kg	21.0	10.5	1	03/13/15 08:18	03/13/15 13:49	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	64	%	39-130		1	03/13/15 08:18	03/13/15 13:49	321-60-8	
Terphenyl-d14 (S)	76	%	37-130		1	03/13/15 08:18	03/13/15 13:49	1718-51-0	
<b>8260 MSV Med Level Normal List</b> Analytical Method: EPA 8260      Preparation Method: EPA 5035/5030B									
Benzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	71-43-2	W
Bromobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	108-86-1	W
Bromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	74-97-5	W
Bromodichloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	75-27-4	W
Bromoform	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	75-25-2	L2,W
Bromomethane	<69.9	ug/kg	250	69.9	1	03/13/15 07:30	03/13/15 16:59	74-83-9	W
n-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	104-51-8	W
sec-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	135-98-8	W
tert-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	98-06-6	W
Carbon tetrachloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	56-23-5	W

### REPORT OF LABORATORY ANALYSIS

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

**Sample: GP-8 S3**      **Lab ID: 40111561013**      Collected: 03/11/15 13:30      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260    Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/13/15 07:30	03/13/15 16:59	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/13/15 07:30	03/13/15 16:59	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/13/15 07:30	03/13/15 16:59	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	108-20-3	W
Ethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	100-41-4	W
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	87-68-3	W
Isopropylbenzene (Cumene)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	98-82-8	W
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	1634-04-4	W
Naphthalene	<40.0	ug/kg	250	40.0	1	03/13/15 07:30	03/13/15 16:59	91-20-3	W
n-Propylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	103-65-1	W
Styrene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	127-18-4	W
Toluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	108-88-3	W
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/13/15 07:30	03/13/15 16:59	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	75-69-4	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-8 S3**      **Lab ID: 40111561013**      Collected: 03/11/15 13:30      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	96-18-4	W
1,2,4-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	95-63-6	W
1,3,5-Trimethylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	108-67-8	W
Vinyl chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 16:59	75-01-4	W
Xylene (Total)	<75.0	ug/kg	180	75.0	1	03/13/15 07:30	03/13/15 16:59	1330-20-7	W
<b>Surrogates</b>									
Dibromofluoromethane (S)	110	%	37-152		1	03/13/15 07:30	03/13/15 16:59	1868-53-7	
Toluene-d8 (S)	121	%	38-154		1	03/13/15 07:30	03/13/15 16:59	2037-26-5	
4-Bromofluorobenzene (S)	111	%	39-139		1	03/13/15 07:30	03/13/15 16:59	460-00-4	
<b>Percent Moisture</b>		Analytical Method: ASTM D2974-87							
Percent Moisture	20.7	%	0.10	0.10	1		03/16/15 15:01		

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-7 S1**      **Lab ID: 40111561014**      Collected: 03/11/15 13:15      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b>									
Analytical Method: EPA 6010 Preparation Method: EPA 3050									
Arsenic	10.6	mg/kg	2.2	0.71	1	03/16/15 07:20	03/17/15 20:24	7440-38-2	
Barium	81.6	mg/kg	0.56	0.13	1	03/16/15 07:20	03/17/15 20:24	7440-39-3	
Cadmium	1.2	mg/kg	0.56	0.074	1	03/16/15 07:20	03/17/15 20:24	7440-43-9	
Chromium	14.4	mg/kg	0.56	0.22	1	03/16/15 07:20	03/17/15 20:24	7440-47-3	
Lead	248	mg/kg	1.1	0.48	1	03/16/15 07:20	03/17/15 20:24	7439-92-1	
Selenium	<0.86	mg/kg	2.2	0.86	1	03/16/15 07:20	03/17/15 20:24	7782-49-2	
Silver	0.47J	mg/kg	1.1	0.31	1	03/16/15 07:20	03/17/15 20:24	7440-22-4	
<b>7471 Mercury</b>									
Analytical Method: EPA 7471 Preparation Method: EPA 7471									
Mercury	0.064	mg/kg	0.0080	0.0040	1	03/13/15 12:05	03/16/15 15:43	7439-97-6	
<b>8270 MSSV PAH by SIM</b>									
Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546									
Acenaphthene	<40.2	ug/kg	80.4	40.2	4	03/13/15 08:18	03/13/15 16:42	83-32-9	
Acenaphthylene	489	ug/kg	80.4	36.0	4	03/13/15 08:18	03/13/15 16:42	208-96-8	
Anthracene	324	ug/kg	80.4	41.7	4	03/13/15 08:18	03/13/15 16:42	120-12-7	
Benzo(a)anthracene	844	ug/kg	80.4	27.9	4	03/13/15 08:18	03/13/15 16:42	56-55-3	
Benzo(a)pyrene	1000	ug/kg	80.4	28.8	4	03/13/15 08:18	03/13/15 16:42	50-32-8	
Benzo(b)fluoranthene	859	ug/kg	80.4	40.2	4	03/13/15 08:18	03/13/15 16:42	205-99-2	
Benzo(g,h,i)perylene	540	ug/kg	80.4	30.6	4	03/13/15 08:18	03/13/15 16:42	191-24-2	
Benzo(k)fluoranthene	947	ug/kg	80.4	44.5	4	03/13/15 08:18	03/13/15 16:42	207-08-9	
Chrysene	824	ug/kg	80.4	37.2	4	03/13/15 08:18	03/13/15 16:42	218-01-9	
Dibenz(a,h)anthracene	181	ug/kg	80.4	29.5	4	03/13/15 08:18	03/13/15 16:42	53-70-3	
Fluoranthene	1260	ug/kg	80.4	40.2	4	03/13/15 08:18	03/13/15 16:42	206-44-0	
Fluorene	<40.2	ug/kg	80.4	40.2	4	03/13/15 08:18	03/13/15 16:42	86-73-7	L2
Indeno(1,2,3-cd)pyrene	523	ug/kg	80.4	30.6	4	03/13/15 08:18	03/13/15 16:42	193-39-5	
1-Methylnaphthalene	212	ug/kg	80.4	40.2	4	03/13/15 08:18	03/13/15 16:42	90-12-0	
2-Methylnaphthalene	409	ug/kg	80.4	40.2	4	03/13/15 08:18	03/13/15 16:42	91-57-6	
Naphthalene	538	ug/kg	80.4	40.2	4	03/13/15 08:18	03/13/15 16:42	91-20-3	
Phenanthrene	587	ug/kg	80.4	40.2	4	03/13/15 08:18	03/13/15 16:42	85-01-8	
Pyrene	1330	ug/kg	80.4	40.2	4	03/13/15 08:18	03/13/15 16:42	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	42	%	39-130		4	03/13/15 08:18	03/13/15 16:42	321-60-8	
Terphenyl-d14 (S)	51	%	37-130		4	03/13/15 08:18	03/13/15 16:42	1718-51-0	
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Benzene	65.5J	ug/kg	72.4	30.2	1	03/13/15 07:30	03/13/15 17:22	71-43-2	
Bromobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	108-86-1	W
Bromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	74-97-5	W
Bromodichloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	75-27-4	W
Bromoform	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	75-25-2	L2,W
Bromomethane	<69.9	ug/kg	250	69.9	1	03/13/15 07:30	03/13/15 17:22	74-83-9	W
n-Butylbenzene	71.4J	ug/kg	72.4	30.2	1	03/13/15 07:30	03/13/15 17:22	104-51-8	
sec-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	135-98-8	W
tert-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	98-06-6	W
Carbon tetrachloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	56-23-5	W

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

**Sample: GP-7 S1**      **Lab ID: 40111561014**      Collected: 03/11/15 13:15      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260    Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/13/15 07:30	03/13/15 17:22	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/13/15 07:30	03/13/15 17:22	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/13/15 07:30	03/13/15 17:22	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	108-20-3	W
Ethylbenzene	126	ug/kg	72.4	30.2	1	03/13/15 07:30	03/13/15 17:22	100-41-4	
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	87-68-3	W
Isopropylbenzene (Cumene)	32.2J	ug/kg	72.4	30.2	1	03/13/15 07:30	03/13/15 17:22	98-82-8	
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	1634-04-4	W
Naphthalene	259J	ug/kg	302	48.3	1	03/13/15 07:30	03/13/15 17:22	91-20-3	
n-Propylbenzene	71.6J	ug/kg	72.4	30.2	1	03/13/15 07:30	03/13/15 17:22	103-65-1	
Styrene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	127-18-4	W
Toluene	354	ug/kg	72.4	30.2	1	03/13/15 07:30	03/13/15 17:22	108-88-3	
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/13/15 07:30	03/13/15 17:22	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	75-69-4	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-7 S1**      **Lab ID: 40111561014**      Collected: 03/11/15 13:15      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	96-18-4	W
1,2,4-Trimethylbenzene	397	ug/kg	72.4	30.2	1	03/13/15 07:30	03/13/15 17:22	95-63-6	
1,3,5-Trimethylbenzene	165	ug/kg	72.4	30.2	1	03/13/15 07:30	03/13/15 17:22	108-67-8	
Vinyl chloride	<25.0	ug/kg	60.0	25.0	1	03/13/15 07:30	03/13/15 17:22	75-01-4	W
Xylene (Total)	776	ug/kg	217	90.5	1	03/13/15 07:30	03/13/15 17:22	1330-20-7	
<b>Surrogates</b>									
Dibromofluoromethane (S)	102	%	37-152		1	03/13/15 07:30	03/13/15 17:22	1868-53-7	
Toluene-d8 (S)	105	%	38-154		1	03/13/15 07:30	03/13/15 17:22	2037-26-5	
4-Bromofluorobenzene (S)	96	%	39-139		1	03/13/15 07:30	03/13/15 17:22	460-00-4	
<b>Percent Moisture</b>		Analytical Method: ASTM D2974-87							
Percent Moisture	17.1	%	0.10	0.10	1		03/16/15 15:01		

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-5**      **Lab ID: 40111561015**      Collected: 03/11/15 00:00      Received: 03/12/15 08:30      Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV</b> Analytical Method: EPA 8260									
Benzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	71-43-2	
Bromobenzene	<0.23	ug/L	1.0	0.23	1		03/13/15 15:16	108-86-1	
Bromochloromethane	<0.34	ug/L	1.0	0.34	1		03/13/15 15:16	74-97-5	
Bromodichloromethane	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	75-27-4	
Bromoform	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	75-25-2	
Bromomethane	<2.4	ug/L	5.0	2.4	1		03/13/15 15:16	74-83-9	
n-Butylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	104-51-8	
sec-Butylbenzene	<2.2	ug/L	5.0	2.2	1		03/13/15 15:16	135-98-8	
tert-Butylbenzene	<0.18	ug/L	1.0	0.18	1		03/13/15 15:16	98-06-6	
Carbon tetrachloride	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	56-23-5	
Chlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	108-90-7	
Chloroethane	<0.37	ug/L	1.0	0.37	1		03/13/15 15:16	75-00-3	
Chloroform	<2.5	ug/L	5.0	2.5	1		03/13/15 15:16	67-66-3	
Chloromethane	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	74-87-3	
2-Chlorotoluene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	95-49-8	
4-Chlorotoluene	<0.21	ug/L	1.0	0.21	1		03/13/15 15:16	106-43-4	
1,2-Dibromo-3-chloropropane	<2.2	ug/L	5.0	2.2	1		03/13/15 15:16	96-12-8	
Dibromochloromethane	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	124-48-1	
1,2-Dibromoethane (EDB)	<0.18	ug/L	1.0	0.18	1		03/13/15 15:16	106-93-4	
Dibromomethane	<0.43	ug/L	1.0	0.43	1		03/13/15 15:16	74-95-3	
1,2-Dichlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	95-50-1	
1,3-Dichlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	541-73-1	
1,4-Dichlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	106-46-7	
Dichlorodifluoromethane	<0.22	ug/L	1.0	0.22	1		03/13/15 15:16	75-71-8	
1,1-Dichloroethane	<0.24	ug/L	1.0	0.24	1		03/13/15 15:16	75-34-3	
1,2-Dichloroethane	<0.17	ug/L	1.0	0.17	1		03/13/15 15:16	107-06-2	
1,1-Dichloroethene	<0.41	ug/L	1.0	0.41	1		03/13/15 15:16	75-35-4	
cis-1,2-Dichloroethene	<0.26	ug/L	1.0	0.26	1		03/13/15 15:16	156-59-2	
trans-1,2-Dichloroethene	<0.26	ug/L	1.0	0.26	1		03/13/15 15:16	156-60-5	
1,2-Dichloropropane	<0.23	ug/L	1.0	0.23	1		03/13/15 15:16	78-87-5	
1,3-Dichloropropane	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	142-28-9	
2,2-Dichloropropane	<0.48	ug/L	1.0	0.48	1		03/13/15 15:16	594-20-7	
1,1-Dichloropropene	<0.44	ug/L	1.0	0.44	1		03/13/15 15:16	563-58-6	
cis-1,3-Dichloropropene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	10061-01-5	
trans-1,3-Dichloropropene	<0.23	ug/L	1.0	0.23	1		03/13/15 15:16	10061-02-6	
Diisopropyl ether	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	108-20-3	
Ethylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	100-41-4	
Hexachloro-1,3-butadiene	<2.1	ug/L	5.0	2.1	1		03/13/15 15:16	87-68-3	
Isopropylbenzene (Cumene)	<0.14	ug/L	1.0	0.14	1		03/13/15 15:16	98-82-8	
p-Isopropyltoluene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	99-87-6	
Methylene Chloride	<0.23	ug/L	1.0	0.23	1		03/13/15 15:16	75-09-2	
Methyl-tert-butyl ether	<0.17	ug/L	1.0	0.17	1		03/13/15 15:16	1634-04-4	
Naphthalene	<2.5	ug/L	5.0	2.5	1		03/13/15 15:16	91-20-3	
n-Propylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	103-65-1	
Styrene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	100-42-5	
1,1,1,2-Tetrachloroethane	<0.18	ug/L	1.0	0.18	1		03/13/15 15:16	630-20-6	

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-5**      **Lab ID: 40111561015**      Collected: 03/11/15 00:00      Received: 03/12/15 08:30      Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV</b>									
Analytical Method: EPA 8260									
1,1,2,2-Tetrachloroethane	<0.25	ug/L	1.0	0.25	1		03/13/15 15:16	79-34-5	
Tetrachloroethene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	127-18-4	
Toluene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	108-88-3	
1,2,3-Trichlorobenzene	<2.1	ug/L	5.0	2.1	1		03/13/15 15:16	87-61-6	
1,2,4-Trichlorobenzene	<2.2	ug/L	5.0	2.2	1		03/13/15 15:16	120-82-1	
1,1,1-Trichloroethane	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	71-55-6	
1,1,2-Trichloroethane	<0.20	ug/L	1.0	0.20	1		03/13/15 15:16	79-00-5	
Trichloroethene	<0.33	ug/L	1.0	0.33	1		03/13/15 15:16	79-01-6	
Trichlorofluoromethane	<0.18	ug/L	1.0	0.18	1		03/13/15 15:16	75-69-4	
1,2,3-Trichloropropane	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	96-18-4	
1,2,4-Trimethylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	95-63-6	
1,3,5-Trimethylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:16	108-67-8	
Vinyl chloride	<0.18	ug/L	1.0	0.18	1		03/13/15 15:16	75-01-4	
Xylene (Total)	<1.5	ug/L	3.0	1.5	1		03/13/15 15:16	1330-20-7	
<b>Surrogates</b>									
4-Bromofluorobenzene (S)	94	%	70-130		1		03/13/15 15:16	460-00-4	
Dibromofluoromethane (S)	120	%	70-130		1		03/13/15 15:16	1868-53-7	
Toluene-d8 (S)	91	%	70-130		1		03/13/15 15:16	2037-26-5	

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Sample: GP-6 S2 Lab ID: 40111561016 Collected: 03/11/15 14:00 Received: 03/12/15 08:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b>									
Analytical Method: EPA 6010 Preparation Method: EPA 3050									
Arsenic	23.7	mg/kg	2.8	0.88	1	03/16/15 07:20	03/17/15 20:26	7440-38-2	
Barium	1920	mg/kg	0.69	0.17	1	03/16/15 07:20	03/17/15 20:26	7440-39-3	
Cadmium	1.1	mg/kg	0.69	0.092	1	03/16/15 07:20	03/17/15 20:26	7440-43-9	
Chromium	69.7	mg/kg	0.69	0.27	1	03/16/15 07:20	03/17/15 20:26	7440-47-3	
Lead	835	mg/kg	1.4	0.60	1	03/16/15 07:20	03/17/15 20:26	7439-92-1	
Selenium	<1.1	mg/kg	2.8	1.1	1	03/16/15 07:20	03/17/15 20:26	7782-49-2	
Silver	0.83J	mg/kg	1.4	0.39	1	03/16/15 07:20	03/17/15 20:26	7440-22-4	
<b>7471 Mercury</b>									
Analytical Method: EPA 7471 Preparation Method: EPA 7471									
Mercury	0.36	mg/kg	0.0094	0.0047	1	03/13/15 12:05	03/16/15 15:45	7439-97-6	
<b>8270 MSSV PAH by SIM</b>									
Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546									
Acenaphthene	<66.6	ug/kg	133	66.6	5	03/13/15 08:18	03/13/15 16:59	83-32-9	
Acenaphthylene	1240	ug/kg	133	59.6	5	03/13/15 08:18	03/13/15 16:59	208-96-8	
Anthracene	859	ug/kg	133	69.0	5	03/13/15 08:18	03/13/15 16:59	120-12-7	
Benzo(a)anthracene	1360	ug/kg	133	46.2	5	03/13/15 08:18	03/13/15 16:59	56-55-3	
Benzo(a)pyrene	1930	ug/kg	133	47.6	5	03/13/15 08:18	03/13/15 16:59	50-32-8	
Benzo(b)fluoranthene	1520	ug/kg	133	66.6	5	03/13/15 08:18	03/13/15 16:59	205-99-2	
Benzo(g,h,i)perylene	1120	ug/kg	133	50.7	5	03/13/15 08:18	03/13/15 16:59	191-24-2	
Benzo(k)fluoranthene	1390	ug/kg	133	73.7	5	03/13/15 08:18	03/13/15 16:59	207-08-9	
Chrysene	1680	ug/kg	133	61.6	5	03/13/15 08:18	03/13/15 16:59	218-01-9	
Dibenz(a,h)anthracene	338	ug/kg	133	48.8	5	03/13/15 08:18	03/13/15 16:59	53-70-3	
Fluoranthene	1820	ug/kg	133	66.6	5	03/13/15 08:18	03/13/15 16:59	206-44-0	
Fluorene	103J	ug/kg	133	66.6	5	03/13/15 08:18	03/13/15 16:59	86-73-7	L2
Indeno(1,2,3-cd)pyrene	993	ug/kg	133	50.6	5	03/13/15 08:18	03/13/15 16:59	193-39-5	
1-Methylnaphthalene	340	ug/kg	133	66.6	5	03/13/15 08:18	03/13/15 16:59	90-12-0	
2-Methylnaphthalene	605	ug/kg	133	66.6	5	03/13/15 08:18	03/13/15 16:59	91-57-6	
Naphthalene	1590	ug/kg	133	66.6	5	03/13/15 08:18	03/13/15 16:59	91-20-3	
Phenanthrene	701	ug/kg	133	66.6	5	03/13/15 08:18	03/13/15 16:59	85-01-8	
Pyrene	2110	ug/kg	133	66.6	5	03/13/15 08:18	03/13/15 16:59	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	46	%	39-130		5	03/13/15 08:18	03/13/15 16:59	321-60-8	
Terphenyl-d14 (S)	51	%	37-130		5	03/13/15 08:18	03/13/15 16:59	1718-51-0	
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Benzene	178	ug/kg	95.9	39.9	1	03/16/15 07:50	03/16/15 11:50	71-43-2	
Bromobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	108-86-1	W
Bromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	74-97-5	W
Bromodichloromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	75-27-4	W
Bromoform	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	75-25-2	W
Bromomethane	<69.9	ug/kg	250	69.9	1	03/16/15 07:50	03/16/15 11:50	74-83-9	W
n-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	104-51-8	W
sec-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	135-98-8	W
tert-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	98-06-6	W
Carbon tetrachloride	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	56-23-5	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

Sample: **GP-6 S2** Lab ID: **40111561016** Collected: 03/11/15 14:00 Received: 03/12/15 08:30 Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/16/15 07:50	03/16/15 11:50	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/16/15 07:50	03/16/15 11:50	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/16/15 07:50	03/16/15 11:50	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	108-20-3	W
Ethylbenzene	81.8J	ug/kg	95.9	39.9	1	03/16/15 07:50	03/16/15 11:50	100-41-4	
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	87-68-3	W
Isopropylbenzene (Cumene)	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	98-82-8	W
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	1634-04-4	W
Naphthalene	2090	ug/kg	399	64.0	1	03/16/15 07:50	03/16/15 11:50	91-20-3	
n-Propylbenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	103-65-1	W
Styrene	72.7J	ug/kg	95.9	39.9	1	03/16/15 07:50	03/16/15 11:50	100-42-5	
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	127-18-4	W
Toluene	324	ug/kg	95.9	39.9	1	03/16/15 07:50	03/16/15 11:50	108-88-3	
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/16/15 07:50	03/16/15 11:50	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	75-69-4	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-6 S2**      **Lab ID: 40111561016**      Collected: 03/11/15 14:00      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	96-18-4	W
1,2,4-Trimethylbenzene	<b>190</b>	ug/kg	95.9	39.9	1	03/16/15 07:50	03/16/15 11:50	95-63-6	
1,3,5-Trimethylbenzene	<b>78.4J</b>	ug/kg	95.9	39.9	1	03/16/15 07:50	03/16/15 11:50	108-67-8	
Vinyl chloride	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 11:50	75-01-4	W
Xylene (Total)	<b>404</b>	ug/kg	288	120	1	03/16/15 07:50	03/16/15 11:50	1330-20-7	
<b>Surrogates</b>									
Dibromofluoromethane (S)	85	%	49-157		1	03/16/15 07:50	03/16/15 11:50	1868-53-7	
Toluene-d8 (S)	85	%	61-148		1	03/16/15 07:50	03/16/15 11:50	2037-26-5	
4-Bromofluorobenzene (S)	75	%	53-134		1	03/16/15 07:50	03/16/15 11:50	460-00-4	
<b>Percent Moisture</b>		Analytical Method: ASTM D2974-87							
Percent Moisture	<b>37.4</b>	%	0.10	0.10	1		03/16/15 15:01		

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-9 S1**      **Lab ID: 40111561017**      Collected: 03/11/15 14:30      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b> Analytical Method: EPA 6010      Preparation Method: EPA 3050									
Arsenic	5.1	mg/kg	2.0	0.65	1	03/16/15 07:20	03/17/15 20:33	7440-38-2	
Barium	61.5	mg/kg	0.51	0.12	1	03/16/15 07:20	03/17/15 20:33	7440-39-3	
Cadmium	0.34J	mg/kg	0.51	0.067	1	03/16/15 07:20	03/17/15 20:33	7440-43-9	
Chromium	11.5	mg/kg	0.51	0.20	1	03/16/15 07:20	03/17/15 20:33	7440-47-3	
Lead	59.8	mg/kg	1.0	0.44	1	03/16/15 07:20	03/17/15 20:33	7439-92-1	
Selenium	<0.78	mg/kg	2.0	0.78	1	03/16/15 07:20	03/17/15 20:33	7782-49-2	
Silver	0.57J	mg/kg	1.0	0.28	1	03/16/15 07:20	03/17/15 20:33	7440-22-4	
<b>7471 Mercury</b> Analytical Method: EPA 7471      Preparation Method: EPA 7471									
Mercury	0.23	mg/kg	0.0073	0.0037	1	03/13/15 12:05	03/16/15 15:47	7439-97-6	
<b>8270 MSSV PAH by SIM</b> Analytical Method: EPA 8270 by SIM      Preparation Method: EPA 3546									
Acenaphthene	20.1J	ug/kg	37.4	18.7	2	03/13/15 08:18	03/13/15 17:16	83-32-9	
Acenaphthylene	186	ug/kg	37.4	16.7	2	03/13/15 08:18	03/13/15 17:16	208-96-8	
Anthracene	162	ug/kg	37.4	19.4	2	03/13/15 08:18	03/13/15 17:16	120-12-7	
Benzo(a)anthracene	502	ug/kg	37.4	13.0	2	03/13/15 08:18	03/13/15 17:16	56-55-3	
Benzo(a)pyrene	624	ug/kg	37.4	13.4	2	03/13/15 08:18	03/13/15 17:16	50-32-8	
Benzo(b)fluoranthene	524	ug/kg	37.4	18.7	2	03/13/15 08:18	03/13/15 17:16	205-99-2	
Benzo(g,h,i)perylene	281	ug/kg	37.4	14.2	2	03/13/15 08:18	03/13/15 17:16	191-24-2	
Benzo(k)fluoranthene	558	ug/kg	37.4	20.7	2	03/13/15 08:18	03/13/15 17:16	207-08-9	
Chrysene	550	ug/kg	37.4	17.3	2	03/13/15 08:18	03/13/15 17:16	218-01-9	
Dibenz(a,h)anthracene	102	ug/kg	37.4	13.7	2	03/13/15 08:18	03/13/15 17:16	53-70-3	
Fluoranthene	731	ug/kg	37.4	18.7	2	03/13/15 08:18	03/13/15 17:16	206-44-0	
Fluorene	24.6J	ug/kg	37.4	18.7	2	03/13/15 08:18	03/13/15 17:16	86-73-7	L2
Indeno(1,2,3-cd)pyrene	289	ug/kg	37.4	14.2	2	03/13/15 08:18	03/13/15 17:16	193-39-5	
1-Methylnaphthalene	63.4	ug/kg	37.4	18.7	2	03/13/15 08:18	03/13/15 17:16	90-12-0	
2-Methylnaphthalene	114	ug/kg	37.4	18.7	2	03/13/15 08:18	03/13/15 17:16	91-57-6	
Naphthalene	129	ug/kg	37.4	18.7	2	03/13/15 08:18	03/13/15 17:16	91-20-3	
Phenanthrene	314	ug/kg	37.4	18.7	2	03/13/15 08:18	03/13/15 17:16	85-01-8	
Pyrene	902	ug/kg	37.4	18.7	2	03/13/15 08:18	03/13/15 17:16	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	57	%	39-130		2	03/13/15 08:18	03/13/15 17:16	321-60-8	
Terphenyl-d14 (S)	69	%	37-130		2	03/13/15 08:18	03/13/15 17:16	1718-51-0	
<b>8260 MSV Med Level Normal List</b> Analytical Method: EPA 8260      Preparation Method: EPA 5035/5030B									
Benzene	28.5J	ug/kg	67.3	28.1	1	03/16/15 07:50	03/16/15 12:12	71-43-2	
Bromobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	108-86-1	W
Bromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	74-97-5	W
Bromodichloromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	75-27-4	W
Bromoform	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	75-25-2	W
Bromomethane	<69.9	ug/kg	250	69.9	1	03/16/15 07:50	03/16/15 12:12	74-83-9	W
n-Butylbenzene	37.0J	ug/kg	67.3	28.1	1	03/16/15 07:50	03/16/15 12:12	104-51-8	
sec-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	135-98-8	W
tert-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	98-06-6	W
Carbon tetrachloride	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	56-23-5	W

### REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-9 S1**      **Lab ID: 40111561017**      Collected: 03/11/15 14:30      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260    Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/16/15 07:50	03/16/15 12:12	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/16/15 07:50	03/16/15 12:12	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/16/15 07:50	03/16/15 12:12	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	108-20-3	W
Ethylbenzene	62.1J	ug/kg	67.3	28.1	1	03/16/15 07:50	03/16/15 12:12	100-41-4	
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	87-68-3	W
Isopropylbenzene (Cumene)	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	98-82-8	W
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	1634-04-4	W
Naphthalene	180J	ug/kg	281	44.9	1	03/16/15 07:50	03/16/15 12:12	91-20-3	
n-Propylbenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	103-65-1	W
Styrene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	127-18-4	W
Toluene	155	ug/kg	67.3	28.1	1	03/16/15 07:50	03/16/15 12:12	108-88-3	
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/16/15 07:50	03/16/15 12:12	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	75-69-4	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-9 S1**      **Lab ID: 40111561017**      Collected: 03/11/15 14:30      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	96-18-4	W
1,2,4-Trimethylbenzene	156	ug/kg	67.3	28.1	1	03/16/15 07:50	03/16/15 12:12	95-63-6	
1,3,5-Trimethylbenzene	58.1J	ug/kg	67.3	28.1	1	03/16/15 07:50	03/16/15 12:12	108-67-8	
Vinyl chloride	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:12	75-01-4	W
Xylene (Total)	392	ug/kg	202	84.2	1	03/16/15 07:50	03/16/15 12:12	1330-20-7	
<b>Surrogates</b>									
Dibromofluoromethane (S)	110	%	49-157		1	03/16/15 07:50	03/16/15 12:12	1868-53-7	
Toluene-d8 (S)	110	%	61-148		1	03/16/15 07:50	03/16/15 12:12	2037-26-5	
4-Bromofluorobenzene (S)	100	%	53-134		1	03/16/15 07:50	03/16/15 12:12	460-00-4	
<b>Percent Moisture</b>		Analytical Method: ASTM D2974-87							
Percent Moisture	10.9	%	0.10	0.10	1		03/16/15 15:02		

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-10 S2**      **Lab ID: 40111561018**      Collected: 03/11/15 15:00      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b>									
Analytical Method: EPA 6010 Preparation Method: EPA 3050									
Arsenic	9.5	mg/kg	2.4	0.78	1	03/16/15 07:20	03/17/15 20:35	7440-38-2	
Barium	126	mg/kg	0.61	0.15	1	03/16/15 07:20	03/17/15 20:35	7440-39-3	
Cadmium	0.45J	mg/kg	0.61	0.081	1	03/16/15 07:20	03/17/15 20:35	7440-43-9	
Chromium	14.2	mg/kg	0.61	0.24	1	03/16/15 07:20	03/17/15 20:35	7440-47-3	
Lead	457	mg/kg	1.2	0.53	1	03/16/15 07:20	03/17/15 20:35	7439-92-1	
Selenium	<0.94	mg/kg	2.4	0.94	1	03/16/15 07:20	03/17/15 20:35	7782-49-2	
Silver	0.69J	mg/kg	1.2	0.34	1	03/16/15 07:20	03/17/15 20:35	7440-22-4	
<b>7471 Mercury</b>									
Analytical Method: EPA 7471 Preparation Method: EPA 7471									
Mercury	0.24	mg/kg	0.0074	0.0037	1	03/13/15 12:05	03/16/15 15:54	7439-97-6	
<b>8270 MSSV PAH by SIM</b>									
Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546									
Acenaphthene	<429	ug/kg	858	429	40	03/16/15 09:25	03/20/15 11:03	83-32-9	
Acenaphthylene	1650	ug/kg	858	384	40	03/16/15 09:25	03/20/15 11:03	208-96-8	
Anthracene	4110	ug/kg	858	445	40	03/16/15 09:25	03/20/15 11:03	120-12-7	
Benzo(a)anthracene	12100	ug/kg	858	297	40	03/16/15 09:25	03/20/15 11:03	56-55-3	
Benzo(a)pyrene	15300	ug/kg	858	307	40	03/16/15 09:25	03/20/15 11:03	50-32-8	
Benzo(b)fluoranthene	13300	ug/kg	858	429	40	03/16/15 09:25	03/20/15 11:03	205-99-2	
Benzo(g,h,i)perylene	13700	ug/kg	858	327	40	03/16/15 09:25	03/20/15 11:03	191-24-2	
Benzo(k)fluoranthene	13300	ug/kg	858	475	40	03/16/15 09:25	03/20/15 11:03	207-08-9	
Chrysene	13900	ug/kg	858	397	40	03/16/15 09:25	03/20/15 11:03	218-01-9	
Dibenz(a,h)anthracene	4050	ug/kg	858	315	40	03/16/15 09:25	03/20/15 11:03	53-70-3	
Fluoranthene	18800	ug/kg	858	429	40	03/16/15 09:25	03/20/15 11:03	206-44-0	
Fluorene	449J	ug/kg	858	429	40	03/16/15 09:25	03/20/15 11:03	86-73-7	
Indeno(1,2,3-cd)pyrene	11300	ug/kg	858	326	40	03/16/15 09:25	03/20/15 11:03	193-39-5	
1-Methylnaphthalene	<429	ug/kg	858	429	40	03/16/15 09:25	03/20/15 11:03	90-12-0	
2-Methylnaphthalene	<429	ug/kg	858	429	40	03/16/15 09:25	03/20/15 11:03	91-57-6	
Naphthalene	895	ug/kg	858	429	40	03/16/15 09:25	03/20/15 11:03	91-20-3	
Phenanthrene	7230	ug/kg	858	429	40	03/16/15 09:25	03/20/15 11:03	85-01-8	
Pyrene	16100	ug/kg	858	429	40	03/16/15 09:25	03/20/15 11:03	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	69	%	39-130		40	03/16/15 09:25	03/20/15 11:03	321-60-8	
Terphenyl-d14 (S)	71	%	37-130		40	03/16/15 09:25	03/20/15 11:03	1718-51-0	
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Benzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	71-43-2	W
Bromobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	108-86-1	W
Bromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	74-97-5	W
Bromodichloromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	75-27-4	W
Bromoform	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	75-25-2	W
Bromomethane	<69.9	ug/kg	250	69.9	1	03/16/15 07:50	03/16/15 12:35	74-83-9	W
n-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	104-51-8	W
sec-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	135-98-8	W
tert-Butylbenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	98-06-6	W
Carbon tetrachloride	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	56-23-5	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

Sample: GP-10 S2 Lab ID: 40111561018 Collected: 03/11/15 15:00 Received: 03/12/15 08:30 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Chlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	108-90-7	W
Chloroethane	<67.0	ug/kg	250	67.0	1	03/16/15 07:50	03/16/15 12:35	75-00-3	W
Chloroform	<46.4	ug/kg	250	46.4	1	03/16/15 07:50	03/16/15 12:35	67-66-3	W
Chloromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	74-87-3	W
2-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	95-49-8	W
4-Chlorotoluene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	106-43-4	W
1,2-Dibromo-3-chloropropane	<91.2	ug/kg	250	91.2	1	03/16/15 07:50	03/16/15 12:35	96-12-8	W
Dibromochloromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	124-48-1	W
1,2-Dibromoethane (EDB)	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	106-93-4	W
Dibromomethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	74-95-3	W
1,2-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	95-50-1	W
1,3-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	541-73-1	W
1,4-Dichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	106-46-7	W
Dichlorodifluoromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	75-71-8	W
1,1-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	75-34-3	W
1,2-Dichloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	107-06-2	W
1,1-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	75-35-4	W
cis-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	156-59-2	W
trans-1,2-Dichloroethene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	156-60-5	W
1,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	78-87-5	W
1,3-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	142-28-9	W
2,2-Dichloropropane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	594-20-7	W
1,1-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	563-58-6	W
cis-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	10061-01-5	W
trans-1,3-Dichloropropene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	10061-02-6	W
Diisopropyl ether	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	108-20-3	W
Ethylbenzene	40.8J	ug/kg	77.2	32.2	1	03/16/15 07:50	03/16/15 12:35	100-41-4	
Hexachloro-1,3-butadiene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	87-68-3	W
Isopropylbenzene (Cumene)	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	98-82-8	W
p-Isopropyltoluene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	99-87-6	W
Methylene Chloride	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	75-09-2	W
Methyl-tert-butyl ether	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	1634-04-4	W
Naphthalene	341	ug/kg	322	51.5	1	03/16/15 07:50	03/16/15 12:35	91-20-3	
n-Propylbenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	103-65-1	W
Styrene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	100-42-5	W
1,1,1,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	630-20-6	W
1,1,2,2-Tetrachloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	79-34-5	W
Tetrachloroethene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	127-18-4	W
Toluene	160	ug/kg	77.2	32.2	1	03/16/15 07:50	03/16/15 12:35	108-88-3	
1,2,3-Trichlorobenzene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	87-61-6	W
1,2,4-Trichlorobenzene	<47.6	ug/kg	250	47.6	1	03/16/15 07:50	03/16/15 12:35	120-82-1	W
1,1,1-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	71-55-6	W
1,1,2-Trichloroethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	79-00-5	W
Trichloroethene	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	79-01-6	W
Trichlorofluoromethane	<25.0	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	75-69-4	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-10 S2**      **Lab ID: 40111561018**      Collected: 03/11/15 15:00      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260    Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	96-18-4	W
1,2,4-Trimethylbenzene	<b>106</b>	ug/kg	77.2	32.2	1	03/16/15 07:50	03/16/15 12:35	95-63-6	
1,3,5-Trimethylbenzene	<b>66.4J</b>	ug/kg	77.2	32.2	1	03/16/15 07:50	03/16/15 12:35	108-67-8	
Vinyl chloride	<b>&lt;25.0</b>	ug/kg	60.0	25.0	1	03/16/15 07:50	03/16/15 12:35	75-01-4	W
Xylene (Total)	<b>297</b>	ug/kg	232	96.5	1	03/16/15 07:50	03/16/15 12:35	1330-20-7	
<b>Surrogates</b>									
Dibromofluoromethane (S)	89	%	49-157		1	03/16/15 07:50	03/16/15 12:35	1868-53-7	
Toluene-d8 (S)	94	%	61-148		1	03/16/15 07:50	03/16/15 12:35	2037-26-5	
4-Bromofluorobenzene (S)	88	%	53-134		1	03/16/15 07:50	03/16/15 12:35	460-00-4	
<b>Percent Moisture</b>		Analytical Method: ASTM D2974-87							
Percent Moisture	<b>22.3</b>	%	0.10	0.10	1		03/16/15 15:02		

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-10 S4**      **Lab ID: 40111561019**      Collected: 03/11/15 15:00      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>6010 MET ICP</b>									
Analytical Method: EPA 6010 Preparation Method: EPA 3050									
Arsenic	3.6	mg/kg	2.1	0.66	1	03/16/15 07:20	03/17/15 20:37	7440-38-2	
Barium	59.3	mg/kg	0.52	0.12	1	03/16/15 07:20	03/17/15 20:37	7440-39-3	
Cadmium	0.081J	mg/kg	0.52	0.069	1	03/16/15 07:20	03/17/15 20:37	7440-43-9	
Chromium	14.5	mg/kg	0.52	0.20	1	03/16/15 07:20	03/17/15 20:37	7440-47-3	
Lead	6.5	mg/kg	1.0	0.45	1	03/16/15 07:20	03/17/15 20:37	7439-92-1	
Selenium	<0.80	mg/kg	2.1	0.80	1	03/16/15 07:20	03/17/15 20:37	7782-49-2	
Silver	0.36J	mg/kg	1.0	0.29	1	03/16/15 07:20	03/17/15 20:37	7440-22-4	
<b>7471 Mercury</b>									
Analytical Method: EPA 7471 Preparation Method: EPA 7471									
Mercury	0.011	mg/kg	0.0067	0.0033	1	03/13/15 12:05	03/16/15 15:57	7439-97-6	
<b>8270 MSSV PAH by SIM</b>									
Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3546									
Acenaphthene	<102	ug/kg	203	102	10	03/16/15 09:25	03/20/15 12:46	83-32-9	
Acenaphthylene	<90.9	ug/kg	203	90.9	10	03/16/15 09:25	03/20/15 12:46	208-96-8	
Anthracene	<105	ug/kg	203	105	10	03/16/15 09:25	03/20/15 12:46	120-12-7	
Benzo(a)anthracene	<70.5	ug/kg	203	70.5	10	03/16/15 09:25	03/20/15 12:46	56-55-3	
Benzo(a)pyrene	<72.7	ug/kg	203	72.7	10	03/16/15 09:25	03/20/15 12:46	50-32-8	
Benzo(b)fluoranthene	<102	ug/kg	203	102	10	03/16/15 09:25	03/20/15 12:46	205-99-2	
Benzo(g,h,i)perylene	<77.4	ug/kg	203	77.4	10	03/16/15 09:25	03/20/15 12:46	191-24-2	
Benzo(k)fluoranthene	<112	ug/kg	203	112	10	03/16/15 09:25	03/20/15 12:46	207-08-9	
Chrysene	<94.0	ug/kg	203	94.0	10	03/16/15 09:25	03/20/15 12:46	218-01-9	
Dibenz(a,h)anthracene	<74.6	ug/kg	203	74.6	10	03/16/15 09:25	03/20/15 12:46	53-70-3	
Fluoranthene	<102	ug/kg	203	102	10	03/16/15 09:25	03/20/15 12:46	206-44-0	
Fluorene	<102	ug/kg	203	102	10	03/16/15 09:25	03/20/15 12:46	86-73-7	
Indeno(1,2,3-cd)pyrene	<77.2	ug/kg	203	77.2	10	03/16/15 09:25	03/20/15 12:46	193-39-5	
1-Methylnaphthalene	953	ug/kg	203	102	10	03/16/15 09:25	03/20/15 12:46	90-12-0	
2-Methylnaphthalene	3090	ug/kg	203	102	10	03/16/15 09:25	03/20/15 12:46	91-57-6	
Naphthalene	5720	ug/kg	203	102	10	03/16/15 09:25	03/20/15 12:46	91-20-3	
Phenanthrene	<102	ug/kg	203	102	10	03/16/15 09:25	03/20/15 12:46	85-01-8	
Pyrene	128J	ug/kg	203	102	10	03/16/15 09:25	03/20/15 12:46	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	72	%	39-130		10	03/16/15 09:25	03/20/15 12:46	321-60-8	
Terphenyl-d14 (S)	71	%	37-130		10	03/16/15 09:25	03/20/15 12:46	1718-51-0	
<b>8260 MSV Med Level Normal List</b>									
Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B									
Benzene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	71-43-2	W
Bromobenzene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	108-86-1	W
Bromochloromethane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	74-97-5	W
Bromodichloromethane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	75-27-4	W
Bromoform	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	75-25-2	W
Bromomethane	<1400	ug/kg	5000	1400	20	03/16/15 07:50	03/16/15 19:46	74-83-9	W
n-Butylbenzene	3800	ug/kg	1460	610	20	03/16/15 07:50	03/16/15 19:46	104-51-8	
sec-Butylbenzene	1700	ug/kg	1460	610	20	03/16/15 07:50	03/16/15 19:46	135-98-8	
tert-Butylbenzene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	98-06-6	W
Carbon tetrachloride	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	56-23-5	W

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Sample: **GP-10 S4** Lab ID: **40111561019** Collected: 03/11/15 15:00 Received: 03/12/15 08:30 Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
Chlorobenzene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	108-90-7	W
Chloroethane	<1340	ug/kg	5000	1340	20	03/16/15 07:50	03/16/15 19:46	75-00-3	W
Chloroform	<929	ug/kg	5000	929	20	03/16/15 07:50	03/16/15 19:46	67-66-3	W
Chloromethane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	74-87-3	W
2-Chlorotoluene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	95-49-8	W
4-Chlorotoluene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	106-43-4	W
1,2-Dibromo-3-chloropropane	<1820	ug/kg	5000	1820	20	03/16/15 07:50	03/16/15 19:46	96-12-8	W
Dibromochloromethane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	124-48-1	W
1,2-Dibromoethane (EDB)	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	106-93-4	W
Dibromomethane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	74-95-3	W
1,2-Dichlorobenzene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	95-50-1	W
1,3-Dichlorobenzene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	541-73-1	W
1,4-Dichlorobenzene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	106-46-7	W
Dichlorodifluoromethane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	75-71-8	W
1,1-Dichloroethane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	75-34-3	W
1,2-Dichloroethane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	107-06-2	W
1,1-Dichloroethene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	75-35-4	W
cis-1,2-Dichloroethene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	156-59-2	W
trans-1,2-Dichloroethene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	156-60-5	W
1,2-Dichloropropane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	78-87-5	W
1,3-Dichloropropane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	142-28-9	W
2,2-Dichloropropane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	594-20-7	W
1,1-Dichloropropene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	563-58-6	W
cis-1,3-Dichloropropene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	10061-01-5	W
trans-1,3-Dichloropropene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	10061-02-6	W
Diisopropyl ether	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	108-20-3	W
Ethylbenzene	9820	ug/kg	1460	610	20	03/16/15 07:50	03/16/15 19:46	100-41-4	
Hexachloro-1,3-butadiene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	87-68-3	W
Isopropylbenzene (Cumene)	3860	ug/kg	1460	610	20	03/16/15 07:50	03/16/15 19:46	98-82-8	
p-Isopropyltoluene	3760	ug/kg	1460	610	20	03/16/15 07:50	03/16/15 19:46	99-87-6	
Methylene Chloride	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	75-09-2	W
Methyl-tert-butyl ether	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	1634-04-4	W
Naphthalene	18800	ug/kg	6100	977	20	03/16/15 07:50	03/16/15 19:46	91-20-3	
n-Propylbenzene	6550	ug/kg	1460	610	20	03/16/15 07:50	03/16/15 19:46	103-65-1	
Styrene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	100-42-5	W
1,1,1,2-Tetrachloroethane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	630-20-6	W
1,1,2,2-Tetrachloroethane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	79-34-5	W
Tetrachloroethene	661J	ug/kg	1460	610	20	03/16/15 07:50	03/16/15 19:46	127-18-4	
Toluene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	108-88-3	W
1,2,3-Trichlorobenzene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	87-61-6	W
1,2,4-Trichlorobenzene	<951	ug/kg	5000	951	20	03/16/15 07:50	03/16/15 19:46	120-82-1	W
1,1,1-Trichloroethane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	71-55-6	W
1,1,2-Trichloroethane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	79-00-5	W
Trichloroethene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	79-01-6	W
Trichlorofluoromethane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	75-69-4	W

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-10 S4**      **Lab ID: 40111561019**      Collected: 03/11/15 15:00      Received: 03/12/15 08:30      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV Med Level Normal List</b>		Analytical Method: EPA 8260 Preparation Method: EPA 5035/5030B							
1,2,3-Trichloropropane	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	96-18-4	W
1,2,4-Trimethylbenzene	43100	ug/kg	1460	610	20	03/16/15 07:50	03/16/15 19:46	95-63-6	
1,3,5-Trimethylbenzene	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	108-67-8	W
Vinyl chloride	<500	ug/kg	1200	500	20	03/16/15 07:50	03/16/15 19:46	75-01-4	W
Xylene (Total)	11500	ug/kg	4390	1830	20	03/16/15 07:50	03/16/15 19:46	1330-20-7	
<b>Surrogates</b>									
Dibromofluoromethane (S)	0	%	49-157		20	03/16/15 07:50	03/16/15 19:46	1868-53-7	D3,S4
Toluene-d8 (S)	0	%	61-148		20	03/16/15 07:50	03/16/15 19:46	2037-26-5	S4
4-Bromofluorobenzene (S)	0	%	53-134		20	03/16/15 07:50	03/16/15 19:46	460-00-4	S4
<b>Percent Moisture</b>		Analytical Method: ASTM D2974-87							
Percent Moisture	18.0	%	0.10	0.10	1		03/16/15 15:02		

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-10**      **Lab ID: 40111561020**      Collected: 03/11/15 15:00      Received: 03/12/15 08:30      Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV</b> Analytical Method: EPA 8260									
Benzene	174	ug/L	20.0	10.0	20		03/13/15 18:29	71-43-2	
Bromobenzene	<4.6	ug/L	20.0	4.6	20		03/13/15 18:29	108-86-1	
Bromochloromethane	<6.8	ug/L	20.0	6.8	20		03/13/15 18:29	74-97-5	
Bromodichloromethane	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	75-27-4	
Bromoform	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	75-25-2	
Bromomethane	<48.7	ug/L	100	48.7	20		03/13/15 18:29	74-83-9	
n-Butylbenzene	106	ug/L	20.0	10.0	20		03/13/15 18:29	104-51-8	
sec-Butylbenzene	47.6J	ug/L	100	43.7	20		03/13/15 18:29	135-98-8	
tert-Butylbenzene	<3.6	ug/L	20.0	3.6	20		03/13/15 18:29	98-06-6	
Carbon tetrachloride	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	56-23-5	
Chlorobenzene	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	108-90-7	
Chloroethane	8.7J	ug/L	20.0	7.5	20		03/13/15 18:29	75-00-3	
Chloroform	<50.0	ug/L	100	50.0	20		03/13/15 18:29	67-66-3	
Chloromethane	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	74-87-3	
2-Chlorotoluene	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	95-49-8	
4-Chlorotoluene	<4.3	ug/L	20.0	4.3	20		03/13/15 18:29	106-43-4	
1,2-Dibromo-3-chloropropane	<43.3	ug/L	100	43.3	20		03/13/15 18:29	96-12-8	
Dibromochloromethane	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	124-48-1	
1,2-Dibromoethane (EDB)	<3.6	ug/L	20.0	3.6	20		03/13/15 18:29	106-93-4	
Dibromomethane	<8.5	ug/L	20.0	8.5	20		03/13/15 18:29	74-95-3	
1,2-Dichlorobenzene	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	95-50-1	
1,3-Dichlorobenzene	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	541-73-1	
1,4-Dichlorobenzene	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	106-46-7	
Dichlorodifluoromethane	<4.5	ug/L	20.0	4.5	20		03/13/15 18:29	75-71-8	
1,1-Dichloroethane	<4.8	ug/L	20.0	4.8	20		03/13/15 18:29	75-34-3	
1,2-Dichloroethane	<3.4	ug/L	20.0	3.4	20		03/13/15 18:29	107-06-2	
1,1-Dichloroethene	<8.2	ug/L	20.0	8.2	20		03/13/15 18:29	75-35-4	
cis-1,2-Dichloroethene	<5.1	ug/L	20.0	5.1	20		03/13/15 18:29	156-59-2	
trans-1,2-Dichloroethene	<5.1	ug/L	20.0	5.1	20		03/13/15 18:29	156-60-5	
1,2-Dichloropropane	<4.7	ug/L	20.0	4.7	20		03/13/15 18:29	78-87-5	
1,3-Dichloropropane	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	142-28-9	
2,2-Dichloropropane	<9.7	ug/L	20.0	9.7	20		03/13/15 18:29	594-20-7	
1,1-Dichloropropene	<8.8	ug/L	20.0	8.8	20		03/13/15 18:29	563-58-6	
cis-1,3-Dichloropropene	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	10061-01-5	
trans-1,3-Dichloropropene	<4.6	ug/L	20.0	4.6	20		03/13/15 18:29	10061-02-6	
Diisopropyl ether	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	108-20-3	
Ethylbenzene	1380	ug/L	20.0	10.0	20		03/13/15 18:29	100-41-4	
Hexachloro-1,3-butadiene	<42.1	ug/L	100	42.1	20		03/13/15 18:29	87-68-3	
Isopropylbenzene (Cumene)	199	ug/L	20.0	2.9	20		03/13/15 18:29	98-82-8	
p-Isopropyltoluene	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	99-87-6	
Methylene Chloride	<4.7	ug/L	20.0	4.7	20		03/13/15 18:29	75-09-2	
Methyl-tert-butyl ether	<3.5	ug/L	20.0	3.5	20		03/13/15 18:29	1634-04-4	
Naphthalene	1530	ug/L	100	50.0	20		03/13/15 18:29	91-20-3	
n-Propylbenzene	326	ug/L	20.0	10.0	20		03/13/15 18:29	103-65-1	
Styrene	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	100-42-5	
1,1,1,2-Tetrachloroethane	<3.6	ug/L	20.0	3.6	20		03/13/15 18:29	630-20-6	

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

**Sample: GP-10**      **Lab ID: 40111561020**      Collected: 03/11/15 15:00      Received: 03/12/15 08:30      Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV</b> Analytical Method: EPA 8260									
1,1,2,2-Tetrachloroethane	<5.0	ug/L	20.0	5.0	20		03/13/15 18:29	79-34-5	
Tetrachloroethene	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	127-18-4	
Toluene	147	ug/L	20.0	10.0	20		03/13/15 18:29	108-88-3	
1,2,3-Trichlorobenzene	<42.7	ug/L	100	42.7	20		03/13/15 18:29	87-61-6	
1,2,4-Trichlorobenzene	<44.2	ug/L	100	44.2	20		03/13/15 18:29	120-82-1	
1,1,1-Trichloroethane	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	71-55-6	
1,1,2-Trichloroethane	<3.9	ug/L	20.0	3.9	20		03/13/15 18:29	79-00-5	
Trichloroethene	<6.6	ug/L	20.0	6.6	20		03/13/15 18:29	79-01-6	
Trichlorofluoromethane	<3.7	ug/L	20.0	3.7	20		03/13/15 18:29	75-69-4	
1,2,3-Trichloropropane	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	96-18-4	
1,2,4-Trimethylbenzene	2130	ug/L	20.0	10.0	20		03/13/15 18:29	95-63-6	
1,3,5-Trimethylbenzene	<10.0	ug/L	20.0	10.0	20		03/13/15 18:29	108-67-8	
Vinyl chloride	<3.5	ug/L	20.0	3.5	20		03/13/15 18:29	75-01-4	
Xylene (Total)	1740	ug/L	60.0	30.0	20		03/13/15 18:29	1330-20-7	
<b>Surrogates</b>									
4-Bromofluorobenzene (S)	99	%	70-130		20		03/13/15 18:29	460-00-4	HS
Dibromofluoromethane (S)	99	%	70-130		20		03/13/15 18:29	1868-53-7	
Toluene-d8 (S)	96	%	70-130		20		03/13/15 18:29	2037-26-5	

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-3**      **Lab ID: 40111561021**      Collected: 03/11/15 00:00      Received: 03/12/15 08:30      Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV</b> Analytical Method: EPA 8260									
Benzene	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	71-43-2	
Bromobenzene	<0.23	ug/L	1.0	0.23	1		03/13/15 18:07	108-86-1	
Bromochloromethane	<0.34	ug/L	1.0	0.34	1		03/13/15 18:07	74-97-5	
Bromodichloromethane	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	75-27-4	
Bromoform	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	75-25-2	
Bromomethane	<2.4	ug/L	5.0	2.4	1		03/13/15 18:07	74-83-9	
n-Butylbenzene	5.0	ug/L	1.0	0.50	1		03/13/15 18:07	104-51-8	
sec-Butylbenzene	8.9	ug/L	5.0	2.2	1		03/13/15 18:07	135-98-8	
tert-Butylbenzene	0.53J	ug/L	1.0	0.18	1		03/13/15 18:07	98-06-6	
Carbon tetrachloride	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	56-23-5	
Chlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	108-90-7	
Chloroethane	<0.37	ug/L	1.0	0.37	1		03/13/15 18:07	75-00-3	
Chloroform	<2.5	ug/L	5.0	2.5	1		03/13/15 18:07	67-66-3	
Chloromethane	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	74-87-3	
2-Chlorotoluene	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	95-49-8	
4-Chlorotoluene	<0.21	ug/L	1.0	0.21	1		03/13/15 18:07	106-43-4	
1,2-Dibromo-3-chloropropane	<2.2	ug/L	5.0	2.2	1		03/13/15 18:07	96-12-8	
Dibromochloromethane	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	124-48-1	
1,2-Dibromoethane (EDB)	<0.18	ug/L	1.0	0.18	1		03/13/15 18:07	106-93-4	
Dibromomethane	<0.43	ug/L	1.0	0.43	1		03/13/15 18:07	74-95-3	
1,2-Dichlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	95-50-1	
1,3-Dichlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	541-73-1	
1,4-Dichlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	106-46-7	
Dichlorodifluoromethane	<0.22	ug/L	1.0	0.22	1		03/13/15 18:07	75-71-8	
1,1-Dichloroethane	<0.24	ug/L	1.0	0.24	1		03/13/15 18:07	75-34-3	
1,2-Dichloroethane	<0.17	ug/L	1.0	0.17	1		03/13/15 18:07	107-06-2	
1,1-Dichloroethene	<0.41	ug/L	1.0	0.41	1		03/13/15 18:07	75-35-4	
cis-1,2-Dichloroethene	<0.26	ug/L	1.0	0.26	1		03/13/15 18:07	156-59-2	
trans-1,2-Dichloroethene	<0.26	ug/L	1.0	0.26	1		03/13/15 18:07	156-60-5	
1,2-Dichloropropane	<0.23	ug/L	1.0	0.23	1		03/13/15 18:07	78-87-5	
1,3-Dichloropropane	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	142-28-9	
2,2-Dichloropropane	<0.48	ug/L	1.0	0.48	1		03/13/15 18:07	594-20-7	
1,1-Dichloropropene	<0.44	ug/L	1.0	0.44	1		03/13/15 18:07	563-58-6	
cis-1,3-Dichloropropene	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	10061-01-5	
trans-1,3-Dichloropropene	<0.23	ug/L	1.0	0.23	1		03/13/15 18:07	10061-02-6	
Diisopropyl ether	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	108-20-3	
Ethylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	100-41-4	
Hexachloro-1,3-butadiene	<2.1	ug/L	5.0	2.1	1		03/13/15 18:07	87-68-3	
Isopropylbenzene (Cumene)	3.2	ug/L	1.0	0.14	1		03/13/15 18:07	98-82-8	
p-Isopropyltoluene	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	99-87-6	
Methylene Chloride	<0.23	ug/L	1.0	0.23	1		03/13/15 18:07	75-09-2	
Methyl-tert-butyl ether	<0.17	ug/L	1.0	0.17	1		03/13/15 18:07	1634-04-4	
Naphthalene	<2.5	ug/L	5.0	2.5	1		03/13/15 18:07	91-20-3	
n-Propylbenzene	8.5	ug/L	1.0	0.50	1		03/13/15 18:07	103-65-1	
Styrene	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	100-42-5	
1,1,1,2-Tetrachloroethane	<0.18	ug/L	1.0	0.18	1		03/13/15 18:07	630-20-6	

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-3**      **Lab ID: 40111561021**      Collected: 03/11/15 00:00      Received: 03/12/15 08:30      Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV</b>									
Analytical Method: EPA 8260									
1,1,2,2-Tetrachloroethane	<0.25	ug/L	1.0	0.25	1		03/13/15 18:07	79-34-5	
Tetrachloroethene	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	127-18-4	
Toluene	1.0	ug/L	1.0	0.50	1		03/13/15 18:07	108-88-3	
1,2,3-Trichlorobenzene	<2.1	ug/L	5.0	2.1	1		03/13/15 18:07	87-61-6	
1,2,4-Trichlorobenzene	<2.2	ug/L	5.0	2.2	1		03/13/15 18:07	120-82-1	
1,1,1-Trichloroethane	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	71-55-6	
1,1,2-Trichloroethane	<0.20	ug/L	1.0	0.20	1		03/13/15 18:07	79-00-5	
Trichloroethene	<0.33	ug/L	1.0	0.33	1		03/13/15 18:07	79-01-6	
Trichlorofluoromethane	<0.18	ug/L	1.0	0.18	1		03/13/15 18:07	75-69-4	
1,2,3-Trichloropropane	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	96-18-4	
1,2,4-Trimethylbenzene	0.74J	ug/L	1.0	0.50	1		03/13/15 18:07	95-63-6	
1,3,5-Trimethylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 18:07	108-67-8	
Vinyl chloride	<0.18	ug/L	1.0	0.18	1		03/13/15 18:07	75-01-4	
Xylene (Total)	<1.5	ug/L	3.0	1.5	1		03/13/15 18:07	1330-20-7	
<b>Surrogates</b>									
4-Bromofluorobenzene (S)	99	%	70-130		1		03/13/15 18:07	460-00-4	HS
Dibromofluoromethane (S)	104	%	70-130		1		03/13/15 18:07	1868-53-7	
Toluene-d8 (S)	96	%	70-130		1		03/13/15 18:07	2037-26-5	

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-2**      **Lab ID: 40111561022**      Collected: 03/11/15 00:00      Received: 03/12/15 08:30      Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV</b> Analytical Method: EPA 8260									
Benzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	71-43-2	
Bromobenzene	<0.23	ug/L	1.0	0.23	1		03/13/15 15:38	108-86-1	
Bromochloromethane	<0.34	ug/L	1.0	0.34	1		03/13/15 15:38	74-97-5	
Bromodichloromethane	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	75-27-4	
Bromoform	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	75-25-2	
Bromomethane	<2.4	ug/L	5.0	2.4	1		03/13/15 15:38	74-83-9	
n-Butylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	104-51-8	
sec-Butylbenzene	<2.2	ug/L	5.0	2.2	1		03/13/15 15:38	135-98-8	
tert-Butylbenzene	<0.18	ug/L	1.0	0.18	1		03/13/15 15:38	98-06-6	
Carbon tetrachloride	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	56-23-5	
Chlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	108-90-7	
Chloroethane	<0.37	ug/L	1.0	0.37	1		03/13/15 15:38	75-00-3	
Chloroform	<2.5	ug/L	5.0	2.5	1		03/13/15 15:38	67-66-3	
Chloromethane	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	74-87-3	
2-Chlorotoluene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	95-49-8	
4-Chlorotoluene	<0.21	ug/L	1.0	0.21	1		03/13/15 15:38	106-43-4	
1,2-Dibromo-3-chloropropane	<2.2	ug/L	5.0	2.2	1		03/13/15 15:38	96-12-8	
Dibromochloromethane	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	124-48-1	
1,2-Dibromoethane (EDB)	<0.18	ug/L	1.0	0.18	1		03/13/15 15:38	106-93-4	
Dibromomethane	<0.43	ug/L	1.0	0.43	1		03/13/15 15:38	74-95-3	
1,2-Dichlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	95-50-1	
1,3-Dichlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	541-73-1	
1,4-Dichlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	106-46-7	
Dichlorodifluoromethane	<0.22	ug/L	1.0	0.22	1		03/13/15 15:38	75-71-8	
1,1-Dichloroethane	<0.24	ug/L	1.0	0.24	1		03/13/15 15:38	75-34-3	
1,2-Dichloroethane	<0.17	ug/L	1.0	0.17	1		03/13/15 15:38	107-06-2	
1,1-Dichloroethene	<0.41	ug/L	1.0	0.41	1		03/13/15 15:38	75-35-4	
cis-1,2-Dichloroethene	<0.26	ug/L	1.0	0.26	1		03/13/15 15:38	156-59-2	
trans-1,2-Dichloroethene	<0.26	ug/L	1.0	0.26	1		03/13/15 15:38	156-60-5	
1,2-Dichloropropane	<0.23	ug/L	1.0	0.23	1		03/13/15 15:38	78-87-5	
1,3-Dichloropropane	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	142-28-9	
2,2-Dichloropropane	<0.48	ug/L	1.0	0.48	1		03/13/15 15:38	594-20-7	
1,1-Dichloropropene	<0.44	ug/L	1.0	0.44	1		03/13/15 15:38	563-58-6	
cis-1,3-Dichloropropene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	10061-01-5	
trans-1,3-Dichloropropene	<0.23	ug/L	1.0	0.23	1		03/13/15 15:38	10061-02-6	
Diisopropyl ether	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	108-20-3	
Ethylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	100-41-4	
Hexachloro-1,3-butadiene	<2.1	ug/L	5.0	2.1	1		03/13/15 15:38	87-68-3	
Isopropylbenzene (Cumene)	<0.14	ug/L	1.0	0.14	1		03/13/15 15:38	98-82-8	
p-Isopropyltoluene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	99-87-6	
Methylene Chloride	<0.23	ug/L	1.0	0.23	1		03/13/15 15:38	75-09-2	
Methyl-tert-butyl ether	<0.17	ug/L	1.0	0.17	1		03/13/15 15:38	1634-04-4	
Naphthalene	<2.5	ug/L	5.0	2.5	1		03/13/15 15:38	91-20-3	
n-Propylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	103-65-1	
Styrene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	100-42-5	
1,1,1,2-Tetrachloroethane	<0.18	ug/L	1.0	0.18	1		03/13/15 15:38	630-20-6	

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### ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-2**      **Lab ID: 40111561022**      Collected: 03/11/15 00:00      Received: 03/12/15 08:30      Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV</b>									
Analytical Method: EPA 8260									
1,1,2,2-Tetrachloroethane	<0.25	ug/L	1.0	0.25	1		03/13/15 15:38	79-34-5	
Tetrachloroethene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	127-18-4	
Toluene	0.57J	ug/L	1.0	0.50	1		03/13/15 15:38	108-88-3	
1,2,3-Trichlorobenzene	<2.1	ug/L	5.0	2.1	1		03/13/15 15:38	87-61-6	
1,2,4-Trichlorobenzene	<2.2	ug/L	5.0	2.2	1		03/13/15 15:38	120-82-1	
1,1,1-Trichloroethane	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	71-55-6	
1,1,2-Trichloroethane	<0.20	ug/L	1.0	0.20	1		03/13/15 15:38	79-00-5	
Trichloroethene	<0.33	ug/L	1.0	0.33	1		03/13/15 15:38	79-01-6	
Trichlorofluoromethane	<0.18	ug/L	1.0	0.18	1		03/13/15 15:38	75-69-4	
1,2,3-Trichloropropane	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	96-18-4	
1,2,4-Trimethylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	95-63-6	
1,3,5-Trimethylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 15:38	108-67-8	
Vinyl chloride	<0.18	ug/L	1.0	0.18	1		03/13/15 15:38	75-01-4	
Xylene (Total)	<1.5	ug/L	3.0	1.5	1		03/13/15 15:38	1330-20-7	
<b>Surrogates</b>									
4-Bromofluorobenzene (S)	93	%	70-130		1		03/13/15 15:38	460-00-4	
Dibromofluoromethane (S)	123	%	70-130		1		03/13/15 15:38	1868-53-7	
Toluene-d8 (S)	87	%	70-130		1		03/13/15 15:38	2037-26-5	

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-8**      **Lab ID: 40111561023**      Collected: 03/11/15 00:00      Received: 03/12/15 08:30      Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV</b> Analytical Method: EPA 8260									
Benzene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	71-43-2	
Bromobenzene	<0.23	ug/L	1.0	0.23	1		03/13/15 16:01	108-86-1	
Bromochloromethane	<0.34	ug/L	1.0	0.34	1		03/13/15 16:01	74-97-5	
Bromodichloromethane	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	75-27-4	
Bromoform	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	75-25-2	
Bromomethane	<2.4	ug/L	5.0	2.4	1		03/13/15 16:01	74-83-9	
n-Butylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	104-51-8	
sec-Butylbenzene	<2.2	ug/L	5.0	2.2	1		03/13/15 16:01	135-98-8	
tert-Butylbenzene	<0.18	ug/L	1.0	0.18	1		03/13/15 16:01	98-06-6	
Carbon tetrachloride	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	56-23-5	
Chlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	108-90-7	
Chloroethane	<0.37	ug/L	1.0	0.37	1		03/13/15 16:01	75-00-3	
Chloroform	<2.5	ug/L	5.0	2.5	1		03/13/15 16:01	67-66-3	
Chloromethane	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	74-87-3	
2-Chlorotoluene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	95-49-8	
4-Chlorotoluene	<0.21	ug/L	1.0	0.21	1		03/13/15 16:01	106-43-4	
1,2-Dibromo-3-chloropropane	<2.2	ug/L	5.0	2.2	1		03/13/15 16:01	96-12-8	
Dibromochloromethane	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	124-48-1	
1,2-Dibromoethane (EDB)	<0.18	ug/L	1.0	0.18	1		03/13/15 16:01	106-93-4	
Dibromomethane	<0.43	ug/L	1.0	0.43	1		03/13/15 16:01	74-95-3	
1,2-Dichlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	95-50-1	
1,3-Dichlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	541-73-1	
1,4-Dichlorobenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	106-46-7	
Dichlorodifluoromethane	<0.22	ug/L	1.0	0.22	1		03/13/15 16:01	75-71-8	
1,1-Dichloroethane	<0.24	ug/L	1.0	0.24	1		03/13/15 16:01	75-34-3	
1,2-Dichloroethane	<0.17	ug/L	1.0	0.17	1		03/13/15 16:01	107-06-2	
1,1-Dichloroethene	<0.41	ug/L	1.0	0.41	1		03/13/15 16:01	75-35-4	
cis-1,2-Dichloroethene	<0.26	ug/L	1.0	0.26	1		03/13/15 16:01	156-59-2	
trans-1,2-Dichloroethene	<0.26	ug/L	1.0	0.26	1		03/13/15 16:01	156-60-5	
1,2-Dichloropropane	<0.23	ug/L	1.0	0.23	1		03/13/15 16:01	78-87-5	
1,3-Dichloropropane	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	142-28-9	
2,2-Dichloropropane	<0.48	ug/L	1.0	0.48	1		03/13/15 16:01	594-20-7	
1,1-Dichloropropene	<0.44	ug/L	1.0	0.44	1		03/13/15 16:01	563-58-6	
cis-1,3-Dichloropropene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	10061-01-5	
trans-1,3-Dichloropropene	<0.23	ug/L	1.0	0.23	1		03/13/15 16:01	10061-02-6	
Diisopropyl ether	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	108-20-3	
Ethylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	100-41-4	
Hexachloro-1,3-butadiene	<2.1	ug/L	5.0	2.1	1		03/13/15 16:01	87-68-3	
Isopropylbenzene (Cumene)	0.17J	ug/L	1.0	0.14	1		03/13/15 16:01	98-82-8	
p-Isopropyltoluene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	99-87-6	
Methylene Chloride	<0.23	ug/L	1.0	0.23	1		03/13/15 16:01	75-09-2	
Methyl-tert-butyl ether	<0.17	ug/L	1.0	0.17	1		03/13/15 16:01	1634-04-4	
Naphthalene	<2.5	ug/L	5.0	2.5	1		03/13/15 16:01	91-20-3	
n-Propylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	103-65-1	
Styrene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	100-42-5	
1,1,1,2-Tetrachloroethane	<0.18	ug/L	1.0	0.18	1		03/13/15 16:01	630-20-6	

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## ANALYTICAL RESULTS

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

**Sample: GP-8**      **Lab ID: 40111561023**      Collected: 03/11/15 00:00      Received: 03/12/15 08:30      Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
<b>8260 MSV</b>									
Analytical Method: EPA 8260									
1,1,2,2-Tetrachloroethane	<0.25	ug/L	1.0	0.25	1		03/13/15 16:01	79-34-5	
Tetrachloroethene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	127-18-4	
Toluene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	108-88-3	
1,2,3-Trichlorobenzene	<2.1	ug/L	5.0	2.1	1		03/13/15 16:01	87-61-6	
1,2,4-Trichlorobenzene	<2.2	ug/L	5.0	2.2	1		03/13/15 16:01	120-82-1	
1,1,1-Trichloroethane	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	71-55-6	
1,1,2-Trichloroethane	<0.20	ug/L	1.0	0.20	1		03/13/15 16:01	79-00-5	
Trichloroethene	<0.33	ug/L	1.0	0.33	1		03/13/15 16:01	79-01-6	
Trichlorofluoromethane	<0.18	ug/L	1.0	0.18	1		03/13/15 16:01	75-69-4	
1,2,3-Trichloropropane	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	96-18-4	
1,2,4-Trimethylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	95-63-6	
1,3,5-Trimethylbenzene	<0.50	ug/L	1.0	0.50	1		03/13/15 16:01	108-67-8	
Vinyl chloride	<0.18	ug/L	1.0	0.18	1		03/13/15 16:01	75-01-4	
Xylene (Total)	<1.5	ug/L	3.0	1.5	1		03/13/15 16:01	1330-20-7	
<b>Surrogates</b>									
4-Bromofluorobenzene (S)	97	%	70-130		1		03/13/15 16:01	460-00-4	
Dibromofluoromethane (S)	114	%	70-130		1		03/13/15 16:01	1868-53-7	
Toluene-d8 (S)	93	%	70-130		1		03/13/15 16:01	2037-26-5	

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

QC Batch: MERP/4798 Analysis Method: EPA 7471  
QC Batch Method: EPA 7471 Analysis Description: 7471 Mercury  
Associated Lab Samples: 40111561001, 40111561002, 40111561003, 40111561004, 40111561005, 40111561006, 40111561007, 40111561008, 40111561009, 40111561010, 40111561011, 40111561012, 40111561013, 40111561014, 40111561016, 40111561017, 40111561018, 40111561019

METHOD BLANK: 1127143 Matrix: Solid  
Associated Lab Samples: 40111561001, 40111561002, 40111561003, 40111561004, 40111561005, 40111561006, 40111561007, 40111561008, 40111561009, 40111561010, 40111561011, 40111561012, 40111561013, 40111561014, 40111561016, 40111561017, 40111561018, 40111561019

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mercury	mg/kg	<0.0033	0.0067	03/16/15 14:59	

LABORATORY CONTROL SAMPLE: 1127144

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mercury	mg/kg	.17	0.18	106	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1127145 1127146

Parameter	Units	40111561001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mercury	mg/kg	0.22	.2	.2	0.25	0.25	16	16	85-115	0	20	M0

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

QC Batch: MPRP/11578 Analysis Method: EPA 6010  
 QC Batch Method: EPA 3050 Analysis Description: 6010 MET  
 Associated Lab Samples: 40111561001, 40111561002, 40111561003, 40111561004, 40111561005, 40111561006, 40111561007, 40111561008, 40111561009, 40111561010, 40111561011, 40111561012, 40111561013, 40111561014, 40111561016, 40111561017, 40111561018, 40111561019

METHOD BLANK: 1127438 Matrix: Solid  
 Associated Lab Samples: 40111561001, 40111561002, 40111561003, 40111561004, 40111561005, 40111561006, 40111561007, 40111561008, 40111561009, 40111561010, 40111561011, 40111561012, 40111561013, 40111561014, 40111561016, 40111561017, 40111561018, 40111561019

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/kg	<0.64	2.0	03/17/15 19:27	
Barium	mg/kg	<0.12	0.50	03/17/15 19:27	
Cadmium	mg/kg	<0.066	0.50	03/17/15 19:27	
Chromium	mg/kg	<0.19	0.50	03/17/15 19:27	
Lead	mg/kg	<0.43	1.0	03/17/15 19:27	
Selenium	mg/kg	<0.77	2.0	03/17/15 19:27	
Silver	mg/kg	<0.28	1.0	03/17/15 19:27	

LABORATORY CONTROL SAMPLE: 1127439

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	50	49.3	99	80-120	
Barium	mg/kg	50	50.0	100	80-120	
Cadmium	mg/kg	50	49.9	100	80-120	
Chromium	mg/kg	50	50.4	101	80-120	
Lead	mg/kg	50	50.5	101	80-120	
Selenium	mg/kg	50	48.4	97	80-120	
Silver	mg/kg	25	24.2	97	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1127440 1127441

Parameter	Units	MS		MSD		MS % Rec	MSD % Rec	% Rec Limits	Max RPD	Qual	
		40111479014 Result	Spike Conc.	Spike Conc.	MS Result						MSD Result
Arsenic	mg/kg	3.5	58.5	58.5	54.5	54.4	87	87	75-125	0	20
Barium	mg/kg	73.8	58.5	58.5	127	128	91	93	75-125	1	20
Cadmium	mg/kg	<0.077	58.5	58.5	54.1	54.2	92	93	75-125	0	20
Chromium	mg/kg	28.2	58.5	58.5	83.6	83.6	95	95	75-125	0	20
Lead	mg/kg	7.3	58.5	58.5	58.7	58.1	88	87	75-125	1	20
Selenium	mg/kg	<0.90	58.5	58.5	50.8	50.3	87	86	75-125	1	20
Silver	mg/kg	0.55J	29.3	29.3	26.9	27.1	90	91	75-125	1	20

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

QC Batch: MSV/27740 Analysis Method: EPA 8260  
 QC Batch Method: EPA 5035/5030B Analysis Description: 8260 MSV Med Level Normal List  
 Associated Lab Samples: 40111561001, 40111561002, 40111561003, 40111561004, 40111561005, 40111561006, 40111561007, 40111561008, 40111561009, 40111561010, 40111561011, 40111561012, 40111561013, 40111561014

METHOD BLANK: 1127163 Matrix: Solid  
 Associated Lab Samples: 40111561001, 40111561002, 40111561003, 40111561004, 40111561005, 40111561006, 40111561007, 40111561008, 40111561009, 40111561010, 40111561011, 40111561012, 40111561013, 40111561014

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	ug/kg	<13.7	50.0	03/13/15 09:27	
1,1,1-Trichloroethane	ug/kg	<14.4	50.0	03/13/15 09:27	
1,1,2,2-Tetrachloroethane	ug/kg	<17.5	50.0	03/13/15 09:27	
1,1,2-Trichloroethane	ug/kg	<20.2	50.0	03/13/15 09:27	
1,1-Dichloroethane	ug/kg	<17.6	50.0	03/13/15 09:27	
1,1-Dichloroethene	ug/kg	<17.6	50.0	03/13/15 09:27	
1,1-Dichloropropene	ug/kg	<14.0	50.0	03/13/15 09:27	
1,2,3-Trichlorobenzene	ug/kg	<17.0	50.0	03/13/15 09:27	
1,2,3-Trichloropropane	ug/kg	<22.3	50.0	03/13/15 09:27	
1,2,4-Trichlorobenzene	ug/kg	<47.6	250	03/13/15 09:27	
1,2,4-Trimethylbenzene	ug/kg	<12.2	50.0	03/13/15 09:27	
1,2-Dibromo-3-chloropropane	ug/kg	<91.2	250	03/13/15 09:27	
1,2-Dibromoethane (EDB)	ug/kg	<14.7	50.0	03/13/15 09:27	
1,2-Dichlorobenzene	ug/kg	<16.2	50.0	03/13/15 09:27	
1,2-Dichloroethane	ug/kg	<15.0	50.0	03/13/15 09:27	
1,2-Dichloropropane	ug/kg	<16.8	50.0	03/13/15 09:27	
1,3,5-Trimethylbenzene	ug/kg	<14.5	50.0	03/13/15 09:27	
1,3-Dichlorobenzene	ug/kg	<13.2	50.0	03/13/15 09:27	
1,3-Dichloropropane	ug/kg	<12.0	50.0	03/13/15 09:27	
1,4-Dichlorobenzene	ug/kg	<15.9	50.0	03/13/15 09:27	
2,2-Dichloropropane	ug/kg	<12.6	50.0	03/13/15 09:27	
2-Chlorotoluene	ug/kg	<15.8	50.0	03/13/15 09:27	
4-Chlorotoluene	ug/kg	<13.0	50.0	03/13/15 09:27	
Benzene	ug/kg	<9.2	20.0	03/13/15 09:27	
Bromobenzene	ug/kg	<20.6	50.0	03/13/15 09:27	
Bromochloromethane	ug/kg	<21.4	50.0	03/13/15 09:27	
Bromodichloromethane	ug/kg	<9.8	50.0	03/13/15 09:27	
Bromoform	ug/kg	<19.8	50.0	03/13/15 09:27	
Bromomethane	ug/kg	<69.9	250	03/13/15 09:27	
Carbon tetrachloride	ug/kg	<12.1	50.0	03/13/15 09:27	
Chlorobenzene	ug/kg	<14.8	50.0	03/13/15 09:27	
Chloroethane	ug/kg	<67.0	250	03/13/15 09:27	
Chloroform	ug/kg	<46.4	250	03/13/15 09:27	
Chloromethane	ug/kg	<20.4	50.0	03/13/15 09:27	
cis-1,2-Dichloroethene	ug/kg	<16.6	50.0	03/13/15 09:27	
cis-1,3-Dichloropropene	ug/kg	<16.6	50.0	03/13/15 09:27	
Dibromochloromethane	ug/kg	<17.9	50.0	03/13/15 09:27	
Dibromomethane	ug/kg	<19.3	50.0	03/13/15 09:27	
Dichlorodifluoromethane	ug/kg	<12.3	50.0	03/13/15 09:27	
Diisopropyl ether	ug/kg	<17.7	50.0	03/13/15 09:27	

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

METHOD BLANK: 1127163

Matrix: Solid

Associated Lab Samples: 40111561001, 40111561002, 40111561003, 40111561004, 40111561005, 40111561006, 40111561007, 40111561008, 40111561009, 40111561010, 40111561011, 40111561012, 40111561013, 40111561014

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Ethylbenzene	ug/kg	<12.4	50.0	03/13/15 09:27	
Hexachloro-1,3-butadiene	ug/kg	<24.5	50.0	03/13/15 09:27	
Isopropylbenzene (Cumene)	ug/kg	<12.6	50.0	03/13/15 09:27	
Methyl-tert-butyl ether	ug/kg	<12.7	50.0	03/13/15 09:27	
Methylene Chloride	ug/kg	<16.2	50.0	03/13/15 09:27	
n-Butylbenzene	ug/kg	<10.5	50.0	03/13/15 09:27	
n-Propylbenzene	ug/kg	<11.6	50.0	03/13/15 09:27	
Naphthalene	ug/kg	<40.0	250	03/13/15 09:27	
p-Isopropyltoluene	ug/kg	<12.0	50.0	03/13/15 09:27	
sec-Butylbenzene	ug/kg	<11.9	50.0	03/13/15 09:27	
Styrene	ug/kg	<9.0	50.0	03/13/15 09:27	
tert-Butylbenzene	ug/kg	<9.5	50.0	03/13/15 09:27	
Tetrachloroethene	ug/kg	<12.9	50.0	03/13/15 09:27	
Toluene	ug/kg	<11.2	50.0	03/13/15 09:27	
trans-1,2-Dichloroethene	ug/kg	<16.5	50.0	03/13/15 09:27	
trans-1,3-Dichloropropene	ug/kg	<14.4	50.0	03/13/15 09:27	
Trichloroethene	ug/kg	<23.6	50.0	03/13/15 09:27	
Trichlorofluoromethane	ug/kg	<24.7	50.0	03/13/15 09:27	
Vinyl chloride	ug/kg	<21.1	50.0	03/13/15 09:27	
Xylene (Total)	ug/kg	<48.4	150	03/13/15 09:27	
4-Bromofluorobenzene (S)	%	93	39-139	03/13/15 09:27	
Dibromofluoromethane (S)	%	98	37-152	03/13/15 09:27	
Toluene-d8 (S)	%	104	38-154	03/13/15 09:27	

LABORATORY CONTROL SAMPLE & LCSD: 1127164

1127165

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
1,1,1-Trichloroethane	ug/kg	2500	2020	2230	81	89	70-130	10	20	
1,1,2,2-Tetrachloroethane	ug/kg	2500	2270	2310	91	93	70-130	2	20	
1,1,2-Trichloroethane	ug/kg	2500	2330	2380	93	95	70-130	2	20	
1,1-Dichloroethane	ug/kg	2500	2300	2490	92	99	70-130	8	20	
1,1-Dichloroethene	ug/kg	2500	2270	2440	91	97	70-130	7	20	
1,2,4-Trichlorobenzene	ug/kg	2500	2200	2360	88	95	70-130	7	20	
1,2-Dibromo-3-chloropropane	ug/kg	2500	1690	1860	68	75	50-150	10	20	
1,2-Dibromoethane (EDB)	ug/kg	2500	2270	2400	91	96	70-130	6	20	
1,2-Dichlorobenzene	ug/kg	2500	2380	2470	95	99	70-130	4	20	
1,2-Dichloroethane	ug/kg	2500	2170	2340	87	94	70-141	8	20	
1,2-Dichloropropane	ug/kg	2500	2370	2520	95	101	70-130	6	20	
1,3-Dichlorobenzene	ug/kg	2500	2340	2500	94	100	70-130	7	20	
1,4-Dichlorobenzene	ug/kg	2500	2370	2460	95	98	70-130	4	20	
Benzene	ug/kg	2500	2280	2450	91	98	70-130	7	20	
Bromodichloromethane	ug/kg	2500	2040	2120	82	85	70-130	4	20	
Bromoform	ug/kg	2500	1670	1770	67	71	70-130	6	20 LO	

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### REPORT OF LABORATORY ANALYSIS

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Parameter	Units	LABORATORY CONTROL SAMPLE & LCSD: 1127164		1127165			% Rec Limits	RPD	Max RPD	Qualifiers
		Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec				
Bromomethane	ug/kg	2500	2330	2480	93	99	34-173	6	20	
Carbon tetrachloride	ug/kg	2500	2150	2310	86	93	70-130	7	20	
Chlorobenzene	ug/kg	2500	2440	2540	98	102	70-130	4	20	
Chloroethane	ug/kg	2500	2410	2590	97	103	44-173	7	20	
Chloroform	ug/kg	2500	2200	2370	88	95	70-130	7	20	
Chloromethane	ug/kg	2500	2530	2640	101	105	43-130	4	20	
cis-1,2-Dichloroethene	ug/kg	2500	2210	2470	88	99	70-130	11	20	
cis-1,3-Dichloropropene	ug/kg	2500	2000	2140	80	86	70-130	7	20	
Dibromochloromethane	ug/kg	2500	2080	2150	83	86	70-130	3	20	
Dichlorodifluoromethane	ug/kg	2500	2240	2360	90	94	10-150	5	20	
Ethylbenzene	ug/kg	2500	2360	2450	95	98	70-130	4	20	
Isopropylbenzene (Cumene)	ug/kg	2500	2360	2500	94	100	70-130	6	20	
Methyl-tert-butyl ether	ug/kg	2500	2090	2190	83	88	65-131	5	20	
Methylene Chloride	ug/kg	2500	2210	2390	88	96	64-143	8	20	
Styrene	ug/kg	2500	2390	2530	95	101	70-130	6	20	
Tetrachloroethene	ug/kg	2500	2500	2550	100	102	70-130	2	20	
Toluene	ug/kg	2500	2440	2530	98	101	70-130	3	20	
trans-1,2-Dichloroethene	ug/kg	2500	2120	2320	85	93	70-130	9	20	
trans-1,3-Dichloropropene	ug/kg	2500	1890	1980	75	79	70-130	5	20	
Trichloroethene	ug/kg	2500	2300	2410	92	96	70-130	5	20	
Trichlorofluoromethane	ug/kg	2500	2230	2500	89	100	50-150	11	20	
Vinyl chloride	ug/kg	2500	2630	2700	105	108	57-130	3	20	
Xylene (Total)	ug/kg	7500	7230	7620	96	102	70-130	5	20	
4-Bromofluorobenzene (S)	%				93	95	39-139			
Dibromofluoromethane (S)	%				104	108	37-152			
Toluene-d8 (S)	%				104	106	38-154			

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

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QC Batch: MSV/27755 Analysis Method: EPA 8260  
 QC Batch Method: EPA 5035/5030B Analysis Description: 8260 MSV Med Level Normal List  
 Associated Lab Samples: 40111561016, 40111561017, 40111561018, 40111561019

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METHOD BLANK: 1128148 Matrix: Solid  
 Associated Lab Samples: 40111561016, 40111561017, 40111561018, 40111561019

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	ug/kg	<13.7	50.0	03/16/15 09:57	
1,1,1-Trichloroethane	ug/kg	<14.4	50.0	03/16/15 09:57	
1,1,2,2-Tetrachloroethane	ug/kg	<17.5	50.0	03/16/15 09:57	
1,1,2-Trichloroethane	ug/kg	<20.2	50.0	03/16/15 09:57	
1,1-Dichloroethane	ug/kg	<17.6	50.0	03/16/15 09:57	
1,1-Dichloroethene	ug/kg	<17.6	50.0	03/16/15 09:57	
1,1-Dichloropropene	ug/kg	<14.0	50.0	03/16/15 09:57	
1,2,3-Trichlorobenzene	ug/kg	29.6J	50.0	03/16/15 09:57	
1,2,3-Trichloropropane	ug/kg	<22.3	50.0	03/16/15 09:57	
1,2,4-Trichlorobenzene	ug/kg	<47.6	250	03/16/15 09:57	
1,2,4-Trimethylbenzene	ug/kg	<12.2	50.0	03/16/15 09:57	
1,2-Dibromo-3-chloropropane	ug/kg	<91.2	250	03/16/15 09:57	
1,2-Dibromoethane (EDB)	ug/kg	<14.7	50.0	03/16/15 09:57	
1,2-Dichlorobenzene	ug/kg	<16.2	50.0	03/16/15 09:57	
1,2-Dichloroethane	ug/kg	<15.0	50.0	03/16/15 09:57	
1,2-Dichloropropane	ug/kg	<16.8	50.0	03/16/15 09:57	
1,3,5-Trimethylbenzene	ug/kg	<14.5	50.0	03/16/15 09:57	
1,3-Dichlorobenzene	ug/kg	<13.2	50.0	03/16/15 09:57	
1,3-Dichloropropane	ug/kg	<12.0	50.0	03/16/15 09:57	
1,4-Dichlorobenzene	ug/kg	<15.9	50.0	03/16/15 09:57	
2,2-Dichloropropane	ug/kg	<12.6	50.0	03/16/15 09:57	
2-Chlorotoluene	ug/kg	<15.8	50.0	03/16/15 09:57	
4-Chlorotoluene	ug/kg	<13.0	50.0	03/16/15 09:57	
Benzene	ug/kg	<9.2	20.0	03/16/15 09:57	
Bromobenzene	ug/kg	<20.6	50.0	03/16/15 09:57	
Bromochloromethane	ug/kg	<21.4	50.0	03/16/15 09:57	
Bromodichloromethane	ug/kg	<9.8	50.0	03/16/15 09:57	
Bromoform	ug/kg	<19.8	50.0	03/16/15 09:57	
Bromomethane	ug/kg	<69.9	250	03/16/15 09:57	
Carbon tetrachloride	ug/kg	<12.1	50.0	03/16/15 09:57	
Chlorobenzene	ug/kg	<14.8	50.0	03/16/15 09:57	
Chloroethane	ug/kg	<67.0	250	03/16/15 09:57	
Chloroform	ug/kg	<46.4	250	03/16/15 09:57	
Chloromethane	ug/kg	<20.4	50.0	03/16/15 09:57	
cis-1,2-Dichloroethene	ug/kg	<16.6	50.0	03/16/15 09:57	
cis-1,3-Dichloropropene	ug/kg	<16.6	50.0	03/16/15 09:57	
Dibromochloromethane	ug/kg	<17.9	50.0	03/16/15 09:57	
Dibromomethane	ug/kg	<19.3	50.0	03/16/15 09:57	
Dichlorodifluoromethane	ug/kg	<12.3	50.0	03/16/15 09:57	
Diisopropyl ether	ug/kg	<17.7	50.0	03/16/15 09:57	
Ethylbenzene	ug/kg	<12.4	50.0	03/16/15 09:57	

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

METHOD BLANK: 1128148

Matrix: Solid

Associated Lab Samples: 40111561016, 40111561017, 40111561018, 40111561019

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Hexachloro-1,3-butadiene	ug/kg	<24.5	50.0	03/16/15 09:57	
Isopropylbenzene (Cumene)	ug/kg	<12.6	50.0	03/16/15 09:57	
Methyl-tert-butyl ether	ug/kg	<12.7	50.0	03/16/15 09:57	
Methylene Chloride	ug/kg	<16.2	50.0	03/16/15 09:57	
n-Butylbenzene	ug/kg	14.5J	50.0	03/16/15 09:57	
n-Propylbenzene	ug/kg	<11.6	50.0	03/16/15 09:57	
Naphthalene	ug/kg	<40.0	250	03/16/15 09:57	
p-Isopropyltoluene	ug/kg	<12.0	50.0	03/16/15 09:57	
sec-Butylbenzene	ug/kg	<11.9	50.0	03/16/15 09:57	
Styrene	ug/kg	<9.0	50.0	03/16/15 09:57	
tert-Butylbenzene	ug/kg	<9.5	50.0	03/16/15 09:57	
Tetrachloroethene	ug/kg	<12.9	50.0	03/16/15 09:57	
Toluene	ug/kg	<11.2	50.0	03/16/15 09:57	
trans-1,2-Dichloroethene	ug/kg	<16.5	50.0	03/16/15 09:57	
trans-1,3-Dichloropropene	ug/kg	<14.4	50.0	03/16/15 09:57	
Trichloroethene	ug/kg	<23.6	50.0	03/16/15 09:57	
Trichlorofluoromethane	ug/kg	<24.7	50.0	03/16/15 09:57	
Vinyl chloride	ug/kg	<21.1	50.0	03/16/15 09:57	
Xylene (Total)	ug/kg	<48.4	150	03/16/15 09:57	
4-Bromofluorobenzene (S)	%	94	53-134	03/16/15 09:57	
Dibromofluoromethane (S)	%	101	49-157	03/16/15 09:57	
Toluene-d8 (S)	%	104	61-148	03/16/15 09:57	

LABORATORY CONTROL SAMPLE & LCSD: 1128149

1128150

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
1,1,1-Trichloroethane	ug/kg	2500	2190	2100	87	84	70-130	4	20	
1,1,2,2-Tetrachloroethane	ug/kg	2500	2340	2260	94	90	70-130	4	20	
1,1,2-Trichloroethane	ug/kg	2500	2430	2370	97	95	70-130	3	20	
1,1-Dichloroethane	ug/kg	2500	2350	2350	94	94	70-130	0	20	
1,1-Dichloroethene	ug/kg	2500	2270	2330	91	93	70-132	3	20	
1,2,4-Trichlorobenzene	ug/kg	2500	2170	2320	87	93	70-130	7	20	
1,2-Dibromo-3-chloropropane	ug/kg	2500	1960	1960	78	78	45-150	0	20	
1,2-Dibromoethane (EDB)	ug/kg	2500	2360	2320	94	93	70-130	1	20	
1,2-Dichlorobenzene	ug/kg	2500	2350	2410	94	96	70-130	2	20	
1,2-Dichloroethane	ug/kg	2500	2300	2250	92	90	70-134	2	20	
1,2-Dichloropropane	ug/kg	2500	2470	2440	99	98	70-130	1	20	
1,3-Dichlorobenzene	ug/kg	2500	2370	2430	95	97	70-130	2	20	
1,4-Dichlorobenzene	ug/kg	2500	2380	2430	95	97	70-130	2	20	
Benzene	ug/kg	2500	2330	2320	93	93	70-130	0	20	
Bromodichloromethane	ug/kg	2500	2170	2130	87	85	70-130	1	20	
Bromoform	ug/kg	2500	1850	1820	74	73	48-130	2	20	
Bromomethane	ug/kg	2500	2240	2230	90	89	70-169	1	20	
Carbon tetrachloride	ug/kg	2500	2290	2250	92	90	67-130	2	20	

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

LABORATORY CONTROL SAMPLE & LCSD: 1128149			1128150								
Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers	
Chlorobenzene	ug/kg	2500	2480	2450	99	98	70-130	1	20		
Chloroethane	ug/kg	2500	2350	2350	94	94	70-191	0	20		
Chloroform	ug/kg	2500	2230	2260	89	90	70-130	1	20		
Chloromethane	ug/kg	2500	2440	2420	98	97	52-132	1	20		
cis-1,2-Dichloroethene	ug/kg	2500	2250	2270	90	91	70-130	1	20		
cis-1,3-Dichloropropene	ug/kg	2500	2180	2130	87	85	70-130	2	20		
Dibromochloromethane	ug/kg	2500	2170	2140	87	86	65-130	1	20		
Dichlorodifluoromethane	ug/kg	2500	2150	2050	86	82	12-150	5	20		
Ethylbenzene	ug/kg	2500	2350	2370	94	95	70-130	1	20		
Isopropylbenzene (Cumene)	ug/kg	2500	2380	2400	95	96	70-130	1	20		
Methyl-tert-butyl ether	ug/kg	2500	2320	2100	93	84	70-130	10	20		
Methylene Chloride	ug/kg	2500	2250	2240	90	90	70-131	1	20		
Styrene	ug/kg	2500	2420	2370	97	95	70-130	2	20		
Tetrachloroethene	ug/kg	2500	2490	2500	100	100	70-130	0	20		
Toluene	ug/kg	2500	2480	2440	99	98	70-130	2	20		
trans-1,2-Dichloroethene	ug/kg	2500	2180	2190	87	87	69-130	0	20		
trans-1,3-Dichloropropene	ug/kg	2500	2080	1990	83	80	65-130	5	20		
Trichloroethene	ug/kg	2500	2330	2320	93	93	70-130	0	20		
Trichlorofluoromethane	ug/kg	2500	2320	2200	93	88	50-150	5	20		
Vinyl chloride	ug/kg	2500	2520	2590	101	104	67-134	3	20		
Xylene (Total)	ug/kg	7500	7370	7320	98	98	70-130	1	20		
4-Bromofluorobenzene (S)	%				94	95	53-134				
Dibromofluoromethane (S)	%				100	102	49-157				
Toluene-d8 (S)	%				105	103	61-148				

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

QC Batch: MSV/27717 Analysis Method: EPA 8260  
 QC Batch Method: EPA 8260 Analysis Description: 8260 MSV  
 Associated Lab Samples: 40111561015, 40111561020, 40111561021, 40111561022, 40111561023

METHOD BLANK: 1126650 Matrix: Water  
 Associated Lab Samples: 40111561015, 40111561020, 40111561021, 40111561022, 40111561023

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	<0.18	1.0	03/13/15 07:47	
1,1,1-Trichloroethane	ug/L	<0.50	1.0	03/13/15 07:47	
1,1,2,2-Tetrachloroethane	ug/L	<0.25	1.0	03/13/15 07:47	
1,1,2-Trichloroethane	ug/L	<0.20	1.0	03/13/15 07:47	
1,1-Dichloroethane	ug/L	<0.24	1.0	03/13/15 07:47	
1,1-Dichloroethene	ug/L	<0.41	1.0	03/13/15 07:47	
1,1-Dichloropropene	ug/L	<0.44	1.0	03/13/15 07:47	
1,2,3-Trichlorobenzene	ug/L	<2.1	5.0	03/13/15 07:47	
1,2,3-Trichloropropane	ug/L	<0.50	1.0	03/13/15 07:47	
1,2,4-Trichlorobenzene	ug/L	<2.2	5.0	03/13/15 07:47	
1,2,4-Trimethylbenzene	ug/L	<0.50	1.0	03/13/15 07:47	
1,2-Dibromo-3-chloropropane	ug/L	<2.2	5.0	03/13/15 07:47	
1,2-Dibromoethane (EDB)	ug/L	<0.18	1.0	03/13/15 07:47	
1,2-Dichlorobenzene	ug/L	<0.50	1.0	03/13/15 07:47	
1,2-Dichloroethane	ug/L	<0.17	1.0	03/13/15 07:47	
1,2-Dichloropropane	ug/L	<0.23	1.0	03/13/15 07:47	
1,3,5-Trimethylbenzene	ug/L	<0.50	1.0	03/13/15 07:47	
1,3-Dichlorobenzene	ug/L	<0.50	1.0	03/13/15 07:47	
1,3-Dichloropropane	ug/L	<0.50	1.0	03/13/15 07:47	
1,4-Dichlorobenzene	ug/L	<0.50	1.0	03/13/15 07:47	
2,2-Dichloropropane	ug/L	<0.48	1.0	03/13/15 07:47	
2-Chlorotoluene	ug/L	<0.50	1.0	03/13/15 07:47	
4-Chlorotoluene	ug/L	<0.21	1.0	03/13/15 07:47	
Benzene	ug/L	<0.50	1.0	03/13/15 07:47	
Bromobenzene	ug/L	<0.23	1.0	03/13/15 07:47	
Bromochloromethane	ug/L	<0.34	1.0	03/13/15 07:47	
Bromodichloromethane	ug/L	<0.50	1.0	03/13/15 07:47	
Bromoform	ug/L	<0.50	1.0	03/13/15 07:47	
Bromomethane	ug/L	<2.4	5.0	03/13/15 07:47	
Carbon tetrachloride	ug/L	<0.50	1.0	03/13/15 07:47	
Chlorobenzene	ug/L	<0.50	1.0	03/13/15 07:47	
Chloroethane	ug/L	<0.37	1.0	03/13/15 07:47	
Chloroform	ug/L	<2.5	5.0	03/13/15 07:47	
Chloromethane	ug/L	<0.50	1.0	03/13/15 07:47	
cis-1,2-Dichloroethene	ug/L	<0.26	1.0	03/13/15 07:47	
cis-1,3-Dichloropropene	ug/L	<0.50	1.0	03/13/15 07:47	
Dibromochloromethane	ug/L	<0.50	1.0	03/13/15 07:47	
Dibromomethane	ug/L	<0.43	1.0	03/13/15 07:47	
Dichlorodifluoromethane	ug/L	<0.22	1.0	03/13/15 07:47	
Diisopropyl ether	ug/L	<0.50	1.0	03/13/15 07:47	
Ethylbenzene	ug/L	<0.50	1.0	03/13/15 07:47	

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### REPORT OF LABORATORY ANALYSIS

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

METHOD BLANK: 1126650

Matrix: Water

Associated Lab Samples: 40111561015, 40111561020, 40111561021, 40111561022, 40111561023

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Hexachloro-1,3-butadiene	ug/L	<2.1	5.0	03/13/15 07:47	
Isopropylbenzene (Cumene)	ug/L	<0.14	1.0	03/13/15 07:47	
Methyl-tert-butyl ether	ug/L	<0.17	1.0	03/13/15 07:47	
Methylene Chloride	ug/L	<0.23	1.0	03/13/15 07:47	
n-Butylbenzene	ug/L	<0.50	1.0	03/13/15 07:47	
n-Propylbenzene	ug/L	<0.50	1.0	03/13/15 07:47	
Naphthalene	ug/L	<2.5	5.0	03/13/15 07:47	
p-Isopropyltoluene	ug/L	<0.50	1.0	03/13/15 07:47	
sec-Butylbenzene	ug/L	<2.2	5.0	03/13/15 07:47	
Styrene	ug/L	<0.50	1.0	03/13/15 07:47	
tert-Butylbenzene	ug/L	<0.18	1.0	03/13/15 07:47	
Tetrachloroethene	ug/L	<0.50	1.0	03/13/15 07:47	
Toluene	ug/L	<0.50	1.0	03/13/15 07:47	
trans-1,2-Dichloroethene	ug/L	<0.26	1.0	03/13/15 07:47	
trans-1,3-Dichloropropene	ug/L	<0.23	1.0	03/13/15 07:47	
Trichloroethene	ug/L	<0.33	1.0	03/13/15 07:47	
Trichlorofluoromethane	ug/L	<0.18	1.0	03/13/15 07:47	
Vinyl chloride	ug/L	<0.18	1.0	03/13/15 07:47	
Xylene (Total)	ug/L	<1.5	3.0	03/13/15 07:47	
4-Bromofluorobenzene (S)	%	94	70-130	03/13/15 07:47	
Dibromofluoromethane (S)	%	117	70-130	03/13/15 07:47	
Toluene-d8 (S)	%	91	70-130	03/13/15 07:47	

LABORATORY CONTROL SAMPLE & LCSD: 1126651

1126652

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
1,1,1-Trichloroethane	ug/L	50	56.8	57.6	114	115	70-130	1	20	
1,1,2,2-Tetrachloroethane	ug/L	50	52.5	55.0	105	110	70-130	5	20	
1,1,2-Trichloroethane	ug/L	50	51.3	50.9	103	102	70-130	1	20	
1,1-Dichloroethane	ug/L	50	57.6	58.1	115	116	70-130	1	20	
1,1-Dichloroethene	ug/L	50	49.2	51.2	98	102	70-130	4	20	
1,2,4-Trichlorobenzene	ug/L	50	45.0	47.8	90	96	70-130	6	20	
1,2-Dibromo-3-chloropropane	ug/L	50	44.3	44.7	89	89	50-150	1	20	
1,2-Dibromoethane (EDB)	ug/L	50	49.8	50.2	100	100	70-130	1	20	
1,2-Dichlorobenzene	ug/L	50	50.5	52.6	101	105	70-130	4	20	
1,2-Dichloroethane	ug/L	50	57.4	57.5	115	115	70-131	0	20	
1,2-Dichloropropane	ug/L	50	57.1	57.2	114	114	70-130	0	20	
1,3-Dichlorobenzene	ug/L	50	51.4	53.2	103	106	70-130	3	20	
1,4-Dichlorobenzene	ug/L	50	51.3	53.2	103	106	70-130	4	20	
Benzene	ug/L	50	57.5	57.3	115	115	70-130	0	20	
Bromodichloromethane	ug/L	50	59.9	60.3	120	121	70-130	1	20	
Bromoform	ug/L	50	42.4	41.8	85	84	68-130	1	20	
Bromomethane	ug/L	50	43.8	49.3	88	99	38-137	12	20	
Carbon tetrachloride	ug/L	50	57.6	59.0	115	118	70-130	2	20	

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

LABORATORY CONTROL SAMPLE & LCSD:		1126651		1126652							
Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers	
Chlorobenzene	ug/L	50	54.1	54.1	108	108	70-130	0	20		
Chloroethane	ug/L	50	51.9	51.9	104	104	70-136	0	20		
Chloroform	ug/L	50	59.1	59.2	118	118	70-130	0	20		
Chloromethane	ug/L	50	56.9	55.0	114	110	48-144	3	20		
cis-1,2-Dichloroethene	ug/L	50	52.7	53.0	105	106	70-130	1	20		
cis-1,3-Dichloropropene	ug/L	50	46.2	47.1	92	94	70-130	2	20		
Dibromochloromethane	ug/L	50	47.3	47.0	95	94	70-130	1	20		
Dichlorodifluoromethane	ug/L	50	53.9	52.5	108	105	33-157	3	20		
Ethylbenzene	ug/L	50	57.9	57.8	116	116	70-132	0	20		
Isopropylbenzene (Cumene)	ug/L	50	58.5	58.8	117	118	70-130	1	20		
Methyl-tert-butyl ether	ug/L	50	48.6	49.3	97	99	48-141	1	20		
Methylene Chloride	ug/L	50	48.4	48.7	97	97	70-130	1	20		
Styrene	ug/L	50	50.8	51.6	102	103	70-130	2	20		
Tetrachloroethene	ug/L	50	53.0	52.8	106	106	70-130	0	20		
Toluene	ug/L	50	56.4	55.7	113	111	70-130	1	20		
trans-1,2-Dichloroethene	ug/L	50	58.7	58.3	117	117	70-130	1	20		
trans-1,3-Dichloropropene	ug/L	50	41.6	41.2	83	82	70-130	1	20		
Trichloroethene	ug/L	50	58.9	59.8	118	120	70-130	1	20		
Trichlorofluoromethane	ug/L	50	49.5	50.1	99	100	50-150	1	20		
Vinyl chloride	ug/L	50	53.1	52.8	106	106	65-142	1	20		
Xylene (Total)	ug/L	150	167	167	111	112	70-132	0	20		
4-Bromofluorobenzene (S)	%				102	101	70-130				
Dibromofluoromethane (S)	%				103	103	70-130				
Toluene-d8 (S)	%				97	95	70-130				

MATRIX SPIKE & MATRIX SPIKE DUPLICATE:		1126946		1126947							
Parameter	Units	MS		MSD		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
		40111541001 Result	Spike Conc.	Spike Conc.	MS Result						
1,1,1-Trichloroethane	ug/L	<0.50	50	50	56.8	57.2	114	114	70-130	1	20
1,1,2,2-Tetrachloroethane	ug/L	<0.25	50	50	55.0	54.2	110	108	70-130	1	20
1,1,2-Trichloroethane	ug/L	<0.20	50	50	52.2	50.0	104	100	70-130	4	20
1,1-Dichloroethane	ug/L	<0.24	50	50	57.3	56.5	115	113	70-134	1	20
1,1-Dichloroethene	ug/L	<0.41	50	50	49.9	49.9	100	100	70-139	0	20
1,2,4-Trichlorobenzene	ug/L	<2.2	50	50	48.9	48.7	98	97	70-130	0	20
1,2-Dibromo-3-chloropropane	ug/L	<2.2	50	50	46.8	46.1	94	92	50-150	2	20
1,2-Dibromoethane (EDB)	ug/L	<0.18	50	50	50.1	50.1	100	100	70-130	0	20
1,2-Dichlorobenzene	ug/L	<0.50	50	50	52.1	51.5	104	103	70-130	1	20
1,2-Dichloroethane	ug/L	<0.17	50	50	56.4	56.6	113	113	70-132	0	20
1,2-Dichloropropane	ug/L	<0.23	50	50	56.6	55.9	113	112	70-130	1	20
1,3-Dichlorobenzene	ug/L	<0.50	50	50	52.8	52.8	106	106	70-130	0	20
1,4-Dichlorobenzene	ug/L	<0.50	50	50	51.2	50.9	102	102	70-130	1	20
Benzene	ug/L	3.6	50	50	60.4	61.2	114	115	70-130	1	20
Bromodichloromethane	ug/L	<0.50	50	50	58.9	58.0	118	116	70-132	2	20

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Parameter	Units	40111541001		1126946		1126947		% Rec	% Rec	Limits	RPD	Max RPD	Qual
		Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec						
Bromoform	ug/L	<0.50	50	50	42.4	40.6	85	81	68-130	4	20		
Bromomethane	ug/L	<2.4	50	50	47.1	47.2	94	94	38-141	0	20		
Carbon tetrachloride	ug/L	<0.50	50	50	57.4	57.4	115	115	70-130	0	20		
Chlorobenzene	ug/L	<0.50	50	50	53.0	52.4	106	105	70-130	1	20		
Chloroethane	ug/L	<0.37	50	50	50.9	51.1	102	102	66-152	0	20		
Chloroform	ug/L	<2.5	50	50	58.1	58.7	116	117	70-130	1	20		
Chloromethane	ug/L	<0.50	50	50	53.3	52.1	107	104	44-151	2	20		
cis-1,2-Dichloroethene	ug/L	52.4	50	50	102	102	99	100	70-130	0	20		
cis-1,3-Dichloropropene	ug/L	<0.50	50	50	46.9	45.2	94	90	70-130	4	20		
Dibromochloromethane	ug/L	<0.50	50	50	47.9	45.9	96	92	70-130	4	20		
Dichlorodifluoromethane	ug/L	<0.22	50	50	50.8	50.4	102	101	29-160	1	20		
Ethylbenzene	ug/L	8.5	50	50	67.7	66.5	118	116	70-132	2	20		
Isopropylbenzene (Cumene)	ug/L	0.74J	50	50	59.2	58.3	117	115	70-130	2	20		
Methyl-tert-butyl ether	ug/L	<0.17	50	50	49.5	51.0	99	102	48-143	3	20		
Methylene Chloride	ug/L	<0.23	50	50	47.9	48.4	96	97	70-130	1	20		
Styrene	ug/L	<0.50	50	50	48.6	44.5	97	89	70-130	9	20		
Tetrachloroethene	ug/L	3.5	50	50	55.8	55.4	105	104	70-130	1	20		
Toluene	ug/L	23.1	50	50	79.8	77.6	113	109	70-130	3	20		
trans-1,2-Dichloroethene	ug/L	1.3	50	50	58.6	59.5	114	116	70-132	1	20		
trans-1,3-Dichloropropene	ug/L	<0.23	50	50	43.1	40.3	86	81	70-130	7	20		
Trichloroethene	ug/L	1.2	50	50	58.9	58.2	115	114	70-130	1	20		
Trichlorofluoromethane	ug/L	<0.18	50	50	49.0	49.7	98	99	50-153	1	20		
Vinyl chloride	ug/L	8.4	50	50	59.7	61.3	103	106	60-155	3	20		
Xylene (Total)	ug/L	56.2	150	150	227	219	114	108	70-132	4	20		
4-Bromofluorobenzene (S)	%						102	101	70-130				
Dibromofluoromethane (S)	%						103	106	70-130				
Toluene-d8 (S)	%						96	95	70-130				

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

QC Batch: OEXT/26002 Analysis Method: EPA 8270 by SIM  
 QC Batch Method: EPA 3546 Analysis Description: 8270/3546 MSSV PAH by SIM  
 Associated Lab Samples: 40111561001, 40111561002, 40111561003, 40111561004, 40111561005, 40111561006, 40111561007,  
 40111561008, 40111561009, 40111561010, 40111561011, 40111561012, 40111561013, 40111561014,  
 40111561016, 40111561017

METHOD BLANK: 1126983

Matrix: Solid

Associated Lab Samples: 40111561001, 40111561002, 40111561003, 40111561004, 40111561005, 40111561006, 40111561007,  
 40111561008, 40111561009, 40111561010, 40111561011, 40111561012, 40111561013, 40111561014,  
 40111561016, 40111561017

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1-Methylnaphthalene	ug/kg	<8.3	16.7	03/13/15 10:39	
2-Methylnaphthalene	ug/kg	<8.3	16.7	03/13/15 10:39	
Acenaphthene	ug/kg	<8.3	16.7	03/13/15 10:39	
Acenaphthylene	ug/kg	<7.5	16.7	03/13/15 10:39	
Anthracene	ug/kg	<8.6	16.7	03/13/15 10:39	
Benzo(a)anthracene	ug/kg	<5.8	16.7	03/13/15 10:39	
Benzo(a)pyrene	ug/kg	<6.0	16.7	03/13/15 10:39	
Benzo(b)fluoranthene	ug/kg	<8.3	16.7	03/13/15 10:39	
Benzo(g,h,i)perylene	ug/kg	<6.3	16.7	03/13/15 10:39	
Benzo(k)fluoranthene	ug/kg	<9.2	16.7	03/13/15 10:39	
Chrysene	ug/kg	<7.7	16.7	03/13/15 10:39	
Dibenz(a,h)anthracene	ug/kg	<6.1	16.7	03/13/15 10:39	
Fluoranthene	ug/kg	<8.3	16.7	03/13/15 10:39	
Fluorene	ug/kg	<8.3	16.7	03/13/15 10:39	
Indeno(1,2,3-cd)pyrene	ug/kg	<6.3	16.7	03/13/15 10:39	
Naphthalene	ug/kg	<8.3	16.7	03/13/15 10:39	
Phenanthrene	ug/kg	<8.3	16.7	03/13/15 10:39	
Pyrene	ug/kg	<8.3	16.7	03/13/15 10:39	
2-Fluorobiphenyl (S)	%	74	39-130	03/13/15 10:39	
Terphenyl-d14 (S)	%	94	37-130	03/13/15 10:39	

LABORATORY CONTROL SAMPLE: 1126984

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1-Methylnaphthalene	ug/kg	333	252	76	53-130	
2-Methylnaphthalene	ug/kg	333	235	70	52-130	
Acenaphthene	ug/kg	333	254	76	54-130	
Acenaphthylene	ug/kg	333	256	77	55-130	
Anthracene	ug/kg	333	295	89	64-130	
Benzo(a)anthracene	ug/kg	333	253	76	50-130	
Benzo(a)pyrene	ug/kg	333	231	69	46-130	
Benzo(b)fluoranthene	ug/kg	333	280	84	43-130	
Benzo(g,h,i)perylene	ug/kg	333	225	68	48-130	
Benzo(k)fluoranthene	ug/kg	333	255	77	55-130	
Chrysene	ug/kg	333	307	92	62-130	
Dibenz(a,h)anthracene	ug/kg	333	210	63	49-130	

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

LABORATORY CONTROL SAMPLE: 1126984

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Fluoranthene	ug/kg	333	286	86	57-130	
Fluorene	ug/kg	333	170	51	57-130	L0
Indeno(1,2,3-cd)pyrene	ug/kg	333	228	68	50-130	
Naphthalene	ug/kg	333	231	69	48-130	
Phenanthrene	ug/kg	333	244	73	51-130	
Pyrene	ug/kg	333	288	86	55-130	
2-Fluorobiphenyl (S)	%			72	39-130	
Terphenyl-d14 (S)	%			93	37-130	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1126985 1126986

Parameter	Units	MS		MSD		MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	Max RPD	Qual
		40111479012 Result	Spike Conc.	Spike Conc.	MSD Result							
1-Methylnaphthalene	ug/kg	<9.6	382	382	250	286	65	75	50-130	13	30	
2-Methylnaphthalene	ug/kg	<9.6	382	382	232	273	61	71	44-130	16	32	
Acenaphthene	ug/kg	<9.6	382	382	250	291	65	76	46-130	15	26	
Acenaphthylene	ug/kg	<8.6	382	382	250	296	65	77	49-130	17	23	
Anthracene	ug/kg	<9.9	382	382	274	341	72	89	52-130	22	28	
Benzo(a)anthracene	ug/kg	<6.6	382	382	226	279	59	73	34-130	21	36	
Benzo(a)pyrene	ug/kg	<6.8	382	382	217	267	57	70	34-130	21	40	
Benzo(b)fluoranthene	ug/kg	<9.6	382	382	227	292	59	76	22-130	25	40	
Benzo(g,h,i)perylene	ug/kg	<7.3	382	382	191	231	50	60	24-130	19	35	
Benzo(k)fluoranthene	ug/kg	<10.6	382	382	259	311	68	81	41-130	18	37	
Chrysene	ug/kg	<8.8	382	382	292	349	76	91	49-130	18	33	
Dibenz(a,h)anthracene	ug/kg	<7.0	382	382	175	214	46	56	27-130	20	31	
Fluoranthene	ug/kg	<9.6	382	382	258	317	68	83	34-130	20	37	
Fluorene	ug/kg	<9.6	382	382	145	182	38	48	45-130	22	25	M0
Indeno(1,2,3-cd)pyrene	ug/kg	<7.3	382	382	189	234	50	61	30-130	21	34	
Naphthalene	ug/kg	<9.6	382	382	247	285	64	75	38-130	14	30	
Phenanthrene	ug/kg	<9.6	382	382	230	277	60	72	38-130	19	34	
Pyrene	ug/kg	<9.6	382	382	264	321	69	84	35-130	19	35	
2-Fluorobiphenyl (S)	%						54	64	39-130			
Terphenyl-d14 (S)	%						66	80	37-130			

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

QC Batch: OEXT/26009 Analysis Method: EPA 8270 by SIM  
QC Batch Method: EPA 3546 Analysis Description: 8270/3546 MSSV PAH by SIM  
Associated Lab Samples: 40111561018, 40111561019

METHOD BLANK: 1128100 Matrix: Solid  
Associated Lab Samples: 40111561018, 40111561019

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1-Methylnaphthalene	ug/kg	<8.3	16.7	03/20/15 10:28	
2-Methylnaphthalene	ug/kg	<8.3	16.7	03/20/15 10:28	
Acenaphthene	ug/kg	<8.3	16.7	03/20/15 10:28	
Acenaphthylene	ug/kg	<7.5	16.7	03/20/15 10:28	
Anthracene	ug/kg	<8.6	16.7	03/20/15 10:28	
Benzo(a)anthracene	ug/kg	<5.8	16.7	03/20/15 10:28	
Benzo(a)pyrene	ug/kg	<6.0	16.7	03/20/15 10:28	
Benzo(b)fluoranthene	ug/kg	<8.3	16.7	03/20/15 10:28	
Benzo(g,h,i)perylene	ug/kg	<6.3	16.7	03/20/15 10:28	
Benzo(k)fluoranthene	ug/kg	<9.2	16.7	03/20/15 10:28	
Chrysene	ug/kg	<7.7	16.7	03/20/15 10:28	
Dibenz(a,h)anthracene	ug/kg	<6.1	16.7	03/20/15 10:28	
Fluoranthene	ug/kg	<8.3	16.7	03/20/15 10:28	
Fluorene	ug/kg	<8.3	16.7	03/20/15 10:28	
Indeno(1,2,3-cd)pyrene	ug/kg	<6.3	16.7	03/20/15 10:28	
Naphthalene	ug/kg	<8.3	16.7	03/20/15 10:28	
Phenanthrene	ug/kg	<8.3	16.7	03/20/15 10:28	
Pyrene	ug/kg	<8.3	16.7	03/20/15 10:28	
2-Fluorobiphenyl (S)	%	73	39-130	03/20/15 10:28	
Terphenyl-d14 (S)	%	81	37-130	03/20/15 10:28	

LABORATORY CONTROL SAMPLE: 1128101

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1-Methylnaphthalene	ug/kg	333	245	74	53-130	
2-Methylnaphthalene	ug/kg	333	237	71	52-130	
Acenaphthene	ug/kg	333	249	75	54-130	
Acenaphthylene	ug/kg	333	247	74	55-130	
Anthracene	ug/kg	333	264	79	64-130	
Benzo(a)anthracene	ug/kg	333	248	74	50-130	
Benzo(a)pyrene	ug/kg	333	258	78	46-130	
Benzo(b)fluoranthene	ug/kg	333	270	81	43-130	
Benzo(g,h,i)perylene	ug/kg	333	243	73	48-130	
Benzo(k)fluoranthene	ug/kg	333	247	74	55-130	
Chrysene	ug/kg	333	252	75	62-130	
Dibenz(a,h)anthracene	ug/kg	333	259	78	49-130	
Fluoranthene	ug/kg	333	250	75	57-130	
Fluorene	ug/kg	333	245	73	57-130	
Indeno(1,2,3-cd)pyrene	ug/kg	333	260	78	50-130	
Naphthalene	ug/kg	333	232	70	48-130	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

### REPORT OF LABORATORY ANALYSIS

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

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LABORATORY CONTROL SAMPLE: 1128101

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Phenanthrene	ug/kg	333	255	77	51-130	
Pyrene	ug/kg	333	245	73	55-130	
2-Fluorobiphenyl (S)	%			68	39-130	
Terphenyl-d14 (S)	%			71	37-130	

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

---

QC Batch: PMST/10963	Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87	Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 40111561001, 40111561002, 40111561003, 40111561004, 40111561005, 40111561006, 40111561007, 40111561008	

---

SAMPLE DUPLICATE: 1128187

Parameter	Units	40111561003 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	16.5	17.2	4	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

QC Batch: PMST/10964

Analysis Method: ASTM D2974-87

QC Batch Method: ASTM D2974-87

Analysis Description: Dry Weight/Percent Moisture

Associated Lab Samples: 40111561009

SAMPLE DUPLICATE: 1128275

Parameter	Units	40111733001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	10.5	10.3	1	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

### REPORT OF LABORATORY ANALYSIS

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### QUALITY CONTROL DATA

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

---

QC Batch:	PMST/10966	Analysis Method:	ASTM D2974-87
QC Batch Method:	ASTM D2974-87	Analysis Description:	Dry Weight/Percent Moisture
Associated Lab Samples:	40111561010, 40111561011, 40111561012, 40111561013, 40111561014, 40111561016, 40111561017, 40111561018, 40111561019		

---

SAMPLE DUPLICATE: 1128294

Parameter	Units	40111593004 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	4.6	4.5	1	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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## QUALIFIERS

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

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### DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.  
ND - Not Detected at or above LOD.  
J - Estimated concentration at or above the LOD and below the LOQ.  
LOD - Limit of Detection adjusted for dilution factor and percent moisture.  
LOQ - Limit of Quantitation adjusted for dilution factor and percent moisture.  
S - Surrogate  
1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.  
Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.  
LCS(D) - Laboratory Control Sample (Duplicate)  
MS(D) - Matrix Spike (Duplicate)  
DUP - Sample Duplicate  
RPD - Relative Percent Difference  
NC - Not Calculable.  
SG - Silica Gel - Clean-Up  
U - Indicates the compound was analyzed for, but not detected at or above the adjusted LOD.  
N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.  
Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.  
TNI - The NELAC Institute.

### LABORATORIES

PASI-G Pace Analytical Services - Green Bay

### BATCH QUALIFIERS

Batch: MSSV/7706  
[IP] Benzo(b)fluoranthene and benzo(k)fluoranthene were in the check standard but did not meet the resolution criteria in SW846 Method 8270C. Whereas sample results included are reported as individual isomers, the lab and the customer must recognize them as an isomeric pair.  
Batch: MSV/27742  
[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.  
Batch: MSV/27761  
[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

### ANALYTE QUALIFIERS

D3 Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.  
HS Results are from sample aliquot taken from VOA vial with headspace (air bubble greater than 6 mm diameter).  
L0 Analyte recovery in the laboratory control sample (LCS) was outside QC limits.  
L2 Analyte recovery in the laboratory control sample (LCS) was below QC limits. Results may be biased low.  
M0 Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits.  
S4 Surrogate recovery not evaluated against control limits due to sample dilution.  
W Non-detect results are reported on a wet weight basis.

## REPORT OF LABORATORY ANALYSIS

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### QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40111561001	GP-1 S2	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561002	GP-2 S2	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561003	GP-2 S4	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561004	GP-3 S1	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561005	GP-3 S4	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561006	GP-3 S5	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561007	GP-4 S1	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561008	GP-4 S4	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561009	GP-5 S1	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561010	GP-5 S5	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561011	GP-5 S3	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561012	GP-8 S2	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561013	GP-8 S3	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561014	GP-7 S1	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561016	GP-6 S2	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561017	GP-9 S1	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561018	GP-10 S2	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561019	GP-10 S4	EPA 3050	MPRP/11578	EPA 6010	ICP/10286
40111561001	GP-1 S2	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561002	GP-2 S2	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561003	GP-2 S4	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561004	GP-3 S1	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561005	GP-3 S4	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561006	GP-3 S5	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561007	GP-4 S1	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561008	GP-4 S4	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561009	GP-5 S1	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561010	GP-5 S5	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561011	GP-5 S3	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561012	GP-8 S2	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561013	GP-8 S3	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561014	GP-7 S1	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561016	GP-6 S2	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561017	GP-9 S1	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561018	GP-10 S2	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561019	GP-10 S4	EPA 7471	MERP/4798	EPA 7471	MERC/6502
40111561001	GP-1 S2	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706
40111561002	GP-2 S2	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706
40111561003	GP-2 S4	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706
40111561004	GP-3 S1	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706
40111561005	GP-3 S4	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706
40111561006	GP-3 S5	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706
40111561007	GP-4 S1	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706
40111561008	GP-4 S4	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706
40111561009	GP-5 S1	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706
40111561010	GP-5 S5	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706
40111561011	GP-5 S3	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706
40111561012	GP-8 S2	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706

### REPORT OF LABORATORY ANALYSIS

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### QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 25215045 MADISON WATER UTILITY

Pace Project No.: 40111561

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40111561013	GP-8 S3	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706
40111561014	GP-7 S1	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706
40111561016	GP-6 S2	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706
40111561017	GP-9 S1	EPA 3546	OEXT/26002	EPA 8270 by SIM	MSSV/7706
40111561018	GP-10 S2	EPA 3546	OEXT/26009	EPA 8270 by SIM	MSSV/7709
40111561019	GP-10 S4	EPA 3546	OEXT/26009	EPA 8270 by SIM	MSSV/7709
40111561001	GP-1 S2	EPA 5035/5030B	MSV/27740	EPA 8260	MSV/27742
40111561002	GP-2 S2	EPA 5035/5030B	MSV/27740	EPA 8260	MSV/27742
40111561003	GP-2 S4	EPA 5035/5030B	MSV/27740	EPA 8260	MSV/27742
40111561004	GP-3 S1	EPA 5035/5030B	MSV/27740	EPA 8260	MSV/27742
40111561005	GP-3 S4	EPA 5035/5030B	MSV/27740	EPA 8260	MSV/27742
40111561006	GP-3 S5	EPA 5035/5030B	MSV/27740	EPA 8260	MSV/27742
40111561007	GP-4 S1	EPA 5035/5030B	MSV/27740	EPA 8260	MSV/27742
40111561008	GP-4 S4	EPA 5035/5030B	MSV/27740	EPA 8260	MSV/27742
40111561009	GP-5 S1	EPA 5035/5030B	MSV/27740	EPA 8260	MSV/27742
40111561010	GP-5 S5	EPA 5035/5030B	MSV/27740	EPA 8260	MSV/27742
40111561011	GP-5 S3	EPA 5035/5030B	MSV/27740	EPA 8260	MSV/27742
40111561012	GP-8 S2	EPA 5035/5030B	MSV/27740	EPA 8260	MSV/27742
40111561013	GP-8 S3	EPA 5035/5030B	MSV/27740	EPA 8260	MSV/27742
40111561014	GP-7 S1	EPA 5035/5030B	MSV/27740	EPA 8260	MSV/27742
40111561016	GP-6 S2	EPA 5035/5030B	MSV/27755	EPA 8260	MSV/27761
40111561017	GP-9 S1	EPA 5035/5030B	MSV/27755	EPA 8260	MSV/27761
40111561018	GP-10 S2	EPA 5035/5030B	MSV/27755	EPA 8260	MSV/27761
40111561019	GP-10 S4	EPA 5035/5030B	MSV/27755	EPA 8260	MSV/27761
40111561015	GP-5	EPA 8260	MSV/27717		
40111561020	GP-10	EPA 8260	MSV/27717		
40111561021	GP-3	EPA 8260	MSV/27717		
40111561022	GP-2	EPA 8260	MSV/27717		
40111561023	GP-8	EPA 8260	MSV/27717		
40111561001	GP-1 S2	ASTM D2974-87	PMST/10963		
40111561002	GP-2 S2	ASTM D2974-87	PMST/10963		
40111561003	GP-2 S4	ASTM D2974-87	PMST/10963		
40111561004	GP-3 S1	ASTM D2974-87	PMST/10963		
40111561005	GP-3 S4	ASTM D2974-87	PMST/10963		
40111561006	GP-3 S5	ASTM D2974-87	PMST/10963		
40111561007	GP-4 S1	ASTM D2974-87	PMST/10963		
40111561008	GP-4 S4	ASTM D2974-87	PMST/10963		
40111561009	GP-5 S1	ASTM D2974-87	PMST/10964		
40111561010	GP-5 S5	ASTM D2974-87	PMST/10966		
40111561011	GP-5 S3	ASTM D2974-87	PMST/10966		
40111561012	GP-8 S2	ASTM D2974-87	PMST/10966		
40111561013	GP-8 S3	ASTM D2974-87	PMST/10966		
40111561014	GP-7 S1	ASTM D2974-87	PMST/10966		
40111561016	GP-6 S2	ASTM D2974-87	PMST/10966		
40111561017	GP-9 S1	ASTM D2974-87	PMST/10966		

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## QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 25215045 MADISON WATER UTILITY  
Pace Project No.: 40111561

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Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40111561018	GP-10 S2	ASTM D2974-87	PMST/10966		
40111561019	GP-10 S4	ASTM D2974-87	PMST/10966		

## REPORT OF LABORATORY ANALYSIS

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(Please Print Clearly)

Company Name: SCS Engineers  
 Branch/Location: 25-Madison Oppar Wild  
 Project Contact: Bob Langdon  
 Phone: 608-216-7329  
 Project Number: 25215045  
 Project Name: West + Hunt - Madison  
 Project State: WI  
 Sampled By (Print): Bob Langdon  
 Sampled By (Sign): *Bob Langdon*  
 PO #:   
 Regulatory Program:   
 Data Package Options:   
 EPA Level III  On your sample (billable)  
 EPA Level IV  NOT needed on your sample  
 Matrix Codes:   
 A = Air W = Water  
 B = Biota DW = Drinking Water  
 C = Charcoal GW = Ground Water  
 O = Oil SW = Surface Water  
 S = Soil WW = Waste Water  
 SI = Sludge WP = Wipe



# CHAIN OF CUSTODY

A=None B=HCL C=H2SO4 D=HNO3 E=D1 Water F=Methanol G=NaOH  
 H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

FILTERED?  
 (YES/NO)  
 PRESERVATION  
 (CODE)

PAGE LAB #	CLIENT FIELD ID	DATE	COLLECTION TIME	MATRIX	Analyses Requested	Y / I / N	Pick Letter
001	GR-1 S2	3/11	8:45	S	VOC	X	
002	GR-2 S2	3/11	9:30	S	RLRA 8	X	
003	GR-2 S4	3/11	9:35	S	PAHS	X	
004	GR-3 S1	3/11	10:00	S		X	
005	GR-3 S4	3/11	10:00	S		X	
006	GR-3 S5	3/11	10:15	S		X	
007	GR-4 S1	3/11	12:30	S		X	
008	GR-4 S4	3/11	12:30	S		X	
009	GR-5 S1	3/11	11:10	S		X	
010	GR-5 S1	3/11	11:10	S		X	
011	GR-5 S3	3/11	11:10	S		X	
012	GR-5 S2	3/11	13:30	S		X	
013	GR-5 S3	3/11	13:30	S		X	

UPPER MIDWEST REGION  
 MN: 612-607-1700 WI: 920-469-2436  
 40115601

Quote #:   
 Mail To Contact: Bob Langdon  
 Mail To Company: SCS Engineers  
 Mail To Address: 2830 Dairy Dr Madison, WI 53718  
 Invoice To Contact: Bob Langdon  
 Invoice To Company: SCS Engineers  
 Invoice To Address: 2830 Dairy Dr Madison, WI 53718  
 Invoice To Phone:   
 CLIENT COMMENTS:   
 LAB COMMENTS (Lab Use Only): 1-40115601 4-14-09 4  
 Profile #   
 Received By: *MARKS* Date/Time: 3/12/15 0930  
 Received By: *MARKS* Date/Time: 3/12/15 0930  
 Received By: *MARKS* Date/Time: 3/12/15 0930  
 Received By: *MARKS* Date/Time: 3/12/15 0930  
 Receipt Temp = *ROT* °C  
 Cooler Custody Seal Present / Not Present Intact / Not Intact



Company Name: **SCS Engineers**  
 Branch/Location: **25-Modern Upper MD**  
 Project Contact: **Bob Langdon**  
 Phone: **608-216-3329**  
 Project Number: **25215045**  
 Project Name: **Mead + Hegt + Madison + Ker + CHIKY**  
 Project State: **WI**  
 Sampled By (Print): **Date Above**  
 Sampled By (Sign): *[Signature]*  
 PO #:   
 Regulatory Program:   
 Data Package Options (billable):  
 EPA Level III  On your sample (billable)  
 EPA Level IV  NOT needed on your sample  
 Matrix Codes:  
 A = Air W = Water  
 B = Biota DW = Drinking Water  
 C = Charcoal GW = Ground Water  
 O = Oil SW = Surface Water  
 S = Soil WP = Waste Water  
 Sl = Sludge



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### CHAIN OF CUSTODY

Retention Codes:  
 A=None B=HCL C=H2SO4 D=HNO3 E=D1 Water F=Methanol G=NaOH  
 H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

DATE	TIME	MATRIX	Y/N	Pick Letter	ANALYSES REQUESTED	DATE/TIME	RECEIVED BY	DATE/TIME	LAB COMMENTS (Lab Use Only)	PROFILE #
3/11	13:15	S	X		VOLS	3/11 17:00	Received By: <i>[Signature]</i>	3/11 17:00		
3/11	14:00	S	X		RCR 8					
3/11	14:30	S	X		PHS					
3/11	15:30	S	X							
3/11	15:30	S	X							
3/11	15:00	S	X							
3/11	15:00	S	X							
3/11	15:00	S	X							
3/11	15:00	S	X							
3/11	15:00	S	X							
3/11	15:00	S	X							
3/11	15:00	S	X							
3/11	15:00	S	X							
3/11	15:00	S	X							
3/11	15:00	S	X							
3/11	15:00	S	X							

Quote #: **31215045**  
 Mail To Contact: **Bob Langdon**  
 Mail To Company: **SCS Engineers**  
 Mail To Address: **2830 Hwy D, Madison WI 53718**  
 Invoice To Contact:  
 Invoice To Company:  
 Invoice To Address:  
 Invoice To Phone:  
 CLIENT COMMENTS  
 LAB COMMENTS (Lab Use Only)  
 Cooler Custody Seal Present / Not Present Intact / Not Intact  
 Sample Receipt pH OK / Adjusted  
 Receipt Temp = **10.1** °C  
 PACE Project No. **4011501**  
 Version 6.0 06/14/06



Sample Condition Upon Receipt

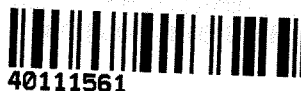
Pace Analytical Services, Inc.
1241 Bellevue Street, Suite 9
Green Bay, WI 54302

Project #

WO#: 40111561

Client Name: SCS Engineers

Courier: Fed Ex UPS Client Pace Other: CS Logistics
Tracking #: NA



Custody Seal on Cooler/Box Present: yes no Seals intact: yes no

Custody Seal on Samples Present: yes no Seals intact: yes no

Packing Material: Bubble Wrap Bubble Bags None Other

Thermometer Used NA Type of Ice: Wet Blue Dry None

Cooler Temperature Uncorr: 60F ICorr: Biological Tissue is Frozen: yes no

Temp Blank Present: yes no

Temp should be above freezing to 6°C for all sample except Biota.
Frozen Biota Samples should be received ≤ 0°C.

Person examining contents:
Date: 3/12/15
Initials: MG

Comments:

Table with 15 rows and 3 columns. Columns: Description, Yes/No/N/A checkboxes, and Comments. Includes items like Chain of Custody Present, Short Hold Time Analysis, and Headspace in VOA Vials.

Client Notification/ Resolution:

Person Contacted: 610

Date/Time:

If checked, see attached form for additional comments

Comments/ Resolution: 010 1-4 only time is 11:15, 011 1-4 only time is 11:15
0015 No time or date, 016 time is 14:30, 017 time is 14:45
018 time is 15:10, 019 time is 15:10

Project Manager Review:

MG 3/12/15
mmh for DM

Date:

3/12/15

## **DOCUMENT 003132 - GEOTECHNICAL DATA**

### **PART 1 - GENERAL**

#### **1.1 GEOTECHNICAL DATA**

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. A geotechnical investigation report and soil-boring data for Project, obtained by CGC, Inc., dated December 5, 2005, is available for viewing as appended to this Document.
- C. A materials management plan for Project, prepared by CGC, Inc., dated June, 2015, is available for viewing as appended to this Document.
- D. Related Requirements:
  - 1. Document 003126 "Existing Hazardous Material Information" for hazardous materials reports that are made available to bidders.

### **PART 2 - PRODUCTS (Not Used)**

### **PART 3 - EXECUTION (Not Used)**

**END OF DOCUMENT 003132**

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Construction • Geotechnical  
Consulting Engineering/Testing  
December 5, 2005  
C05459

Mr. Alan Larson, P.E.  
Madison Water Utility  
119 E. Olin Avenue  
Madison, WI 53713-1431

Re: Geotechnical Exploration Report  
Paterson Street Vehicle Maintenance Facility  
Madison, Wisconsin

Dear Mr. Larson:

Construction • Geotechnical Consultants, Inc. (CGC) has completed the subsurface exploration for the proposed addition to the vehicle maintenance building, as well as the future dry storage facility on the property across Paterson Street. The primary purpose of this exploration was to evaluate the subsurface conditions on the sites and to provide geotechnical recommendations regarding foundation, floor slab, below-grade wall and pavement design/construction. Two copies of this report are provided for your use, and two additional copies are being forwarded to the project architect, Mr. Chris Romney of Bray Associates (Bray) and the project structural engineer, Mr. Fred Groth of Graef Anhalt & Schloemer (GAS).

### PROJECT DESCRIPTION

We understand the project will consist of demolishing the 1918 wing of the existing building at 110 S. Paterson Street and building a new addition. The new vehicle maintenance building will be approximately 11,000 sq ft in area. The building is expected to be a combination of masonry load bearing wall and steel frame. The mezzanine and office areas will be precast plank. The typical roof will be steel bar joist and metal deck. A pit for a vehicle hoist will be constructed in one of the bays. We understand the pit may extend as deep as 9 ft below the slab and will be a reinforced concrete structure.

Typical column loads for spread footings will be 60 kips (dead) and 46 kips (live load) for a total load of 106 kips. Typical wall loads will be 5 kips per lineal foot (total).

We also understand that a temporary vehicle maintenance building will be constructed in a current storage yard behind the existing Water Utility Vehicle Storage Building located across the street on the east side of Paterson Street. The building will ultimately be converted for dry storage of materials and supplies but will temporarily serve as a vehicle maintenance facility during construction of the new facility at 110 S. Paterson Street. Column and wall loads were not provided but are expected to be comparable to those described above.

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Mr. Alan Larson, P.E.  
Madison Water Utility  
December 5, 2005  
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## **SUBSURFACE EXPLORATION**

The subsurface conditions in the areas of proposed construction were explored by drilling six Standard Penetration Test (SPT) borings (Borings 1 through 7, excluding 6) to planned depths of 40 ft for the vehicle maintenance building addition and three SPT borings (Borings 8, 9 and 10) also to depths of 40 ft for the future dry storage building. Note that Boring 6 was deleted because its location was inaccessible due to overhead power lines. The boring locations were selected by Bray/GAS. The approximate boring locations are shown in plan on the soil boring location maps presented in Appendix B. Ground surface elevations at the boring locations were surveyed by the drillers and are referenced to a stormwater inlet rim near Boring 4 at EL 849.96 ft.

The soil borings were performed by Badger State Drilling (under subcontract to CGC) on November 15-17, 2005 using truck-mounted drill rigs equipped with hollow-stem augers and mud rotary drilling tools. Soil samples were obtained at the boring locations in accordance with SPT techniques (ASTM D1586). The specific procedures used for drilling and sampling are described in Appendix A.

Temporary water table wells were installed in two borings (B5 and B7) to obtain 48-hr water level readings. The water level observations are included at the bottom of the boring logs.

## **SURFACE CHARACTERISTICS**

The 110 S. Paterson site is occupied by the existing vehicle maintenance building, a portion of which is slated for demolition and replacement. The wing to be demolished is a one-story masonry building. The remainder of the site is paved parking area and drives. A fueling facility is located in the parking lot west of the addition and will remain after construction. We understand one or more releases of petroleum products have occurred on the site, and the site has been explored and monitored by another consultant for petroleum contaminants for a number of years.

The site of the future dry storage building is across Paterson Street to the east, behind the existing vehicle storage building. The area is a gravel-surfaced storage yard with various materials stored around the perimeter and two soil stockpiles in the center. Site grades at both locations are flat and are generally in the range of EL 850-851, based on boring elevations.

## **SITE CONDITIONS**

The subsurface profile revealed by the borings is fairly uniform and can be described by the following generalized strata, in descending order:

Mr. Alan Larson, P.E.  
Madison Water Utility  
December 5, 2005  
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- 8 to 12 in. of *asphalt* and/or *crushed stone* base course, except for Boring 7 which has topsoil at the surface; underlain by
- 4.5 to 7.5 ft of miscellaneous *fill* consisting of cinders, ash, coal, gravel, sand, clay and glass, with possible topsoil or peat pockets noted in a few locations; followed by
- 3.5 to 26.5 ft of medium stiff to stiff (typically) *lean clay*, with softer zones near the top of the layer and scattered very stiff zones elsewhere; followed by
- Medium to very dense *sand strata* with significant silt/clay content and varying percentages of gravel extending to the maximum depths explored.

Note that the fill is a non-engineered material with a significant proportion of waste material (cinders, ash, glass, etc.).

Groundwater was encountered in the boreholes during or shortly after drilling at depths ranging from about 10 to 24 ft below ground surface (bgs). However, the use of drilling mud to advance the holes has obscured the short-term water levels in the boreholes, and only the two-day readings in the two temporary water table wells (Borings 5 and 7) are considered reliable. These readings show the water table at about 10 to 11 ft bgs. Note also that Gannett Fleming, the environmental consultant at the site, has indicated on their Residual Groundwater Information Map that "the average depth to groundwater is approximately 4 to 5 ft below ground surface when the remediation system is not pumping groundwater." Gannett Fleming's statement puts the static water level at about EL 845.5 ft, or approximately the same elevation at Lake Monona and roughly 4 ft below Lake Mendota. In view of these observations, we estimate that the long-term static water table would be at about EL 846, or approximately 4 ft below grade. Fluctuations in the water table should be expected in response to seasonal variations in precipitation, infiltration, evapotranspiration, pumping rates from nearby wells, lake levels and other factors. Additional details on the soil and groundwater conditions can be found on the boring logs in Appendix B.

The drillers noted possible petroleum odors in most borings, and in some cases the odor was quite strong. We understand that the site has been studied in the past by Gannett Fleming. *However, because these new findings may impact the cost of disposal of soil removed from the site, we recommend additional environmental review be conducted.* Such a review is beyond our area of expertise and is not included in the scope of our work.

## DISCUSSION AND RECOMMENDATIONS

The presence of miscellaneous, non-engineered fill and soft zones in the underlying clay stratum pose significant problems in construction on both sites. However, the satisfactory performance of the existing buildings indicate that construction is feasible, provided the cost of dealing with

Mr. Alan Larson, P.E.  
Madison Water Utility  
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possible environmental issues can be controlled. Our recommendations for site preparation, as well as foundation, floor slab, below-grade walls and pavement design/construction are presented in the following subsections. Additional information regarding the conclusions and recommendations presented in this report is discussed in Appendix C.

### **I. Site Preparation/Floor Slab Support**

As the initial step in preparing the 110 Paterson Street site for construction, the portion of the existing building slated for removal will be demolished. Building debris, including foundations and floor slabs, should be removed in its entirety from the site and properly disposed of. We next recommend that the existing pavement and any vegetation/ topsoil be stripped to a minimum of 5 to 10 ft beyond the proposed construction areas.

Once the building has been removed at 110 S. Paterson Street, site preparation for footings and floor slabs can proceed on both sites in about the same fashion, due to the similarity in soil conditions. As an overview, we recommend that the existing miscellaneous fill and upper zone of soft clay be removed below foundations and replaced with compacted sand and/or gravel fill. As the most positive means of reducing the risk of floor slab settlement, the fill and soft clay should be removed in their entirety below floor slab areas also. However, in view of the apparently satisfactory performance of the slabs in the existing building, we believe a partial undercut/replacement approach would be appropriate below floor slab areas, *provided a slight risk of settlement possibly leading to minor floor slab distress (i.e., cracking) is acceptable to the owner.*

Assuming partial undercutting/replacement is acceptable below floor slabs, we recommend the following steps be taken:

- The existing fill should be removed to a depth of 1.5 ft below the bottom of the floor slab.
- Excavated soils should be tested for possible environmental contaminants and disposed in a licensed solid waste landfill, if necessary.
- The fill soils and underlying soft clay zones should be removed below foundations, as described in more detail in the next section.
- Following footing construction, the fill soils to be left in place below floor slabs should be thoroughly compacted with a large (i.e., 10 ton) self-propelled vibratory sheepsfoot roller by making at least two passes in each direction.
- A 1-ft layer of breaker rock stone with fines should be placed and compacted in lifts until no further consolidation is evident.



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- Finally, a 6-in. layer of subfloor granular fill (e.g., a reasonably well graded sand with less than 5 percent passing the No. 200 sieve) should be placed as slab bedding material.

Additional recommendations on floor slab design and construction are included in a later section.

**2. Foundation Design**

It is our opinion that the proposed structures can be supported on conventional shallow spread foundations following removal of the miscellaneous fill/soft clay to an estimated depth of about 8 ft below grade.

Footing excavations should be performed with a smooth-edged backhoe bucket. We further recommend that a 6-in. layer of breaker rock be placed in the base of each footing excavation and rigorously compacted with a hoe-pak or large plate compactor into the bottom. The undercut areas should be restored with granular fill (i.e., sand and/or gravel with less than 25 percent passing the No. 200 sieve) and compacted to at least 95 percent of modified Proctor (ASTM D1557) dry density. For stress distribution purposes, the width of undercut excavations should be widened 1 ft for each foot of undercut. Subgrade observation by CGC is recommended to check the adequacy of bearing conditions and recommend additional remedial measures, if necessary. Note that clay soils exposed at the base of the excavation with pocket penetrometer readings of 0.75 tsf or less will also require undercutting.

Provided the foundations are installed in accordance with the preceding recommendations, the following parameters may be used for foundation design:

- Maximum allowable bearing pressure for footings resting on at least 3 ft of compacted fill following undercutting/replacement as described above: 3000 psf
- Minimum foundation widths:
  - Continuous wall footings: 18 in.
  - Column footings: 30 in.
- Minimum footing depths for frost protection: 4 ft

Provided the foundation design/construction recommendations discussed above are followed, we estimate that total and differential settlements should not exceed 1.0 and 0.5 in., respectively.

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Alternative methods of foundation and floor slab support may be considered should disposal costs of the fill to be removed from the site become excessive. These alternatives include helical piers and driven pipe piles. Recommendations for these options can be provided at a later date.

In our opinion, the average soil/rock properties in the upper 100 ft of the site (based on SPT N-values averaging between 15 and 50) can be characterized as a stiff soil profile. This characterization would place the site in Site Class D for seismic design according to the International Building Code (see Table 1615.1.1).

### **3. Floor Slabs**

In our opinion, the floor slabs for the structures can be supported after partially undercutting and replacing the existing fill to 1.5 ft below the slab as described above and may be designed using a subgrade modulus of 100 pci. Prior to slab construction, the subgrades should be recompacted to densify soils that may become disturbed or loosened during construction activities such that non-yielding conditions are developed. As mentioned previously, to serve as a capillary break, the final 6 in. of soil placed below the slab should consist of an imported well-graded sand or gravel with no more than 5 percent by weight passing the No. 200 U.S. standard sieve. To further minimize the potential for moisture migration, a plastic vapor barrier could also be utilized. Fill and drainage course material below the floor slab should be placed as described in the Site Preparation section of this report.

The floor slabs should be isolated from the building walls and columns with a compressible filler, and the design should include an adequate number of isolation and contraction joints.

### **4. Below-Grade Walls**

We anticipate that the below-grade walls for the proposed hoist pit will be rigidly framed. Therefore, *at-rest* lateral earth pressures should be used during design. To minimize the buildup of such pressures, high-quality backfill should be placed within 4 to 6 ft of the walls. The granular backfill should be an imported, well-graded sand or gravel having no more than 12 percent passing the No. 200 U.S. standard sieve.

Current groundwater levels are about 10 to 11 ft below grade but may rise to within 4 ft of the ground surface with time. Two options are available for designing the pit walls and slab: (1) they can be designed as a watertight structure to resist the uplift forces due to a water level at EL 846 or (2) they can incorporate an underdrain system to artificially lower the water table on a permanent basis below the pit. The underdrain system would include a 12-in. thick layer of 3/4-in. clear stone below the base and against the pit walls up to EL 846 with a geotextile fabric (Mirafi 160N or equivalent) separating the stone from the native soils. The drainage layer should be connected to a sump with pumps to remove the infiltrating water. Depending on the sensitivity to water damage

Mr. Alan Larson, P.E.  
 Madison Water Utility  
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of the equipment in the pit, redundant/backup systems may be necessary, such as a duplicate pump and an emergency generator.

Before placing the pit wall backfill, the exterior walls should be damp-proofed with spray-applied or mopped-on rubber or bituminous sealer or a waterproof membrane applied if the pit is designed to be watertight. Compaction of backfill within 3 ft of the walls should be performed with lightweight equipment to avoid the development of excessive lateral earth pressures. The backfill should be compacted to a minimum of 93 percent modified Proctor following Appendix D guidelines. Lower level walls constructed in accordance with the above recommendations may be designed for an equivalent fluid pressure of 55 psf per ft of depth.

**5. Pavement Design**

We assume the parking lot/access drive pavement will be exposed to significant truck traffic (i.e., a medium to heavy traffic class). The pavement design will likely be controlled by the miscellaneous soils expected at subgrade elevation across some of the site. After stripping to subgrade elevations and prior to fill placement, the subgrade soils should be recompacted and proof-rolled as discussed in the Site Preparation section of this report. The pavement section tabulated below was selected assuming a CBR value of approximately 2 for the miscellaneous fill soils anticipated at subgrade elevation and a design life of 20 years.

**TABLE 1  
 RECOMMENDED PAVEMENT SECTIONS**

Material	Truck Drive Areas Thickness (in.)	DOT Specification <sup>1</sup>
Bituminous surface course	1.75	Section 460, Table 460-1, 12.5 mm
Bituminous binder course	2.25	Section 460, Table 460-1, 19.0 mm
Dense graded base course	6.0	Sections 301 and 305, 31.5 mm
3" Dense graded base course or breaker run	12.0	Sections 301 and 305, 75 mm or Section 311
<b>TOTAL THICKNESS</b>	<b>22.0</b>	

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Notes:

1. Wisconsin DOT *Standard Specifications for Highway and Structure Construction*, 2003 Edition, including supplemental specifications.
2. Compaction requirements:
  - Bituminous concrete: Refer to Section 460.3
  - Base course: Refer to Section 301.3.4.2, Standard Compaction
3. Mixture Type E-1 bituminous pavement is recommended; refer to Section 460, Table 460-2 of the *Standard Specifications*.

The pavement design assumes a stable non-yielding subgrade and a regular program of preventative maintenance. If there is a delay between subgrade preparation and placing the base course, the subgrade should be recompacted.

Pavement areas subjected to concentrated wheel loads (i.e., loading docks, dumpster pads, etc.) should be constructed of Portland cement concrete. The slab should be a minimum of 6-in. thick and should contain mesh reinforcement for crack control. A subgrade modulus of 100 pci may be used for design of rigid pavements founded on 12 in. of breaker rock over proof-rolled existing fill soils.

**6. Corrosion Potential**

Because of the presence of miscellaneous fill containing cinders, ash and similar refuse-type materials, we recommend that any metallic pipe or conduit used on the project be protected against corrosion or replaced with plastic materials.

**CONSTRUCTION CONSIDERATIONS**

Due to variations in weather, construction methods and other factors, specific construction problems are difficult to predict. Soil-related difficulties which could be encountered on the site are discussed below:

- Due to the potentially sensitive nature of some of the on-site surficial soils to construction traffic disturbance, we recommend that general site grading activities be completed during dry weather, if possible. Earthwork construction during the early spring or late fall could be complicated as a result of wet weather and freezing temperatures. Also, to the extent practical, construction traffic should be kept off prepared subgrades to minimize their disturbance.
- During cold weather, exposed subgrades should be protected from freezing before and after footing construction. Fill should never be placed while frozen.

Mr. Alan Larson, P.E.  
Madison Water Utility  
December 5, 2005  
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- Excavations extending greater than 4 ft in depth below the existing ground surface should be sloped or braced in accordance with current OSHA standards, if it is necessary for workers to enter the excavation.
- Based on observations made during the field investigation, groundwater infiltration into undercut excavations for foundations should be expected. Water accumulating at the base of the excavations as a result of precipitation or seepage should be quickly removed using pumps operating from filtered sump pits. The layer of breaker run stone recommended in the base of footing undercut excavations should assist with the dewatering effort.

#### **RECOMMENDED CONSTRUCTION MONITORING**

The quality of the foundation and floor slab subgrades will largely be determined by the level of care exercised during site development. To check that earthwork and foundation construction proceeds in accordance with our recommendations, the following operations should be monitored by CGC:

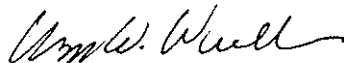
- Site stripping/subgrade proof-rolling within the construction areas;
- Fill placement and compaction;
- Foundation excavation and subgrade preparation; and
- Concrete placement.

#### **CLOSING REMARKS**

It has been a pleasure to serve you on this project. If you have any questions or need additional consultation, please contact us.

Sincerely,

**CGC, INC.**



William W. Wuellner, P.E.  
Senior Geotechnical Engineer



Michael N. Schultz, P.E.  
Principal/Consulting Professional

# **CGC, Inc.**

Mr. Alan Larson, P.E.  
Madison Water Utility  
December 5, 2005  
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Encl: Appendix A - Field Exploration  
Appendix B - Soil Boring Location Maps (2)  
Logs of Test Borings (9)  
Log of Test Boring-General Notes  
Unified Soil Classification System  
Appendix C - Document Qualifications  
Appendix D - Recommended Compacted Fill Specifications

cc: Mr. Chris Romney, Bray & Associates, Madison  
Mr. Fred Groth, Graef Anhalt Schloemer, Madison

**APPENDIX A**

**FIELD EXPLORATION**

## APPENDIX A

### FIELD EXPLORATION

Nine standard penetration test borings were drilled on November 15-17, 2005 at locations selected by Bray and GAS. The approximate locations of the borings are shown on the Boring Location Maps presented in Appendix B. The soil borings were drilled to depths of 40 ft by Badger State Drilling using truck-mounted drill rigs equipped with hollow-stem augers and mud rotary tooling. Ground surface elevations were surveyed by the drillers and are referenced to the inlet rim near Boring 4 at an elevation of 849.96 ft (USGS datum).

Soil samples were obtained at 2.5-ft intervals for a depth of 10 ft and at 5-ft intervals thereafter. The soil samples were obtained in general accordance with specifications for standard penetration testing, ASTM D 1586. The specific procedures used for drilling and sampling are described below.

1. Boring Procedures between Samples

The boring is extended downward, between samples, by a hollow-stem auger.

2. Standard Penetration Test and Split-Barrel Sampling of Soils  
(ASTM Designation: D 1586)

This method consists of driving a 2-inch outside diameter split barrel sampler using a 140-pound weight falling freely through a distance of 30 inches. The sampler is first seated 6 inches into the material to be sampled and then driven 12 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the log of borings and is known as the Standard Penetration Resistance. Recovered samples are first classified as to texture by the driller.

During the field exploration, the driller visually classified the soil and prepared a field log. *Field screening of the samples for possible environmental contaminants was not conducted by the drillers, as environmental site assessment activities were not part of CGC's work scope.* Water level observations were made in each boring during and after drilling and are shown at the bottom of each boring log. Upon completion of drilling, the borings were backfilled with bentonite in accordance with WDNR regulations, and the soil samples were delivered to our laboratory for visual classification and laboratory testing. The soils were visually classified by a geotechnical engineer using the Unified Soil Classification System. The final logs prepared by the engineer and a description of the Unified Soil Classification System are presented in Appendix B.

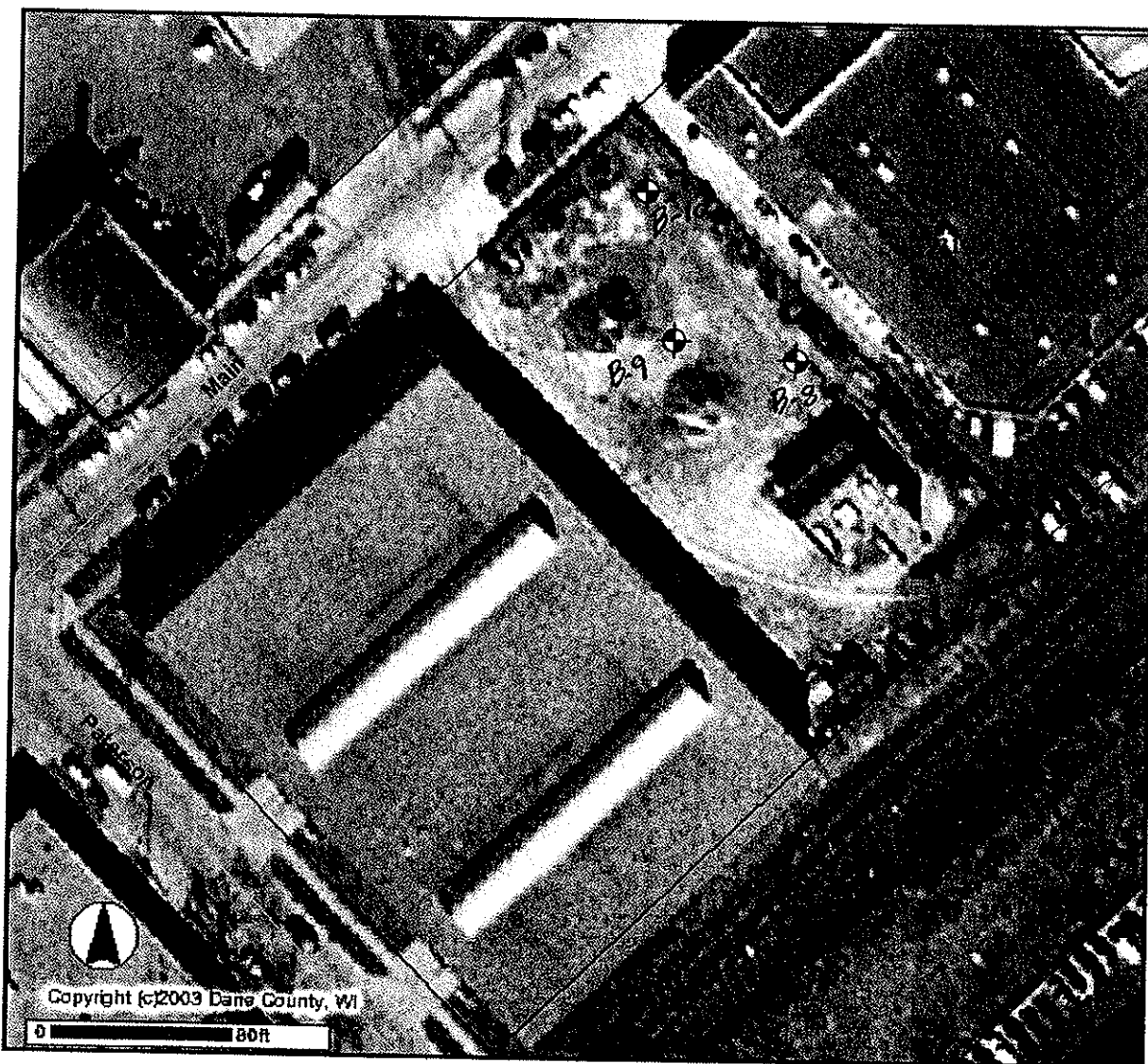


**APPENDIX B**

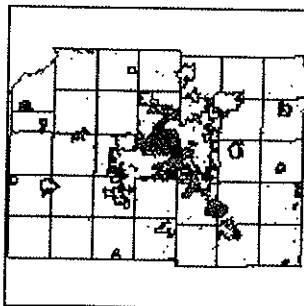
**SOIL BORING LOCATION MAPS (2)  
LOGS OF TEST BORINGS (9)  
LOG OF TEST BORING - GENERAL NOTES  
UNIFIED SOIL CLASSIFICATION SYSTEM**



# Temp Veh Maint Fac



2004 Roads		Interstate		US Highways		On/Off Ramps		State Highways (cont)		Local Roads		County Highways		Parcel boundaries		Ownership Boundaries		Plat Text		Acreage Text		Hydrology (lines)	
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**DCI Map**

**DISCLAIMER**  
 This map was prepared using the Dane County DCI Map online geographic information system. All information is believed accurate but is NOT guaranteed to be without error. This map and its underlying data is intended to be used as a general index to land related information and is not intended for detailed, site-specific analysis. Dane County GIS datasets used to produce this map are copyrighted.

**Legend**

Recent Soil Boring location and number

**Notes**

1. Borings were performed by Badger State Drilling in November 2005.
2. Base map obtained from Dane County DCI Map.
3. Boring locations are approximate.

Date:  
12/05

Job No.  
C05459

**CGC, Inc.**

**SOIL BORING LOCATION MAP**  
 109 S. Paterson Street "Temp.  
 Vehicle Maintenance Facility"  
 Madison, Wisconsin



# LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**  
**110 S. Paterson Street**  
 Location **Madison, Wisconsin**

Boring No. **1**  
 Surface Elevation (ft) **850.6**  
 Job No. **C05459**  
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
1	10	M	23		5" Asphalt/5" Base Course					
2	8	M	3		FILL: Black/Brown Cinders, Ash, Sand, Clay, Glass, Sand					
3	10	M	3		Peat Seam near 6.5 ft	(0.75)				
4	12	M	6		Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams	(1.5)				
5	12	M	49		Medium to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)					
6	12	M	64							
7	9	W	100	73"						
8	5	W	100	75"	Probable Boulder at 29 ft					
9	12	W	26							
10	12	W	40							
					End Boring at 40 ft					
					Borehole grouted with bentonite slurry Possible petroleum odor noted while drilling					

## WATER LEVEL OBSERVATIONS

## GENERAL NOTES

While Drilling  24.0' Upon Completion of Drilling \_\_\_\_\_  
 Time After Drilling \_\_\_\_\_ 1/4 hr \_\_\_\_\_  
 Depth to Water \_\_\_\_\_ 20.0' ▼  
 Depth to Cave in \_\_\_\_\_ 25.0'

Start 11/15/05 End 11/15/05  
 Driller Badger Chief AP Rig B-59  
 Logger AP Editor WWW  
 Drill Method 4 1/4" HSA

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



# LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**  
 110 S. Paterson Street  
 Location **Madison, Wisconsin**

Boring No. **2**  
 Surface Elevation (ft) **850.5**  
 Job No. **C05459**  
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
No.	TYPE	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
1		12	M	66	0-5	6" Asphalt/4" Base Course FILL: Black/Brown Cinders, Ash, Sand, Clay, Glass					
2		10	M	2	5-5.5						
3		12	M	5	5.5-10	Medium Stiff, Gray Lean CLAY (CL) with Rootlets	(0.75)				
4		12	M	6	10-15	Stiff to Very Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams	(1.5)				
5		12	M	28	15-20		(2.5)				
6		12	W	18	20-25	Medium to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)					
7		10	W	80	25-30						
8		12	W	54	30-35						
9		12	W	100 /5"	35-40						
10		14	W	100 /2"	40-45	End Boring at 40 ft  Borehole grouted with bentonite slurry Possible petroleum odor noted while drilling					

## WATER LEVEL OBSERVATIONS

## GENERAL NOTES

While Drilling  16.0' Upon Completion of Drilling \_\_\_\_\_  
 Time After Drilling \_\_\_\_\_  
 Depth to Water \_\_\_\_\_  
 Depth to Cave in \_\_\_\_\_

Start **11/15/05** End **11/15/05**  
 Driller **Badger** Chief **AP** Rig **B-59**  
 Logger **AP** Editor **WWW**  
 Drill Method **4 1/4" HSA: 0-20'**  
**DM/RB: 20-40'**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



# LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**  
**110 S. Paterson Street**  
 Location **Madison, Wisconsin**

Boring No. **3**  
 Surface Elevation (ft) **850.7**  
 Job No. **C05459**  
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					Depth (ft)	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N			qu (qa) (tsf)	W	LL	PL	LI
1		10	M	58	5	5" Asphalt/5" Base Course FILL: Black/Brown/Gray Cinders, Coal, Sand, Gravel, Ash, Possible Peat Seam at Base					
2		12	M	10							
3		12	M	4							
4		12	M	12		Medium Stiff, Dark Gray/Brown (Mottled) Lean CLAY (CL)	(0.5)				
						Stiff to Very Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams	(0.75)				
5		12	M	10			(1.5)				
6		12	W	13			(2.25)				
7		12	W	17		Medium Dense to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)					
8		12	W	107							
9		12	W	100 /4"							
10		2	W	100 /2"							
End Boring at 40 ft											
Borehole grouted with bentonite slurry Possible petroleum odor noted while drilling											

WATER LEVEL OBSERVATIONS					GENERAL NOTES				
While Drilling	∇	18.5'	Upon Completion of Drilling		Start	11/15/05	End	11/15/05	
Time After Drilling					Driller	Badger	Chief	AP	Rig B-59
Depth to Water				∇	Logger	AP	Editor	WWW	
Depth to Cave in				25.0'	Drill Method	4 1/4" HSA	0-10'		
The stratification lines represent the approximate boundary between soil types and the transition may be gradual.					DM/RB: 10-40'				



# LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**  
**110 S. Paterson Street**  
 Location **Madison, Wisconsin**

Boring No. **4**  
 Surface Elevation (ft) **850.4**  
 Job No. **C05459**  
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
1	2	M	12	0-1	6" Asphalt/4" Base Course					
2	12	M	11	1-2	FILL: Brown Fine to Coarse Sand, Some Gravel and Silt					
3	11	M	5	2-3	FILL: Black Ash, Peat, Topsoil					
4	12	M	5	3-4	Soft to Medium Stiff, Dark Gray/Gray (Mottled) Lean CLAY (CL)	(0.25-0.5)				
5	12	M	7	4-5	Medium Stiff to Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams	(0.75)				
6	12	W	13	5-6						
7	18	W	12	6-7		(0.5-0.75)				
8	12	W	75	7-8	Dense to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)	(2.0)				
9	8	W	100 /4"	8-9						
10	1	W	100 /2"	9-10		(1.5)				
					End Boring at 40 ft					
					Borehole grouted with bentonite slurry Possible petroleum odor noted while drilling					

## WATER LEVEL OBSERVATIONS

## GENERAL NOTES

While Drilling  $\nabla$  **18.0'** Upon Completion of Drilling \_\_\_\_\_  
 Time After Drilling \_\_\_\_\_  
 Depth to Water \_\_\_\_\_  
 Depth to Cave in \_\_\_\_\_

Start **11/15/05** End **11/15/05**  
 Driller **Badger** Chief **AP** Rig **B-59**  
 Logger **AP** Editor **WWW**  
 Drill Method **4 1/4" HSA: 0-10'**  
**DM/RB: 10-40'**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



# LOG OF TEST BORING

Project Madison Water Utility Vehicle Storage Bldg.  
110 S. Paterson Street  
 Location Madison, Wisconsin

Boring No. 5  
 Surface Elevation (ft) 850.3  
 Job No. C05459  
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	W	LL	PL
1		18	M	5	2" Asphalt Pavement/10" Silty Gravel FILL: Brown/Orange/Gray/Black Cinders, Ash, Sand, Gravel					
2		14	M	4						
3		18	M	0	Medium Stiff to Stiff, Gray Lean CLAY (CL)	(0.5)				
4		18	M	5		(1.5)				
5		18	M	5	Stiff, Gray/Brown Lean CLAY (CL) with Occasional Thin Sand and Silt Seams	(1.5)				
6		18	W	7		(1.5)				
7		18	W	7		(1.5)				
8		12	W	6	Loose, Yellow Brown Fine SAND, Some Silt (SM)					
9		10	W	50	Very Dense, Yellow- Brown/Brown Fine to Coarse GRAVEL, Some Sand and Silt (GM)					
10		5	W	50	Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)					

End Boring at 39 ft  
 Temporary well set to 20' & pulled on 11/17  
 Borehole grouted with bentonite slurry  
 Possible petroleum odor noted while drilling

## WATER LEVEL OBSERVATIONS

## GENERAL NOTES

While Drilling  $\nabla$  13.5' Upon Completion of Drilling 26.6'  
 Time After Drilling \_\_\_\_\_ 2 days  
 Depth to Water \_\_\_\_\_ 10.2'  $\nabla$   
 Depth to Cave in \_\_\_\_\_

Start 11/15/05 End 11/15/05  
 Driller Badger Chief JHR Rig CME-55  
 Logger JHR Editor WWW  
 Drill Method 2 1/4" HSA

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.





# LOG OF TEST BORING

Project Madison Water Utility Vehicle Storage Bldg.  
110 S. Paterson Street  
 Location Madison, Wisconsin

Boring No. 7  
 Surface Elevation (ft) 849.8  
 Job No. C05459  
 Sheet 1 of 1

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					Depth (ft)	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N			qu (qa) (tsf)	W	LL	PL	LI
1		14	M	16	0-5	Black Sandy Silt TOPSOIL FILL FILL: Brown/Orange/Gray/Black Cinders, Ash, Sand, Gravel					
2		16	M	9	5-10	Stiff, Brown/Gray (Slightly Mottled) Lean CLAY (CL)	(1.5)				
4		18	M	4	10-15	Very Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams	(1.5)				
5		18	M	9	15-20	Dense to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)	(2.5)				
6		18	M-W	43	20-25		(1.5)				
7		12	M	50	25-30						
8		10	W	50	30-35						
9		18	W	53	35-40						
10		18	W	87	40-45						
End Boring at 40 ft Temporary well set to 20' & pulled on 11/17 Borehole backfilled with bentonite chips											

WATER LEVEL OBSERVATIONS				GENERAL NOTES	
While Drilling	▽ 18.5'	Upon Completion of Drilling	31.7'	Start	11/15/05 End 11/15/05
Time After Drilling			2 days	Driller	Badger Chief JHR Rig CME-55
Depth to Water			11.1' ▼	Logger	JHR Editor WWW
Depth to Cave in				Drill Method	2 1/4" HSA
<small>The stratification lines represent the approximate boundary between soil types and the transition may be gradual.</small>					



# LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**  
**109 S. Paterson Street**  
 Location **Madison, Wisconsin**

Boring No. **8**  
 Surface Elevation (ft) **850.6**  
 Job No. **C05459**  
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	Rec (in.)	Moist	N	Depth (ft)		qu (qa) (tsf)	W	LL	PL	LI
1	12	M	79	0	8" GRAVEL FILL: Gray Fine to Coarse Sand, Some Gravel and silt					
2	12	M	7	5	FILL: Black/Brown Cinders, Ash, Sand, Clay, Glass					
3	12	M	7	7	Medium Stiff, Gray Silty CLAY, Little Sand	(0.5)				
4	12	M	15	10	(CL-ML) Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams					
5	12	W	16	15		(1.75)				
6	12	W	21	20		(2.0)				
7	12	W	23	25		(1.75)				
8	12	W	37	30	Dense to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)					
9	10	W	87	35						
10	1	W	100 /1"	40	End Boring at 40 ft					
					Borehole grouted with bentonite slurry Possible petroleum odor noted while drilling					

## WATER LEVEL OBSERVATIONS

## GENERAL NOTES

While Drilling  $\nabla$  **11.0'** Upon Completion of Drilling \_\_\_\_\_  
 Time After Drilling \_\_\_\_\_ **1/4 hr**  
 Depth to Water \_\_\_\_\_  
 Depth to Cave in \_\_\_\_\_ **25.0'**

Start **11/17/05** End **11/17/05**  
 Driller **Badger** Chief **AP** Rig **B-59**  
 Logger **AP** Editor **WWW**  
 Drill Method **4 1/4" HSA: 0-10'**  
**DM/RB: 10-40'**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



# LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**  
**109 S. Paterson Street**  
 Location **Madison, Wisconsin**

Boring No. **9**  
 Surface Elevation (ft) **850.5**  
 Job No. **C05459**  
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES					
No.	TYPE	Rec (in.)	Moist	N		Depth (ft)	qu (qa) (tsf)	W	LL	PL	LI
1		12	M	71	0-5	8"± Crushed Stone Base Course FILL: Brown/Orange/Gray/Black Cinders, Ash, Sand, Gravel					
2		12	M	8	5-10	Medium Stiff, Gray Silty CLAY, Little Sand (CL-ML)					
3		12	M	11	10-15		(0.5)				
4		12	M	10	15-20	Stiff to Very Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams					
5		12	W	14	20-25		(0.5)				
6		12	W	33	25-30	Dense to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)					
7		12	W	33	30-35		(1.5)				
8		6	W	30	35-40	Numerous Cobbles/Boulders near 35 ft					
9		5	W	100 /5"	40-45		(2.75)				
10		2	W	100 /2"	45	End Boring at 40 ft  Borehole backfilled with bentonite chips					

### WATER LEVEL OBSERVATIONS

### GENERAL NOTES

While Drilling  $\nabla$  **18.0'** Upon Completion of Drilling \_\_\_\_\_  
 Time After Drilling \_\_\_\_\_  
 Depth to Water \_\_\_\_\_  
 Depth to Cave in \_\_\_\_\_

Start **11/17/05** End **11/17/05**  
 Driller **Badger** Chief **AP** Rig **B-59**  
 Logger **AP** Editor **WWW**  
 Drill Method **4 1/4" HSA: 0-10'**  
**DM/RB: 10-40'**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.



# LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**  
 Location **109 S. Paterson Street**  
**Madison, Wisconsin**

Boring No. **10**  
 Surface Elevation (ft) **850.6**  
 Job No. **C05459**  
 Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE					Depth (ft)	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
No.	TYPE	Rec (in.)	Moist	N			qu (qa) (tsf)	W	LL	PL	LI
1		12	M	30	0-5	4" Crushed Stone Base Course FILL: Brown/Orange/Gray/Black Cinders, Ash, Sand, Gravel					
2		12	M	7	5-7						
3		11	M	11	7-11	Medium Stiff, Gray Silty CLAY, Little Sand (CL-ML)	(0.5)				
4		15	M	9	11-15	Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams	(1.5)				
5		12	W	28	15-22		(1.5)				
6		12	W	22	22-26						
7		12	W	26	26-31.5	Medium Dense to Dense to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)					
8		0	W	100	30-31.5	Large Boulder from 28 to 31.5 ft					
9		0	W	100	35-40						
10		0	W	100	40-45						
End Boring at 40 ft											
Borehole grouted with bentonite slurry											

## WATER LEVEL OBSERVATIONS

## GENERAL NOTES

While Drilling  $\nabla$  **10.0'** Upon Completion of Drilling \_\_\_\_\_  
 Time After Drilling \_\_\_\_\_  
 Depth to Water \_\_\_\_\_  
 Depth to Cave in \_\_\_\_\_

Start **11/17/05** End **11/17/05**  
 Driller **Badger Chief AP** Rig **B-59**  
 Logger **AP** Editor **WWW**  
 Drill Method **4 1/4" HSA: 0-10'**  
**DM/RB: 10-40'**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

**CGC, Inc.**

**LOG OF TEST BORING**  
**General Notes**

**Descriptive Soil Classification**

GRAIN SIZE TERMINOLOGY

Soil Fraction	Particle Size	U.S. Standard Sieve Size
Boulders	Larger than 12"	Larger than 12"
Cobbles	3" to 12"	3" to 12"
Gravel: Coarse	3/4" to 3"	3/4" to 3"
Fine	4.76 mm to 3/4"	#4 to 3/4"
Sand: Coarse	2.00 mm to 4.76 mm	#10 to #4
Medium	0.42 to mm to 2.00 mm	#40 to #10
Fine	0.074 mm to 0.42 mm	#200 to #40
Silt	0.005 mm to 0.074 mm	Smaller than #200
Clay	Smaller than 0.005 mm	Smaller than #200

Plasticity characteristics differentiate between silt and clay.

GENERAL TERMINOLOGY

Physical Characteristics  
Color, moisture, grain shape, fineness, etc.  
Major Constituents  
Clay, silt, sand, gravel  
Structure  
Laminated, varved, fibrous, stratified, cemented, fissured, etc.  
Geologic Origin  
Glacial, alluvial, eolian, residual, etc.

RELATIVE DENSITY

Term	"N" Value
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

RELATIVE PROPORTIONS OF OF COHESIONLESS SOILS

Proportional Term	Defining Range by Percentage of Weight
Trace	0%-5%
Little	5%-12%
Some	12%-35%
And	35%-50%

CONSISTENCY

Term	q <sub>v</sub> -tons/sq. ft.
Very Soft	0.0 to 0.25
Soft	0.25 to 0.50
Medium	0.50 to 1.0
Stiff	1.0 to 2.0
Very Stiff	2.0 to 4.0
Hard	Over 4.0

ORGANIC CONTENT BY COMBUSTION METHOD

Soil Description	Loss on Ignition
Non Organic	Less than 4%
Organic Silt/Clay	4-12%
Sedimentary Peat	12-50%
Fibrous and Woody Peat	More than 50%

PLASTICITY

Term	Plastic Index
None to Slight	0-4
Slight	5-7
Medium	8-22
High to Very High	Over 22

The penetration resistance, N, is the summation of the number of blows required to effect two successive 6" penetrations of the 2" split-barrel sampler. The sampler is driven with a 140 lb. weight falling 30" and is seated to a depth of 6" before commencing the standard penetration test.

**SYMBOLS**

DRILLING AND SAMPLING

CS--Continuous Sampling  
RC--Rock Coring: Size AW, BW, NW, 2"W  
RQD--Rock Quality Designator  
RB--Rock Bit  
FT--Fish Tail  
DC--Drove Casing  
C--Casing: Size 2 1/2", NW, 4", HW  
CW--Clear Water  
DM--Drilling Mud  
HSA--Hollow Stem Auger  
FA--Flight Auger  
HA--Hand Auger  
COA--Clean-Out Auger  
SS--2" Diameter Split-Barrel Sample  
2ST--2" Diameter Thin-Walled Tube Sample  
3ST--3" Diameter Thin-Walled Tube Sample  
PT--3" Diameter Piston Tube Sample  
AS--Auger Sample  
WS--Wash Sample  
PTS--Peat Sample  
PS--Pitcher Sample  
NR--No Recovery  
S--Sounding  
PMT--Borehole Pressuremeter Test  
VS--Vane Shear Test  
WPT--Water Pressure Test

LABORATORY TESTS

q<sub>a</sub>--Penetrometer Reading, tons/sq. ft.  
q<sub>u</sub>--Unconfined Strength, tons/sq. ft.  
W--Moisture Content, %  
LL--Liquid Limit, %  
PL--Plastic Limit, %  
SL--Shrinkage Limit, %  
LI--Loss on Ignition, %  
D--Dry Unit Weight, lbs/cu. ft.  
pH--Measure of Soil Alkalinity or Acidity  
FS--Free Swell, %

WATER LEVEL MEASUREMENT

▽ --Water Level at time shown  
NW--No Water Encountered  
WD--While Drilling  
BCR--Before Casing Removal  
ACR--After Casing Removal  
CW--Caved and Wet  
CM--Caved and Moist

Note: Water level measurements shown on the boring logs represent conditions at the time indicated and may not reflect static levels, especially in cohesive soils.

# UNIFIED SOIL CLASSIFICATION SYSTEM

## COARSE-GRAINED SOILS

(More than half of material is larger than No. 200 sieve size.)

### GRAVELS

More than half of coarse fraction larger than No. 4 sieve size

- Clean Gravels** (Little or no fines)
- GW** Well-graded gravels, gravel-sand mixtures, little or no fines
  - GP** Poorly graded gravels, gravel-sand mixtures, little or no fines
- Gravels with Fines** (Appreciable amount of fines)
- GM<sub>u</sub><sup>d</sup>** Silty gravels, gravel-sand-silt mixtures
  - GC** Clayey gravels, gravel-sand-clay mixtures

### SANDS

More than half of coarse fraction smaller than No. 4 sieve size

- Clean Sands** (Little or no fines)
- SW** Well-graded sands, gravelly sands, little or no fines
  - SP** Poorly graded sands, gravelly sands, little or no fines
- Sands with Fines** (Appreciable amount of fines)
- SM<sub>u</sub><sup>d</sup>** Silty sands, sand-silt mixtures
  - SC** Clayey sands, sand-clay mixtures

## FINE-GRAINED SOILS

(More than half of material is smaller than No. 200 sieve.)

### SILTS AND CLAYS

Liquid limit less than 50%

- ML** Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
- CL** Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
- OL** Organic silts and organic silty clays of low plasticity

### SILTS AND CLAYS

Liquid limit greater than 50%

- MH** Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
- CH** Inorganic clays of high plasticity, fat clays
- OH** Organic clays of medium to high plasticity, organic silts

### HIGHLY ORGANIC SOILS

- PT** Peat and other highly organic soils

## LABORATORY CLASSIFICATION CRITERIA

**GW**  $C_u = \frac{D_{60}}{D_{10}}$  greater than 4;  $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$  between 1 and 3

**GP** Not meeting all gradation requirements for GW

**GM** Atterberg limits below "A" line or P.I. less than 4

Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols

**GC** Atterberg limits above "A" line with P.I. greater than 7

**SW**  $C_u = \frac{D_{60}}{D_{10}}$  greater than 6;  $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$  between 1 and 3

**SP** Not meeting all gradation requirements for SW

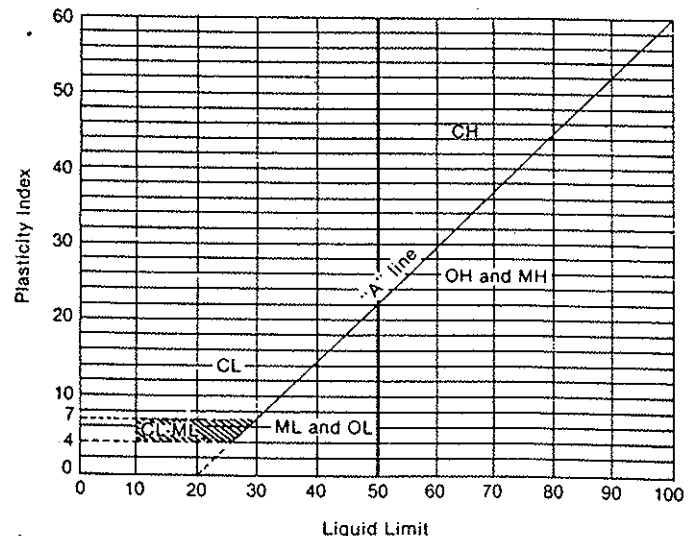
**SM** Atterberg limits below "A" line or P.I. less than 4

Limits plotting in hatched zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.

**SC** Atterberg limits above "A" line with P.I. greater than 7

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:  
 Less than 5 per cent ..... GW, GP, SW, SP  
 More than 12 per cent ..... GM, GC, SM, SC  
 5 to 12 per cent ..... Borderline cases requiring dual symbols

## PLASTICITY CHART



For classification of fine-grained soils and fine fraction of coarse-grained soils.

Atterberg Limits plotting in hatched area are borderline classifications requiring use of dual symbols.

Equation of A-line:  $PI = 0.73 (LL - 20)$

**APPENDIX C**

**DOCUMENT QUALIFICATIONS**

## APPENDIX C

### DOCUMENT QUALIFICATIONS

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#### I. GENERAL RECOMMENDATIONS/LIMITATIONS

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CGC, Inc. should be provided the opportunity for a general review of the final design and specifications to confirm that earthwork and foundation requirements have been properly interpreted in the design and specifications. CGC should be retained to provide soil engineering services during excavation and subgrade preparation. This will allow us to observe that construction proceeds in compliance with the design concepts, specifications and recommendations, and also will allow design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction. CGC does not assume responsibility for compliance with the recommendations in this report unless we are retained to provide construction testing and observation services.

This report has been prepared in accordance with generally accepted soil and foundation engineering practices and no other warranties are expressed or implied. The opinions and recommendations submitted in this report are based on interpretation of the subsurface information revealed by the test borings indicated on the location plan. The report does not reflect potential variations in subsurface conditions between or beyond these borings. Therefore, variations in soil conditions can be expected between the boring locations and fluctuations of groundwater levels may occur with time. The nature and extent of the variations may not become evident until construction.

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#### II. IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

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Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. *No one except you* should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one - not even you -* should apply the report for any purpose or project except the one originally contemplated.

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

#### A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, *do not rely on a geotechnical engineering report* that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes - even minor ones - and request an assessment of their impact. *CGC cannot accept responsibility or liability for problems that occur because our reports do not consider developments of which we were not informed.*

#### SUBSURFACE CONDITIONS CAN CHANGE

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

#### MOST GEOTECHNICAL FINDINGS ARE PROFESSIONAL OPINIONS

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are



taken. Geotechnical engineers review field and laboratory data and then apply their professional judgement to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ - sometimes significantly - from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

#### **A REPORT'S RECOMMENDATIONS ARE NOT FINAL**

Do not over-rely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgement and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *CGC cannot assume responsibility or liability for the report's recommendations if we do not perform construction observation.*

#### **A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION**

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having CGC participate in prebid and preconstruction conferences, and by providing construction observation.

#### **DO NOT REDRAW THE ENGINEER'S LOGS**

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

#### **GIVE CONTRACTORS A COMPLETE REPORT AND GUIDANCE**

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited;

encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

#### **READ RESPONSIBILITY PROVISIONS CLOSELY**

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce such risks, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineer's responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

#### **GEOENVIRONMENTAL CONCERNS ARE NOT COVERED**

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any *geoenvironmental* findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own *geoenvironmental* information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

#### **RELY ON YOUR GEOTECHNICAL ENGINEER FOR ADDITIONAL ASSISTANCE**

Membership in ASFE exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with CGC, a member of ASFE, for more information.

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ASFE  
8811 Colesville Road, Suite G 106  
Silver Spring, MD 20910

**APPENDIX D**

**RECOMMENDED COMPACTED FILL SPECIFICATIONS**

## **APPENDIX D**

### **CGC, INC.**

#### **RECOMMENDED COMPACTED FILL SPECIFICATIONS**

##### **Fill Materials**

Proposed fill shall contain no vegetation, roots, topsoil, peat, ash, wood or any other non-soil material which by decomposition might cause settlement. Also, fill shall never be placed while frozen or on frozen surfaces. Rock, stone or broken concrete greater than 6 in. in the largest dimension shall not be placed within 10 ft of the building area. Fill used greater than 10 ft beyond the building limits shall not contain rock, boulders or concrete pieces greater than a 2 sq ft area and shall not be placed within the final 2 ft of finish subgrade or in designated utility construction areas. The rock, boulders or concrete pieces should contain finer material to fill in void spaces between the larger material.

##### **Placement Method**

The approved fill shall be placed, spread and leveled in layers generally not exceeding 10 in. in thickness before compaction. The fill shall be placed at a moisture content capable of achieving the desired compaction level. For clay soils or granular soils containing an appreciable amount of cohesive fines, moisture conditioning will likely be required.

It is the Contractor's responsibility to provide all necessary compaction equipment and other grading equipment that may be required to attain the specified compaction. Hand-guided vibratory or tamping compactors will be required whenever fill is placed adjacent to walls, footings, columns or in confined areas.

##### **Compaction Specifications**

Maximum dry density and optimum moisture content of the fill soil shall be determined in accordance with modified Proctor methods (ASTM D1557). The recommended field compaction as a percentage of the maximum dry density is shown in Table 1.

**Table 1**  
**Compaction Guidelines**

Area	Percent Compaction <sup>+</sup>	
	Clay/Silt	Sand/Gravel
<u>Within 10 feet of building lines</u>		
● Footing bearing soils	93-95	95
● Under floors, steps and walks		
- Lightly loaded floor slab	90	90
- Heavily loaded floor slab & thicker fill zones	92	95
<u>Beyond 10 feet of building lines</u>		
● Under walks and pavements		
- Less than 2 ft below subgrade	92	95
- Greater than 2 ft below subgrade	90	90
● Landscaping	85	90

**NOTES:**

<sup>+</sup> Based on Modified Proctor (ASTM D 1557)

Testing Procedures

Representative samples of proposed fill shall be submitted to CGC, Inc. for optimum moisture-maximum density determination (ASTM D1557) prior to the start of fill placement. The sample size should be approximately 50 lb.

CGC, Inc. shall be retained to perform field density tests to determine the level of compaction being achieved in the fill. The tests shall generally be conducted on each lift at the beginning of fill placement and at a frequency mutually agreed upon by the project team for the remainder of the project.

## **SECTION 011000 - SUMMARY**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work under separate contracts.
5. Purchase contracts.
6. Owner-furnished products.
7. Access to site.
8. Coordination with occupants.
9. Work restrictions.
10. Specification and drawing conventions.
11. Miscellaneous provisions.

- B. Related Requirements:

1. Section 012200 "Unit Prices."
2. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

#### **1.3 PROJECT INFORMATION**

- A. Project Identification: Vehicle Storage Renovation and Material Storage Building, 115 S. Paterson Street, Contract No. 7823.

1. Project Location: 115 S. Paterson Street, Madison, WI

- B. Owner: Madison Water Utility, City of Madison, 1600 Emil St, Madison, WI 53713

1. Owner's Representative: Al Larson.

- C. Architect: Mead & Hunt, Inc.

- D. Civil, Plumbing, Mechanical, Electrical, and Technology: Mead & Hunt, Inc.

- E. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Structural Engineer: Graef, Fred Groth P.E., 5126 West Terrace Drive, Suite 111, Madison, WI. 53718, Telephone: 608-242-1550

2. Landscape Architect: Ken Saiki Design, Ken Saiki, 303 S. Paterson St, Madison, WI 53703, Telephone: 608-251-3600
- F. Project Web Site: A project Web site administered by Contractor will be used for purposes of managing communication and documents during the construction stage.
1. See Section 013100 "Project Management and Coordination." for requirements for establishing administering and using the Project Web site.

#### 1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
1. Associated site and utility work to include approximately 25,000 SF of new concrete pavement of the existing gravel storage lot. New landscaping and security fence work with vehicle and man gates also required.
  2. Excavation, transportation, and disposal for contaminated soil shall be required to accommodate site work, along with an additional allowance for backfill. See 003126 Existing Hazardous Material Information and Unit Prices section 012200.
  3. New construction of a material storage building that is 5,350 SF.
  4. The existing Vehicle Storage building shall contain some selective demolition and new construction components for a 1700 SF Gear room, 600 SF separated storage bays, standby generator, and trench drain replacements.
  5. Skylight framing system replacement, associated demolition, louvered penthouse construction, and minor roof repair/alterations.
  6. Rain-water harvesting collection system serving the existing Vehicle Storage Building.
- B. Type of Contract:
1. Project will be constructed under a single prime contract.
- C. Construction Duration: Demolition and new construction work shall commence within 7 days after Notice to Proceed and be substantially complete and ready for occupancy by November 3<sup>rd</sup>, 2017

#### 1.5 PHASED CONSTRUCTION

- A. Construction Activities will be sequenced to allow for OWNER access and operations.
1. Contractor to submit Construction Phasing Plan for review and approval by OWNER.
- B. General: The Owner shall maintain access to the site and the Vehicle Storage Building.
1. Contractor shall construct the Material Storage Building, while providing access, thru the yard, to the vehicle doors for the Vehicle Storage Building. These doors will be closed only during paving operations of yard. Limited closures for construction sequencing to be approved by OWNER on an individual basis, with 72 hour notification.

2. Contractor shall construct the Gear Room and Material Storage Bays, within the Vehicle Storage Building while maintaining OWNER use of the drive lanes adjacent to the Gear Room and Material Storage Bays.
3. Construction of the floor trench drains and skylights, replacements, in the Vehicle Storage Building shall be sequenced to minimize disturbance to OWNER operations and vehicle parking. (*One aisle for trench drains and overhead skylight replacement closed off at a time*)

#### 1.6 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

#### 1.7 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.
- B. Owner-Furnished Products:
  1. Gear Room Washer and Dryers.

#### 1.8 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  1. Limits: Confine construction operations to area identified on drawings.
  2. Driveways, Walkways and Entrances: Keep the Vehicle Storage Building, driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weather tight condition throughout construction period. Repair damage caused by construction operations.
- D. Site Security and Access: The contractor shall be given a limited number of access control cards for use during construction. It will be the contractor's responsibility to secure the site during construction.

1. No holding open of doors or gates during the work day will be allowed. Security of the building and site will be maintained at all times.

#### 1.9 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner will occupy the Vehicle Storage Building (with 24-hour operations) premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

#### 1.10 WORK RESTRICTIONS

A. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7 a.m. to 7 p.m., Monday through Saturday, unless otherwise indicated.

1. Weekend Hours: Obtain Owner's written permission for weekend hour work.
2. Early Morning Hours: Comply with City of Madison requirements on noise.
3. Hours for Utility Shutdowns: Obtain Owner's written consent for all utility shutdowns.
4. Work is not permitted on City of Madison Holidays: New Year's Day, Martin Luther King Day, Memorial Day, 4<sup>th</sup> of July, Labor Day, Thanksgiving, the Friday after Thanksgiving, and Christmas Day.



- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
  - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
  - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- C. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
  - 1. Notify Owner not less than two days in advance of proposed disruptive operations.
  - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- D. Nonsmoking Building: Smoking is not permitted on the property, within the building, or within 25 feet of entrances, operable windows, or outdoor-air intakes.
- E. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.
- F. On-site construction personnel parking is not allowed.

#### 1.11 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
  - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  - 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
  - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

## **PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 011000**

## **SECTION 012200 - UNIT PRICES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
  - 1. Section 014000 "Quality Requirements" for general testing and inspecting requirements.

#### **1.3 DEFINITIONS**

- A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

#### **1.4 PROCEDURES**

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

### **PART 2 - PRODUCTS (Not Used)**

### **PART 3 - EXECUTION**

#### **3.1 SCHEDULE OF UNIT PRICES**

- A. General: Contaminated Soil Disposal shall consist of excavation, transportation, and disposal of contaminated soil at an approved landfill according to specification section 003126 Existing Hazardous Material Information, for the Disposal of Contaminated Media, Memorandum, Materials Management Plan for Vehicle and Material Storage Facility Redevelopment, and specification section 312000 Earth Moving. It shall include excavation, hauling, all material, labor, equipment, taxes, and fees from the landfill for acceptance of the material, record keeping of the quantity, contractor acting as the manifest and providing the delivery tickets to the Architect/Owner for review prior to payment. Payment shall be made based on the actual tonnage accepted and recorded by the landfill. There are 2 profiles of materials that require separate hauling to the landfill which are defined in the Materials Management Plan:
1. Unit Price 1: Class I Contaminated Soil, cost per ton based on 8,050 tons. (8,050 tons is based on an estimated quantity of 6,440 tons with an additional 25% contingency included)
  2. Unit Price 2: Class II Contaminated Soil, cost per ton based on 225 tons. (225 tons is based on an estimated quantity of 180 tons with an additional 25% contingency included)
  3. Unit Price 3: Backfill of over-excavated areas beyond base bid excavations. Backfill shall consist of drainage course and unit price be based on 1655 tons.

**END OF SECTION 012200**

## **SECTION 012500 - SUBSTITUTION PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

#### **1.3 DEFINITIONS**

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

#### **1.4 SUBMITTALS**

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use CSI Form 13.1A.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design

- characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
  - e. Samples, where applicable or requested.
  - f. Certificates and qualification data, where applicable or requested.
  - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
  - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
  - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

## 1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

## 1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

## **PART 2 - PRODUCTS**

### **2.1    SUBSTITUTIONS**

- A.     Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1.     Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
- a.     Requested substitution is consistent with the Contract Documents and will produce indicated results.
  - b.     Substitution request is fully documented and properly submitted.
  - c.     Requested substitution will not adversely affect Contractor's construction schedule.
  - d.     Requested substitution has received necessary approvals of authorities having jurisdiction.
  - e.     Requested substitution is compatible with other portions of the Work.
  - f.     Requested substitution has been coordinated with other portions of the Work.
  - g.     Requested substitution provides specified warranty.
  - h.     If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B.     Substitutions for Convenience: Not allowed unless otherwise indicated.

## **PART 3 - EXECUTION (Not Used)**

**END OF SECTION 012500**

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## **SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Project Web site.
5. Project meetings.

- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

- C. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

#### **1.3 DEFINITIONS**

- A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

#### **1.4 SUBMITTALS**

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

## 1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
  3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
  2. Preparation of the schedule of values.
  3. Installation and removal of temporary facilities and controls.
  4. Delivery and processing of submittals.
  5. Progress meetings.
  6. Preinstallation conferences.
  7. Project closeout activities.
  8. Startup and adjustment of systems.
- C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

## 1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.

- b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
- c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
- d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
- e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
- f. Indicate required installation sequences.
- g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

**B. Coordination Drawing Organization: Organize coordination drawings as follows:**

- 1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
- 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
- 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
- 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
- 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
- 6. Mechanical and Plumbing Work: Show the following:
  - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
  - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
  - c. Fire-rated enclosures around ductwork.
- 7. Electrical Work: Show the following:
  - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
  - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.

- c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
  - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
8. Fire-Protection System: Show the following:
- a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."

#### 1.7 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
- 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
  - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
- 1. Project name.
  - 2. Project number.
  - 3. Date.
  - 4. Name of Contractor.
  - 5. Name of Architect.
  - 6. RFI number, numbered sequentially.
  - 7. RFI subject.
  - 8. Specification Section number and title and related paragraphs, as appropriate.
  - 9. Drawing number and detail references, as appropriate.
  - 10. Field dimensions and conditions, as appropriate.
  - 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  - 12. Contractor's signature.
  - 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

- a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716 or equal.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for approval of Contractor's means and methods.
    - d. Requests for coordination information already indicated in the Contract Documents.
    - e. Requests for adjustments in the Contract Time or the Contract Sum.
    - f. Requests for interpretation of Architect's actions on submittals.
    - g. Incomplete RFIs or inaccurately prepared RFIs.
  2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
  3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Use CSI Log Form 13.2B or equal.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

## 1.8 PROJECT WEB SITE

- A. Provide, administer, and use Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web site shall include the following functions:
1. Project directory.
  2. Project correspondence.

3. Meeting minutes.
  4. Contract modifications forms and logs.
  5. RFI forms and logs.
  6. Task and issue management.
  7. Photo documentation.
  8. Schedule and calendar management.
  9. Submittals forms and logs.
  10. Payment application forms.
  11. Drawing and specification document hosting, viewing, and updating.
  12. Online document collaboration.
  13. Reminder and tracking functions.
  14. Archiving functions.
- B. Provide up to seven Project Web site user licenses for use of the Owner, Architect, and Architect's consultants. Provide eight hours of software training at Architect's office for Project Web site users.
- C. On completion of Project, provide one complete archive copy(ies) of Project Web site files to Owner and to Architect in a digital storage format acceptable to Architect.
- D. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement in the form of AIA Document C106 or similar Agreement acceptable to Owner and Architect.

#### 1.9 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Contractor is responsible for conducting meeting and will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Conduct the conference to review responsibilities and personnel assignments.
  2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Discuss items of significance that could affect progress, including the following:

- a. Tentative construction schedule.
  - b. Phasing.
  - c. Critical work sequencing and long-lead items.
  - d. Designation of key personnel and their duties.
  - e. Lines of communications.
  - f. Procedures for processing field decisions and Change Orders.
  - g. Procedures for RFIs.
  - h. Procedures for testing and inspecting.
  - i. Procedures for processing Applications for Payment.
  - j. Distribution of the Contract Documents.
  - k. Submittal procedures.
  - l. Preparation of record documents.
  - m. Use of the premises and existing building.
  - n. Work restrictions.
  - o. Working hours.
  - p. Owner's occupancy requirements.
  - q. Responsibility for temporary facilities and controls.
  - r. Procedures for moisture and mold control.
  - s. Procedures for disruptions and shutdowns.
  - t. Construction waste management and recycling.
  - u. Parking availability.
  - v. Office, work, and storage areas.
  - w. Equipment deliveries and priorities.
  - x. First aid.
  - y. Security.
  - z. Progress cleaning.
4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility requirements.
    - k. Time schedules.

- l. Weather limitations.
  - m. Manufacturer's written instructions.
  - n. Warranty requirements.
  - o. Compatibility of materials.
  - p. Acceptability of substrates.
  - q. Temporary facilities and controls.
  - r. Space and access limitations.
  - s. Regulations of authorities having jurisdiction.
  - t. Testing and inspecting requirements.
  - u. Installation procedures.
  - v. Coordination with other work.
  - w. Required performance results.
  - x. Protection of adjacent work.
  - y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
  2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    - a. Preparation of record documents.
    - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    - c. Submittal of written warranties.
    - d. Requirements for preparing operations and maintenance data.
    - e. Requirements for delivery of material samples, attic stock, and spare parts.
    - f. Requirements for demonstration and training.
    - g. Preparation of Contractor's punch list.
    - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    - i. Submittal procedures.
    - j. Owner's partial occupancy requirements.
    - k. Installation of Owner's furniture, fixtures, and equipment.
    - l. Responsibility for removing temporary facilities and controls.



4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at monthly intervals or more frequently if requested by Owner.
1. Coordinate dates of meetings with preparation of payment requests.
  2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Resolution of BIM component conflicts.
      - 4) Status of submittals.
      - 5) Status of sustainable design documentation.
      - 6) Deliveries.
      - 7) Off-site fabrication.
      - 8) Access.
      - 9) Site utilization.
      - 10) Temporary facilities and controls.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Status of correction of deficient items.
      - 14) Field observations.
      - 15) Status of RFIs.
      - 16) Status of proposal requests.
      - 17) Pending changes.
      - 18) Status of Change Orders.
      - 19) Pending claims and disputes.
      - 20) Documentation of information for payment requests.
  4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 013100**

## **SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
1. Contractor's construction schedule.
  2. Construction schedule updating reports.
  3. Daily construction reports.
  4. Material location reports.
  5. Site condition reports.
  6. Special reports.
- B. Related Requirements:
1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
  2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

#### **1.3 DEFINITIONS**

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
  2. Predecessor Activity: An activity that precedes another activity in the network.
  3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.

- F. Float: The measure of leeway in starting and completing an activity.
1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
  2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
  3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
1. Working electronic copy of schedule file, where indicated.
  2. PDF electronic file.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- C. Construction Schedule Updating Reports: Submit with Applications for Payment.

#### 1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

#### 1.6 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from entities involved.
  2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

### **PART 2 - PRODUCTS**

#### 2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
4. Work Restrictions: Show the effect of the following items on the schedule:
  - a. Coordination with existing construction.
  - b. Limitations of continued occupancies.
  - c. Uninterruptible services.
  - d. Partial occupancy before Substantial Completion.
  - e. Use of premises restrictions.
  - f. Provisions for future construction.
  - g. Seasonal variations.
  - h. Environmental control.
5. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
  - a. Structural completion.
  - b. Temporary enclosure and space conditioning.
  - c. Permanent space enclosure.
  - d. Completion of mechanical installation.
  - e. Completion of electrical installation.
  - f. Substantial Completion.

- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and the following interim milestones:
1. Completion of Phase 1.
  2. Completion of Phase 2.
  3. Completion of Phase 3.
- E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
  2. Unanswered Requests for Information.
  3. Rejected or unreturned submittals.
  4. Notations on returned submittals.
  5. Pending modifications affecting the Work and Contract Time.
- F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

## 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 5 days after date established for the Notice to Proceed.
    - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
  2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
  3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
  4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

- C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
    - a. Preparation and processing of submittals.
    - b. Mobilization and demobilization.
    - c. Purchase of materials.
    - d. Delivery.
    - e. Fabrication.
    - f. Utility interruptions.
    - g. Installation.
    - h. Work by Owner that may affect or be affected by Contractor's activities.
    - i. Testing.
    - j. Punch list and final completion.
    - k. Activities occurring following final completion.
  2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
  3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
  4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
    - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
  2. Description of activity.
  3. Main events of activity.
  4. Immediate preceding and succeeding activities.
  5. Early and late start dates.
  6. Early and late finish dates.
  7. Activity duration in workdays.
  8. Total float or slack time.
  9. Average size of workforce.
  10. Dollar value of activity (coordinated with the schedule of values).

- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
  2. Changes in early and late start dates.
  3. Changes in early and late finish dates.
  4. Changes in activity durations in workdays.
  5. Changes in the critical path.
  6. Changes in total float or slack time.
  7. Changes in the Contract Time.

### **PART 3 - EXECUTION**

#### **3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE**

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
  2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

**END OF SECTION 013200**



## **SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes administrative and procedural requirements for the following:
1. Preconstruction photographs.
  2. Periodic construction photographs.
  3. Final completion construction photographs.
- B. Related Requirements:
1. Section 013300 "Submittal Procedures" for submitting photographic documentation.
  2. Section 017700 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
  3. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
  4. Section 024119 "Selective Demolition" for photographic documentation before selective demolition operations commence.

#### **1.3 SUBMITTALS**

- A. Digital Photographs: Submit image files within three days of taking photographs.
1. Digital Camera: Minimum sensor resolution of 8 megapixels.
  2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
  3. Identification: Provide the following information with each image description in file metadata tag:
    - a. Name of Project.
    - b. Date photograph was taken.
    - c. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

#### **1.4 USAGE RIGHTS**

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

## **PART 2 - PRODUCTS**

### **2.1 PHOTOGRAPHIC MEDIA**

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

## **PART 3 - EXECUTION**

### **3.1 CONSTRUCTION PHOTOGRAPHS**

- A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
  - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
  - 1. Date and Time: Include date and time in file name for each image.
- C. Preconstruction Photographs: Before commencement of excavation, commencement of demolition, starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
  - 1. Flag excavation areas and construction limits before taking construction photographs.
  - 2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
  - 3. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
  - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Periodic Construction Photographs: Take 20 photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken. Include photographs of entire site from east, west, north and south vantage points. Provide at least 1 photo of each wall and ceiling condition prior to concealment documenting systems to be concealed by other finishes.

**END OF SECTION 013233**

## **SECTION 013300 - SUBMITTAL PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
  - 1. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
  - 2. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 4. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

#### **1.3 DEFINITIONS**

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

#### **1.4 ACTION SUBMITTALS**

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering,

manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Submit concurrently with the first complete submittal of Contractor's construction schedule.
  - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
3. Format: Arrange the following information in a tabular format:
  - a. Scheduled date for first submittal.
  - b. Specification Section number and title.
  - c. Submittal category: Action; informational.
  - d. Name of subcontractor.
  - e. Description of the Work covered.
  - f. Scheduled date for Architect's final release or approval.
  - g. Scheduled date of fabrication.
  - h. Scheduled dates for purchasing.
  - i. Scheduled dates for installation.
  - j. Activity or event number.

#### 1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
  1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.
    - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    - b. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
    - c. The following digital data files will be furnished for each appropriate discipline:
      - 1) Floor plans.
      - 2) Reflected ceiling plans.
      - 3) Other drawings as requested by Contractor and agreed upon by Architect.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 15 days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
    - a. All Specification Sections are subject to sequential Owner review.
  5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
    - a. All Division 03 Sections.
    - b. All Division 04 Sections.
    - c. All Division 05 Sections.
    - d. All Division 32 Sections.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  2. Name file with submittal number or other unique identifier, including revision identifier.
    - a. File name shall use the Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01).

Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
  4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software or electronic form acceptable to Owner, containing the following information:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name of Contractor.
    - e. Name of firm or entity that prepared submittal.
    - f. Names of subcontractor, manufacturer, and supplier.
    - g. Category and type of submittal.
    - h. Submittal purpose and description.
    - i. Specification Section number and title.
    - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
    - k. Drawing number and detail references, as appropriate.
    - l. Location(s) where product is to be installed, as appropriate.
    - m. Related physical samples submitted directly.
    - n. Indication of full or partial submittal.
    - o. Transmittal number, numbered consecutively.
    - p. Submittal and transmittal distribution record.
    - q. Other necessary identification.
    - r. Remarks.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

## **PART 2 - PRODUCTS**

### **2.1 SUBMITTAL PROCEDURES**

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project.
    - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
  2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before or concurrent with Samples.
  6. Submit Product Data in the following format:

- a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.
- 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
  - 3. Submit Shop Drawings in the following format:
    - a. PDF electronic file.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
- 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  - 2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of applicable Specification Section.
    - e. Specification paragraph number and generic name of each item.
  - 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
  - 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.



- b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
  - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
- 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
  - a. Number of Samples: Submit 2 set of Samples. Architect will retain 1 Sample sets; remainder will be returned.
    - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
    - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  - 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  - 2. Manufacturer and product name, and model number if applicable.
  - 3. Number and name of room or space.
  - 4. Location within room or space.
  - 5. Submit product schedule in the following format:
    - a. PDF electronic file.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

- H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- J. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- R. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.

7. Limitations of use.
- T. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- U. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- V. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- W. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

## 2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

## **PART 3 - EXECUTION**

### 3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.2 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will mark transmittal form for each submittal with an action.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

**END OF SECTION 013300**

## **SECTION 014200 - REFERENCES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 DEFINITIONS**

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

#### **1.3 INDUSTRY STANDARDS**

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

#### 1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; [www.aabc.com](http://www.aabc.com)
2. AAMA - American Architectural Manufacturers Association; [www.aamanet.org](http://www.aamanet.org).
3. AAPFCO - Association of American Plant Food Control Officials; [www.aapfco.org](http://www.aapfco.org).
4. AASHTO - American Association of State Highway and Transportation Officials; [www.transportation.org](http://www.transportation.org).
5. AATCC - American Association of Textile Chemists and Colorists; [www.aatcc.org](http://www.aatcc.org).
6. ABMA - American Bearing Manufacturers Association; [www.americanbearings.org](http://www.americanbearings.org).
7. ABMA - American Boiler Manufacturers Association; [www.abma.com](http://www.abma.com).
8. ACI - American Concrete Institute; (Formerly: ACI International); [www.abma.com](http://www.abma.com).
9. ACPA - American Concrete Pipe Association; [www.concrete-pipe.org](http://www.concrete-pipe.org).
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); [www.aeic.org](http://www.aeic.org).
11. AF&PA - American Forest & Paper Association; [www.afandpa.org](http://www.afandpa.org).
12. AGA - American Gas Association; [www.aga.org](http://www.aga.org).
13. AHAM - Association of Home Appliance Manufacturers; [www.aham.org](http://www.aham.org).
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); [www.ahrinet.org](http://www.ahrinet.org).
15. AI - Asphalt Institute; [www.asphaltinstitute.org](http://www.asphaltinstitute.org).
16. AIA - American Institute of Architects (The); [www.aia.org](http://www.aia.org).
17. AISC - American Institute of Steel Construction; [www.aisc.org](http://www.aisc.org).
18. AISI - American Iron and Steel Institute; [www.steel.org](http://www.steel.org).
19. AITC - American Institute of Timber Construction; [www.aitc-glulam.org](http://www.aitc-glulam.org).
20. AMCA - Air Movement and Control Association International, Inc.; [www.amca.org](http://www.amca.org).
21. ANSI - American National Standards Institute; [www.ansi.org](http://www.ansi.org).
22. AOSA - Association of Official Seed Analysts, Inc.; [www.aosaseed.com](http://www.aosaseed.com).
23. APA - APA - The Engineered Wood Association; [www.apawood.org](http://www.apawood.org).
24. APA - Architectural Precast Association; [www.archprecast.org](http://www.archprecast.org).
25. API - American Petroleum Institute; [www.api.org](http://www.api.org).
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; [www.asphaltroofing.org](http://www.asphaltroofing.org).
29. ASCE - American Society of Civil Engineers; [www.asce.org](http://www.asce.org).

30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; [www.ashrae.org](http://www.ashrae.org).
32. ASME - ASME International; (American Society of Mechanical Engineers); [www.asme.org](http://www.asme.org).
33. ASSE - American Society of Safety Engineers (The); [www.asse.org](http://www.asse.org).
34. ASSE - American Society of Sanitary Engineering; [www.asse-plumbing.org](http://www.asse-plumbing.org).
35. ASTM - ASTM International; [www.astm.org](http://www.astm.org).
36. ATIS - Alliance for Telecommunications Industry Solutions; [www.atis.org](http://www.atis.org).
37. AWEA - American Wind Energy Association; [www.awea.org](http://www.awea.org).
38. AWI - Architectural Woodwork Institute; [www.awinet.org](http://www.awinet.org).
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; [www.awmac.com](http://www.awmac.com).
40. AWPA - American Wood Protection Association; [www.awpa.com](http://www.awpa.com).
41. AWS - American Welding Society; [www.aws.org](http://www.aws.org).
42. AWWA - American Water Works Association; [www.awwa.org](http://www.awwa.org).
43. BHMA - Builders Hardware Manufacturers Association; [www.buildershardware.com](http://www.buildershardware.com).
44. BIA - Brick Industry Association (The); [www.gobrick.com](http://www.gobrick.com).
45. BICSI - BICSI, Inc.; [www.bicsi.org](http://www.bicsi.org).
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); [www.bifma.org](http://www.bifma.org).
47. BISSC - Baking Industry Sanitation Standards Committee; [www.bissc.org](http://www.bissc.org).
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); [www.bissc.org](http://www.bissc.org).
49. CDA - Copper Development Association; [www.copper.org](http://www.copper.org).
50. CEA - Canadian Electricity Association; [www.electricity.ca](http://www.electricity.ca).
51. CEA - Consumer Electronics Association; [www.ce.org](http://www.ce.org).
52. CFFA - Chemical Fabrics and Film Association, Inc.; [www.chemicalfabricsandfilm.com](http://www.chemicalfabricsandfilm.com).
53. CFSEI - Cold-Formed Steel Engineers Institute; [www.cfsei.org](http://www.cfsei.org).
54. CGA - Compressed Gas Association; [www.cganet.com](http://www.cganet.com).
55. CIMA - Cellulose Insulation Manufacturers Association; [www.cellulose.org](http://www.cellulose.org).
56. CISCA - Ceilings & Interior Systems Construction Association; [www.cisca.org](http://www.cisca.org).
57. CISPI - Cast Iron Soil Pipe Institute; [www.cispi.org](http://www.cispi.org).
58. CLFMI - Chain Link Fence Manufacturers Institute; [www.chainlinkinfo.org](http://www.chainlinkinfo.org).
59. CPA - Composite Panel Association; [www.pbmdf.com](http://www.pbmdf.com).
60. CRI - Carpet and Rug Institute (The); [www.carpet-rug.org](http://www.carpet-rug.org).
61. CRRC - Cool Roof Rating Council; [www.coolroofs.org](http://www.coolroofs.org).
62. CRSI - Concrete Reinforcing Steel Institute; [www.crsi.org](http://www.crsi.org).
63. CSA - Canadian Standards Association; [www.csa.ca](http://www.csa.ca).
64. CSA - CSA International; (Formerly: IAS - International Approval Services); [www.csa-international.org](http://www.csa-international.org).
65. CSI - Construction Specifications Institute (The); [www.csinet.org](http://www.csinet.org).
66. CSSB - Cedar Shake & Shingle Bureau; [www.cedarbureau.org](http://www.cedarbureau.org).
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); [www.cti.org](http://www.cti.org).
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; [www.dasma.com](http://www.dasma.com).

70. DHI - Door and Hardware Institute; [www.dhi.org](http://www.dhi.org).
71. ECA - Electronic Components Association; (See ECIA).
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
73. ECIA - Electronic Components Industry Association; [www.eciaonline.org](http://www.eciaonline.org).
74. EIA - Electronic Industries Alliance; (See TIA).
75. EIMA - EIFS Industry Members Association; [www.eima.com](http://www.eima.com).
76. EJMA - Expansion Joint Manufacturers Association, Inc.; [www.ejma.org](http://www.ejma.org).
77. ESD - ESD Association; (Electrostatic Discharge Association); [www.esda.org](http://www.esda.org).
78. ESTA - Entertainment Services and Technology Association; (See PLASA).
79. EVO - Efficiency Valuation Organization; [www.evo-world.org](http://www.evo-world.org).
80. FCI - Fluid Controls Institute; [www.fluidcontrolsinstitute.org](http://www.fluidcontrolsinstitute.org).
81. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); [www.fiba.com](http://www.fiba.com).
82. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); [www.fivb.org](http://www.fivb.org).
83. FM Approvals - FM Approvals LLC; [www.fmglobal.com](http://www.fmglobal.com).
84. FM Global - FM Global; (Formerly: FMG - FM Global); [www.fmglobal.com](http://www.fmglobal.com).
85. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; [www.floridarroof.com](http://www.floridarroof.com).
86. FSA - Fluid Sealing Association; [www.fluidsealing.com](http://www.fluidsealing.com).
87. FSC - Forest Stewardship Council U.S.; [www.fscus.org](http://www.fscus.org).
88. GA - Gypsum Association; [www.gypsum.org](http://www.gypsum.org).
89. GANA - Glass Association of North America; [www.glasswebsite.com](http://www.glasswebsite.com).
90. GS - Green Seal; [www.greenseal.org](http://www.greenseal.org).
91. HI - Hydraulic Institute; [www.pumps.org](http://www.pumps.org).
92. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
93. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
94. HPVA - Hardwood Plywood & Veneer Association; [www.hpva.org](http://www.hpva.org).
95. HPW - H. P. White Laboratory, Inc.; [www.hpwhite.com](http://www.hpwhite.com).
96. IAPSC - International Association of Professional Security Consultants; [www.iapsc.org](http://www.iapsc.org).
97. IAS - International Accreditation Service; [www.iasonline.org](http://www.iasonline.org).
98. IAS - International Approval Services; (See CSA).
99. ICBO - International Conference of Building Officials; (See ICC).
100. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
101. ICEA - Insulated Cable Engineers Association, Inc.; [www.icea.net](http://www.icea.net).
102. ICPA - International Cast Polymer Alliance; [www.icpa-hq.org](http://www.icpa-hq.org).
103. ICRI - International Concrete Repair Institute, Inc.; [www.icri.org](http://www.icri.org).
104. IEC - International Electrotechnical Commission; [www.iec.ch](http://www.iec.ch).
105. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); [www.ieee.org](http://www.ieee.org).
106. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); [www.ies.org](http://www.ies.org).
107. IESNA - Illuminating Engineering Society of North America; (See IES).
108. IEST - Institute of Environmental Sciences and Technology; [www.iest.org](http://www.iest.org).
109. IGMA - Insulating Glass Manufacturers Alliance; [www.igmaonline.org](http://www.igmaonline.org).
110. IGSHPA - International Ground Source Heat Pump Association; [www.igshpa.okstate.edu](http://www.igshpa.okstate.edu).
111. ILI - Indiana Limestone Institute of America, Inc.; [www.iliai.com](http://www.iliai.com).



112. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); [www.intertek.com](http://www.intertek.com).
113. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); [www.isa.org](http://www.isa.org).
114. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
115. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); [www.isfanow.org](http://www.isfanow.org).
116. ISO - International Organization for Standardization; [www.iso.org](http://www.iso.org).
117. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
118. ITU - International Telecommunication Union; [www.itu.int/home](http://www.itu.int/home).
119. KCMA - Kitchen Cabinet Manufacturers Association; [www.kcma.org](http://www.kcma.org).
120. LMA - Laminating Materials Association; (See CPA).
121. LPI - Lightning Protection Institute; [www.lightning.org](http://www.lightning.org).
122. MBMA - Metal Building Manufacturers Association; [www.mbma.com](http://www.mbma.com).
123. MCA - Metal Construction Association; [www.metalconstruction.org](http://www.metalconstruction.org).
124. MFMA - Maple Flooring Manufacturers Association, Inc.; [www.maplefloor.org](http://www.maplefloor.org).
125. MFMA - Metal Framing Manufacturers Association, Inc.; [www.metalframingmfg.org](http://www.metalframingmfg.org).
126. MHIA - Material Handling Industry of America; [www.mhia.org](http://www.mhia.org).
127. MIA - Marble Institute of America; [www.marble-institute.com](http://www.marble-institute.com).
128. MMPA - Moulding & Millwork Producers Association; [www.wmmpa.com](http://www.wmmpa.com).
129. MPI - Master Painters Institute; [www.paintinfo.com](http://www.paintinfo.com).
130. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; [www.mss-hq.org](http://www.mss-hq.org).
131. NAAMM - National Association of Architectural Metal Manufacturers; [www.naamm.org](http://www.naamm.org).
132. NACE - NACE International; (National Association of Corrosion Engineers International); [www.nace.org](http://www.nace.org).
133. NADCA - National Air Duct Cleaners Association; [www.nadca.com](http://www.nadca.com).
134. NAIMA - North American Insulation Manufacturers Association; [www.naima.org](http://www.naima.org).
135. NBGQA - National Building Granite Quarries Association, Inc.; [www.nbgqa.com](http://www.nbgqa.com).
136. NBI - New Buildings Institute; [www.newbuildings.org](http://www.newbuildings.org).
137. NCAA - National Collegiate Athletic Association (The); [www.ncaa.org](http://www.ncaa.org).
138. NCMA - National Concrete Masonry Association; [www.ncma.org](http://www.ncma.org).
139. NEBB - National Environmental Balancing Bureau; [www.nebb.org](http://www.nebb.org).
140. NECA - National Electrical Contractors Association; [www.necanet.org](http://www.necanet.org).
141. NeLMA - Northeastern Lumber Manufacturers Association; [www.nelma.org](http://www.nelma.org).
142. NEMA - National Electrical Manufacturers Association; [www.nema.org](http://www.nema.org).
143. NETA - InterNational Electrical Testing Association; [www.netaworld.org](http://www.netaworld.org).
144. NFHS - National Federation of State High School Associations; [www.nfhs.org](http://www.nfhs.org).
145. NFPA - National Fire Protection Association; [www.nfpa.org](http://www.nfpa.org).
146. NFPA - NFPA International; (See NFPA).
147. NFRC - National Fenestration Rating Council; [www.nfrc.org](http://www.nfrc.org).
148. NHLA - National Hardwood Lumber Association; [www.nhla.com](http://www.nhla.com).
149. NLGA - National Lumber Grades Authority; [www.nlga.org](http://www.nlga.org).
150. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
151. NOMMA - National Ornamental & Miscellaneous Metals Association; [www.nomma.org](http://www.nomma.org).
152. NRCA - National Roofing Contractors Association; [www.nrca.net](http://www.nrca.net).
153. NRMCA - National Ready Mixed Concrete Association; [www.nrmca.org](http://www.nrmca.org).
154. NSF - NSF International; [www.nsf.org](http://www.nsf.org).

155. NSPE - National Society of Professional Engineers; [www.nspe.org](http://www.nspe.org).
156. NSSGA - National Stone, Sand & Gravel Association; [www.nssga.org](http://www.nssga.org).
157. NTMA - National Terrazzo & Mosaic Association, Inc. (The); [www.ntma.com](http://www.ntma.com).
158. NWFPA - National Wood Flooring Association; [www.nwfa.org](http://www.nwfa.org).
159. PCI - Precast/Prestressed Concrete Institute; [www.pci.org](http://www.pci.org).
160. PDI - Plumbing & Drainage Institute; [www.pdionline.org](http://www.pdionline.org).
161. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); [www.plasa.org](http://www.plasa.org).
162. RCSC - Research Council on Structural Connections; [www.boltcouncil.org](http://www.boltcouncil.org).
163. RFCI - Resilient Floor Covering Institute; [www.rfci.com](http://www.rfci.com).
164. RIS - Redwood Inspection Service; [www.redwoodinspection.com](http://www.redwoodinspection.com).
165. SAE - SAE International; [www.sae.org](http://www.sae.org).
166. SCTE - Society of Cable Telecommunications Engineers; [www.scte.org](http://www.scte.org).
167. SDI - Steel Deck Institute; [www.sdi.org](http://www.sdi.org).
168. SDI - Steel Door Institute; [www.steeldoor.org](http://www.steeldoor.org).
169. SEFA - Scientific Equipment and Furniture Association (The); [www.sefalabs.com](http://www.sefalabs.com).
170. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
171. SIA - Security Industry Association; [www.siaonline.org](http://www.siaonline.org).
172. SJI - Steel Joist Institute; [www.steeljoist.org](http://www.steeljoist.org).
173. SMA - Screen Manufacturers Association; [www.smainfo.org](http://www.smainfo.org).
174. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; [www.smacna.org](http://www.smacna.org).
175. SMPTE - Society of Motion Picture and Television Engineers; [www.smpte.org](http://www.smpte.org).
176. SPFA - Spray Polyurethane Foam Alliance; [www.sprayfoam.org](http://www.sprayfoam.org).
177. SPIB - Southern Pine Inspection Bureau; [www.spib.org](http://www.spib.org).
178. SPRI - Single Ply Roofing Industry; [www.spri.org](http://www.spri.org).
179. SRCC - Solar Rating & Certification Corporation; [www.solar-rating.org](http://www.solar-rating.org).
180. SSINA - Specialty Steel Industry of North America; [www.ssina.com](http://www.ssina.com).
181. SSPC - SSPC: The Society for Protective Coatings; [www.sspc.org](http://www.sspc.org).
182. STI - Steel Tank Institute; [www.steeltank.com](http://www.steeltank.com).
183. SWI - Steel Window Institute; [www.steelwindows.com](http://www.steelwindows.com).
184. SWPA - Submersible Wastewater Pump Association; [www.swpa.org](http://www.swpa.org).
185. TCA - Tilt-Up Concrete Association; [www.tilt-up.org](http://www.tilt-up.org).
186. TCNA - Tile Council of North America, Inc.; [www.tileusa.com](http://www.tileusa.com).
187. TEMA - Tubular Exchanger Manufacturers Association, Inc.; [www.tema.org](http://www.tema.org).
188. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); [www.tiaonline.org](http://www.tiaonline.org).
189. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
190. TMS - The Masonry Society; [www.masonrysociety.org](http://www.masonrysociety.org).
191. TPI - Truss Plate Institute; [www.tpinst.org](http://www.tpinst.org).
192. TPI - Turfgrass Producers International; [www.turfgrassod.org](http://www.turfgrassod.org).
193. TRI - Tile Roofing Institute; [www.tilerroofing.org](http://www.tilerroofing.org).
194. UL - Underwriters Laboratories Inc.; [www.ul.com](http://www.ul.com).
195. UNI - Uni-Bell PVC Pipe Association; [www.uni-bell.org](http://www.uni-bell.org).
196. USAV - USA Volleyball; [www.usavolleyball.org](http://www.usavolleyball.org).
197. USGBC - U.S. Green Building Council; [www.usgbc.org](http://www.usgbc.org).
198. USITT - United States Institute for Theatre Technology, Inc.; [www.usitt.org](http://www.usitt.org).

199. WASTEC - Waste Equipment Technology Association; [www.wastec.org](http://www.wastec.org).
200. WCLIB - West Coast Lumber Inspection Bureau; [www.wclib.org](http://www.wclib.org).
201. WCMA - Window Covering Manufacturers Association; [www.wcmanet.org](http://www.wcmanet.org).
202. WDMA - Window & Door Manufacturers Association; [www.wdma.com](http://www.wdma.com).
203. WI - Woodwork Institute; [www.wicnet.org](http://www.wicnet.org).
204. WSRCA - Western States Roofing Contractors Association; [www.wsrca.com](http://www.wsrca.com).
205. WWPA - Western Wood Products Association; [www.wwpa.org](http://www.wwpa.org).

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut für Normung e.V.; [www.din.de](http://www.din.de).
2. IAPMO - International Association of Plumbing and Mechanical Officials; [www.iapmo.org](http://www.iapmo.org).
3. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
4. ICC-ES - ICC Evaluation Service, LLC; [www.icc-es.org](http://www.icc-es.org).

## **PART 2 - PRODUCTS (Not Used)**

## **PART 3 - EXECUTION (Not Used)**

**END OF SECTION 014200**

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## **SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
  2. Section 312319 "Dewatering" for disposal of ground water at Project site.
  3. Section 321216 "Asphalt Paving" for construction and maintenance of asphalt pavement for temporary roads and paved areas.
  4. Section 321313 "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

#### **1.3 USE CHARGES**

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.
- C. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

#### **1.4 SUBMITTALS**

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
  2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.

3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- C. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust-control partitions at each phase of work.
  2. HVAC system isolation schematic drawing.
  3. Location of proposed air-filtration system discharge.
  4. Waste handling procedures.
  5. Other dust-control measures.

## 1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

## 1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

## **PART 2 - PRODUCTS**

### 2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top rails.
- B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide concrete bases for supporting posts.
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- D. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

- E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

## 2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
  - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
  - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
  - 3. Drinking water and private toilet.
  - 4. Coffee machine and supplies.
  - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
  - 6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
  - 1. Store combustible materials apart from building.

## 2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
  - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures".

- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

### **3.2 TEMPORARY UTILITY INSTALLATION**

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
  - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
    - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
    - b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition



construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
  3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- H. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
1. Install electric power service overhead unless otherwise indicated.
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
  2. Install lighting for Project identification sign.
- J. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
1. At each telephone, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Contractor's emergency after-hours telephone number.
    - e. Architect's office.
    - f. Engineers' offices.
    - g. Owner's office.
    - h. Principal subcontractors' field and home offices.
  2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
  2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
  2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 "Earth Moving."
  3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
  4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 321216 "Asphalt Paving."
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
  2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
  2. Remove snow and ice as required to minimize accumulations.
- F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
  2. Maintain and touchup signs so they are legible at all times.
- G. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- I. Temporary Elevator Use: See Section Section 142413 "Holeless Hydraulic Elevators" for temporary use of new elevators.
  - J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
  - K. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
    1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.
  - L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

#### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
  1. Comply with work restrictions specified in Section 011000 "Summary."
- C. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Section 311000 "Site Clearing."
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
  1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.

2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- I. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
1. Construct covered walkways using scaffold or shoring framing.
  2. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
  3. Paint and maintain appearance of walkway for duration of the Work.
- J. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas.
  2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
  3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

### 3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
1. Protect porous materials from water damage.

2. Protect stored and installed material from flowing or standing water.
  3. Keep porous and organic materials from coming into prolonged contact with concrete.
  4. Remove standing water from decks.
  5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
  2. Keep interior spaces reasonably clean and protected from water damage.
  3. Periodically collect and remove waste containing cellulose or other organic matter.
  4. Discard or replace water-damaged material.
  5. Do not install material that is wet.
  6. Discard, replace, or clean stored or installed material that begins to grow mold.
  7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
  2. Use permanent HVAC system to control humidity.
  3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
    - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
    - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
    - c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

### 3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
  3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

**END OF SECTION 015000**

## **SECTION 017300 - EXECUTION**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

- B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

#### **1.3 DEFINITIONS**

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

#### **1.4 SUBMITTALS**

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
  2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
  3. Products: List products to be used for patching and firms or entities that will perform patching work.
  4. Dates: Indicate when cutting and patching will be performed.
  5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
    - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

## 1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
    - a. Masonry walls.
    - b. Beams.
    - c. Joists.
  2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
  3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
  4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.



- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
  - 1. Description of the Work.
  - 2. List of detrimental conditions, including substrates.

3. List of unacceptable installation tolerances.
  4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  2. Establish limits on use of Project site.
  3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  4. Inform installers of lines and levels to which they must comply.
  5. Check the location, level and plumb, of every major element as the Work progresses.
  6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

### 3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

### 3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
  - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. 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.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
  1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
  2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

### 3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
  3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Use containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.

- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls" And Section 017419 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

**3.10 PROTECTION OF INSTALLED CONSTRUCTION**

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

**END OF SECTION 017300**



## **SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes administrative and procedural requirements for the following:
1. Salvaging nonhazardous demolition and construction waste.
  2. Recycling nonhazardous demolition and construction waste.
  3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
1. Section 024119 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.
  2. Section 042000 "Unit Masonry" for disposal requirements for masonry waste.

#### **1.3 DEFINITIONS**

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable

means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

## 1.5 SUBMITTALS

- A. Waste Management Plan: Submit plan within 7 days of date established for the Notice to Proceed.
- B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste or similar. Include the following information:
  - 1. Material category.
  - 2. Generation point of waste.
  - 3. Total quantity of waste in tons.
  - 4. Quantity of waste salvaged, both estimated and actual in tons.
  - 5. Quantity of waste recycled, both estimated and actual in tons.
  - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
  - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- C. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

## 1.6 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

- C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
1. Review and discuss waste management plan including responsibilities of waste management coordinator.
  2. Review requirements for documenting quantities of each type of waste and its disposition.
  3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
  4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
  5. Review waste management requirements for each trade.

### 1.7 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste or similar. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste or similar. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
  2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
  3. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
  4. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
  5. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

## **PART 2 - PRODUCTS (Not Used)**

## **PART 3 - EXECUTION**

### **3.1 PLAN IMPLEMENTATION**

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
  - 1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
  - 1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  - 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

### **3.2 SALVAGING DEMOLITION WASTE**

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
  - 3. Store items in a secure area until installation.
  - 4. Protect items from damage during transport and storage.
  - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.

### **3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL**

- A. General: Recycle paper and beverage containers used by on-site workers.

- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.
  - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  - 4. Store components off the ground and protect from the weather.
  - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

### 3.4 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving Removal may be completed by grinding asphalt to maximum 1 ½" size for re-use on site or break up and transport to asphalt-recycling facility.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
- C. Crush concrete to maximum 1-1/2-inch size. Crushed concrete may be used as satisfactory soil for fill or subbase.
- D. Metals: Separate metals by type.
  - 1. Structural Steel: Stack members according to size, type of member, and length.
  - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- E. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- F. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

- G. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.
- H. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
  - 1. Store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- I. Carpet Tile: Remove debris, trash, and adhesive.
  - 1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- J. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- K. Conduit: Reduce conduit to straight lengths and store by type and size.

### 3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
  - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
  - 2. Polystyrene Packaging: Separate and bag materials.
  - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
  - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
  - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
  - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

### 3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

**END OF SECTION 017419**

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## **SECTION 017700 - CLOSEOUT PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
1. Substantial Completion procedures.
  2. Final completion procedures.
  3. Warranties.
  4. Final cleaning.
  5. Repair of the Work.
- B. Related Requirements:
1. Section 013233 "Photographic Documentation" for submitting final completion construction photographic documentation.
  2. Section 017300 "Execution" for progress cleaning of Project site.
  3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
  4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  5. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

## 1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.

8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Complete final cleaning requirements, including touchup painting.
  10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. Results of completed inspection will form the basis of requirements for final completion.

## 1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
  2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

## 1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, proceeding from lowest floor to highest floor.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
  - a. Project name.
  - b. Date.
  - c. Name of Architect.
  - d. Name of Contractor.
  - e. Page number.
4. Submit list of incomplete items in the following format:
  - a. MS Excel electronic file. Architect will return annotated file.

## 1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
  1. Bind 2 copies of warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
  2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
  4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

## **PART 2 - PRODUCTS**

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## **PART 3 - EXECUTION**

### **3.1 FINAL CLEANING**

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - h. Sweep concrete floors broom clean in unoccupied spaces.
    - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
    - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - k. Remove labels that are not permanent.
    - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

- m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
  - p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
  - q. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls" And Section 017419 "Construction Waste Management and Disposal."

### 3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
- 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
  - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
    - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
  - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
  - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

**END OF SECTION 017700**

## **SECTION 017823 - OPERATION AND MAINTENANCE DATA**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
1. Operation and maintenance documentation directory.
  2. Emergency manuals.
  3. Operation manuals for systems, subsystems, and equipment.
  4. Product maintenance manuals.
  5. Systems and equipment maintenance manuals.
- B. Related Requirements:
1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
  2. Section 019113 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

#### **1.3 DEFINITIONS**

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
  2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
1. PDF electronic file. Assemble one manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

- a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
  - b. Enable inserted reviewer comments on draft submittals.
2. 2 paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

## **PART 2 - PRODUCTS**

### **2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY**

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
1. List of documents.
  2. List of systems.
  3. List of equipment.
  4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."



## 2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
  2. Table of contents.
  3. Manual contents.
- B. Title Page: Include the following information:
1. Subject matter included in manual.
  2. Name and address of Project.
  3. Name and address of Owner.
  4. Date of submittal.
  5. Name and contact information for Contractor.
  6. Name and contact information for Construction Manager.
  7. Name and contact information for Architect.
  8. Name and contact information for Commissioning Authority.
  9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents. Indicate volume number for multiple-volume sets.
  2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
  4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
  5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

### 2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
  2. Flood.
  3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.

7. System, subsystem, or equipment failure.
  8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.
  3. Operating instructions for conditions outside normal operating limits.
  4. Required sequences for electric or electronic systems.
  5. Special operating instructions and procedures.

## 2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  2. Performance and design criteria if Contractor has delegated design responsibility.
  3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.
  10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
  2. Manufacturer's name.
  3. Equipment identification with serial number of each component.
  4. Equipment function.
  5. Operating characteristics.
  6. Limiting conditions.
  7. Performance curves.
  8. Engineering data and tests.
  9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
  2. Equipment or system break-in procedures.
  3. Routine and normal operating instructions.

4. Regulation and control procedures.
  5. Instructions on stopping.
  6. Normal shutdown instructions.
  7. Seasonal and weekend operating instructions.
  8. Required sequences for electric or electronic systems.
  9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## 2.5 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
  2. Manufacturer's name.
  3. Color, pattern, and texture.
  4. Material and chemical composition.
  5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
  2. Types of cleaning agents to be used and methods of cleaning.
  3. List of cleaning agents and methods of cleaning detrimental to product.
  4. Schedule for routine cleaning and maintenance.
  5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

## 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting, and checking instructions.
  - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

## **PART 3 - EXECUTION**

### **3.1 MANUAL PREPARATION**

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original project record documents as part of operation and maintenance manuals.
- F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

**END OF SECTION 017823**

## **SECTION 017839 - PROJECT RECORD DOCUMENTS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

- B. Related Requirements:

1. Section 017300 "Execution" for final property survey.
2. Section 017700 "Closeout Procedures" for general closeout procedures.
3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

#### **1.3 CLOSEOUT SUBMITTALS**

- A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.

### **PART 2 - PRODUCTS**

#### **2.1 RECORD DRAWINGS**

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
  - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
  - b. Accurately record information in an acceptable drawing technique.
  - c. Record data as soon as possible after obtaining it.
  - d. Record and check the markup before enclosing concealed installations.

- e. Cross-reference record prints to corresponding archive photographic documentation.
2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

## 2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as paper copy.

## 2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.



1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file.
1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

#### **2.4 MISCELLANEOUS RECORD SUBMITTALS**

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file or paper copy.
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

### **PART 3 - EXECUTION**

#### **3.1 RECORDING AND MAINTENANCE**

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

**END OF SECTION 017839**

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## **SECTION 017900 - DEMONSTRATION AND TRAINING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
1. Demonstration of operation of systems, subsystems, and equipment.
  2. Training in operation and maintenance of systems, subsystems, and equipment.
  3. Demonstration and training video recordings.

#### **1.3 INFORMATIONAL SUBMITTALS**

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For instructor.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
1. Identification: On each copy, provide an applied label with the following information:
    - a. Name of Project.
    - b. Name and address of videographer.
    - c. Name of Architect.
    - d. Name of Construction Manager.
    - e. Name of Contractor.
    - f. Date of video recording.

2. At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals and in PDF electronic file format on compact disc.

## 1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  1. Inspect and discuss locations and other facilities required for instruction.
  2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  3. Review required content of instruction.
  4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

## 1.6 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

## **PART 2 - PRODUCTS**

### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Operations manuals.
    - c. Maintenance manuals.
    - d. Project record documents.
    - e. Identification systems.
    - f. Warranties and bonds.
    - g. Maintenance service agreements and similar continuing commitments.
  3. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.
    - c. Shutdown instructions for each type of emergency.
    - d. Operating instructions for conditions outside of normal operating limits.
    - e. Sequences for electric or electronic systems.
    - f. Special operating instructions and procedures.
  4. Operations: Include the following, as applicable:
    - a. Startup procedures.
    - b. Equipment or system break-in procedures.
    - c. Routine and normal operating instructions.
    - d. Regulation and control procedures.
    - e. Control sequences.
    - f. Safety procedures.
    - g. Instructions on stopping.
    - h. Normal shutdown instructions.
    - i. Operating procedures for emergencies.
    - j. Operating procedures for system, subsystem, or equipment failure.
    - k. Seasonal and weekend operating instructions.

- l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
  - a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
  - a. Diagnostic instructions.
  - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

### **3.2 INSTRUCTION**

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
  - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
  - 3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

### 3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
  - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.
  - 1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
  - 2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
  - 3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
  - 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
    - a. Name of Contractor/Installer.
    - b. Business address.
    - c. Business phone number.
    - d. Point of contact.
    - e. E-mail address.

- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
1. Film training session(s) in segments not to exceed 15 minutes.
    - a. Produce segments to present a single significant piece of equipment per segment.
    - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
1. Furnish additional portable lighting as required.

**END OF SECTION 017900**



## **SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:

1. General requirements for coordinating and scheduling commissioning.
2. Commissioning meetings.
3. Commissioning reports.
4. Use of test equipment, instrumentation, and tools for commissioning.
5. Construction checklists, including, but not limited to, installation checks, startup, performance tests, and performance test demonstration.
6. Commissioning tests and commissioning test demonstration.
7. Adjusting, verifying, and documenting identified systems and assemblies.

- B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submittal procedures requirements for commissioning.
2. Section 017700 "Closeout Procedures" for certificate of Construction Phase Commissioning Completion submittal requirements.
3. Section 017823 "Operation and Maintenance Data" for preliminary operation and maintenance data submittal.

#### **1.3 DEFINITIONS**

- A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, construction checklists, performance tests, performance test demonstrations, commissioning tests and commissioning test demonstrations.
- B. Commissioning Plan: A document, prepared by Commissioning Authority, that outlines the organization, schedule, allocation of resources, and documentation requirements of commissioning.
- C. Commissioning: A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with Owner's Project Requirements. The requirements specified here are limited to the construction phase commissioning activities.
- D. Construction Phase Commissioning Completion: The stage of completion and acceptance of commissioning when resolution of deficient conditions and issues discovered during commissioning and retesting until acceptable results are obtained has

been accomplished. Owner will establish in writing the date Construction Phase Commissioning Completion is achieved.

1. Commissioning is complete when the work specified in this Section and related Sections has been completed and accepted, including, but not limited to, the following:
  - a. Completion of tests and acceptance of test results.
  - b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.
  - c. Comply with requirements in Section 017900 "Demonstration and Training."
  - d. Completion and acceptance of submittals and reports.
- E. Owner's Witness: Commissioning Authority, Owner's Project Manager, or Architect-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.
- F. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.
- G. Test: Performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.
- H. Sampling Procedures and Tables for Inspection by Attributes: As defined in ASQ Z1.4.

#### 1.4 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s):
  1. Commissioning Coordinator: A person or entity employed by Contractor to manage, schedule, and coordinate commissioning.
  2. Project superintendent and other employees that Contractor may deem appropriate for a particular portion of the commissioning.
  3. Subcontractors, installers, suppliers, and specialists that Contractor may deem appropriate for a particular portion of the commissioning.
  4. Appointed team members shall have the authority to act on behalf of the entity they represent.
- B. Members Appointed by Owner:
  1. Commissioning authority, plus consultants that Commissioning Authority may deem appropriate for a particular portion of the commissioning.
  2. Owner representative(s), facility operations and maintenance personnel, plus other employees, separate contractors, and consultants that Owner may deem appropriate for a particular portion of the commissioning.
  3. Architect, plus employees and consultants that Architect may deem appropriate for a particular portion of the commissioning.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Comply with requirements in Section 013300 "Submittal Procedures" for submittal procedures general requirements for commissioning.
- B. Commissioning Plan Information:
  - 1. List of Contractor-appointed commissioning team members to include specific personnel and subcontractors to the performance of the various commissioning requirements.
  - 2. Schedule of commissioning activities, integrated with the construction schedule. Comply with requirements in Section 013200 "Construction Progress Documentation" for construction schedule general requirements for commissioning.
  - 3. Contractor personnel and subcontractors to participate in each test.
  - 4. List of instrumentation required for each test to include identification of parties that will provide instrumentation for each test.
- C. Commissioning schedule.
- D. Two-week look-ahead schedules.
- E. Commissioning Coordinator Letter of Authority:
  - 1. Within 10 days after approval of Commissioning Coordinator qualifications, submit a letter of authority for Commissioning Coordinator, signed by a principal of Contractor's firm. Letter shall authorize Commissioning Coordinator to do the following:
    - a. Make inspections required for commissioning.
    - b. Coordinate, schedule, and manage commissioning of Contractor, subcontractors, and suppliers.
    - c. Obtain documentation required for commissioning from Contractor, subcontractors, and suppliers.
    - d. Report issues, delayed resolution of issues, schedule conflicts, and lack of cooperation or expertise on the part of members of the commissioning team.
- F. Commissioning Coordinator Qualification Data: For entity coordinating Contractor's commissioning activities to demonstrate their capabilities and experience.
  - 1. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- G. List test instrumentation, equipment, and monitoring devices. Include the following information:

1. Make, model, serial number, and application for each instrument, equipment, and monitoring device.
2. Brief description of intended use.
3. Calibration record showing the following:
  - a. Calibration agency, including name and contact information.
  - b. Last date of calibration.
  - c. Range of values for which calibration is valid.
  - d. Certification of accuracy.
  - e. N.I.S.T. traceability certification for calibration equipment.
  - f. Due date of the next calibration.

H. Test Reports:

1. Pre-Startup Report: Prior to startup of equipment or a system, submit signed, completed construction checklists.
2. Test Data Reports: At the end of each day in which tests are conducted, submit test data for tests performed.
3. Commissioning Issues Reports: Daily, at the end of each day in which tests are conducted, submit commissioning issue reports for tests for which acceptable results were not achieved.
4. Weekly Progress Report: Weekly, at the end of each week in which tests are conducted, submit a progress report.
5. Data Trend Logs: Submit data trend logs at the end of the trend log period.
6. System Alarm Logs: Daily, at the start of days following a day in which tests were performed, submit print-out of log of alarms that occurred since the last log was printed.

I. Construction Checklists:

1. Material checks.
2. Installation checks.
3. Startup procedures, where required.

1.6 CLOSEOUT SUBMITTALS

A. Commissioning Report:

1. At Construction Phase Commissioning Completion, include the following:
  - a. Pre-startup reports.
  - b. Approved test procedures.
  - c. Test data forms, completed and signed.
  - d. Progress reports.
  - e. Commissioning issues report log.
  - f. Commissioning issues reports showing resolution of issues.
  - g. Correspondence or other documents related to resolution of issues.
  - h. Other reports required by commissioning.
  - i. List unresolved issues and reasons they remain unresolved and should be exempted from the requirements for Construction Phase Commissioning Completion.

- j. Report shall include commissioning work of Contractor.
- B. Request for Certificate of Construction Phase Commissioning Completion.
- C. Operation and Maintenance Data: For proprietary test equipment, instrumentation, and tools to include in operation and maintenance manuals.

## 1.7 QUALITY ASSURANCE

- A. Commissioning Coordinator Qualifications:
  - 1. Documented experience commissioning systems of similar complexity to those contained in these documents on at least three projects of similar scope and complexity.
- B. Calibration Agency Qualifications: Certified by The American Association of Laboratory Accreditation that the calibration agency complies with minimum requirements of ISO/IEC 17025.

## **PART 2 - PRODUCTS**

### 2.1 TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

- A. Test equipment and instrumentation required to perform the commissioning shall remain the property of Contractor unless otherwise indicated.
- B. Test equipment and instrumentation required to perform commissioning shall comply with the following criteria:
  - 1. Be manufactured for the purpose of testing and measuring tests for which they are being used and have an accuracy to test and measure system performance within the tolerances required to determine acceptable performance.
  - 2. Calibrated and certified.
    - a. Calibration performed and documented by a qualified calibration agency according to national standards applicable to the tools and instrumentation being calibrated. Calibration shall be current according to national standards or within test equipment and instrumentation manufacturer's recommended intervals, whichever is more frequent, but not less than within six months of initial use on Project. Calibration tags permanently affixed.
    - b. Repair and recalibrate test equipment and instrumentation if dismantled, dropped, or damaged since last calibrated.
  - 3. Maintain test equipment and instrumentation.
  - 4. Use test equipment and instrumentation only for testing or monitoring Work for which they are designed.

## 2.2 PROPRIETARY TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

- A. Proprietary test equipment, instrumentation, and tools are those manufactured or prescribed by tested equipment manufacturer and required for work on its equipment as a condition of equipment warranty, or as otherwise required to service, repair, adjust, calibrate, or perform work on its equipment.
1. Identify proprietary test equipment, instrumentation, and tools required in the test equipment identification list submittal.
  2. Proprietary test equipment, instrumentation, and tools shall become the property of Owner at Substantial Completion.

## 2.3 REPORT FORMAT AND ORGANIZATION

A. General Format and Organization:

1. Bind report in three-ring binders (2).
2. Label the front cover and spine of each binder with the report title, volume number, project name, Contractor's name, and date of report.
3. Record report on compact disk (1).
4. Electronic Data: Portable document format (PDF); a single file with outline-organized bookmarks for major and minor tabs and tab contents itemized for specific reports.

B. Commissioning Report:

1. Include a table of contents and an index to each test.
2. Include major tabs for each Specification Section.
3. Include minor tabs for each test.
4. Within each minor tab, include the following:
  - a. Test specification.
  - b. Pre-startup reports.
  - c. Approved test procedures.
  - d. Test data forms, completed and signed.
  - e. Commissioning issue reports, showing resolution of issues, and documentation related to resolution of issues pertaining to a single test. Group data forms, commissioning issue reports showing resolution of issues, and documentation related to resolution of issues for each test repetition together within the minor tab, in reverse chronological order (most recent on top).

## **PART 3 - EXECUTION**

### 3.1 PREPARATION

- A. Review preliminary construction checklists and preliminary test procedures and data forms.

### 3.2 CONSTRUCTION CHECKLISTS

- A. Construction checklists cannot modify or conflict with the Contract Documents.
- B. Create construction checklists based on actual systems and equipment to be included in Project.
- C. Material Checks: Compare specified characteristics and approved submittals with materials as received. Include factory tests and other evaluations, adjustments, and tests performed prior to shipment, if applicable.
  - 1. Services connection requirements, including configuration, size, location, and other pertinent characteristics.
  - 2. Included optional features.
  - 3. Delivery Receipt Check: Inspect and record physical condition of materials and equipment on delivery to Project site, including agreement with approved submittals, cleanliness and lack of damage.
  - 4. Installation Checks:
    - a. Location according to Drawings and approved Shop Drawings.
    - b. Configuration.
    - c. Compliance with manufacturers' written installation instructions.
    - d. Attachment to structure.
    - e. Access clearance to allow for maintenance, service, repair, removal, and replacement without the need to disassemble or remove other equipment or building elements. Access coordinated with other building elements and equipment, including, but not limited to, ceiling and wall access panels, in a manner consistent with OSHA fall-protection regulations and safe work practices.
    - f. Utility connections are of the correct characteristics, as applicable.
    - g. Correct labeling and identification.
    - h. Startup Checks: Verify readiness of equipment to be energized. Include manufacturer's standard startup procedures and forms.
- D. Startup: Perform and document initial operation of equipment to prove that it is installed properly and operates as intended according to manufacturer's standard startup procedures, minimum. Include manufacturer's representative at startup of all equipment and documentation of manufacturer's acceptance of installation.
- E. Performance Tests:
  - 1. Static Tests: As specified elsewhere, including, but not limited to, duct and pipe leakage tests, insulation-resistance tests, and water-penetration tests.
  - 2. Component Performance Tests: Tests evaluate the performance of an input or output of components under a full range of operating conditions.
  - 3. Equipment and Assembly Performance Tests: Test and evaluate performance of equipment and assemblies under a full range of operating conditions and loads.
  - 4. System Performance Tests: Test and evaluate performance of systems under a full range of operating conditions and loads.
  - 5. Intersystem Performance Tests: Test and evaluate the interface of different systems under a full range of operating conditions and loads.

### 3.3 GENERAL EXECUTION REQUIREMENTS

- A. Schedule and coordinate commissioning with the construction schedule.
- B. Perform activities identified in construction checklists, including tests, and document results of actions as construction proceeds.
- C. Perform test demonstrations for Owner's witness. Unless otherwise indicated, demonstrate tests for 100 percent of work to which the test applies. In some instances, demonstration of a random sample of other than 100 percent of the results of a test is specified.
- D. Report test data and commissioning issue resolutions.
- E. Schedule personnel to participate in and perform Commissioning-Process Work.
- F. Installing contractors' commissioning responsibilities include, but are not limited to, the following:
  - 1. Operating the equipment and systems they install during tests.
  - 2. In addition, installing contractors may be required to assist in tests of equipment and systems with which their work interfaces.

### 3.4 COMMISSIONING COORDINATOR RESPONSIBILITIES

- A. Management and Coordination: Manage, schedule, and coordinate commissioning, including, but not limited to, the following:
  - 1. Coordinate with subcontractors on their commissioning responsibilities and activities.
  - 2. Obtain, assemble, and submit commissioning documentation.
  - 3. Conduct periodic on-site commissioning meetings. Comply with requirements in Section 013100 "Project Management and Coordination."
  - 4. Develop and maintain the commissioning schedule. Integrate commissioning schedule into the construction schedule. Update schedule at specified intervals.
  - 5. Review and comment on preliminary test procedures and data forms.
  - 6. Report inconsistencies and issues in system operations.
  - 7. Verify that tests have been completed and results comply with acceptance criteria, and that equipment and systems are ready before scheduling test demonstrations.
  - 8. Direct and coordinate test demonstrations.
  - 9. Coordinate witnessing of test demonstrations by Owner's witness.
  - 10. Coordinate and manage training. Be present during training sessions to direct video recording, present training and direct the training presentations of others. Comply with requirements in Section 017900 "Demonstration and Training."
  - 11. Prepare and submit specified commissioning reports.
  - 12. Track commissioning issues until resolution and retesting is successfully completed.
  - 13. Retain original records of Commissioning-Process Work, organized as required for the commissioning report. Provide Owner's representative access to these records on request.



14. Assemble and submit commissioning report.

### 3.5 COMMISSIONING TESTING

- A. Quality Control: Construction checklists, including tests, are quality-control tools designed to improve the functional quality of Project. Test demonstrations evaluate the effectiveness of Contractor's quality-control process.
- B. Owner's witness and manufacturer's representative will be present to witness commissioning work requiring the signature of an owner's witness, including, but not limited to, test demonstrations. Owner's project manager will coordinate attendance by Owner's witness with Contractor's published commissioning schedule. Owner's witness will provide no labor or materials in the commissioning work. The only function of Owner's witness will be to observe and comment on the progress and results of commissioning.
- C. Installation Compliance Issues: Record as an installation compliance issue Work found to be incomplete, inaccessible, at variance with the Contract Documents, nonfunctional, or that does not comply with construction checklists. Record installation compliance issues on the construction checklist at the time they are identified. Record corrective action and how future Work should be modified before signing off the construction checklist.
- D. Pre-Startup Audit: Prior to executing startup procedures, review completed installation checks to determine readiness for startup and operation. Report conditions, which, if left uncorrected, adversely impact the ability of systems or equipment to operate satisfactorily or to comply with acceptance criteria. Prepare pre-startup report for each system.
- E. Test Procedures and Test Data Forms:
  - 1. Test procedures shall define the step-by-step procedures to be used to execute tests and test demonstrations.
  - 2. Test procedures shall be specific to the make, model, and application of the equipment and systems being tested.
  - 3. Completed test data forms are the official records of the results of tests.
  - 4. Commissioning Authority will provide to Contractor preliminary test procedures and test data forms for performance tests and commissioning tests after approval of Product Data, Shop Drawings, and preliminary operation and maintenance manual.
  - 5. Review preliminary test procedures and test data forms and provide comments within 14 days of receipt from Commissioning Authority. Review shall address the following:
    - a. Equipment protection and warranty issues, including, but not limited to, manufacturers' installation and startup recommendations, and operation and maintenance instructions.
    - b. Applicability of the procedure to the specific software, equipment, and systems approved for installation.

6. After Contractor has reviewed and commented on the preliminary test procedures and test data forms, Commissioning Authority will revise and reissue the approved revised test procedures and test data forms marked "Approved for Testing."
7. Use only approved test procedures and test data forms marked "Approved for Testing" to perform and document tests and test demonstrations.

F. Performance of Tests:

1. The sampling rate for tests is 100 percent. The sampling rate for test demonstrations is 100 percent unless otherwise indicated.
2. Perform and complete each step of the approved test procedures in the order listed.
3. Record data observed during performance of tests on approved data forms at the time of test performance and when the results are observed.
4. Record test results that are not within the range of acceptable results on commissioning issue report forms in addition to recording the results on approved test procedures and data forms according to the "Commissioning Compliance Issues" Paragraph in this Article.
5. On completion of a test, sign the completed test procedure and data form. Tests for which test procedures and data forms are incomplete, not signed, or which indicate performance that does not comply with acceptance criteria will be rejected. Tests for which test procedures and data forms are rejected shall be repeated and results resubmitted.

G. Performance of Test Demonstration:

1. Perform test demonstrations on a sample of tests after test data submittals are approved. The sampling rate for test demonstrations shall be 100 percent unless otherwise indicated in the individual test specification.
2. Notify Owner's witness at least three days in advance of each test demonstration.
3. Perform and complete each step of the approved test procedures in the order listed.
4. Record data observed during performance of test demonstrations on approved data forms at the time of demonstration and when the results are observed.
5. Provide full access to Owner's witness to directly observe the performance of all aspects of system response during the test demonstration. On completion of a test demonstration, sign the completed data form and obtain signature of Owner's witness at the time of the test to authenticate the reported results.
6. Test demonstration data forms not signed by Contractor and Owner's witness at the time of the completion of the procedure will be rejected. Test demonstrations for which data forms are rejected shall be repeated and results shall be resubmitted.
  - a. Exception for Failure of Owner's Witness to Attend: Failure of Owner's witness to be present for agreed-on schedule of test demonstration shall not delay Contractor. If Owner's witness fails to attend a scheduled test, Contractor shall proceed with the scheduled test. On completion, Contractor shall sign the data form for Contractor and for Owner's witness, and shall note the absence of Owner's witness at the scheduled time and place.

7. False load test requirements are specified in related sections.
  - a. Where false load testing is specified, provide temporary equipment, power, controls, wiring, piping, valves, and other necessary equipment and connections required to apply the specified load to the system. False load system shall be capable of steady-state operation and modulation at the level of load specified. Equipment and systems permanently installed in this work shall not be used to create the false load without Architect's written approval.

H. Deferred Tests:

1. Deferred Tests List: Identify, in the request for Certificate of Construction Phase Commissioning Completion, proposed deferred tests or other tests approved for deferral until specified seasonal or other conditions are available. When approved, deferred tests may be completed after the date of Construction Phase Commissioning Completion. Identify proposed deferred tests in the request for Certificate of Construction Phase Commissioning Completion as follows:
  - a. Identify deferred tests by number and title.
  - b. Provide a target schedule for completion of deferred tests.
2. Schedule and coordinate deferred tests. Schedule deferred tests when specified conditions are available. Notify Architect and Commissioning Authority at least three working days (minimum) in advance of tests.
3. Where deferred tests are specified, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule deferred tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

I. Delayed Tests:

1. Delayed Tests List: Identify, in the request for Certificate of Construction Phase Commissioning Completion, proposed delayed tests. Obtain Owner approval of proposed delayed tests, including proposed schedule of completion of each delayed test, before submitting request for Certificate of Construction Phase Commissioning Completion. Include the following in the request for Certificate of Construction Phase Commissioning Completion:
  - a. Identify delayed tests by test number and title.
  - b. Written approval of proposed delayed tests, including approved schedule of completion of delayed tests.
2. Schedule and coordinate delayed tests. Schedule delayed tests when conditions that caused the delay have been rectified. Notify Architect and Commissioning Authority at least three working days (minimum) in advance of tests.
3. Where delayed tests are approved, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule delayed tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

J. Commissioning Compliance Issues:

1. Test results that are not within the range of acceptable results are commissioning compliance issues.
2. Track and report commissioning compliance issues until resolution and retesting are successfully completed.
3. If a test demonstration fails, determine the cause of failure. Direct timely resolution of issue and then repeat the demonstration. If a test demonstration must be repeated due to failure caused by Contractor work or materials, reimburse Owner for billed costs for the participation in the repeated demonstration.
4. Test Results: If a test demonstration fails to meet the acceptance criteria, perform the following:
  - a. Complete a commissioning compliance issue report form promptly on discovery of test results that do not comply with acceptance criteria.
  - b. Submit commissioning compliance issue report form within 24 hours of the test.
  - c. Determine the cause of the failure.
  - d. Establish responsibility for corrective action if the failure is due to conditions found to be Contractor's responsibility.
5. Commissioning Compliance Issue Report: Provide a commissioning compliance issue report for each issue. Do not report multiple issues on the same commissioning compliance issue report.
  - a. Exception: If an entire class of devices is determined to exhibit the identical issue, they may be reported on a single commissioning compliance issue report. (For example, if all return-air damper actuators that are specified to fail to the open position are found to fail to the closed position, they may be reported on a single commissioning issue report. If a single commissioning issue report is used for multiple commissioning compliance issues, each device shall be identified in the report, and the total number of devices at issue shall be identified.
  - b. Complete and submit Part 1 of the commissioning compliance issue report immediately when the condition is observed.
  - c. Record the commissioning compliance issue report number and describe the deficient condition on the data form.
  - d. Resolve commissioning compliance issues promptly. Complete and submit Part 2 of the commissioning compliance issue report when issues are resolved.
6. Diagnose and correct failed test demonstrations as follows:
  - a. Perform diagnostic tests and activities required to determine the fundamental cause of issues observed.
  - b. Record each step of the diagnostic procedure prior to performing the procedure. Update written procedure as changes become necessary.
  - c. Record the results of each step of the diagnostic procedure.
  - d. Record the conclusion of the diagnostic procedure on the fundamental cause of the issue.

- e. Determine and record corrective measures.
  - f. Include diagnosis of fundamental cause of issues in commissioning compliance issue report.
7. Retest:
- a. Schedule and repeat the complete test procedure for each test demonstration for which acceptable results are not achieved. Obtain signature of Owner's witness on retest data forms. Repeat test demonstration until acceptable results are achieved. Except for issues that are determined to result from design errors or omissions, or other conditions beyond Contractor's responsibility, compensate Owner for direct costs incurred as the result of repeated test demonstrations to achieve acceptable results.
  - b. For each repeated test demonstration, submit a new test data form, marked "Retest."
8. Do not correct commissioning compliance issues during test demonstrations.
- a. Exceptions will be allowed if the cause of the issue is obvious and resolution can be completed in less than five minutes. If corrections are made under this exception, note the deficient conditions on the test data form and issue a commissioning compliance issue report. A new test data form, marked "Retest," shall be initiated after the resolution has been completed.

### 3.6 COMMISSIONING MEETINGS

- A. Schedule and conduct commissioning meetings. Comply with requirements in Section 013100 "Project Management and Coordination."

### 3.7 SEQUENCING

- A. Sequencing of Commissioning Verification Activities: For a particular material, item of equipment, assembly, or system, perform the following in the order listed unless otherwise indicated:

- 1. Construction Checklists:
  - a. Material checks.
  - b. Installation checks.
  - c. Start up, as appropriate. Some startup may depend on component performance. Such startup may follow component performance tests on which the startup depends.
  - d. Performance Tests:
    - 1) Static tests, as appropriate.
    - 2) Component performance tests. Some component performance tests may depend on completion of startup. Such component performance tests may follow startup.
    - 3) Equipment and assembly performance tests.

- 4) System performance tests.
- 5) Intersystem performance tests.

2. Commissioning tests.

- B. Before performing commissioning tests, verify that materials, equipment, assemblies, and systems are delivered, installed, started, and adjusted to perform according to construction checklists.
- C. Verify readiness of materials, equipment, assemblies, and systems by performing tests prior to performing test demonstrations. Notify Architect if acceptable results cannot be achieved due to conditions beyond Contractor's control or responsibility.
- D. Commence tests as soon as installation checks for materials, equipment, assemblies, or systems are satisfactorily completed. Tests of a particular system may proceed prior to completion of other systems, provided the incomplete work does not interfere with successful execution of test.

**3.8 SCHEDULING**

- A. Commence commissioning as early in the construction period as possible.
- B. Commissioning Schedule: Integrate commissioning into Contractor's construction schedule. See Section 013200 "Construction Progress Documentation."
  1. Include detailed commissioning activities in monthly updated Contractor's construction schedule and short interval schedule submittals.
  2. Schedule the start date and duration for the following commissioning activities:
    - a. Submittals.
    - b. Preliminary operation and maintenance manual submittals.
    - c. Installation checks.
    - d. Startup, where required.
    - e. Performance tests.
    - f. Performance test demonstrations.
    - g. Commissioning tests.
    - h. Commissioning test demonstrations.
  3. Schedule shall include a line item for each installation check, startup, and test activity specific to the equipment or systems involved.
  4. Determine milestones and prerequisites for commissioning. Show commissioning milestones, prerequisites, and dependencies in monthly updated critical-path-method construction schedule and short interval schedule submittals.
- C. Two-Week Look-Ahead Commissioning Schedule:
  1. Two weeks prior to the beginning of tests, submit a detailed two-week look-ahead schedule. Thereafter, submit updated two-week look-ahead schedules weekly for the duration of commissioning.

2. Two-week look-ahead schedules shall identify the date, time, beginning location, Contractor personnel required, and anticipated duration for each startup or test activity.
3. Use two-week look-ahead schedules to notify and coordinate participation of Owner's witnesses.

D. Owner's Witness Coordination:

1. Coordinate Owner's witness participation via Architect.
2. Notify Architect of commissioning schedule changes at least two work days in advance for activities requiring the participation of Owner's witness.

### 3.9 COMMISSIONING REPORTS

A. Test Reports:

1. Pre-startup reports include observations of the conditions of installation, organized into the following sections:
  - a. Equipment Model Verification: Compare contract requirements, approved submittals, and provided equipment. Note inconsistencies.
  - b. Preinstallation Physical Condition Checks: Observe physical condition of equipment prior to installation. Note conditions including, but not limited to, physical damage, corrosion, water damage, or other contamination or dirt.
  - c. Preinstallation Component Verification Checks: Verify components supplied with the equipment, preinstalled or field installed, are correctly installed and functional. Verify external components required for proper operation of equipment correctly installed and functional. Note missing, improperly configured, improperly installed, or nonfunctional components.
  - d. Summary of Installation Compliance Issues and Corrective Actions: Identify installation compliance issues and the corrective actions for each. Verify that issues noted have been corrected.
  - e. Evaluation of System Readiness for Startup: For each item of equipment for each system for which startup is anticipated, document in summary form acceptable to Owner completion of equipment model verification, preinstallation physical condition checks, preinstallation component verification checks, and completion of corrective actions for installation compliance issues.
2. Test data reports include the following:
  - a. "As-tested" system configuration. Complete record of conditions under which the test was performed, including, but not limited to, the status of equipment, systems, and assemblies; temporary adjustments and settings; and ambient conditions.
  - b. Data and observations, including, but not limited to, data trend logs, recorded during the tests.
  - c. Signatures of individuals performing and witnessing tests.
  - d. Data trend logs accumulated overnight from the previous day of testing.

3. Commissioning Compliance Issues Reports: Report as commissioning compliance issues results of tests and test demonstrations that do not comply with acceptance criteria. Report only one issue per commissioning compliance issue report. Use sequentially numbered facsimiles of commissioning compliance issue report form included in this Section, or other form approved by Owner. Distribute commissioning compliance issue reports to parties responsible for taking corrective action. Identify the following:
  - a. Commissioning compliance issue report number. Assign unique, sequential numbers to individual commissioning compliance issue reports when they are created, to be used for tracking.
  - b. Action distribution list.
  - c. Report date.
  - d. Test number and description.
  - e. Equipment identification and location.
  - f. Briefly describe observations about the performance associated with failure to achieve acceptable results. Identify the cause of failure if apparent.
  - g. Diagnostic procedure or plan to determine the cause (include in initial submittal).
  - h. Diagnosis of fundamental cause of issues as specified below (include in resubmittal).
  - i. Fundamental cause of unacceptable performance as determined by diagnostic tests and activities.
  - j. When issues have been resolved, update and resubmit the commissioning issue report forms by completing Part 2. Identify resolution taken and the dates and initials of the persons making the entries.
  - k. Schedule for retesting.
4. Weekly progress reports include information for tests conducted since the preceding report and the following:
  - a. Completed data forms.
  - b. Equipment or system tested, including test number, system or equipment tag number and location, and notation about the apparent acceptability of results.
  - c. Activities scheduled but not conducted per schedule.
  - d. Commissioning compliance issue report log.
  - e. Schedule changes for remaining Commissioning-Process Work, if any.
5. Data trend logs shall be initiated and running prior to the time scheduled for the test demonstration.
  - a. Trend log data format shall be multiple data series graphs. Where multiple data series are trend logged concurrently, present the data on a common horizontal time axis. Individual data series may be presented on a segmented vertical axis to avoid interference of one data series with another, and to accommodate different axis scale values. Graphs shall be sufficiently clear to interpret data within the accuracy required by the acceptance criteria.



- b. Attach to the data form printed trend log data collected during the test or test demonstration.
  - c. Record, print out, and attach to the data form operator activity during the time the trend log is running. During the time the trend log is running, operator intervention not directed by the test procedure invalidates the test results.
6. System Alarm Logs: Record and print out a log of alarms that occurred since the last log was printed. Evaluate alarms to determine if the previous day's work resulted in any conditions that are not considered "normal operation."
- a. Conditions that are not considered "normal operation" shall be reported on a commissioning issue report attached to the alarm log. Resolve as necessary. The intent of this requirement is to discover control system points or sequences left in manual or disabled conditions, equipment left disconnected, set points left with abnormal values, or similar conditions that may have resulted from failure to fully restore systems to normal, automatic control after test completion.

### 3.10 CERTIFICATE OF CONSTRUCTION PHASE COMMISSIONING COMPLETION

- A. When Contractor considers that construction phase commissioning, or a portion thereof which Owner agrees to accept separately, is complete, Contractor shall prepare and submit to Owner and Commissioning Authority through Architect a comprehensive list of items to be completed or corrected. Failure to include an item on such list does not alter Contractor's responsibility to complete commissioning.
- B. On receipt of Contractor's list, Commissioning Authority will make an inspection to determine whether the construction phase commissioning or designated portion thereof is complete. If Commissioning Authority's inspection discloses items, whether included on Contractor's list, which is not sufficiently complete as defined in "Construction Phase Commissioning Completion" Paragraph in the "Definitions" Article, Contractor shall, before issuance of the Certificate of Construction Phase Completion, complete or correct such items on notification by Commissioning Authority. In such case, Contractor shall then submit a request for another inspection by Commissioning Authority to determine construction phase commissioning completion.
- C. Contractor shall promptly correct deficient conditions and issues discovered during commissioning. Costs of correcting such deficient conditions and issues, including additional testing and inspections, the cost of uncovering and replacement, and compensation for Architect's and Commissioning Authority's services and expenses made necessary thereby, shall be at Contractor's expense.
- D. When construction phase commissioning or designated portion is complete, Commissioning Authority will prepare a Certificate of Construction Phase Commissioning that shall establish the date of completion of construction phase commissioning. Certificate of Construction Phase Commissioning Completion shall be submitted prior to requesting inspection for determining date of Substantial Completion.

**END OF SECTION 019113**

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## **SECTION 024113 - SELECTIVE SITE DEMOLITION**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

A. Section Includes:

1. Demolition and removal of selected site elements including asphalt pavement and vegetation.

#### **1.2 DEFINITIONS**

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

#### **1.3 PREINSTALLATION MEETINGS**

- A. Predemolition Conference: Conduct conference at Project site.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Schedule of Selective Site Demolition Activities: Indicate the following:

1. Detailed sequence of selective site demolition and removal work, with starting and ending dates for each activity. Ensure owner's on-site operations are uninterrupted.

- B. Predemolition Photographs or Video: Submit before Work begins.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

#### **1.6 FIELD CONDITIONS**

- A. The owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so the owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by owner as far as practical.
- C. Notify the Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Storage or sale of removed items or materials on-site is not permitted.

- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

## 1.7 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

## **PART 2 - PRODUCTS**

### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Contract Officer's Representative.
- D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.

### 3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
  - 1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."

### 3.3 PREPARATION

- A. 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.
  - 1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

### 3.4 SELECTIVE DEMOLITION, GENERAL

- A. 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:
  - 1. Cleanly, full-depth saw cut the perimeter of areas where asphalt pavement will be removed.
  - 2. Dispose of demolished items and materials promptly.
- B. Remove any bushes or trees indicated. Grind stumps to a minimum depth of 18-inches below grade. Dispose of all vegetation, grindings, and lumber off site. Fill all low areas or created depressions in accordance with the applicable provisions of Section 312000 "Earth Moving."
- C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Contracting Officer's Representative, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

### 3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill. At the Contractor's discretion, the removed asphalt materials can be recycled. Written notice of this must be provided a minimum of seven days prior to removal.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Disposal: Transport demolished materials off the owner's property and legally dispose of them.

3.6    CLEANING

- A.    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 024113**

## **SECTION 024119 – SELECTIVE INTERIOR DEMOLITION**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

A. Section Includes:

1. Demolition and removal of selected interior portions of building or structure.
2. Salvage of existing items to be reused.

#### **1.2 REFERENCES**

A. ANSI: American National Standards Institute

1. ANSI/ A10.6-2006: Safety Requirements for Demolition Operations

#### **1.3 DEFINITIONS**

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- C. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For refrigerant recovery technician.
- B. Predemolition Photographs or Video: Submit before Work begins.
- C. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

#### **1.6 QUALITY ASSURANCE**

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

#### **1.7 FIELD CONDITIONS**

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

- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify the Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. Hazardous materials will be removed by Owner before start of the Work.
  - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations

## 1.8 PROTECTION OF EXISTING WARRANTIES

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

## **PART 2 - PRODUCTS**

### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.



- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to the Architect.
- E. Engage a professional engineer to survey 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 demolition operations.
- F. Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

### 3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems not indicated for removal and protect them against damage.
- B. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.
- C. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. The owner will arrange to shut off indicated services/systems when requested by the Contractor.
  - 2. Arrange to shut off indicated utilities with utility companies.
  - 3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  - 4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
    - a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

### 3.3 PREPARATION

- A. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent areas to remain.
  - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.

5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified elsewhere.
- B. Temporary Shoring: 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.

### 3.4 GENERAL SELECTIVE DEMOLITION

- A. 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:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  2. Neatly cut openings and holes 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, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  4. 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. See Division 1 for fire suppression requirements and for welding, cutting, and burning permit.
  5. Maintain adequate ventilation when using cutting torches.
  6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  9. Dispose of demolished items and materials promptly. Comply with requirements in Division 1 regarding solid waste management and construction waste management.
- B. Reuse of Building Elements: Do not demolish building elements beyond what is indicated on drawings without approval.
- C. Removed and Salvaged Items:
1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers.
  3. Store items in a secure area until delivery to the owner.
  4. Transport items to the Port's storage area.
  5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
  2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  3. Protect items from damage during transport and storage.
  4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted, 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.

### 3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."
- E. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.
- F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight.
1. Remove existing roof membrane, flashings, copings, and roof accessories.
  2. Remove existing roofing system down to substrate.

### 3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site.
1. Do not allow demolished materials to accumulate on-site.
  2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn demolished materials.

- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them according to The City of Madison Guidelines.

3.7    CLEANING

- A. 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 033100 - STRUCTURAL CONCRETE**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Structural Concrete.
2. Admixtures.
3. Curing and Treatment Requirements.
4. Floor flatness and levelness.
5. Formwork, shoring, bracing, and anchorage.
6. Concrete reinforcement and accessories.

**B. Work Installed But Furnished Under Other Sections:**

1. Division 04 - Masonry: Masonry accessories attached to formwork.
2. Division 05 - Metals: Metal fabrications attached to formwork.

**C. Related Sections:**

1. Applicable provisions of Division 01 shall govern all work under this Section.
2. Section 034113 - Precast Concrete Hollow Core Planks.
3. Division 31 – Earthwork.

#### **1.2 REFERENCES**

**A. Incorporated Guides and References**

1. American Concrete Institute (ACI):
  - a. ACI 302.1R – Guide for Concrete Floor and Slab Construction.
  - b. ACI 304R – Guide for Measuring, Mixing, Transporting and Placing Concrete.
  - c. ACI 304.2R - Placing Concrete by Pumping Methods.
  - d. ACI 305R - Hot Weather Concreting.
  - e. ACI 309R – Guide for the Consolidation of Concrete.
  - f. ACI 347 – Guide to Formwork for Concrete.
  - g. ACI SP-66 – ACI Detailing Manual.

**B. Specifications**

1. American Concrete Institute (ACI):
  - a. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials.
  - b. ACI 301 - Specifications for Structural Concrete.
  - c. ACI 303.1 – Specification for Cast-In-Place Architectural Concrete.
  - d. ACI 306.1 – Specification for Cold Weather Concreting.

- e. ACI 308.1 – Specification for Curing Concrete.
- f. ACI 315 - Details and Detailing of Concrete Reinforcement.
- g. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.

2. ASTM International (ASTM):

- a. ASTM A185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- b. ASTM A497 – Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
- c. ASTM A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- d. ASTM A706 – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
- e. ASTM C33 – Standard Specification for Concrete Aggregates.
- f. ASTM C94 – Standard Specification for Ready-Mixed Concrete.
- g. ASTM C150 – Standard Specification for Portland Cement.
- h. ASTM C156 – Standard Test Method for Water Loss (From a Mortar Specimen) Through Liquid Membrane-Forming Curing Compounds for Concrete.
- i. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete.
- j. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
- k. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- l. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.
- m. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete.
- n. ASTM C989 – Standard Specification for Slag Cement for Use in Concrete and Mortars.
- o. ASTM C1059 – Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
- p. ASTM C1116 – Standard Specification for Fiber-Reinforced Concrete.
- q. ASTM C1602 – Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
- r. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- s. ASTM E1155 – Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
- t. ASTM E1643 – Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- u. ASTM E1745 – Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

### 1.3 SUBMITTALS

- A. Submit proposed mix design of each class of concrete to Engineer not later than 10 days after Notice to Proceed or 15 days prior to the first concrete placement, whichever comes first.
- B. Submit shop drawings of reinforcing steel under provisions of Division 01 – General Requirements.
  - 1. Initial submittal of reinforcement shop drawings shall be complete. No partial submittals will be accepted.
  - 2. Indicate reinforcement sizes, spacings, locations and quantities of reinforcing steel, and wire reinforcement, bending and cutting schedules, splicing, supporting and spacing devices.
  - 3. Reinforcement placement shop drawings for foundations and walls shall conform to ACI SP-66 providing full wall elevations.
- C. Material Certificates: For each of the following, signed by the manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Waterstops.
  - 4. Curing compounds.
  - 5. Bonding agents.
  - 6. Vapor retarders.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
  - 1. Aggregates.
- E. Control Joint Plan: Submit Control Joint Location Plan.

### 1.4 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301, 305R, and 306.1.
- B. Maintain copy of ACI 301 on site.
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

### 1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of local, state and federal rules and regulations applicable to Work and Project location.

## 1.6 ENVIRONMENTAL REQUIREMENTS

### A. Cold Weather Concreting

1. Placement and curing of concrete where (1) average daily temperature for three consecutive days is less than 40 degrees F, and (2) air temperature is not greater than 50 degrees F for more than one-half of a 24-hour period from midnight to midnight shall be in accordance with ACI 306.1.

### B. Hot Weather Concreting

1. Placement and curing of concrete subject to a combination of (1) rising air temperature (generally greater than 75 degrees F) and (2) wind and low relative humidity shall be in accordance with ACI 305R.
2. Contractor shall provide plan for minimizing exposure of concrete to adverse conditions due to combinations of high air temperature, direct sunlight, drying winds, and high concrete temperature.
3. Protect concrete from rapid temperature drop.
4. Pre-wet subgrade and forms.

## 1.7 SLAB PRE-CONSTRUCTION MEETING

- A. At least 20 days prior to placing first concrete floor slab, Contractor shall hold a meeting to review detailed requirements for preparing final concrete design mixes and to establish procedures for placing, finishing, curing, and protecting concrete to meet required quality under anticipated conditions.
- B. Contractor shall request responsible representatives of each party concerned with concrete work to attend a meeting, including but not limited to the following:
  1. Contractor's Superintendent.
  2. Structural Engineer.
  3. Testing Laboratory responsible for field quality control.
  4. Concrete Subcontractor's Project Manager.
  5. Ready-mix Concrete Supplier.
  6. Architect.
- C. Minutes of the meeting shall be recorded, typed, reproduced and distributed by Contractor to all parties concerned within five working days of meeting.
- D. Minutes shall include a statement by admixture manufacturer(s) indicating that proposed mix design and placing can produce concrete quality required by this Section.
- E. Contractor shall notify Structural Engineer and Architect at least 10 days prior to scheduled date of meeting.
- F. During construction, additional meetings may be held to review and modify procedures and materials established to assure attainment of required quality level.



## **PART 2 - PRODUCTS**

### **2.1 FORM MATERIALS**

- A. Plywood Forms: Douglas Fir or Spruce-Pine-Fir species: Sound, undamaged sheets with clean true edges, exterior glue, facing material to provide finish specified.
- B. Lumber: Douglas Fir or Spruce species; construction grade or better; with grade stamp clearly visible.
- C. Preformed Steel Wall Forms: Minimum 16 gage thick, Vertically and horizontally matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and surface appearance.
- D. Tubular Column Type: Round, spirally wound laminated fiber material; inside surface treated with release agent.
- E. Form Ties For Exposed Surfaces: Plastic cone snap ties with 1-inch outside diameter by 1-inch (nominal) long cones, with no metal within 1-inch of concrete face after removal;
  - 1. Manufacturers:
    - a. Advance Concrete Formwork, Inc.
    - b. Dayton Superior.
    - c. Symons - A Dayton Superior Company.
    - d. Williams Form Engineering Corporation.
    - e. Substitutions: As approved by Engineer.
- F. Form Ties For Hidden Surfaces: Metal spreader type, removable to a depth of 1-inch from concrete face;
  - 1. Manufacturers:
    - a. Advance Concrete Formwork, Inc.
    - b. Dayton Superior.
    - c. Williams Form Engineering Corporation.
    - d. Substitutions: As approved by Engineer.
  - 2. Contractor shall use formwork, form components and accessories provided by a single manufacturer. Intermixing of formwork, components and accessories shall not be allowed.
- G. Wood Pattern Forms: Dayton F70657 6" Cedar – Horizontally orientated parallel to the ground.

### **2.2 REINFORCING STEEL**

- A. Reinforcing Steel: ASTM A615, 60 ksi yield grade carbon steel deformed bars; uncoated, finish. Reinforcing bars to be welded shall conform to ASTM A706.

- B. Welded Steel Wire Reinforcement: Plain type, ASTM A185; Deformed type, ASTM A497; in flat sheets; coiled rolls; uncoated, finish.
- C. Reinforcement Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete.

### 2.3 FIBER REINFORCEMENT

- A. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in concrete, complying with ASTM C1116, Type III, 1/2 to 1-1/2 inches long.
  - 1. Manufacturers - Fibrillated Fibers:
    - a. Axim Italcementi Group - Fibrasol F.
    - b. Forta Corporation - Forta Super-Net.
    - c. Propex Concrete Systems Corporation - Fibermesh 300.
    - d. W.R. Grace & Co., Construction Products Division - Grace Fibers.
    - e. Substitutions: As approved by Architect/Engineer.
- B. Synthetic Macro Fibers: Synthetic macro fibers engineered and designed for use in concrete, complying with ASTM C1116, Type III.
  - 1. Manufacturers – Macro Fibers:
    - a. The Euclid Chemical Company - TUF-STRAND SF
    - b. Propex Concrete Systems Corporation - Fibermesh 650
    - c. W. R. Grace & Co., Construction Products Division - STRUX 90/40
    - d. Substitutions: As approved by Architect/Engineer.

### 2.4 CONCRETE MATERIALS

- A. Cementitious Materials
  - 1. Portland Cement: ASTM C150, gray color, Type I or II except as specified below.
  - 2. Fly Ash: ASTM C618, Class C or F.
  - 3. Ground Granulated Blast Furnace Slag: ASTM C989, Grade 100 or 120.
  - 4. Wood Cedar Finish: DCS #600 Taupe 5% on 50% white Portland Cement.
- B. Fine and Coarse Aggregates: ASTM C33.
- C. Water: ASTM C1602, clean and not detrimental to concrete.

### 2.5 ADMIXTURES

- A. Admixtures to be used in the concrete mixture shall be submitted to the Engineer for approval as part of the mixture design.

- B. Chemical admixtures shall be in accordance with ASTM C494.
- C. Admixtures shall be used in accordance with manufacturer's written recommendations.
- D. Admixtures containing chlorides, sulfides, or nitrides are not permitted.
- E. Admixtures permitted shall be supplied by a single manufacturer for project.
- F. Air Entrainment Admixture: ASTM C260;
  - 1. Manufacturers:
    - a. Axim Italcementi Group.
    - b. BASF Admixtures, Inc.
    - c. Grace Construction Products.
    - d. The Euclid Chemical Company
    - e. Substitutions: As approved by Engineer.

## 2.6 ACCESSORIES

- A. Vapor Retarder: ASTM E1745; Class C, 10 mil minimum thickness, water vapor permeance rating of 0.050 perms or less;
  - 1. Manufacturers:
    - a. Americover - Vapor Block VB 10.
    - b. Fortifiber - Moistop Ultra 10
    - c. Stego Industries - Stego Wrap 10-mil
    - d. W.R. Meadows - Perminator.
    - e. Substitutions: As approved by Architect/Engineer.
- B. Non-Shrink Grout: Premixed compound with non-metallic aggregate, cement, water reducing and plasticizing agents; capable of minimum compressive strength of 2400 psi.
- C. Waterstops: Cold Joint Type;
  - 1. Manufacturers:
    - a. Cetco - Waterstop RX.
    - b. Greenstreak Group, Inc. - Swellstop Waterstop
    - c. JP Specialties, Inc. - Type 20 & 23
    - d. Substitutions: As approved by Architect/Engineer.
- D. Joint Filler: ASTM D1751, Bituminous fiber, 1/2-inch wide by depth of concrete less 1/8-inch.
- E. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating, intended for use on concrete;
  - 1. Manufacturers:

- a. BASF Construction Chemicals, LLC - Building Systems: Castoff
- b. Dayton Superior - Clean Strip Ultra (J-3).
- c. W.R. Meadows - Duogard.
- d. Substitutions: As approved by Architect/Engineer.

## 2.7 CURING AND TREATMENT MATERIALS

- A. Water: Potable and clean.
- B. Curing and Sealing Compound: ASTM C309; Type I free of oil, wax, or grease; Material Storage Slab on Grade;
  - 1. Manufacturers:
    - a. BASF Building Systems, Inc. - Sonneborn Kure-N-Seal WB.
    - b. Dayton Superior - Safe Cure & Seal (J-18).
    - c. The Euclid Chemical Company - Aqua-Cure VOX
    - d. W. R. Meadows - Sealtight - VOCOMP-20.
    - e. Substitutions: As approved by Architect/Engineer.
  - 2. Hardeners and sealer used shall be of same manufacturer.
- C. Sealers: ASTM C309, Type 1, Class A and B; ASTM C1315, Type 1, Class A; Type I free of oil, wax, or grease; Mechanical Platform Topping Slab;
  - 1. Manufacturers:
    - a. Dayton Superior - Ultra Seal EF
    - b. The Euclid Chemical Company - Super Diamond Clear VOX.
    - c. W.R. Meadows - Tiah OTC
    - d. Substitutions: As approved by Architect/Engineer.
  - 2. Hardeners and sealer used shall be of the same manufacturer.
- D. Liquid Hardener and Densifier; Storage Rooms and Trench Drain Slab Replacement:
  - 1. Manufacturers:
    - a. BASF Building Systems, Inc. - Sonneborn Kure-N-Harden.
    - b. Dayton Superior - Day-Chem Sure Hard (J-17).
    - c. The Euclid Chemical Company - Euco Diamond Hard.
    - d. W.R. Meadows - Liqui-Hard.
    - e. Substitutions: As approved by Architect/Engineer.
  - 2. Hardeners and sealer used shall be of same manufacturer.
- E. Polyethylene Film: ASTM C171, 6 mil thick, clear.
- F. Burlap shall be clean, evenly woven, free of encrusted concrete or other contaminating materials, and shall be reasonably free of cuts, tears, broken or missing areas.

## 2.8 CONCRETE MIXTURE

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Mix concrete in accordance with ASTM C94.
- C. Concrete mix designs shall be designed and submitted in accordance with Division 01 and included as part of cost of this Work.
- D. Mix designs shall be prepared by a qualified agency acceptable to Architect/Engineer. Six (6) copies of mix designs shall be submitted for Architect/Engineer's review prior to placing any concrete.
- E. Mix design shall indicate brands, types, and quantities of admixtures included, compressive strength, slump, sieve analysis for fine and coarse aggregate, quantities of all ingredients, type and brand of cement, source of aggregate, whether fine aggregate is natural or manufactured.
- F. Design of mix shall assure placing and finishing characteristics that meet Project requirements.
- G. Mix designs contained in the Schedule of Mixes may be modified and submitted to Engineer for approval, by use of mid or high range water reducing admixtures to control slumps required for pumping of concrete. Strength, placing and finishing requirements shall be maintained.
- H. Concrete mixtures placed directly over vapor retarders shall be designed to have low shrinkage characteristics and designed to minimize slab curling.
- I. Initial and final set times of concrete mix designs shall be coordinated between the contractor and concrete supplier.

## 2.9 SCHEDULE OF MIXES

- A. Footings: Proportion normal-weight concrete mix as follows:
  - 1. Compressive Strength (28 Days): 3000 psi.
  - 2. Maximum Aggregate Size: 1-1/2 inches.
  - 3. Air Entrainment: 6 percent air content is required with an acceptable air content of plus or minus 1.5 percent.
  - 4. Maximum Water-Cement Ratio: 0.50.
- B. Foundation Walls: Proportion normal-weight concrete mix as follows:
  - 1. Compressive Strength (28 Days): 4000 psi.
  - 2. Maximum Aggregate Size: 3/4 - inch.
  - 3. Air Entrainment: 6 percent air content is required with an acceptable air content of plus or minus 1.5 percent.

- C. Interior Slab-on-Ground, Equipment Pads: Proportion normal-weight concrete mix as follows:
  - 1. Compressive Strength (28 Days): 4000 psi.
  - 2. Maximum Aggregate Size: 3/4 - inch.
  
- D. Exterior Slab-on-Ground, Walks, Paving, Curbs, Equipment Pads: Proportion normal-weight concrete mix as follows:
  - 1. Compressive Strength (28 Days): 4000 psi.
  - 2. Maximum Aggregate Size: 3/4 - inch.
  - 3. Maximum Slump (Inch): 3
  - 4. Maximum Water-Cement Ratio: 0.50.
  - 5. Air Entrainment: 6 percent air content is required with an acceptable air content of plus or minus 1.5 percent.
  
- E. Topping Slab: Proportion normal-weight concrete mix as follows:
  - 1. Compressive Strength (28 Days): 3000 psi.
  - 2. Maximum Aggregate Size: 3/4 - inch.
  - 3. Maximum Water-Cement Ratio: 0.45.
  - 4. Synthetic Macro Fibers.

## **PART 3 - EXECUTION**

### **3.1 FORMWORK**

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
  
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits stated below.
  
- C. Verify lines, levels, and measurement before proceeding with formwork.
  
- D. Earth forms are not permitted.
  
- E. Align form joints.
  
- F. Do not apply form release agent where concrete surfaces receive special finishes or applied coatings which may be affected by agent.
  
- G. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
  
- H. Provide chamfer strips for all exposed concrete corners of formwork.

### 3.2 REINFORCEMENT

- A. Place, support, and secure reinforcement against displacement.
- B. Locate reinforcing splices as shown on Drawings.
- C. Damage to rebar coating as a result of bending shall be repaired with equivalent coating.

### 3.3 VAPOR RETARDERS

- A. Vapor retarders shall be provided where slabs will receive vapor-sensitive floor coverings or in humidity-controlled areas or as indicated on drawings.
  - 1. Install vapor retarders directly under concrete slab-on-ground at areas with vapor-sensitive floor coverings and where subgrade granular material is subject to future moisture infiltration.
  - 2. Where subgrade material is dry, and will not be subject to future moisture infiltration and where humidity will be controlled, place the vapor retarder beneath the dry granular material and the concrete slab-on-ground directly on the dry granular material.
- B. Installation of Water Vapor Retarders shall be in accordance with ASTM E1643.
- C. Edges shall be lapped 6 inches and sealed.
- D. Contractor is responsible for maintaining conditions to provide a dry subgrade material where the slab is cast on top of granular material.
- E. Contractor is responsible for maintaining a puncture free vapor retarder. Any punctures shall be sealed appropriately to prevent vapor transmission.
- F. Do not disturb vapor retarder while placing reinforcement.

### 3.4 PLACING CONCRETE

- A. Notify Engineer a minimum of 48 hours prior to commencement of concreting operations.
- B. Failure to notify Engineer may result in rejection of concrete placed without observation.
- C. Place concrete in accordance with ACI 301.
- D. Place pumped concrete in accordance with ACI 304.2R. Line coating mix to initiate pumping shall not be used in pour but shall be wasted.
- E. Ensure reinforcement and embedded items are not disturbed during concrete placement.
- F. Concrete with excessive honeycomb or embedded debris shall be rejected and replaced at no cost to OWNER.

- G. Application of surface retarders and sawcutting of joints shall be planned in advance.
- H. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.
- I. Placing During Hot Weather:
  - 1. Place concrete during hot weather conditions in accordance with ACI 305R.
- J. Placing During Cold Weather:
  - 1. Place concrete during cold weather conditions in accordance with ACI 306.1.
- K. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

### 3.5 FLOOR SLABS

- A. Place floor slabs-on-ground with contraction and construction joints as indicated on Drawings.
- B. Saw cut contraction joints as soon as possible, without raveling, after placement of concrete, but within 24 hours.
- C. Cut slabs with 3/16-inch thick blade, cutting one-fourth depth of slab thickness.
- D. Separate slabs on fill from vertical surfaces with a joint filler.
- E. Extend joint filler from bottom of slab to within 1/8-inch of finished slab surface.
- F. Floor Finishes shall be in accordance with ACI 302.1R. Immediately after finishing, begin curing.

### 3.6 FLOOR CURING AND TREATMENT

- A. Curing shall begin promptly to prevent drying of concrete. Curing shall continue for 7 days after placing.
- B. Curing methods shall not be changed until after the third day, and then only with written approval of the Engineer.
- C. Do not allow concrete to cool rapidly.
- D. Keep forms covered and moist during the first 3 days of the curing period.
- E. Verify compatibility of floor treatment materials with mastics and finish materials to be applied to floor.
- F. Where floors are to be covered, apply one coat of dissipating curing compound, applied immediately after finishing.



- G. Where floors are not scheduled to be covered, apply two coats of curing and sealing compound, with first coat applied immediately after finishing and second coat just before final acceptance of building except where floor covering materials are to be applied.
- H. Apply a non-slip aggregate to stair treads and landings, and ramps not scheduled to receive floor covering, in accordance with manufacturer's instructions, trowel to a hard finish, and treat surface with liquid hardener without sealer.

### 3.7 REPAIR OF VERTICAL SURFACE DEFECTS

- A. Upon stripping of forms, vertical surfaces shall be inspected for defects caused by surface air voids, honeycombing, form tie holes, peeling, and fins.
- B. Surface air voids shall be repaired with a unit packaged mixture of sand and cement mixed on job site with water and a unit of acrylic. Mixture shall be brushed uniformly on to surface and into voids. Where surface is to be exposed, surface finish of repair shall match adjacent surface.
- C. Honeycombed and other defective concrete shall be removed down to sound concrete and patched to match adjacent surfaces.

### 3.8 FINISHING OF FORMED SURFACES

- A. After removal of forms and repair of defects, surfaces of concrete shall be given finishes specified below.
- B. When finish is to match a sample furnished to Contractor, sample finish shall be reproduced on an area at least 100 square feet in size in an inconspicuous location designated by Architect/Engineer prior to application in the specified area. Application of finish shall not be made until approved by Architect/Engineer.
- C. Rough Form Finish: Surface left with texture imparted by forms; form facing material not specified; tie holes and defects shall be patched; fins exceeding 1/4-inch shall be chipped or rubbed off.
- D. Smooth Form Finish: Surface produced by form facing material shall be a smooth, hard, uniform texture on concrete; forms may be plywood, tempered form grade hardboard, metal, plastic, paper or other acceptable material capable of producing finish; arrangement of facing material shall be orderly and symmetrical with number of seams kept to practical minimum; forms supported to prevent deflection and to maintain tolerances; tie holes and defects shall be patched; all fins shall be removed.
  - 1. Smooth Rubbed Finish: produced on newly hardened concrete no later than day following form removal and after defects repaired; surface wetted and rubbed with carborundum brick or other abrasive until uniform color and texture are produced; no cement grout used other than cement paste drawn from concrete itself by rubbing process.

- E. Tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of formed surface.
- F. Final finish on formed surfaces shall continue uniformly across unformed surfaces.
- G. Where a schedule of finishes is not included in this Section, or finishes are not shown on Drawings, the following finishes shall be used as applicable: Rough Form Finish for all concrete surfaces not exposed to public view; Smooth Form Finish with Smooth Rubbed Finish for all concrete surfaces exposed to public view.

**3.9 TOLERANCES**

- A. All tolerances for concrete work shall be in accordance with ACI 117.
- B. Contractor shall employ construction techniques to provide the following tolerances:

		<u>Overall</u>		<u>Local Minimum</u>	
		<u>FF</u>	<u>FL</u>	<u>FF</u>	<u>FL</u>
1.	Interior Slabs on Ground	25	20	17	15

- C. Contractor shall set forms consistent with and is solely responsible for meeting requirements of F-numbers specified above.
- D. Testing:
  - 1. Floor tolerances will be tested by an independent testing agency paid for by Owner. Testing will be performed under provisions of Division 01.
  - 2. Contractor shall conduct its own F-number tests within 72 hours of placing each slab section to determine adequacy of placing operations.
  - 3. All tests performed shall conform to ASTM E1155. Equipment to be used for testing shall be dipstick.
- E. All floors not conforming to these requirements shall be corrected by replacement or other methods approved by Architect/Engineer.

**3.10 FIELD QUALITY CONTROL**

- A. Testing and analysis of concrete shall be performed under provisions of Division 01.
- B. Testing firm will cast test cylinders and perform slump and air entrainment tests in accordance with ACI 301.
- C. Three concrete test cylinders shall be cast from each increment of 100 cubic yards of each class of concrete placed each day or from each placement of each class if less than 100 cubic yards.
- D. During hot or cold weather, as defined in Section 1.6, one additional test cylinder shall be cast from each increment of 100 cubic yards of each class of concrete placed each

day or from each pour of each class if less than 100 cubic yards and be cured on site under same conditions as concrete it represents.

- E. One slump test will be taken for each set of tests cylinders cast and whenever consistency of concrete appears to vary.
- F. No water may be added to the concrete at the site unless pre-approved in writing by the Engineer for that specific mix. If pre-approved, the mix ticket must state how much water may be added.

**END OF SECTION 033100**

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## **SECTION 034113 - PRECAST CONCRETE HOLLOW CORE PLANKS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

##### **A. Section Includes:**

1. Precast concrete hollow core floor planks.
2. Connection plates brackets and hangers.
3. Grouting plank joint keys.

##### **B. Related Sections:**

1. Applicable provisions of Division 01 shall govern all work under this Section.
2. Section 033100 – Structural Concrete: Structural concrete.
3. Division 04 – Masonry: Masonry load bearing support walls.
4. Section 051200 - Structural Steel Framing: Supporting steel lintels, headers.
5. Division 07 – Thermal and Moisture Protection: Firestopping materials.
6. Division 07 – Thermal and Moisture Protection: Caulking of butt joints of precast units at exposed underside of floor members.
7. Division 09 – Finishes: Anchorage devices for ceiling suspension.
8. Division 22 – Plumbing: Anchorage devices for plumbing equipment and piping hangers.
9. Division 23 – Heating, Venting and Air Conditioning: Anchorage devices for HVAC equipment and piping hangers.
10. Division 26 – Electrical: Anchorage devices for electrical equipment and piping hangers.

#### **1.2 REFERENCES**

##### **A. American Concrete Institute (ACI):**

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.

##### **B. American Society for Testing and Materials (ASTM International):**

1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3. ASTM A416 - Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.
4. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
5. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

C. American Welding Society (AWS):

1. AWS B2.1 - Specification for Welding Procedure and Performance Qualification.
2. AWS D1.1 - Structural Welding Code - Steel.
3. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

D. Precast/Prestressed Concrete Institute (PCI):

1. PCI JR-307 - Tolerances for Precast and Prestressed Concrete.
2. PCI MNL-116S - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.
3. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete.
4. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete.
5. PCI MNL-124 - Design for Fire Resistance of Precast Prestressed Concrete.
6. PCI MNL-126 - PCI Manual for the Design of Hollow-Core Slabs.

E. Underwriters Laboratories Inc. (UL):

1. UL - Fire Resistance Directory.

### 1.3 DESIGN REQUIREMENTS

A. Design components to withstand dead loads and live loads in unrestrained condition:

1. Floor Assembly: As indicated on Drawings.
2. Concentrated loads as indicated on Drawings.
3. Lateral Forces.

B. Maximum Allowable Deflection of Floor Planks:  $1/360$  span, cambered to achieve flat surface under dead load.

C. Design components to accommodate construction tolerances, deflection of other building structural members and clearances of intended openings.

D. Grouted Keys: Capable of transmitting horizontal shear force of 2,000 lb/ft.

E. Fire Resistance: Provide designs tested to provide ratings as follows:

1. Floor Assembly: Conform to UL Assembly No. J994, hour rating.

### 1.4 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate plank layout, unit identification marks, connection details, edge conditions, bearing requirements, support conditions, dimensions, openings, openings intended to be field cut, and relationship to adjacent materials.

C. Shop Drawings shall be submitted to State of Wisconsin for review and approval prior to any work related to precast concrete plank installation commencing on site.

- D. Shop Drawings shall also be submitted and reviewed by the Engineer prior to any work related to precast concrete plank installation commencing on site.
- E. Product Data: Indicate standard component configuration, design loads, individual plank weight, deflections, cambers, and fire ratings.
- F. Fabricator:
  - 1. Documented experience when required per paragraph 1.6.A.
  - 2. Precast concrete manufacturing plant certification by the Precast/Prestressed Concrete Institute (PCI) Plant Certification Program in Category C2.
- G. Erector: Documented experience when required per paragraph 1.6.B.
- H. Design Data: Indicate calculations for loadings including uniform loads, point loads, and special loadings resulting from openings and stresses of planks and prestressing. Submit calculations for all embed materials/plates and hangers; signed and sealed by Professional Engineer licensed in the State of Wisconsin.
- I. Fabricator's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

#### 1.5 QUALITY ASSURANCE

- A. Design planks in accordance with requirements of:
  - 1. PCI MNL-120 - Design Handbook.
  - 2. PCI MNL-126 - Manual for the Design of Hollow Core Slabs.
  - 3. PCI MNL-124 - Design for Fire Resistance of Precast Prestressed Concrete.
  - 4. ACI 318.
  - 5. ACI 301.
- B. Design connections in accordance with PCI MNL-123 - Manual on Design of Connections for Precast Prestressed Concrete.
- C. Produce planks in accordance with requirements of PCI MNL-116S. Maintain plant records and quality control program during production of precast planks. Make records available upon request.

#### 1.6 QUALIFICATIONS

- A. Fabricator: Company specializing in manufacturing Work of this section with five years documented experience.
  - 1. Precast concrete fabricator shall be certified by the Precast/Prestressed Concrete Institute (PCI) Plant Certification Program.
  - 2. Fabricator shall be certified at time of bidding in Category C2.
- B. Erector: Company specializing in erecting Work of this section with five years documented experience.

- C. Welder: Qualified within previous 12 months in accordance with AWS B2.1.
- D. Design planks under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Wisconsin.

#### 1.7 PRE-INSTALLATION MEETINGS

- A. Division 01 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.
- C. Discuss anchor and weld plate locations, sleeve locations, and cautions regarding cutting or core drilling.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Lifting or Handling Devices: Capable of supporting member in positions anticipated during manufacture, storage, transportation, and erection.
- C. Mark each member with date of production and final position in structure.

#### 1.9 COORDINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate with framing components directly associated with the Work of this Section.
- C. Coordinate all openings with other contractors.
- D. Coordinate location of hanger tabs and devices for mechanical and electrical work.

### **PART 2 - PRODUCTS**

#### 2.1 MATERIALS

- A. Concrete Materials: ACI 301.
- B. Tensioning Steel Tendons: ASTM A416 Grade 250, of diameter appropriate to member design.
- C. Reinforcing Steel: ASTM A615, deformed steel bars.
- D. Non-Shrink Grout: Non-metallic, minimum compressive strength of 10,000 psi at 28 days.
- E. Cement Grout: Minimum compressive strength of 3,000 psi at 28 days.



## 2.2 ACCESSORIES

- A. Connecting and Supporting Devices: Plates, angles, items cast into concrete, items connected to steel framing members, and inserts: ASTM A36 carbon steel.
- B. Core Hole End Plugs: Cardboard insert with stiff concrete fill. Foamed-in-place insulation or Glass fiber insulation.
- C. Hanger Tabs: Galvanized steel, designed to fit into grouted key joints, capable of supporting 500 lbs. dead load, predrilled to receive hanger.
- D. Anchorage devices for ceiling suspension: Reference Division 09 - Finishes.
- E. Anchorage devices for plumbing equipment and piping hangers: Reference Division 22 - Plumbing.
- F. Anchorage devices for HVAC equipment and piping hangers: Reference Division 23 – Heating, Venting and Air Conditioning.
- G. Anchorage devices for electrical equipment and piping hangers: Reference Division 26 - Electrical.
- H. Bearing Pads: High density plastic, 1/8 inch thick, smooth on one side.
- I. Sill Seal: Compressible glass fiber strips.

## 2.3 FABRICATION

- A. Planks: Plant cast, prestressed, hollow core.
- B. Dimensions as indicated on Drawings.
- C. Weld reinforcing in accordance with AWS D1.4.
- D. Embed anchors, inserts, plates, angles, and other items at locations indicated.
- E. Fabricate openings required by other sections, at locations indicated.
- F. Plank manufacturer shall provide for openings 10 inches round, square or larger as indicated on structural drawings.
- G. All other openings shall be located and field drilled or cut by contractor requiring such work after hollow core slab units have been erected.
- H. Openings and/or cutting of prestressing strand shall be approved by Architect/Engineer and manufacturer before drilling or cutting.
- I. Cut exposed ends flush.
- J. Plant Finish: Finish members to PCI MNL-116S Standard Grade.

- K. Plant Finish: Exposed to view surfaces may contain small surface holes caused by small air bubbles, minor chipping or spalling at edges or ends, without major discoloration.
- L. Connecting and Supporting Steel Devices: Do not paint surfaces in contact with concrete or surfaces requiring field welding.

#### 2.4 FABRICATION TOLERANCES

- A. Conform to PCI MNL-116S and PCI JR-307 - Tolerances for Precast and Prestressed Concrete.
- B. Maximum Variation From Intended Camber: 1/4 inch in 10 feet.
- C. Maximum Out of Square: 1/8 inch/10 feet, non-cumulative.
- D. Maximum Misalignment of Anchors, Inserts, Openings: 1/8 inch.
- E. Maximum Bowing of Members: Length of bow divided by 360.

#### 2.5 SOURCE QUALITY CONTROL AND TESTS

- A. Division 01 - Quality Requirements: Testing and inspection services.
- B. Division 01 - Execution Requirements: Testing, adjusting, and balancing.
- C. Reference Section 033100 – Structural Concrete for testing of concrete and grout materials and mix designs.
- D. Division 01 for requirements for testing and analysis of concrete and grout.
- E. Inspect and test stressing tendons before delivery for compliance with specified standards.

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Verify site conditions are ready to receive Work and field measurements are as indicated on shop drawings.
- C. Verify supporting structure is ready to receive work.

#### 3.2 PREPARATION

- A. Prepare support devices for erection procedure and temporary bracing.

### 3.3 ERECTION

- A. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.
- B. Align and maintain uniform horizontal and end joints, as erection progresses.
- C. Maintain temporary bracing in place until final connections are made. Protect members from staining.
- D. Install bearing pads and sill seal at bearing ends of planks as indicated on Drawings.
- E. Adjust differential camber between precast members to tolerance before final attachment and grouting.
- F. Adjust differential elevation between precast members to tolerance before final attachment.
- G. Install hanger tabs in joints at a spacing required by Construction Product Manager and Mechanical Contractor and at locations as coordinated by Construction Manager.
- H. Secure units in place. Perform welding in accordance with AWS D1.1.
- I. Tape seal underside of plank joints to prevent grout leakage.
- J. Grout longitudinal keys as indicated on Drawings.
- K. Make plank-to-plank joints smooth using grout, troweled smooth. Transition differential elevation of adjoining planks with grout to maximum slope of 1: 12.
- L. If a bonded structural topping is required, refer to Section 03 31 00 for surface preparation of precast plank.

### 3.4 ERECTION TOLERANCES

- A. Division 01 - Quality Requirements: Tolerances.
- B. Erect to the following tolerances:
  - 1. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch in 10 feet and 3/8 inch in 100 feet, non-cumulative.
  - 2. Maximum Offset from Indicated Alignment Between Members: 1/4 inch.
  - 3. Maximum Variation From Dimensions Indicated on Reviewed Shop Drawings Drawings: Plus or minus 1/8 inch.
- C. Exposed Joint Dimension: 3/8 inch plus or minus 1/4 inch.

### 3.5 CLEANING

- A. Division 01 - Execution Requirements: Final cleaning.

B. Clean weld marks, dirt, and blemishes from surface of exposed members.

**3.6 PROTECTION OF INSTALLED CONSTRUCTION**

A. Division 01 - Execution Requirements: Protecting installed construction.

B. Protect members from damage caused by field welding or erection operations.

C. Use non-combustible shields during welding operations to protect adjacent Work.

**END OF SECTION 034113**

## **SECTION 042000 - UNIT MASONRY ASSEMBLIES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Standard Specifications, Proposal Documents, Special Provisions, Supplemental Specifications, Bid Item Manual and other Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Section Includes:
1. Concrete masonry units.
  2. Mortar and grout.
  3. Steel reinforcing bars.
  4. Masonry joint reinforcement.
  5. Ties and anchors.
  6. Miscellaneous masonry accessories.

#### **1.3 DEFINITIONS**

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

#### **1.5 PRECONSTRUCTION TESTING**

- A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
  2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength.
  3. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
  4. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

## 1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
  2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
  3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Verification: For each type and color of the following:
1. CMUs.
  2. Accessories embedded in masonry.
- D. Qualification Data: For testing agency.
- E. Material Certificates: For each type and size of the following:
1. Masonry units.
    - a. Include material test reports substantiating compliance with requirements.
    - b. For masonry units, include data and calculations establishing average net-area compressive strength of units.
  2. Cementitious materials. Include brand, type, and name of manufacturer.
  3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
  4. Grout mixes. Include description of type and proportions of ingredients.
  5. Reinforcing bars.
  6. Joint reinforcement.
  7. Anchors, ties, and metal accessories.
- F. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
  2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- G. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- H. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

## 1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## 1.9 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  - 1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  2. Protect sills, ledges, and projections from mortar droppings.
  3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## **PART 2 - PRODUCTS**

### **2.1 MASONRY UNITS, GENERAL**

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

### **2.2 CONCRETE MASONRY UNITS**

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
1. Provide special shapes for lintels, corners, jambs, movement joints, headers, bonding, and other special conditions.
  2. Provide bullnose units for all outside corners and pass door jambs unless otherwise indicated.
- B. CMUs: Normal Weight, ASTM C 90.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).
  2. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
  3. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.



## 2.3 MASONRY LINTELS

- A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

## 2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Aggregate for Mortar: ASTM C 144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
  2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
- E. Aggregate for Grout: ASTM C 404.
- F. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs, containing integral water repellent by same manufacturer.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. ACM Chemistries, Inc.; RainBloc for Mortar.
    - b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
    - c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
- G. Water: Potable.

## 2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
1. Interior Walls: Mill-galvanized, carbon steel.
  2. Exterior Walls: Hot-dip galvanized, carbon steel.
  3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
  4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
  5. Wire Size for Veneer Ties: 0.187-inch (4.76-mm) diameter.

6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
  7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

## 2.6 MISCELLANEOUS ANCHORS

- A. Anchor Bolts: Headed steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.
- B. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
  2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 unless otherwise indicated.
  3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

## 2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
- b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
- c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
- d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

## 2.8 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
1. 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:
    - a. Diedrich Technologies, Inc.
    - b. EaCo Chem, Inc.
    - c. ProSoCo, Inc.

## 2.9 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
  2. Use portland cement-lime mortar unless otherwise indicated.
  3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
1. For masonry below grade or in contact with earth, use Type S.
  2. For reinforced masonry, use Type S.
  3. For mortar parge coats, use Type S.
  4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S.
- C. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
  2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength of 2500 psi (17.5 MPa).

3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  2. Verify that foundations are within tolerances specified.
  3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION, GENERAL**

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

### **3.3 TOLERANCES**

- A. Dimensions and Locations of Elements:
  1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
  2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
  3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.
- B. Lines and Levels:
  1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
  2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.

3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

### 3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches (100-mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
  - 1. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

### 3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
  - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
  - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
  - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
  - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
  - 2. Allow cleaned surfaces to dry before setting.
  - 3. Wet joint surfaces thoroughly before applying mortar.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

### 3.6 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
  - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
  - 2. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.

- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuous horizontal wire in the facing wythe.
- D. Provide continuity at wall intersections by using prefabricated T-shaped units.
- E. Provide continuity at corners by using prefabricated L-shaped units.

### 3.7 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows:
  - 1. Install preformed control-joint gaskets designed to fit standard sash block.
- C. If not shown on plans, provide at maximum 30 feet joint-to-joint and at maximum 20 joint-to-corner in locations to coincide with changes in wall height or thickness, construction joints in foundation, chases or recesses, columns, sides of wall opening, return angles or reentrant corners, as approved by Architect/Engineer.

### 3.8 LINTELS

- A. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
  - 1. Provide (2) #5 in continuous bond beams immediately above the lintel and below the sill. Extend reinforcing a minimum of 2'-0" beyond jambs of openings.
- B. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

### 3.9 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
  - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Vertical Reinforcement

1. Unless otherwise noted, minimum grouted vertical reinforcement for masonry walls of thickness 8 inches or greater shall correspond to:
    - a. (1) #5 wall bars (one bar each face of core) at 32 inch center to center spacing. Wall bars shall be continuous full height of wall and embedded into horizontal bond beams above.
    - b. (1) #5 by 4'-0" long dowel bar (centered in core) at 48 inch center to center spacing. Dowel bars shall be embedded 2'-0" into foundation walls or grade beams at locations matching the wall bars described above. Alternate #5 hooked footing dowel bars shall be provided where walls bear directly on footings.
  2. Unless otherwise noted, minimum grouted vertical reinforcement for masonry walls of thickness less than 8 inches shall correspond to:
    - a. (1) #5 wall bars (centered in core) at 32 inch center to center spacing. Wall bars shall be continuous full height of wall and embedded into horizontal bond beams above.
    - b. (1) #5 by 4'-0" long dowel bar (centered in core) at 48 inch center to center spacing. Dowel bars shall be embedded 2'-0" into foundation walls or grade beams at locations matching the wall bars described above. Alternate #5 hooked footing dowel bars shall be provided where walls bear directly on footings.
  3. Reinforce jambs of masonry openings greater than 1'-0" with (2) #5 bars grouted solid. Extend reinforcing a minimum 2'-0" beyond openings.
- D. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

### 3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
1. Level 1 Special Inspections shall be performed per Table 1704.5.1 of the International Building Code.
- B. Testing Prior to Construction: One set of tests.
- C. Testing Frequency: One set of tests for each 1000 sq. ft. of wall area or portion thereof.
- D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.



- E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

### 3.11 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
  - 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

### 3.12 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

**END OF SECTION 042000**

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## **SECTION 051200 - STRUCTURAL STEEL FRAMING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

##### **A. Section Includes:**

1. Fabrication, transportation, delivery, and erection of structural steel.
2. Structural steel, framing members, support members, welds, and fasteners.
3. Base plates, anchor rods, bearing plates, weld plates, setting plates, anchors.
4. Inserts for steel work.
5. Non-shrink grout under base plates.

##### **B. Products Supplied But Not Installed Under This Section:**

1. Section 033100 – Structural Concrete: Non-shrink grout under base plates and anchors for casting into concrete.
2. Division 04 – Masonry: Anchors for embedding into masonry.

##### **C. Related Sections:**

1. Applicable provisions of Division 01 shall govern all work under this Section.
2. Section 034113 – Precast Concrete Hollow Core Plank: Precast concrete anchorage devices for attachment to structural steel.
3. Section 052100 - Steel Joist Framing.
4. Section 053123 - Steel Roof Decking: Support framing for small openings in roof deck.
5. Division 07 - Thermal and Moisture Protection: Firestopping materials.
6. Division 09 – Finishes: Finish painting.

#### **1.2 REFERENCES**

##### **A. ASTM International (American Society for Testing and Materials)**

1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
4. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
5. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
7. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

8. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  9. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
  10. ASTM A563 – Standard Specification for Carbons and Alloy Steel Nuts.
  11. ASTM A673 – Standard Specification for Sampling Procedure for Impact Testing of Structural Steel.
  12. ASTM A992 - Standard Specification for Structural Steel Shapes.
  13. ASTM F436 – Standard Specification for Hardened Steel Washers.
  14. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- B. American Welding Society (AWS).
1. AWS A2.0 - Standard Welding Symbols.
  2. AWS D1.1 - Structural Welding Code.
- C. American Institute of Steel Construction, Inc (AISC).
1. AISC – Steel Construction Manual, Current Edition.
  2. AISC - Code of Standard Practice for Steel Buildings and Bridges.
  3. AISC - Specification for Architectural Exposed Structural Steel.
- D. Research Council on Structural Connections (RCSC)
1. RCSC - Specification for Structural Joints Using ASTM A325 or A490 Bolts.
- E. The Society for Protective Coatings (SSPC)
1. Volume 1 – Good Painting Practices, Current Edition.
  2. Volume 2 – Systems and Specifications.

### 1.3 SUBMITTALS

- A. Division 01: Submittal Procedures.
- B. Shop and Erection Drawings:
1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, and fasteners.
- C. Show all connections. Connections shall be designed and drawings and calculations shall be Stamped/Sealed by the Professional Engineer, registered in State of Wisconsin, who is responsible for connection design.
1. Show cambers and loads.
  2. Indicate welded connections with AWS A2.0 welding symbols. Indicate net weld lengths.
  3. Indicate cleaning and painting specifications.

4. Assume responsibility for dimensional errors.
  5. Field verify dimensions affected by existing construction prior to submitting Shop Drawings and so note verified dimensions on shop drawings.
  6. Field verify existing anchor bolt placements and modify base plates to accommodate field conditions.
  7. Fabricator shall check shop drawings before Submittal.
- D. Shop drawings which include the following and have been prepared under supervision of a Professional Engineer registered in the State of Wisconsin and shall bear seal and signature of supervising design engineer:
1. Calculations, connection drawings, job standards, and any other items that are performance specified or designed by Contractor's engineer.
  2. Provide holes for installation of other work.
  3. Any omission from shop drawings of any materials required by Contract Documents shall not relieve Contractor of responsibility of furnishing and installing such materials, even though shop drawings may have been reviewed and approved.
- E. Manufacturer's Mill Certificate: Submit under provisions of Division 01 certifying that products meet or exceed specified requirements.
- F. Mill Test Reports: Submit under provisions of Division 01 Manufacturer's Certificates, indicating structural strength, destructive and non-destructive test analysis.
- G. Welders Certificates: Submit under provisions of Division 01 Manufacturer's Certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

#### 1.4 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC -Specifications and the AISC Code of Standard Practice for Steel Buildings and Bridges.
- B. Special inspections shall be performed in accordance with the International Building Code (IBC) 2006 Edition as follows:
1. Chapter 17: Structural Tests and Special Inspections:
    - a. Section 1704.3: Steel Construction Table.
    - b. Table 1704.3: Required Verification and Inspection of Steel Construction.

#### 1.5 QUALIFICATIONS

- A. Fabricator: Company specializing in performing the work of this Section with minimum ten years documented experience and AISC Certified.
- B. Erector: Company specializing in performing the work of this Section with minimum ten years documented experience.

## 1.6 FIELD MEASUREMENTS

- A. Verify that field measurements are as shown on Drawings and shop drawings.

## **PART 2 - PRODUCTS**

### 2.1 MATERIALS AND EQUIPMENT

- A. Structural Steel W-Shape and WT-Shape Members: ASTM A992,  $F_y = 50$  ksi.
- B. Structural Steel Angles, Plates, Channels and Other Rolled Members: ASTM A36,  $F_y = 36$  ksi.
- C. Rectangular or Square (HSS) Hollow Structural Sections: ASTM A500, Grade B,  $F_y = 46$  ksi.
- D. Round (HSS) Hollow Structural Sections: ASTM A500, Grade B,  $F_y = 42$  ksi.
- E. Steel Pipe: ASTM A53, Grade B,  $F_y = 35$  ksi.
- F. Shear Stud Connectors: ASTM A108 Grade 1015,  $F_u = 60$  ksi Forged Steel, headed and uncoated.
- G. Bolts, Nuts, and Washers: ASTM A325 High-Strength Bolts, Type 1 – Medium Carbon, Carbon Boron or Medium Carbon Alloy Steel finish; with ASTM A563 heavy hex nuts and ASTM F436 washers, head markings on bolts, fully traceable;
  - 1. Manufacturers:
    - a. Nucor Fastener.
    - b. St. Louis Screw & Bolt Co.
    - c. Hayden Bolts.
    - d. Approved equal.
- H. Threaded Anchor Bolts (Anchor Rods): ASTM F1554, Class 2A threads; Grade 36; straight; headless with ASTM A563 heavy hex nuts, and ASTM F436, Type 1 washers.
- I. Non-threaded Anchor Bolts (Anchor Rods): ASTM F1554; Grade 36; straight; headless.
- J. Welding Electrodes: E70XX and shall comply with AWS D1.1; type required for materials being welded.
- K. Non-Shrink Grout: Pre-mixed compound with non-metallic aggregate, cement, water reducing and plasticizing agents; capable of minimum compressive strength of 7,000 psi.
- L. Shop Primer: Exposed Interior and Exterior Steel Receiving Additional Coatings: Primer shall be Universal Metal Primer for Structural Steel compatible with subsequent finish coats specified in Division 09 - Finishes.

## 2.2 FABRICATION

- A. Fabricate items of structural steel in accordance with AISC specifications, and as shown on approved shop drawings.
- B. Field connections are to be bolted unless welded, or other types of connections are indicated.
- C. Bolted connections shall be made with ASTM A325 high strength bolts, unless otherwise noted.
- D. Connections shall support a minimum of one-half the total uniform load capacity shown in the AISC ASD tables for allowable loads on beams for the given shape, span, and steel specified, unless otherwise noted.
- E. Connections shall be made with standard double angles unless otherwise shown.
- F. Install high strength threaded fasteners in accordance with RCSC - "Specifications for Structural Joints Using ASTM A325 or A490 bolts".
- G. Welding shall comply with AISC and AWS Codes for procedures, appearance, quality of welds, and for methods used in correcting welding work.
- H. All welds shall be made by AWS pre-qualified welders, certified for welds made.
- I. Minimum size of fillet welds shall be as specified in TABLE J2.4 of AISC Manual of Steel Construction.
- J. Minimum Strength of Welded Connections: Unless noted otherwise on drawings, all shop and field welds shall develop full tensile strength of member of element joined.
- K. All members with moment connections, noted on drawings, shall be welded to develop full flexural capacity of member, unless noted otherwise on drawings.
- L. Provide holes required for securing other work to structural steel framing and for passage of other work through steel members, as shown on approved shop drawings.
- M. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
- N. Verify or supplement dimensions shown on Drawings by field measurements to assure fit of new work.
- O. Jointed members shall be sealed with continuous welds unless otherwise noted.
- P. Struts and Braces:
  - 1. Connections for all struts hangers, and braces shall have connection designed to develop full allowable tensile strength of member unless design force is indicated on drawings.

## 2.3 FINISH

- A. Prepare interior structural component surfaces for general work in accordance with SSPC - SP1 and SP3 as a minimum.
- B. Prepare structural component surfaces of exterior steel in accordance with SSPC - SP1 and SP6 as a minimum.
- C. Coated surfaces, interior or exterior, shall be prepared in accordance with coating manufacturer's SSPC requirements if more stringent than listed above.
- D. Shop Primed Structural Steel Members: Minimum one coat for interior steel, minimum two coats for exterior steel. Prime coats shall be a minimum of 2.4 mils dry thickness unless manufacturer has more stringent requirements.
- E. Do not prime surfaces that will be fireproofed, in contact with concrete. Do not prime surfaces that will be field welded unless coated with a weldable primer.

## **PART 3 - EXECUTION**

### 3.1 PREPARATION

- A. Verify that field conditions are acceptable and are ready to receive work in accordance with Drawings and shop drawings.
- B. Verify anchors and anchor rods have been preset into connection work in accordance with Drawings and shop drawings.
- C. Beginning of installation and erection means that existing conditions have been checked and found acceptable.
- D. Cost of corrections shall be borne by this Section if variances are not identified prior to start of installation.

### 3.2 ERECTION

- A. Erect structural steel in accordance with AISC Specifications.
- B. Store steel on site on substantial shores or blocking to keep free of ground and to prevent bending, buckling, or twisting.
- C. Prevent water collection on members.
- D. Provide for erection loads, wind, and dead loads, and provide sufficient temporary bracing to maintain structure in safe, plumb, and true alignment until completion of erection and installation of permanent bracing.
- E. Do no final bolting or welding until structure has been properly aligned and plumbed.



- F. Do not field cut or alter structural members without prior approval of Professional Engineer of Record.
- G. Field weld components indicated on Drawings and shop drawings.
- H. All bolted joints may be installed as Snug Tightened joints as specified and permitted in the RCSC - Specification, unless otherwise noted.
- I. Clean and prime welds, bolt and rivet heads, abrasions of prime coat, and surfaces not previously shop primed except surfaces to be in contact with concrete after erection.
- J. Grout solid under base plates and bearing plates in accordance with AISC - Code of Standard Practice for Steel Buildings and Bridges.
- K. Contact surfaces of field connections shall be free from dust, oil, loose scale, burrs, pits, and other defects that prevent solid seating of parts.
- L. Clean all surfaces of dirt, mud, oil, or grease that would impair bonding of fireproofing or concrete.
- M. Reaming is not allowed if reaming weakens or makes it impossible to fill holes or adjust accurately after being reamed.

### 3.3 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

### 3.4 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Division 01 – General Requirements.

**END OF SECTION 051200**

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## **SECTION 053123 - STEEL ROOF DECKING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Steel roof deck and accessories.
2. Framing for openings up to and including 18-inches.
3. Roof drain sump pans.

**B. Related Sections:**

1. Applicable provisions of Division 01 shall govern all work under this Section.
2. Section 033100 – Structural Concrete: Concrete topping over metal roof deck.
3. Section 033100 – Structural Concrete: Placement of anchors for bearing plates and angles cast in concrete.
4. Section 051200 - Structural Steel Framing.

#### **1.2 REFERENCES**

**A. ASTM International (American Society for Testing and Materials)**

1. ASTM A36 - Structural Steel.
2. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic Coated by the Hot-Dip Process.
4. ASTM A992 - Steel for Structural Shapes For Use in Building Framing.
5. ASTM A1008 – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

**B. American Welding Society (AWS)**

1. AWS D1.1 - Structural Welding Code.
2. AWS D1.3 - Structural Welding Code: Sheet Steel.

**C. Steel Deck Institute (SDI)**

1. SDI - Design Manual for Composite Decks, Form decks, Roof Decks, Cellular Metal Floor Deck with Electrical Distribution.

**D. The Society for Protective Coatings (SSPC)**

1. SSPC - Painting Manual. SSPC Paint No. 15, Steel Joist Shop Paint Type 1, red oxide; SSPC - 20 Type I Inorganic; and SSPC - 20, Type II - Organic.

### 1.3 PERFORMANCE REQUIREMENTS

- A. Design metal deck in accordance with SDI Design Manual.
- B. Calculate to structural working limit stress design and maximum vertical deck deflection of 1/180.

### 1.4 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal requirements.
- B. Shop Drawings: Indicate deck plan, support locations, projections, openings and reinforcement, pertinent details and accessories, fasteners and fastener pattern diagram.
- C. Product Data: Submit deck profile characteristics and dimensions, structural properties, and finishes.
- D. Manufacturer's Installation Instructions: Submit manufacturer's installation instructions.
- E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- F. Welders Certificates: Certify welders employed on Work verifying AWS qualification within previous twelve months.

### 1.5 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this Section with minimum 5 years documented experience.

### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Division 01 - Product Requirements: Product Storage and handling requirements.
- B. Cut plastic wrap to encourage ventilation.
- C. Site Storage: Store off ground on dry wood sleepers with one end elevated to provide positive drainage. Protect from elements with a waterproof covering, ventilated to avoid condensation.

## **PART 2 - PRODUCTS**

### 2.1 MANUFACTURERS

- A. Epic Metals Corp.
- B. United Steel Deck, Inc.
- C. Vulcraft Steel Deck, Division of Nucor Corp.

- D. Wheeling Corrugating Co.
- E. Steel deck manufacturer and type shall be listed in the FM Global approval Guide.
- F. No Substitutions permitted.

## 2.2 MATERIALS

- A. Sheet Steel: ASTM A1008, Structural Steel (SS), Grade 33, Structural Quality; prime coated both sides.
- B. Angles, Plates, and Channels: ASTM A36.
- C. Fasteners: Carbon steel, self-tapping screws. Framing connections - #12 minimum; deck stitch connections - #10 minimum.
- D. Welding Materials: AWS D1.1 and D1.3.
- E. Shop and Touch Up Primer: SSPC, Type 1, Red or Gray oxide primer to match prime paint of roof deck.
- F. Framed Openings: ASTM A36 Structural Steel;  $F_y = 36$  ksi.

## 2.3 FABRICATION

- A. Metal Deck: Sheet Steel, configured as follows:
  - 1. Span Design: multiple, Triple span where possible.
  - 2. Minimum Metal Thickness Excluding Finish: See plans.
  - 3. Nominal Height: See plans.
  - 4. Formed Sheet Width: 36 inches.
  - 5. Side Joints: Lapped.
  - 6. Flute Sides: plain vertical face.
- B. Fasteners: Galvanized hardened steel, self tapping, painted to match deck pre-coating color.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Verify that field conditions are acceptable and are ready to receive work.
- C. Beginning of installation means installer accepts existing conditions.

### 3.2    INSTALLATION

- A.    Erect metal deck in accordance with SDI Design Manual.
- B.    Bear deck on masonry support surfaces with 4 inch minimum bearing. Align and level.
- C.    Bear deck on steel supports with 1-1/2 inch minimum bearing. Align and level.
- D.    Fasten deck to steel support members at ends and intermediate supports per the structural plans.
- E.    Welded connections shall be in accordance with AWS D1.1 and D1.3.
- F.    Stitch fastening of deck shall be made with minimum #10 self-tapping screws.
- G.    Mechanically fasten side laps per structural plans.
- H.    Reinforce steel deck openings from 6 to 18 inches in size with 2 by 2 by 1/4 inch steel angles. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld or mechanically attach to deck at each flute.
- I.    Install 6-inch minimum wide sheet steel cover plates, of same thickness as deck, where deck changes direction. Fusion weld or mechanically fasten 12 inches on center maximum.
- J.    Install sheet steel closures and angle flashing to close openings between deck and walls, columns, and openings.
- K.    Position roof sump pans with flange bearing on top surface of deck. Mechanically attach fasten at each deck flute.
- L.    Immediately after any welding of deck and other metal components in position, clean and coat welds, burned areas, and damaged surface coating, with touch-up prime paint.

**END OF SECTION 053123**

## **SECTION 054000 - COLD-FORMED METAL FRAMING**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

##### **A. Section Includes:**

1. Load bearing formed steel stud exterior wall, framing.
2. Formed steel joist, track, floor roof framing and bridging.

##### **B. Related Sections:**

1. Applicable provisions of Division 01 – General Requirements shall govern all work under this Section.
2. Section 051200 – Structural Steel Framing: Structural Steel Framing.

#### **1.2 REFERENCES**

##### **A. American Institute of Steel Construction (AISC):**

1. AISC – Steel Construction Manual, Current Edition.

##### **B. American Iron and Steel Institute (AISI):**

1. AISI SG-973 - Cold-Formed Steel Design Manual.

##### **C. American Society of Civil Engineers (ASCE):**

1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

##### **D. ASTM International (ASTM):**

1. ASTM A90 - Standard Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
2. ASTM A370 - Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
3. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
5. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
6. ASTM A1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
7. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

8. ASTM A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
9. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
10. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
11. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
12. ASTM C1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
13. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
14. ASTM E329 - Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
15. ASTM E548 - Standard Guide for General Criteria Used for Evaluating Laboratory Competence.

E. American Welding Society (AWS):

1. AWS D1.1 - Structural Welding Code - Steel.
2. AWS D.1.3 - Structural Welding Code - Sheet Steel.

F. The Society for Protective Coatings (SSPC):

1. SSPC Paint 15 - Steel Joist Shop Paint.
2. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

### 1.3 SYSTEM DESCRIPTION

A. Size components to withstand design loads as follows:

1. Vertical Assembly: 25 psf positive and 30 psf negative.
2. Horizontal Assembly: 80 psf live and dead loads.

B. Maximum Allowable Deflections:

1. Exterior Load-Bearing Wall Framing: Horizontal deflection of L/360 of the wall height.
2. Floor Joist Framing: Vertical deflection of L/360 of the span and 80 total load.

C. Wall, Floor, Roof System:

1. Design to AISI SG-973 Cold-Formed Steel Design Manual.
2. Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
3. Design system to accommodate construction tolerances, deflection of building structural members, and clearance of intended openings.



4. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with applicable code.
5. Design exterior non-load-bearing curtain-wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
6. Design exterior load-bearing (axially loaded) studs to accommodate axial loads without regard for contributions of exterior or interior sheathing materials.

#### 1.4 SUBMITTALS

- A. Division 01 – General Requirements: Submittal requirements.
- B. Design Data: Shop Drawings shall be prepared under supervision of a Professional Engineer licensed in the State of Wisconsin.
- C. Shop Drawings:
  1. Indicate component details, bearing, anchorage and hold down devices, loading, strapping, bracing, bridging and blocking, welds, type and location of fasteners, and accessories or items required of related Work.
  2. Indicate wall stud, floor joist, roof joist, and layout, using cross sections, plans and/or elevations to show spacing, sizes and thickness.
  3. Describe method for securing studs joists to tracks and for welded framing connections.
  4. Submit calculations for loadings and stresses of wall studs, floor joists, roof joists, under Professional engineer's seal and signature. Include deflection requirements and connection components.
- D. Product Data: Submit data on standard framing members; describe materials and finish, product criteria and limitations.
- E. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.
- F. Mill Certifications: Submit mill certifications for steel delivered to site. Certify steel bare metal thickness in 0.001 inch, yield strength, tensile strength, total elongation in 2 inch or 8 inch gauge length, chemical analysis, and galvanized coating thickness.
- G. Welding Certificates: Upon request of Owner or Engineer/Architect, provide copies of certificates for welding procedures and personnel conforming to AWS D1.1 and AWS D1.3.
  1. Welders Certificates: Submit under provisions of Division 1 Manufacturer's Certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.
- H. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
  1. Expansion and adhesive anchors.
  2. Powder-actuated anchors.
  3. Mechanical fasteners.
  4. Vertical deflection clips.

5. Miscellaneous structural clips and accessories.

#### 1.5 QUALITY ASSURANCE

- A. Calculate structural properties of framing members in accordance with AISI SG-973 Specification for Design of Cold-Formed Steel Structural Members.
- B. Maintain one (1) copy of AISI SG-973 on site.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E329 to conduct testing as specified in this Section, and as documented according to ASTM E548.
- D. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," or by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
- E. Preinstallation Conference: Upon request of Architect or Engineer, conduct conference at Project site to comply with requirements stated within Division 1.

#### 1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five (5) years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum five (5) years documented experience.
- C. Design structural elements under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Wisconsin.
- D. Owner's testing agency may spot check weldments and welding procedures per AWS standards. This inspection is not intended to be comprehensive or complete. Contractor is solely responsible for total quality control.

#### 1.7 DELIVERY, STORAGE AND HANDLING

- A. Division 01 – General Requirements: Product Storage and handling requirements.
- B. All materials delivered to site shall be stored to prevent bending, buckling or twisting.
- C. Protect materials using impervious cover to prevent water or snow from collecting in members.
- D. Protect from elements with a waterproof covering, ventilated to avoid condensation.

## **PART 2 - PRODUCTS**

### **2.1 COLD-FORMED METAL FRAMING AND TRUSSES**

#### **A. Framing Manufacturers:**

1. Clark Steel Framing Systems Company.
2. Dale/Incor Industries, Inc.
3. Dietrich Industries, Inc.
4. Harrison Manufacturing Company.
5. MarinoWare, Division of Ware Industries, Inc.
6. Steel Network, Inc.
7. Unimast Incorporated.
8. Substitutions: In accordance with Division 01 - General Requirements.

### **2.2 FRAMING AND TRUSS MATERIALS**

- A. Studs: ASTM A1003, Structural Grade, Type H, sheet steel, zinc-coated, formed to channel shape, ST33H Grade, solid or punched web, knurled faces.
- B. Joists: ASTM A1003, Structural Grade, Type H sheet steel, zinc-coated, formed to channel shape, ST33H Grade, solid or punched.
- C. Track: ASTM A1003, Structural Grade, Type H, formed steel; channel shaped; same material type and width as studs, tight fit.
- D. Framing Materials: Roll from new sheet steel; cold reduction steels not being acceptable.
- E. For minimum section properties of all members, reference "System Description" paragraph within this Section.

### **2.3 ACCESSORIES**

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined by performance requirements specified.
- B. Bracing, Furring, Bridging: Formed sheet steel, of same material used for framing members.
- C. Plates, Gussets, Clips: Formed sheet steel, thickness determined by performance requirements specified.
- D. Plates, Gussets, Clips: Formed sheet steel, of same material used for framing members ASTM A36 Steel.
- E. Shop and Touch-Up Primer: SSPC Paint 15, Type I, red oxide.
- F. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20.

### **2.4 FASTENERS**

- A. Self-drilling, Self-tapping Screws, Bolts, Nuts, and Washers: Steel, hot dip galvanized to ASTM A123 1.25 oz/sq ft.
- B. Anchorage Devices: Powder actuated, drilled expansion bolts, and screws with sleeves.
- C. Welding: In conformance with AWS D1.1 and AWS D1.3.

## 2.5 FABRICATION

- A. Fabricate assemblies of formed sections of sizes and profiles required, plumb, square and true to line, with connections securely fastened.
- B. Fit, reinforce, and brace framing members to suit design requirements.
- C. Fit and assemble in largest practical sections for delivery to site, ready for installation, but attached to prevent racking and withstand all handling and erection stresses.
- D. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
  - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.
- E. Fabricate extensions for soffits and ceilings where necessary.

## 2.6 FINISHES

- A. Studs: Galvanize to G90 coating class.
- B. Tracks and Headers: Galvanize to G90 coating class.
- C. Joists and Rafters: Galvanize to G90 coating class.
- D. Bracing, Furring, and Bridging: Same finish as framing members.
- E. Plates, Gussets, and Clips: Galvanize to ASTM A123 G90 coating class.
- F. Galvanizing Repair Paint: SSPC-Paint 20.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Division 01 – General Requirements: Coordination and project conditions.
- B. Verify substrate surfaces and building framing components are ready to receive Work.

- C. Verify rough-in utilities are in proper location.
- D. Notify Engineer/Architect of any discrepancies and resolve before installation begins.

### 3.2 ERECTION OF STUDS

- A. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners or by welding at maximum 24 inches oc.
- B. Place studs as indicated on plans; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using clip and tie, fastener or welding method. Align studs and tracks with exterior wall cladding elements as shown per drawings.
- C. Construct corners using minimum three studs. Double stud wall openings, door jambs, and window jambs, unless additional studs are required as determined by performance requirements specified.
- D. Erect load bearing studs one piece full length. Splicing of studs is not permitted.
- E. Erect load bearing studs level and square, brace, and reinforce to develop full strength, to achieve design requirements.
- F. Fully seat axial loaded studs in receiving tracks (maximum 1/8 inch gap between stud and track web).
- G. Coordinate placement of insulation in multiple stud spaces after erection.
- H. Install intermediate studs above and below openings to align with wall stud spacing.
- I. Install studs with deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
- J. Attach cross studs and furring channels to studs for attachment of fixtures anchored to walls.
- K. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- L. Touch-up field welds and damaged galvanized or primed surfaces with zinc rich coating.

### 3.3 ERECTION OF JOISTS AND RAFTERS

- A. Install framing components.
- B. Make provisions for erection stresses. Install temporary bracing to maintain alignment, until permanent bracing and attachments are installed.
- C. Place joists and rafters as indicated on plans; not more than 2 inches from abutting walls. Connect joists to supports using fastener or welding method.
- D. Set floor and ceiling joists parallel and level, with lateral bracing and bridging.

- E. Locate joist end bearing directly over load bearing studs or install load distributing member to top of stud track.
- F. Install web stiffeners at reaction points.
- G. Touch-up field welds and damaged galvanized surfaces with zinc rich coating.

#### 3.4 ERECTION TOLERANCES

- A. Division 01 - General Requirements: Tolerances.
- B. Maximum Variation from Indicated Position: One (1) inch.
- C. Maximum Variation of Members from Plane: 1/8-inch.

**END OF SECTION 054000**

## **SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes:
1. Wood blocking, cants, and nailers.
  2. Plywood backing panels.

#### **1.3 DEFINITIONS**

- A. Dimension Lumber: Lumber of 51 mm (2 inches) nominal or greater but less than 127 mm (5 inches) nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NeLMA: Northeastern Lumber Manufacturers' Association.
  2. NHLA: National Hardwood Lumber Association.
  3. NLGA: National Lumber Grades Authority.
  4. SPIB: The Southern Pine Inspection Bureau.
  5. WCLIB: West Coast Lumber Inspection Bureau.
  6. WWPA: Western Wood Products Association.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

### **PART 2 - PRODUCTS**

#### **2.1 WOOD PRODUCTS, GENERAL**

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.

3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent for 50-mm (2-inch) nominal thickness or less, 19 percent for more than 50-mm (2-inch) nominal thickness unless otherwise indicated.

## 2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWWA U1; Use Category UC4a for items in contact with the ground.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Application: Treat items indicated on Drawings, and the following:
1. Wood sills, sleepers, blocking, stripping, and similar concealed members in contact with masonry or concrete.
  2. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
  3. Wood framing members that are less than 18 inches above the ground in crawl spaces or unexcavated areas.
  4. Wood floor plates that are installed over concrete slabs-on-grade.

## 2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
  2. Nailers.
  3. Rooftop equipment bases and support curbs.
  4. Cants.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and any of the following species:
1. Hem-fir (north); NLGA.
  2. Mixed southern pine; SPIB.
  3. Spruce-pine-fir; NLGA.
  4. Hem-fir; WCLIB or WWPA.
  5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
1. Mixed southern pine, No. 2 grade; SPIB.



2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
  3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

#### 2.4 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 19 mm (3/4-inch) nominal thickness.

#### 2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Metal Framing: ASTM C 1002 for non-load-bearing framing and ASTM C 954 for load-bearing framing, length as recommended by screw manufacturer for material being fastened.
- F. Lag Bolts: ASME B18.2.1.
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

## 2.6 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 1.0-mm (0.025-inches).

## **PART 3 - EXECUTION**

### 3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

### 3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

**END OF SECTION 061053**

## **SECTION 066116 – SOLID SURFACE FABRICATIONS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including the Solicitation and Division 00 and Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Section Includes:

1. Horizontal and trim solid surface product types for the following:
  - a. Countertops
  - b. Cove backsplashes
  - c. Sidesplashes

#### **1.3 DEFINITIONS**

- A. Solid surface is defined as nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

#### **1.4 ACTION SUBMITTALS**

- A. General: Provide all action submittals in this specification section as separate line items within a single submittal to the Government for review. Submission of the action submittals separately will be deemed incomplete and rejected.
- B. Product Data: Manufacturer's data sheets on each product to be used.
1. Indicate product description, fabrication information and compliance with specified performance requirements.
- C. Shop drawings:
1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
    - a. Show full-size details, edge details, thermoforming requirements, attachments, etc.
    - b. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
- D. Samples:
1. For each type of product indicated.
    - a. Submit minimum 6-inch by 6-inch sample in specified gloss.

- b. Cut sample and seam together for representation of inconspicuous seam.
  - c. Indicate full range of color and pattern variation.
- 2. Approved samples will be retained as a standard for work.
- E. Fabricator/installer qualifications:
  - 1. Provide copy of certification number.
- F. Manufacturer certificates:
  - 1. Signed by manufacturers certifying that they comply with requirements.

### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. O&M Data to be include in maintenance manuals.
  - 1. Maintenance kit for finishes shall be submitted.
- B. Warranties: Completed manufacturer's special warranties as described in the "Warranties" Article of this specification section

### 1.6 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.
- B. Fabricator/installer qualifications:
  - 1. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.
- C. Applicable standards:
  - 1. Standards of the following, as referenced herein:
    - a. American National Standards Institute (ANSI)
    - b. American Society for Testing and Materials (ASTM)
- D. Source Limitations: Obtain components and accessories through one source from a single approved manufacturer.

### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver no components to project site until areas are ready for installation.
- B. Store components indoors prior to installation.

- C. Handle materials to prevent damage to finished surfaces.
  - 1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

## 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install lockers until spaces are enclosed and weather tight, wet work in spaces is complete and dry, HVAC system is operating and maintaining ambient temperature at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify field measurements as indicated on Shop Drawings. Where measurements are not possible, provide control dimensions and templates.
- C. Coordinate installation and location of blocking and supports as requested.
  - 1. Verify openings, clearances, storage requirements and other dimensions relevant to the installation and final application.
  - 2. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

## 1.9 WARRANTY

- A. Special Warranty: Submit manufacturer's written 10-year limited warranty to repair or replace components that fail in materials or craftsmanship during the warranty period.

## **PART 2 - PRODUCTS**

### 2.1 MANUFACTURERS

- A. Manufacturer and Product: Basis-of-Design Manufacturer's name is given to clarify the designer's intent and is not intended to limit selection of similar products from acceptable manufacturers.
  - 1. Manufacturer: Corian<sup>®</sup> surfaces from the Dupont company
  - 2. Product: See architectural finish schedule on the drawings.

### 2.2 MATERIALS

- A. Solid polymer components
  - 1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
  - 2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.
- B. Thickness:

1. 1/2 inch

C. Edge treatment:

1. As indicated in the drawings

D. PERFORMANCE CHARACTERISTICS

<b>Property</b>	<b>Typical Result</b>	<b>Test</b>
Tensile Strength	6,000 psi	ASTM D 638
Tensile Modulus	1.5 x 10 <sup>-6</sup> psi	ASTM D 638
Tensile Elongation	0.4% min.	ASTM D 638
Flexural Strength	10,000 psi	ASTM D 790
Flexural Modulus	1.2 x 10 <sup>-6</sup> psi	ASTM D 790
Hardness	>85	Rockwell "M" Scale
	56	ASTM D 785 Barcol Impressor
Thermal Expansion	3.02 x 10 <sup>-5</sup> in./in./°C (1.80 x 10 <sup>-5</sup> in./in./°F)	ASTM D 2583 ASTM D 696
Gloss (60° Gardner)	5–75 (matte—highly polished)	ANSI Z124
Light Resistance	(Xenon Arc) No effect	NEMA LD 3-2000 Method 3.3
Wear and Cleanability	Passes	ANSI Z124.3 & Z124.6
Stain Resistance: Sheets	Passes	ANSI Z124.3 & Z124.6
Fungus and Bacteria Resistance	Does not support microbial growth	ASTM G21&G22
Boiling Water Resistance	No visible change	NEMA LD 3-2000 Method 3.5
High Temperature Resistance	No change	NEMA LD 3-2000 Method 3.6
Izod Impact (Notched Specimen)	0.28 ft.-lbs./in. of notch	ASTM D 256 (Method A)
Ball Impact Resistance: Sheets	No fracture—1/2 lb. ball: 1/4" slab—36" drop 1/2" slab—144" drop	NEMA LD 3-2000 Method 3.8
Weatherability	ΔE*94<5 in 1,000 hrs.	ASTM G 155
Specific Gravity †	1.7	
Water Absorption	Long-term 0.4% (3/4") 0.6% (1/2") 0.8% (1/4")	ASTM D 570
Toxicity	99 (solid colors) 66 (patterned colors)	Pittsburgh Protocol Test ("LC50" Test)
Flammability	All colors (Class I and Class A)	ASTM E 84, NFPA 255 & UL 723
Flame Spread Index	<25	
Smoke Developed Index	<25	

† Approximate weight per square foot: 1/4" (6 mm) 2.2 lbs., 1/2" (12.3 mm) 4.4 lbs.  
Shapes meet or exceed the ANSI Z124.3 and ANSI Z124.6 standards for plastic sinks and lavatories.

NEMA results based on the NEMA LD 3-2000

## 2.3 ACCESSORIES

### A. Joint adhesive:

1. Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.

### B. Sealant:

1. Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant, UL-listed silicone sealant in colors matching components.

### C. Conductive tape:

1. Manufacturer's standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.

### D. Insulating felt tape:

1. Manufacturer's standard for use with conductive tape in insulating solid surface material from adjacent heat source.

## 2.4 MATERIALS

A. Steel Tube: ASTM A501, hot-formed steel tubing.

B. Steel Wire: ASTM C510, cold drawn steel wire

C. Particleboard: To ANSI A208.1, minimum 43 lb/cu. ft. (689 kg/cu. m) density.

D. Plywood: Exterior grade.

E. Anchors and Fasteners:

1. Factory Provided: Material, type, and size recommended by manufacturer for secure anchorage to substrate.

## 2.5 FACTORY FABRICATION

### A. Shop assembly

1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
2. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.

- a. Reinforce with strip of solid polymer material, 2" wide.
- 3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
- 4. Rout and finish component edges with clean, sharp returns.
  - a. Rout cutouts, radii and contours to template.
  - b. Smooth edges.
  - c. Repair or reject defective and inaccurate work.
- B. Thermoforming:
  - 1. Comply with manufacturer's data.
  - 2. Heat entire component.
    - a. Material shall be uniform, between 275 and 325 degrees Fahrenheit during forming.
  - 3. Form pieces to shape prior to seaming and joining.
  - 4. Cut pieces to finished dimensions.
  - 5. Sand edges and remove nicks and scratches.

## 2.6 FINISHES

- A. Reference product(s) in architectural finish schedule for color and finish.
  - 1. Provide surfaces with a uniform finish.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- C. Proceed with installation only after correction of unsatisfactory conditions.

### 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.3 INSTALLATION

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.



1. Provide product in the largest pieces available.
  2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
    - a. Exposed joints/seams shall not be allowed.
  3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
  4. Cut and finish component edges with clean, sharp returns.
  5. Rout radii and contours to template.
  6. Anchor securely to base cabinets or other supports.
  7. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
  8. Carefully dress joints smooth, remove surface scratches and clean entire surface.
  9. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.
- B. Coved backsplashes and applied sidesplashes:
1. Install applied sidesplashes using manufacturer's standard color-matched silicone sealant.
  2. Adhere applied sidesplashes to countertops using manufacturer's standard color-matched silicone sealant.

### 3.4 REPAIR

- A. Repair or replace damaged work which cannot be repaired to architect's satisfaction.

### 3.5 CLEANING AND PROTECTION

- A. Keep components clean during installation.
- B. Remove adhesives, sealants and other stains.

**END OF SECTION 066116**

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## **SECTION 066400 – FIBERGLASS REINFORCED PLASTIC PANELS (FRP)**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section includes glass-fiber reinforced plastic (FRP) wall paneling and trim accessories.

#### **1.3 ACTION SUBMITTALS**

- A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.
- B. Product Data: For each type of product indicated.
- C. Samples for Initial Selection: For plastic paneling.

#### **1.4 QUALITY ASSURANCE**

- A. Source Limitation: Obtain plastic paneling and trim accessories from single manufacturer.
- B. Surface-Burning Characteristics: As determined by testing Identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 450 or less
  - 3. Testing Agency: UL

#### **1.5 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

### **PART 2 - PRODUCTS**

#### **2.1 PLASTIC SHEET PANELING**

- A. General: Corrugated polypropylene core with a fiberglass reinforced plastic face panels complying with ASTM D 5319.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

- a. Nudo Products, Inc.; FiberCorr
2. Nominal Thickness: Not less than 0.400 inch.
3. Surface Finish: Molded pebble texture.
4. Color: As selected by Architect from manufacturer's full range.

## 2.2 ACCESSORIES

- A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
  1. Color: Match panels.
- B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.
- C. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.
- D. Adhesives: As recommended by plastic paneling manufacturer.
- E. Sealant: Single-component, mildew-resistant, neutral-curing silicone sealant recommended by plastic paneling manufacturer.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine substrate and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.
- B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.
- C. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.
- D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half of full panels, unless otherwise indicated.

### 3.3    INSTALLATION

- A.    Install plastic paneling according to manufacturer's written instructions.
- B.    Installing panels in a full spread of adhesive.
- C.    Install panels with fasteners.    Layout fastener locations and mark on face of panels so that fasteners are accurately aligned.
  - 1.     Drill oversized fastener holes in panels and center fasteners in holes.
  - 2.     Apply sealant to fastener holes before installing fasteners.
- D.    Install factory-laminated paneling using concealed mounting splines in panel joints.
- E.    Install trim accessories with adhesive and nails or staples.    Don fastener through panels.
- F.    Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.
- G.    Maintain uniform space between panels and wall fixtures.    Fill space with sealant.
- H.    Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures.    Fill space with sealant.
- I.    Remove excess sealant and smears as paneling is installed.    Clean with solvent recommended by sealant manufacturer and then wipe with dry cloths until no residue remains.

**END OF SECTION 066400**

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## **SECTION 070150 - PREPARATION FOR RE-ROOFING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Partial Roof tear-off.
  - 2. Roof re-cover preparation.
  - 3. Removal of base flashings and installation of new.
  - 4. Maintain the warranty of the existing roof system.

#### **1.3 MATERIALS OWNERSHIP**

- A. Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

#### **1.4 DEFINITIONS**

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
- B. Ballasted BUR System: The existing roof system is a ballasted built-up roof system manufactured by Tremco Roofing Products.
- C. Partial Roof Tear-Off: Removal of existing system as required for replacing the existing skylights with new.
- D. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.
- E. Existing to Remain: Existing items of construction that are not indicated to be removed.

#### **1.5 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Installer Qualifications: See "Quality Assurance" Article.
- C. Temporary Roofing: Include Product Data and description of temporary roofing system. If temporary roof will remain in place, submit surface preparation requirements needed to receive permanent roof, and submit a letter from roofing membrane manufacturer

stating acceptance of the temporary membrane and that its inclusion will not adversely affect the roofing system's resistance to fire and wind.

#### 1.6 INFORMATIONAL SUBMITTAL

- A. Fastener pull-out test report.
- B. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces that might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Tremco approved installer with experience in partial tear-off or existing ballasted BUR systems, repair and attachment to roof curbs such that the new work is incorporated in the existing warranty.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning membrane roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Reroofing Conference: Conduct conference at Project site.
  - 1. Meet with Owner; Architect; Owner's insurer if applicable; testing and inspecting agency representative; roofing system manufacturer's representative; deck Installer; roofing Installer including project manager, superintendent, and foreman; and installers whose work interfaces with or affects reroofing including installers of roof accessories and roof-mounted equipment.
  - 2. Review methods and procedures related to roofing system tear-off and replacement including, but not limited to, the following:
    - a. Reroofing preparation, including membrane roofing system manufacturer's written instructions.
    - b. Temporary protection requirements for existing roofing system that is to remain during and after installation.
    - c. Existing roof drains and roof drainage during each stage of reroofing, and roof drain plugging and plug removal requirements.
    - d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    - e. Existing deck removal procedures and Owner notifications.
    - f. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
    - g. Structural loading limitations of deck during reroofing.
    - h. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect reroofing.
    - i. HVAC shutdown and sealing of air intakes.
    - j. Governing regulations and requirements for insurance and certificates if applicable.
    - k. Existing conditions that may require notification of Architect before proceeding.



## 1.8 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately below reroofing area. Conduct reroofing so Owner's operations will not be disrupted. Provide Owner with not less than 7 days' notice of activities that may affect Owner's operations.
  - 1. Coordinate work activities daily with Owner so Owner can place protective dust or water leakage covers over sensitive equipment or furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below the work area.
  - 2. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below the affected area. Verify that occupants below the work area have been evacuated before proceeding with work over the impaired deck area.
- B. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- D. Limit construction loads on roof and for uniformly distributed loads.
- E. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.

## **PART 2 - PRODUCTS**

### 2.1 MATERIALS

- A. Existing roof system is a ballasted built-up roof system manufactured by Tremco Incorporated. Manufacturer's approved installer shall use Tremco approved products for the re-roofing required in the scope of Work.
  - 1. Tremco representative contact information:  
  
Ryan Crombie  
M: (815) 378-9695  
E: [rcrombie@tremcoinc.com](mailto:rcrombie@tremcoinc.com)

## **PART 3 - EXECUTION**

### 3.1 PREPARATION

- A. Protect existing ballasted BUR roofing system that is indicated not to be reroofed.
- B. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

- C. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- D. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
  - 1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain.
- E. Verify that rooftop utilities and service piping have been shut off before beginning the Work.

### 3.2 ROOF TEAR-OFF

- A. General: Notify Owner each day of extent of roof tear-off proposed for that day.
- B. Remove aggregate ballast from BUR roofing.
- C. Remove loose aggregate from aggregate-surfaced built-up bituminous roofing using a power broom.
- D. Remove protection mat and board insulation from protected BUR roofing where required.
- E. Roof Tear-Off: Remove existing roofing membrane and other membrane roofing system components down to the deck where required.

### 3.3 DECK PREPARATION

- A. Inspect deck after partial tear-off of membrane roofing system.
- B. Verify that structural deck substrate is visibly dry and free of moisture.
- C. If broken or loose fasteners that secure deck panels to one another or to structure are observed or if deck appears or feels inadequately attached, immediately notify Architect. Do not proceed with installation until directed by Architect.
- D. If deck surface is not suitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect. Do not proceed with installation until directed by Architect.

### 3.4 EXISTING BASE FLASHINGS

- A. Remove existing base flashings around parapets, curbs, walls, and penetrations.
  - 1. Clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.

- B. Do not damage metal counterflashings that are to remain.
- C. Install new flashing where required in accordance with roofing manufacturer's requirements.

### 3.5 DISPOSAL

- A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
  - 1. Storage or sale of demolished items or materials on-site is not permitted.
- B. Transport and legally dispose of demolished materials off Owner's property.

**END OF SECTION 070150**

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## **SECTION 072119 – FOAMED-IN-PLACE INSULATION**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Closed-cell spray polyurethane foam

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For Applicator

#### **1.4 QUALITY ASSURANCE**

- A. Applicator's Qualifications:
  - 1. Manufacturer's certification that installer is qualified to install products being applied.
  - 2. Provide documented minimum 2 years' experience in work of this Section.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- A. Store materials at temperatures between 35 and 85 degrees F, except store above 70 degrees for several days before use.
- B. Do not store in direct sunlight.
- C. Keep containers tightly closed and under dry gas pressure of 2 to 3 PSI after opening.

#### **1.6 PROJECT CONDITIONS**

- A. Do not install insulation when ambient temperature is below 50 degrees F without approval by product manufacturer.

#### **1.7 SEQUENCING**

- A. Install insulation after rough plumbing and electrical are completed and inspected and other wall penetrations completed.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Manufacturers' names are given to clarify the designer's intent and are not intended to limit selection of similar products from acceptable manufacturers.

1. BASF
2. Certain Teed
3. ICYNENE

## 2.2 MATERIALS

### A. Foamed-In-Place Insulation:

1. Type: Two component polyurethane closed cell spray foam system
2. Nominal core density: 1.9 to 2.2 PCF, tested to ASTM D1622.
3. Moisture vapor transmission: Maximum 1.0 perms at 1.5 inch thickness, tested to ASTM E96.
4. Compressive strength: Minimum 20 PSI, tested to ASTM D1621.
5. Air leakage: 0 at 1.57 PSF, tested to ASTM E283.
6. Tensile strength: Minimum 15 PSI, tested to ASTM D1623.
7. Hydrostatic pressure resistance: No failure at 45 foot head pressure, tested to AATCC 127.
8. Fire hazard classification: Maximum flame spread/smoke developed rating of 25/450, tested to ASTM E84.
9. R-value: Minimum R-values of 6.4 for 1 inch thickness, tested to ASTM C518 at 75 degrees F.

## 2.3 ACCESSORIES

- A. Joint Filler Foam: CF 124 Filler Foam by Hilti or equivalent.
- B. Joint Sealer: Single component polyurethane type; Sikaflex 1a by Sika
- C. Corp. or equivalent.
- D. Moisture Detection Paper Strips: MDP Strips.
- E. Seam Tape: Butyl Seam Tape.

## **PART 3 - EXECUTION**

### 3.1 PREPARATION

- A. Clean surfaces to receive insulation; remove dirt, sawdust, dust, and debris by blowing with compressed air and/or vacuuming.
- B. Verify dryness of spaces to receive insulation using moisture detection paper strips.
- C. Protect adjacent and underlying surfaces from accidental application using plastic sheeting and masking tape.
- D. Apply vegetable oil release agent to face of framing to facilitate removal of foam.
- E. Apply filler foam or joint sealer around door and window frames, openings, and perimeter to contain insulation.
- F. Cover gaps greater than 2 inches with seam tape or gypsum backer board, then spray insulation over opening.

### 3.2 APPLICATION

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation to uniform monolithic density, without voids.
- C. Apply insulation to average thickness required to achieve minimum R-values indicated on Drawings.
- D. Trim excess thickness unless it does not interfere with installation of covering materials.

### 3.3 CLEANING

- A. Remove insulation applied to adjacent and underlying surfaces.

### 3.4 ADJUSTING

- A. Patch damaged areas that violate air or moisture seal using joint filler foam or joint sealer; recreate seamless foam membrane to full thickness.

**END OF SECTION 072119**

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## **SECTION 074115 – STANDING SEAM METAL ROOF SYSTEM**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes metal roof panel assembly with double seam (180° fold) standing seam metal panels, slip sheet, self-adhering underlayment, cover board, foam board insulation, vapor barrier, copings, flashings, gutters and downspouts, metal fascia panels, metal soffit panels, snow retention system and accessories for a complete weathertight roofing system.
- B. All work in this section shall be completed by the standing seam metal roof panel manufacturer's certified installer.

#### **1.3 REFERENCES:**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

##### **AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

ASTM A 653	(2008) Standard Specification for Steel Sheet, Zinc-Coated (Gavnized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 924	(2008a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B 209	(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM E 1592	(2005) Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
ASTM E 1646	(1995) Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Static Air Pressure Difference
ASTM E 1680	(1995) Standard Test Method for Air Leakage Through Exterior Metal Roof Panel Systems

##### **UNDERWRITERS LABORATORIES (UL)**

UL 580	(2006) Tests for Uplift Resistance of Roof Assemblies
UL 2218	(2002) Impact Resistance of Prepared Roof Covering Materials

##### **METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)**

MBMA RSDM	(2000) Metal Roofing Systems Design Manual
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## NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

NRCA 0405 (2001; R 2003, 5th Ed) Roofing and Waterproofing Manual

### 1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Water penetration: No water penetration when tested according to ASTM E 1646.
- C. Air infiltration: Minimum air infiltration through assembly when tested according to ASTM E 1680
- D. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with ASTM E 1592 UL 580 for wind-uplift-resistance class indicated.
  - 1. Uplift Rating: UL 90.
    - a. Wind Loads: Minimum design wind pressure of 145Km/hour (90 mph), acting inward or outward.
  - 2. Snow Loads: 1916 Pa (40 lbf/sq. ft.).
  - 3. Deflection Limits: Metal roof panel assemblies shall withstand wind and snow loads with vertical deflections no greater than 1/240 of the span.
- E. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 49 deg C (120 deg F), ambient; 82 deg C (180 deg F), material surfaces.

### 1.5 ACTION SUBMITTALS

- A. Provide action submittals for all items in this specification section for review within a single submittal to the Government.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of roof panel and accessory.
- C. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.
  - 1. Accessories: Include details of the following items, at a scale of not less than 38 mm per 305 mm (1-1/2 inches per 12 inches):
    - a. Flashing, coping and trim.

- b. Fascia
- c. Soffit
- d. Gutters.
- e. Downspouts.
- f. Roof penetrations
  - 1) Curbs
  - 2) Ductwork with and without curbs
  - 3) Pipes
  - 4) Conduit
- g. Snow rail detention system.

D. Color Samples for Selection and Approval by Architect:

- 1. Provide manufacturer's full range of standard color samples in minimum sizes of 50 mm (2-inches) x 100 mm (4-inches).
  - a. Double-fold standing seam metal roof panels
  - b. Fascia
  - c. Soffit

E. Manufacturer Certificates: Signed by manufacturer certifying that roof panels comply with energy performance requirements specified in "Performance Requirements" Article.

- 1. Submit evidence of meeting performance requirements.

F. Qualification Data: Signed by the roof panel manufacturer certifying that each party listed complies with requirements specified in "Quality Assurance" article.

- 1. Standing seam metal roof panel manufacturer.
- 2. Standing seam metal roof system installer.

**1.6 INFORMATIONAL SUBMITTALS**

- A. Field quality-control reports.
- B. Field test reports.

**1.7 CLOSEOUT SUBMITTALS**

- A. Warranties: Provide manufacturer and installer warranties with requirements specified in "Warranties" article with submission of O&M manuals.

**1.8 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company that has been in the business of manufacturing metal roof panels specified in this section for a period of not less than 5 years

- 1. Manufacturer's Technical Representative: The manufacturer's technical representative must be thoroughly familiar with the products to be installed, installation requirements and practices, and with special considerations in the

geographical area of the project. The representative must perform field inspections and attend meetings as specified.

- B. Single Source: Roof panels and associated accessories shall be standard products of the same manufacturer to the greatest extent possible. The most recent design of the manufacturer's products shall be used to operate as a complete system of the intended use.
- C. Installer Qualifications: Metal roof installer must be approved, authorized, or licensed in writing by the roof panel manufacturer and have a minimum of three years' experience as an approved, authorized, or licensed installer with that manufacturer, approved at a level capable of providing the specified warranty. Supply the names, locations and client contact information of 5 projects of similar size and scope constructed by installer using the manufacturer's roofing products submitted for this project within the previous three years.
- D. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- E. Field Verification: Prior to the preparation of drawings and fabrication, verify location of roof framing, decking, roof openings and penetrations, and any other special conditions. Indicate all special conditions and measurements on final shop drawings.
- F. Preinstallation Conference:
  - 1. After approval of submittals and before performing roofing system installation work, hold a preinstallation conference to review the following:
    - a. Drawings, specifications, and submittals related to the roof work.
    - b. Roof system components installation.
    - c. Procedure for roof manufacturer's technical representative's onsite inspection and acceptance of the roofing substrate, the name of the manufacturer's technical representative(s), the frequency of the onsite visits, distribution of copies of the inspection reports from the manufacturer's technical representative.
    - d. Contractor's plan for coordination of the work of the various trades involved in providing the standing seam metal roofing system and other components secured to the roofing.
    - e. Quality control plan for the standing seam metal roof system installations.
    - f. Safety requirements.
  - 2. Coordinate preinstallation conference scheduling with the Contracting Officer's Representative. Attendance is mandatory for Contractor, Contracting Officer's designated personnel, personnel directly responsible for the installation of the standing seam metal roof system, flashing and sheet metal work, associated mechanical and electrical work, other trades interfacing with the roof work, and representative of the metal roofing manufacturer. Before beginning roofing work, provide a copy of meeting notes and action items to all attending parties. Note action items requiring resolution prior to start of roof work.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.
- B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.
- E. Protect foam-plastic insulation as follows:
  - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
  - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## 1.10 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements.
- B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

## 1.11 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal roof panels with rain drainage work, flashing, trim, and construction of decks, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

## 1.12 WARRANTY

- A. Provide metal roof system material and workmanship warranties meeting specified requirements. Provide revision or amendment to manufacturer's standard warrant as required to comply with the specified requirements.
- B. Metal Roof Panel Manufacturer Warranty: Furnish the metal roof panel manufacturer's 20-year no dollar limit roof system materials and installation workmanship warranty,

including flash, insulation, components, trim, and accessories necessary for a watertight roof system construction. Make warranty directly to the Government, commencing at time of Government's acceptance of the roof work. The warranty must state that:

1. If within the warranty period, the metal roof system, as installed for its intended use in the normal climatic and environmental conditions of the facility, becomes non-watertight, shows evidence of moisture intrusion within the assembly, displaces, corrodes, perforates, separates at the seams, or shows evidence of excessive weather due to defective materials or installation workmanship, the repair or replacement of the defective and damaged materials of the metal roof system and correction of defective workmanship is the responsibility of the metal roof panel manufacturer. All costs associated with the repair or replacement work are the responsibility of the metal roof panel manufacturer.
  2. If the manufacturer or his approved installer fails to perform the repairs within 48 hours of notification, emergency temporary repairs performed by others do not void the warranty.
- C. **Manufacturer's Finish Warranty:** Provided a manufacturer's no-dollar-limit 20 year warranty for the roofing system. Issue the warranty directly to the Government at the date of Government acceptance warranting that the factory color finish, under normal atmospheric conditions at the site, will not crack, peel, or delaminate; chalk in excess of a numerical rating of 8 when measured in accordance with ASTM D 4214; or fade or change colors in excess of 5 NBS units as measured in accordance with ASTM D 2244.
- D. **Metal Roof System Installer Warranty:** Provide roof system installer warranty for a period no less than two years that the roof system, as installed, is free from defects in installation workmanship, to include roof panel installation, flashing, insulation, accessories, sheet metal installation integral to a complete watertight roof system assembly. Issue warranty directly to Government. Corrections of defective workmanship and replacement of damaged or affected materials is the responsibility of the metal roof system installer. All costs associated with the repair or replacement work are the responsibility of the installer.
- E. **Continuance of Warranty:** Repair or replacement work that becomes necessary within the warranty period must be approved, as required, and accomplished in a manner so as to restore the integrity of the roof system assembly and validity of the metal roof system manufacturer warranty for the remainder of the manufacturer warranty period.

### 1.13 CONFORMANCE AND COMPATIBILITY

- A. The entire metal roofing and flashing system must be in accordance with specified and indicated requirements, including wind resistance. Work not specifically addressed and any deviation from specified requirements must be in general accordance with recommendations of the MBMA RSDM, NRCA 0405, the metal panel manufacturer's published recommendations and details, and compatible with surrounding components and construction. Submit any deviation from specified or indicated requirements to the Contracting Officer's Representative for approval prior to installation.

## **PART 2 - PRODUCTS**

### 2.1 METAL ROOF PANELS

A. Manufacturers and Products

1. Basis-of-Design Manufacturer name and product are given to clarify the designer's intent and are not intended to limit selection of similar products from acceptable manufacturers.

- a. PAC-CLAD, Peterson Aluminum; Tite-Lock Plus Panel

B. Metal Panel Systems: Double-lock (180° bend) standing seam roofing, roll formed roofing panels.

1. Material: galvanized steel
2. Thickness: 24 gauge
3. Seam Height: 51 mm (2 inches)
4. Seam Spacing: 406 mm (16 inches)
5. Color: Military Blue
6. Length: Factory form all roof panels to full length, end splicing not permitted.
7. Pan Profile: Smooth, flat pan
8. Exposed Coil-Coated Finish:

- a. 2-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

9. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

## 2.2 SLIP SHEET

A. Provide manufacturer approved non-combustible slip sheet material to meet roof panel manufacturer's warranty requirements.

1. Coverage: Provide slip sheet material over entire roof area.

## 2.3 SELF-ADHERING UNDERLAYMENT

A. Provide manufacturer approved self-adhering underlayment material to meet roof panel manufacturer's warranty.

1. Coverage: Provide self-adhering underlayment over entire roof including fascia substrate.

## 2.4 SUBSTRATE BOARDS

A. Provide manufacturer approved non-combustible substrate board to meet roof panel manufacturer's warranty.

1. Properties: Glass-Mat Gypsum Sheathing Board: ASTM C 1177.
2. Type and Thickness: Regular, 13 mm (1/2 inch).

## 2.5 METAL SOFFIT PANELS

- A. General Requirements: Metal roof panel manufacturer to provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.
1. Profile: Flat pan with vents.
  2. Color: Match roof panels
  3. Thickness: Manufacturer's standard; provide intermediate stiffening ribs as required to prevent panel sag.

## 2.6 ROOF-EDGE FLASHING

- A. Roof-Edge Fascia: Metal roof panel manufacturer to provide factory formed, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 3658 mm (12 feet) and a continuous formed- or extruded aluminum anchor bar with integral drip-edge cleat to engage fascia cover. Provide matching corner units.
1. Color: Match roof panels
  2. Thickness: Manufacturer's standard; provide intermediate stiffening ribs as required to prevent panel sag.
  3. Corner Construction: Factory mitered and mechanically clinched and sealed watertight.
  4. Splice Plate: Concealed, of same material, finish, and shape as fascia cover.

## 2.7 ACCESSORIES

- A. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, ridge closures, clips, roof penetrations (roof curbs and pipe penetrations), flashings, sealants, gaskets, fillers, closures, and similar items. Match material of metal roof panels unless otherwise indicated. Finish all accessories to match metal roof panels.
1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
  2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 25 mm (1-inch-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
  3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
- B. Flashing and Trim: Formed from same material as roof panels, prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim to match metal roof panels.



- C. Gutters: Formed from same material roof panels. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 2438 mm- (96-inch-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 914 mm (36 inches) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.
- D. Downspouts: Formed from same material as roof panels. Fabricate in 3048 mm- (10-foot-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual". Finish downspouts to match roof panels.
- E. Roof Curbs: Fabricated from same material as roof panels with bottom of skirt profiled to match roof panel profiles, and welded top box and integral full-length cricket. Fabricate curb subframing of minimum 1.5 mm- (0.0598-inch-) thick, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads, of size and height indicated. Finish roof curbs to match metal roof panels.

## 2.8 SNOW RETENTION SYSTEM

- A. Snow Retention System: Surface-mounted snow retention system with factory finished coating to match the color of the roof panels. Mounting hardware shall be U-clamps with stainless steel set screws.
  - 1. Basis-of-Design Manufacturer name and product are given to clarify the designer's intent and are not intended to limit selection of similar products from acceptable manufacturers.
    - a. Alpine SnowGuards, 289 Harrel Street, Morrisville, VT 05661 (888)-766-4273, [www.alpinesnowguards.com](http://www.alpinesnowguards.com)
      - 1) S-5! ColorGard by Metal Roof Innovations, Ltd.
  - 2. Components:
    - a. Clamps: Stainless steel clamps with stainless steel setscrews attached to the panel seam.
      - 1) Clamp Model: No. S-5-U.
    - b. Punched Cross Members: Mill-finished aluminum cross members in 2438 mm (8-foot) lengths with pre-punched slotted holes at 102 mm (4") o.c. for roof panel sizes divisible by 102 mm (4"). Include splice plates to join the cross members together ensuring continuous, unbroken protection.
      - 1) Cross Member Model: Punched ColorGard Cross Member with 1 splice plate per part.
    - c. Snow and Ice Clips: Aluminum, with rubber foot, minimum 76 mm (3 inches) wide.

- 1) Snow and Ice Clip Model: SnoClip III
  - d. Color Strip: Provide snow retention system manufacturer's standard color strip that is inserted in the downslope side of the cross member. Color strip to match color of roof panels

## 2.9 FABRICATION

- A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
  1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  2. End Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
  4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
  5. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal roof panel manufacturer for application, but not less than thickness of metal being secured.

## 2.10 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.
- B. Examine metal roof deck to verify that deck joints are supported by framing and that installation is within flatness tolerances required by metal roof panel manufacturer.
- C. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

### 3.3 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board to comply with metal roof panel manufacturer's requirements to meet metal roof panel manufacturer's warranty.

### 3.4 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated in "Self-Adhering Underlayment" Article. Unless noted otherwise by underlayment manufacturer's installation instructions, install underlayment wrinkle free, in shingle fashion to shed water, and with end laps of not less than 152 mm (6 inches) staggered 610 mm (24 inches) between courses. Overlap side edges not less than 89 mm (3-1/2 inches). Roll laps with roller. Cover underlayment within 14 days.
  - 1. Provide a second layer as flashing around roof penetrating elements for a distance from element of 457 mm (18 inches).
- B. Apply slip sheet over underlayment before installing metal roof panels. If using felt paper apply in shingle fashion to shed water, and with lapped joints of not less than 51 mm (2 inches).
  - 1. Apply over entire roof surface.
- C. Install flashings to cover underlayment to comply manufacturer's requirements to meet metal roof panel manufacturer's warranty.

### 3.5 METAL ROOF PANEL INSTALLATION, GENERAL

- A. Provide metal roof panels of full length from eave to ridge.
- B. Thermal Movement. Rigidly fasten metal roof panels to structure as required by metal panel manufacturer.

- C. Install metal roof panels, closures, ridge and hip caps as required by metal panel manufacturer.
  - 1. Field cutting of metal panels by torch is not permitted.
  - 2. Locate and space fastenings in uniform vertical and horizontal alignment.
  - 3. Flash and seal metal roof panels with weather closures at eaves, rakes, and perimeter of all openings.
  - 4. Install metal flashing to allow moisture to run over and off metal roof panels.
- D. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
  - 1. Coat back side of roof panels with bituminous coating where roof panels will contact wood, ferrous metal, or cementitious construction.
- E. Joint Sealers: Install gaskets, joint fillers, and sealants where required by metal roof panel manufacturer and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants recommended by metal roof panel manufacturer.
  - 1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.

### 3.6 METAL SOFFIT PANEL INSTALLATION

- A. In addition to complying with requirements in "Metal Roof Panel Installation, General" Article, install metal soffit panels to comply with requirements in this article.
- B. Metal Soffit Panels: Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.
  - 1. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.
- C. Metal Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

### 3.7 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
  - 1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide

concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
  2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 3048 mm (10 feet) with no joints allowed within 610 mm (24 inches) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 25 mm (1 inch deep), filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 914 mm (36 inches) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 25 mm (1 inch) away from walls; locate fasteners at top and bottom and at approximately 1524 mm (60 inches) o.c. in between.
1. Provide elbows at base of downspouts to direct water away from building as indicated on the drawings.
- E. Roof Curbs: Install curbs as required for rooftop equipment including flashing around bases where they meet metal roof panels to comply metal roof panel manufacturer's warranty.
- F. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels to comply metal roof panel manufacturer's warranty.

### 3.8 SNOW RAIL RETENTION SYSTEM INSTALLATION

- A. Install system in accordance with manufacturer's instructions and approved Shop Drawings.
1. Place clamps at spacing designated on manufacturer's shop drawings.
  2. Place clamps in straight, aligned rows.
  3. Place both set screws on same side of clamp.
  4. Tighten set screws to manufacturer's recommended torque. Randomly test set screw torque using calibrated torque wrench.
  5. Insert color-matched metal strips into cross members, staggering strips to cover cross member joints.
  6. Attach cross members to clamps; tighten bolts to manufacturer's recommended torque.
  7. Install splice connectors at cross member end joints.
  8. Do not cantilever cross members more than 76 mm (3 inches) beyond last clamp at ends.

9. Install one SnoClip per panel between panel seams.

### 3.9 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.
- C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.10 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION 074115**

## **SECTION 074213 – METAL WALL PANELS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:

1. Concealed-fastener, lap seam metal wall panels.
2. Accessories including carrier rails, hat-channel, fasters, flashings, and perimeter trim.

- B. Related Sections:

1. Section 076200 "Sheet Metal Flashing and Trim" for field-formed flashings and other sheet metal work not part of metal-faced composite wall panel assemblies.

#### **1.3 ACTION SUBMITTALS**

- A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of wall panel and accessory.

- C. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory-, shop- and field-assembled work.

1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:10):

- a. Flashing and trim.
- b. Anchorage systems.

- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Sample in first subparagraph below may be difficult to obtain if custom color is specified.
2. Metal Wall Panels: 2-inch x 3-inch color chips indicating selected finish color on actual panel material. Include fasteners, closures, and other metal wall panel accessories.

3. Trim and Closures: 12 inches (305 mm) long. Include fasteners and other exposed accessories.
4. Qualification Data: For Installer

E. Warranties: Sample of special warranties.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:
1. Wall panels and attachments.
  2. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
  3. Penetrations of wall by pipes and utilities.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal wall panels to include in maintenance manuals.
- B. Warranties: Completed manufacturer's special warranties as described in the "Warranties" Article of this specification section.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
1. Installer: Pre-Qualified Company specializing in performing the work of this Section shall install the system in strict compliance with the written "Installation Guide."
- B. Source Limitations: Obtain each type of metal wall panel from single source from single manufacturer.
- C. Installation Conference: Conduct conference at Project Site.
1. Meet with Owner, Architect, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels, including installers of doors, windows, and louvers.
    - a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    - b. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
    - c. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
    - d. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
    - e. Review temporary protection requirements for metal wall panel assembly during and after installation.



## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.
- B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage. Do not store panels horizontally. Always store vertically with top of panel down.
- C. Store covered with suitable weather tight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Remove strippable protective covering on metal wall panel just prior to panel installation.

## 1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication, and indicate measurements on Shop Drawings.

## 1.9 COORDINATION

- A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, aluminum curtainwall systems and construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

## 1.10 WARRANTY

- A. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 10 years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 PANEL MATERIALS**

- A. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required. Thickness per the requirements of the project as determined by manufacturer.
1. Surface: flat finish.
  2. Exposed Coil-Coated Finish:
    - a. Metallic Fluoropolymer: AAMA 620. 3-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).
- B. Panel Sealants:
1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
  2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

### **2.2 MISCELLANEOUS METAL FRAMING**

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 (Z180) hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Subgirts: Manufacturer's standard C- or Z-shaped sections, 0.064-inch (1.63-mm) nominal thickness.
- C. Zee Clips: 0.079-inch (2.01-mm) nominal thickness.
- D. Base or Sill Angles or Channels: 0.079-inch (2.01-mm) nominal thickness.
- E. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

### 2.3 MISCELLANEOUS MATERIALS

- A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

### 2.4 CONCEALED-FASTENER, RAINSCREEN METAL WALL PANELS

- A. General: Provide factory-formed metal wall panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using exposed fasteners in side laps. Include accessories required for weathertight installation. Single skin metal wall panels fabricated from single sheets of metal formed into a dry-joint pressure equalized rainscreen system with interlocking gutter and drainage system integral to the panel with single horizontal attachment to complete a dry-joint rainscreen assembly. The use of secondary drainage channels, brackets, support pins, joint sealants or gaskets to manage the drainage of the system are not allowed.
- B. Manufacturer and Product:
1. Basis-of-Design Manufacturer name and product are given to clarify the designer's intent and are not intended to limit selection of similar products from acceptable manufacturers.
    - a. Morin, a Kingspan Group Company; Integrity Series Wall Panels, Profile S-16
- C. Panel Description: Concealed fastener wall panel.
1. Material: Aluminum
  2. Panel Depth: 7/8-inch (22-mm)
  3. Cover Width: 16-inches (406-mm)
  4. Gauge: 18
  5. Color: As selected by Architect from manufacturer' full range of colors
    - a. Basis-of-Design Color: Morin; Bright Silver - Metallic.
- D. Formed with horizontal panel edges and formed with alternating ribs spaced across width of panel.
- E. Pre-formed Metal Corners

### 2.5 ACCESSORIES

- A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.
  2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  3. Provide pre-formed metal corners.
- B. Flashing and Trim: Formed from 0.018-inch (0.46-mm) minimum thickness, aluminum sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, fasciae, parapet caps, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.
1. Refer to Drawings for custom shapes and trim pieces to be fabricated from materials to match metal wall panels.

## 2.6 FABRICATION

- A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
  3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  4. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
  5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
  6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.
    - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

## 2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.
  - 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
  - 2. Verify that membrane air barrier has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorages according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

### **3.3 THERMAL INSULATION INSTALLATION**

- A. Rainscreen Cavity Wall Foam Plastic-Board Insulation: Extend insulation in thickness indicated to cover entire wall. Comply with installation requirements in Section 072100 "Thermal Insulation."
- B. Erect insulation horizontally and hold in place with metal furring members spaced 24 inches (610 mm) o.c. Attach furring members to substrate with screws spaced 24 inches (610 mm) o.c.
- C. Retain insulation in place by metal clips and straps or integral pockets within panels, spaced at intervals according to insulation manufacturer's instructions. Maintain cavity width between insulation and metal wall panel of dimension indicated.

### 3.4 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels according to manufacturer's written instructions and approved submittals in orientation, sizes, and locations indicated on Drawings. Install panels parallel to girts and subgirts unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Commence metal wall panel installation
  2. Shim or otherwise plumb substrates receiving metal wall panels.
  3. Flash and seal metal wall panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
  4. Install screw fasteners in predrilled holes.
  5. Locate and space fastenings in uniform vertical and horizontal alignment.
  6. Install flashing and trim as metal wall panel work proceeds.
  7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  8. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
  9. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
  10. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.
- B. Fasteners:
1. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized steel fasteners for surfaces exposed to the interior.
- C. Rainscreen-Principle Installation: Provide manufacturer's standard pressure-equalized, rainscreen-principle system factory-formed, metal plate wall panels fabricated from single sheets of metal formed with interlocking gutter and drainage system integral to the panel with single horizontal attachment to complete dry-joint rainscreen assembly. The use of secondary drainage channels, brackets, support pins, joint sealants or gaskets to manage the drainage of the system are not allowed. Attach metal plate wall panels in a progressive interlocking method by engaging bottom of panel in top of previous panel working left to right.
1. Install metal plate wall panels with single top attachment in pre-punched holes to allow individual panels to free-float. Do not fasten perimeter of panel or compromise internal gutter.
  2. Do not apply sealants to joints unless otherwise indicated on Drawings at dissimilar materials.

### 3.5 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
  2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

### 3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal plate wall panel units within installed tolerance of 1/4 inch in 20 feet, non-cumulative, on level, plumb, and location lines as indicated.

### 3.7 CLEANING AND PROTECTION

- A. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.
- B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION 074213**

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## **SECTION 076200 - SHEET METAL FLASHING AND TRIM**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

A. Section Includes:

1. Formed low-slope roof sheet metal fabrications.
2. Formed roof-drainage sheet metal fabrications.
3. Formed wall sheet metal fabrications.

#### **1.2 ACTION SUBMITTALS**

A. Product Data: For each type of product.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Distinguish between shop- and field-assembled work.
3. Include identification of finish for each item.
4. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.

#### **1.3 QUALITY ASSURANCE**

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

#### **1.4 WARRANTY**

A. Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

### **PART 2 - PRODUCTS**

#### **2.1 PERFORMANCE REQUIREMENTS**

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction.

Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

- B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure: 145Km/hour (90 mph), acting inward or outward.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Temperature Change: 49 deg C (120 deg F), ambient; 82 deg C (180 deg F), material surfaces.

## 2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 (Z275) coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
  - 1. Surface: Manufacturer's standard clear acrylic coating on both sides.
  - 2. Exposed Coil-Coated Finish:
    - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 3. Color:
    - a. Fascia: PPG – Military Blue (5ML4081)
    - b. All other: PPG – Charcoal (BN5A169B).

## 2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 0.76 mm (30 mils) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
    - b. Grace Construction Products, a unit of W. R. Grace & Co.-Conn.; Grace Ice and Water Shield HT Ultra.

- c. Owens Corning; WeatherLock Specialty Tile & Metal Underlayment.
  - 2. Thermal Stability: ASTM D 1970; stable after testing at 116 deg C (240 deg F) or higher.
  - 3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 29 deg C (20 deg F) or lower.
- B. Slip Sheet: Rosin-sized building paper, 0.16 kg/sq. m (3 lb/100 sq. ft.) minimum.

## 2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
- 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
    - b. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
  - 2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 13 mm (1/2 inch) wide and 3 mm (1/8 inch) thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

## 2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
1. Obtain field measurements for accurate fit before shop fabrication.
  2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 25 mm (1 inch) deep, filled with butyl sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
- C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal and of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- E. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

## 2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 2400-mm- (96-inch-) long sections. Furnish flat-stock gutter brackets and gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
1. Fabricate from same material roof panels. Galvanized Steel: 0.56 mm (0.022 inch) thick.
- B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.
1. Fabricate from same material roof panels. Galvanized Steel: 0.56 mm (0.022 inch) thick

## 2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Copings: Fabricate in minimum 2400-mm- (96-inch-) long, but not exceeding 3.6-m- (12-foot-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, watertight.
1. Fabricate from the Following Materials:
    - a. Galvanized Steel: 1.02 mm (0.040 inch) thick.
- B. Base Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.71 mm (0.028 inch) thick.
- C. Counterflashing and Flashing Receivers: Fabricate from the following materials:
1. Galvanized Steel: 0.56 mm (0.022 inch) thick.
- D. Roof-Penetration Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.71 mm (0.028 inch) thick.
- E. Roof-Drain Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.40 mm (0.016 inch) thick.

## 2.8 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 2400-mm- (96-inch-) long, but not exceeding 3.6-m-(12-foot-) long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 150 mm (6 inches) beyond each side of wall openings; and form with 50-mm- (2-inch-) high, end dams. Fabricate from the following materials:
1. Stainless Steel: 0.40 mm (0.016 inch) thick.

## **PART 3 - EXECUTION**

### 3.1 GENERAL

- A. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

### 3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with

end laps of not less than 150 mm (6 inches) staggered 600 mm (24 inches) between courses. Overlap side edges not less than 90 mm (3-1/2 inches). Roll laps and edges with roller. Cover underlayment within 14 days.

### 3.3    INSTALLATION, GENERAL

- A.    General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1.    Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
  2.    Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  3.    Space cleats not more than 300 mm (12 inches) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  4.    Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
  5.    Torch cutting of sheet metal flashing and trim is not permitted.
- B.    Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1.    Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
  2.    Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C.    Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 3 m (10 feet) with no joints within 600 mm (24 inches) of corner or intersection.
1.    Form expansion joints of intermeshing hooked flanges, not less than 25 mm (1 inch) deep, filled with sealant concealed within joints.
- D.    Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E.    Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F.    Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

### 3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters: Join sections with riveted and soldered joints or joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
  - 1. Install gutter with expansion joints at locations indicated, but not exceeding, 15.24 m (50 feet) apart. Install expansion-joint caps.
- C. Downspouts: Join sections with 38-mm (1-1/2-inch) telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 1500 mm (60 inches) o.c.
- D. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 100 mm (4 inches) in direction of water flow.

### 3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 100 mm (4 inches) over base flashing. Install stainless-steel draw band and tighten.
- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 100 mm (4 inches) over base flashing. Lap counterflashing joints minimum of 100 mm (4 inches).
- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with sealant and clamp flashing to pipes that penetrate roof.

### 3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 042000 "Unit Masonry."

### 3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

**END OF SECTION 076200**



## **SECTION 079200 - JOINT SEALANTS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Silicone joint sealants.
  - 2. Urethane joint sealants.
  - 3. Latex joint sealants.
  - 4. Acoustical joint sealants.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- C. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- E. Warranties: Sample of special warranties.

#### **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

## 1.7 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## 1.8 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: 2 years from date of Substantial Completion.
- C. Warranties specified in this article exclude deterioration or failure of joint sealants from the following:
  - 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
  - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
  - 3. Mechanical damage caused by individuals, tools, or other outside agents.
  - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## **PART 2 - PRODUCTS**

### **2.1 PRODUCTS AND MANUFACTURERS**

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified. Manufacturers' names and products are given to clarify the designer's intent and are not intended to limit selection of similar products from acceptable manufacturers.

### **2.2 MATERIALS, GENERAL**

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

### **2.3 SILICONE JOINT SEALANTS**

- A. (JS-1) Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
- a. Dow Corning Corporation; 799.
  - b. Polymeric Systems, Inc.; PSI-631.
  - c. Pecora Corporation; 898
  - d. Tremco Incorporated; Tremsil 600.

### **2.4 URETHANE JOINT SEALANTS**

- A. (JS-2) Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT, M, A, and O.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
- a. Pecora Corporation; Dynatrol II.
  - b. Polymeric Systems, Inc.; PSI-270.

- c. Tremco Incorporated; Dymeric 240.
- B. (JS-3) Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT, T, M, A, and O.
- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. BASF Building Systems; Sonolastic NP 2.
    - b. Pecora Corporation; Dynatred.
    - c. Tremco Incorporated; Vulkem 227.

## 2.5 LATEX JOINT SEALANTS

- A. (JS-4) Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, mildew-resistant, ASTM C 834, Type OP, Grade NF.
- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. BASF Building Systems; Sonolac.
    - b. Bostik, Inc.; Chem-Calk 600.
    - c. Pecora Corporation; AC-20+.
    - d. Schnee-Morehead, Inc.; SM 8200.
    - e. Tremco Incorporated; Tremflex 834.

## 2.6 ACOUSTICAL JOINT SEALANTS

- A. (JS-5) Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Pecora Corporation; AC-20 FTR.
    - b. USG Corporation; SHEETROCK Acoustical Sealant.

## 2.7 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O (open-cell material, not for horizontal applications) Type B (bicellular material with a surface skin, not for horizontal applications) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated,

and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

## 2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.

- c. Unglazed surfaces of ceramic tile.
  - d. Exterior insulation and finish systems.
- 3. Remove laitance and form-release agents from concrete.
- 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
  - a. Metal.
  - b. Glass.
  - c. Porcelain enamel.
  - d. Glazed surfaces of ceramic tile.
- B. **Joint Priming:** Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. **Masking Tape:** Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. **General:** Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. **Sealant Installation Standard:** Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. **Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.**
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. **Install sealants using proven techniques that comply with the following and at the same time backings are installed:**
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. **Tooling of Nonsag Sealants:** Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs

below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

F. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

### 3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
  - a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
  - b. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
2. Inspect tested joints and report on the following:
  - a. Whether sealants filled joint cavities and are free of voids.
  - b. Whether sealant dimensions and configurations comply with specified requirements.
  - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
3. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
4. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

### 3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

### 3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior and interior joints in horizontal traffic surfaces. (JS-3)
1. Joint Locations:
    - a. Isolation and contraction joints in cast-in-place concrete slabs.
    - b. Control joints between concrete slabs and foundation walls, or other slab penetrations.
    - c. Joints between different materials listed above.
    - d. Other joints as indicated.
  2. Urethane Joint Sealant: Multicomponent, nonsag, traffic grade, Class 25.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces. (JS-2)
1. Joint Locations:
    - a. Construction joints in cast-in-place concrete, non-traffic conditions.
    - b. Control and expansion joints in unit masonry.
    - c. Joints between metal panels, where indicated.
    - d. Joints at perimeter of aluminum storefront and window assemblies
    - e. Sealed joints associated with terra cotta rainscreen systems.
    - f. Joints between different materials listed above and at exterior wall penetrations through the above materials and assemblies.
    - g. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
    - h. Control and expansion joints in soffits and other overhead surfaces.
    - i. Other joints as indicated.
  2. Urethane Joint Sealant: Multicomponent, nonsag,, Class 50.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.



- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces (JS-1).
1. Joint Locations:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints of exterior openings where indicated.
    - c. Tile control and expansion joints.
    - d. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
    - e. Perimeter joints between interior wall surfaces and frames of interior doors windows, and mechanical/electrical components.
    - f. Other joints as indicated.
  2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 50.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces (JS-4).
1. Joint Sealant Location:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - b. Other joints as indicated.
  2. Joint Sealant: Acrylic latex or siliconized acrylic latex.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces (JS-5).
1. Joint Location:
    - a. Acoustical joints where indicated.
    - b. Other joints as indicated.
  2. Joint Sealant: Acoustical.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

**END OF SECTION 079200**

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## **SECTION 081613 – FIBERGLASS REINFORCED POLYESTER (FRP) DOORS WITH ALUMINUM FRAMES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:

1. Fiberglass reinforced polyester doors.
2. Aluminum frames for fiberglass reinforced polyester doors.

- B. Related Sections:

1. Division 08 Section "Glazing" for glass view panels in doors.
2. Division 08 Section "Hollow Metal Doors and Frames" for hollow metal frames.
3. Division 08 Sections "Door Hardware" and "Access Control Hardware" for door hardware.

- C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
2. ASTM B 209 - Aluminum and Aluminum-Alloy Sheet and Plate.
3. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
4. ASTM D 256 - Determining the Pendulum Impact Resistance of Notched Specimens of Plastics.
5. ASTM D 543 - Evaluating the Resistance of Plastics to Chemical Reagents.
6. ASTM D 1308 - Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
7. ASTM D 2126 - Response of Rigid Cellular Plastics to Thermal and Humid Aging.
8. ASTM D 6670-01 - Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products.
9. ASTM E 84 - Surface Burning Characteristics of Building Materials.

#### **1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, components, hardware reinforcements, profiles, and finishes.
- B. Templates: Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors.
3. Locations of reinforcement and preparations for hardware.
4. Details of each different wall opening condition.
5. Details of accessories.
6. Details of preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect.

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain doors and frames through one source from a single manufacturer wherever possible.
- B. Pre-Installation Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
- B. Store materials under cover at Project site in accordance with the manufacturer's instructions. Do not store in a manner that traps excess humidity.
1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

#### 1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

#### 1.7 COORDINATION

- A. Coordinate installation of anchorages for door frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

#### 1.8 WARRANTY

- A. Provide manufacturer's written warranty against defects in materials and workmanship upon final completion and acceptance of Work in this section. Warranty period is ten years.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Basis-of-Design Manufacturer name and products are given to clarify the designer's intent and are not intended to limit selection of similar products from acceptable manufacturers.
  - 1. CECO Door Products.
  - 2. Curries Company.
  - 3. Special-Lite.
- B. Substitutions: Material from alternate door and frame fabricators will not be accepted on jobsite without prior written and sample approval in accordance with requirements specified in Division 01.

### **2.2 MATERIALS**

- A. Aluminum: 6063-T6 hardened aluminum alloy.
- B. Fiberglass Reinforced Plastic Sheet: Thickness of .120" with the finish color for the full thickness of the sheet.
- C. Glazing: Comply with requirements in Division 08 Section, "Glazing."

### **2.3 FIBERGLASS REINFORCED POLYESTER DOORS**

- A. General: Provide 1-3/4 inch doors of type and design indicated, not less than thickness indicated; fabricated without visible joints or seams on exposed faces unless otherwise indicated.
  - 1. Design: As indicated on the drawings.
  - 2. Core Construction: Five pound density foam-in-place polyurethane core.
  - 3. Stiles and Rails: Extruded aluminum with mitered corners. Provide 3/8" diameter tie rods top and bottom.
  - 4. Faces: Fiberglass reinforced plastic sheets of .120" thickness with a pebble texture.
  - 5. Surface Applied Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6.

### **2.4 ALUMINUM FRAMES**

- A. General: Provide frames from extruded tube backer with an applied stop.
  - 1. Fabricate frames with butted ends.
  - 2. Fabricate frames with corner brackets for secure fastening.
  - 3. Stops are to be screw applied and include gasketing.
- B. Surface Applied Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6.

## 2.5 FABRICATION

- A. General: Fabricate work to be rigid and free of defects. Accurately form to required sizes and profiles.
- B. Fiberglass Reinforced Polyester Doors:
  - 1. Glazed Lites: Factory cut openings in doors with applied flush aluminum trim kit to fit.
  - 2. Top Caps: Close tops of doors flush with aluminum top caps.
- C. Aluminum Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
- D. Surface Hardware Preparation: Factory prepare work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section, "Door Hardware."
  - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
  - 2. Reinforce doors to receive non-template, mortised and surface-mounted door hardware.
  - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of work for hardware.

## 2.6 FINISHES

- A. FRP Door finish shall be:
  - 1. Light Gray.
- B. Aluminum finish for stiles and rails, light kits, and door frames shall be:
  - 1. Satin Clear.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prior to installation, check openings for squareness, alignment, twist, and plumbness.

- B. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

### 3.3 INSTALLATION

- A. General: Install work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Aluminum Frames: Install aluminum frames of size and profile indicated.
  - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. Shim as necessary to comply with installation tolerances.
  - 2. Floor Anchors: Provide floor anchors for each jamb, and secure with post-installed expansion anchors.
  - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with appropriate mortar.
- C. Fiberglass Reinforced Polyester Doors: Fit doors accurately in frames, within clearances specified below. Shim as necessary.
  - 1. Non-Fire-Rated Doors:
    - a. Jamb and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
    - b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
    - c. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).
- D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with door manufacturer's written instructions.

### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including stainless steel work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from stainless steel work immediately after installation.
- C. Remove stains and materials that will have an adverse effect on the doors and frames and restore slight blemishes in accordance with manufacturer's instructions to match original finish.

**END OF SECTION 081613**

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## **SECTION 083113 - ACCESS DOORS AND FRAMES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes:

1. Access doors and frames for walls and ceilings.
  - a. Exterior Flush Access Doors and Frames with Exposed Trim

#### **1.3 ACTION SUBMITTALS**

- A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.
- B. Product Data: For each type of access door and frame indicated.
- C. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

#### **1.4 COORDINATION**

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

### **PART 2 - PRODUCTS**

#### **2.1 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS**

- A. Manufacturers and Products

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

<b>Manufacturer</b>	<b>Framed Access Door Product Number</b>
J. L. Industries, Inc.	Model XPA
Karp Assoc., Inc.	Model MX
Larsen's Mfg Co.	Model L-XT

- B. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
  - 1. Locations: Exterior walls in standing seam Metal Panel.
  - 2. Door: Minimum 20 gauge thick sheet metal, insulated.
  - 3. Frame: Minimum 16 gauge thick sheet metal with 1-inch- (25-mm-) wide, surface-mounted trim.
  - 4. Hinges: Manufacturer's standard
  - 5. Latch(es): Dual Sided handles

## 2.2 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view, provide materials with smooth, flat surfaces without blemishes.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

## 2.3 STEEL FINISHES

- A. Factory priming: Manufacturer's standard.
- B. Field-Applied Paint Finish: Field paint all access panel doors and frames in accordance with architectural finish schedule and "Painting" in Division 9 of the specifications

## **PART 3 - EXECUTION**

### 3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

### 3.2 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer prior to field painting of finish coat(s).

**END OF SECTION 083113**

## **SECTION 083323 - OVERHEAD COILING DOORS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes:
  - 1. Electrically operated overhead coiling insulated doors.

#### **1.3 REFERENCES**

- A. NFRC 102 - Test Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems.
- B. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Element.
- C. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- D. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- E. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- F. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- G. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- I. NEMA MG 1 - Motors and Generators.
- J. NEMA 4 - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt and windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water, and hose directed water); and that will be undamaged by the external formation of ice on the enclosure.

## 1.4 PERFORMANCE REQUIREMENTS

- A. Overhead coiling insulated doors:
  - 1. Wind Loads: Design door assembly to withstand wind/suction load of 20 psf (958 Pa) without damage to door or assembly components in conformance with ASTM E 330.
  - 2. Operation: Design door assembly, including operator, to operate for not less than 20,000 cycles.
- B. Delegated Design: Design sectional doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Single Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

## 1.5 ACTION SUBMITTALS

- A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.
- B. Product Data: For each type and size of overhead coiling door and accessory. Include the following:
  - 1. Construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
  - 2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
  - 1. Include plans, elevations, sections, details, and attachments to other work.
  - 2. Included detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
  - 4. Wiring Diagrams: For power, signal, and control wiring.
- D. Color Charts for Initial Selection: Manufacturer's finish charts showing full range of standard colors and textures available for units with factory-applied finishes for selection by Architect.
- E. Delegated-Design Submittal: Manufacturer of overhead coiling doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- F. Qualification Data: For qualified Installer provide manufacturer.
- G. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.
- B. Warranties: Completed manufacturer's special warranties as described in the "Warranties" Article of this specification section.

#### 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years' experience in the fabrication and installation of security closures.
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project by the manufacturer.
- C. Source Limitations: Obtain sectional doors from single source from single manufacturer.
  - 1. Obtain operators and controls from sectional door manufacturer.
- D. 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.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened labeled packaging until ready for installation.
- B. Protect materials from exposure to moisture until ready for installation.
- C. Store materials in a dry, ventilated weathertight location.

#### 1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

#### 1.10 COORDINATION

- A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

## 1.11 WARRANTY

- A. Warranty: Manufacturer's limited door and operator system, except the counterbalance spring and finish, to be free from defects in materials and workmanship for 3 years or 20,000 cycles, whichever occurs first.
- B. Warranty: Manufacturer's limited door warranty for 2 years for all parts and components.

## **PART 2 - PRODUCTS**

### 2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer name and products are given to clarify the designer's intent and are not intended to limit selection of similar products from acceptable manufacturers.

- 1. The Overhead Door Co.; Stormtite Insulated Service Doors – Model 625.

### 2.2 INSULATED OVERHEAD COILING SERVICE DOORS

- A. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.

- 1. Flat profile type F-265i for doors up to 40 feet (12.19 m) wide.
  - 2. Front slat fabricated of 24 gauge galvanized steel.
  - 3. Back slat fabricated of 24 gauge galvanized steel.
  - 4. Slat cavity filled with CFC-free foamed-in-place, polyurethane insulation.
    - a. R-Value: 7.7, U-Value: 0.13.
    - b. Sound Rating: STC-21.

- B. Performance:

- 1. Through Curtain Sound Rating: Sound Rating: STC-28 (STC-30+ with HZ noise generator) as per ASTM E 90.
  - 2. Installed System Sound Rating: STC-21 as per ASTM E 90.
  - 3. U-factor: 0.91 NFRC test report, maximum U-factor of no higher than 1.00.

- C. Finish:

- 1. Galvanized Steel: Slats and hood galvanized in accordance with ASTM A 653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.
    - a. Polyester Top Coat.
      - 1) White polyester.
    - b. Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.

2. Heavy Duty Powder Coat Final Finish
  - a. Color: Gray.
- D. Weatherseals:
  1. Vinyl bottom seal, exterior guide and internal hood seals.
  2. Interior guide weatherseal.
  3. Lintel weatherseal.
- E. Bottom Bar:
  1. Two galvanized steel angles minimum thickness 1/8 inch (3 mm) bolted back to back to reinforce curtain in the guides.
- F. Guides: Three Structural steel angles
  1. Finish: PowderGuard Zinc Finish for guides, bottom bar and head plate.
- G. Brackets:
  1. Galvanized steel to support counterbalance, curtain, and hood.
- H. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.
- I. Hood: Provide with internal hood baffle weatherseal.
  1. 24 gauge galvanized steel with intermediate supports as required.
  2. Heavy Duty Powder Coat Final Finish: Gray
- J. Electric Motor Operation: Provide UL listed electric operator, size as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second.
  1. NEMA 4 rated enclosure.
  2. Sensing Edge Protection:
    - a. Electric sensing edge.
  3. Operator Controls:
    - a. Push-button operated control stations with open, close, and stop buttons.
    - b. Controls surface mounted.
  4. Special Operation:
    - a. Radio control operation.
    - b. 1 HP
    - c. Motor Voltage: 208 volt, three phase, 60 Hz.

- d. Auxiliary contacts: N.O./N.C., activation upon activation or open command.
- K. Locking:
- 1. Interior slide bolt lock for electric operation with interlock switch.
  - 2. Cylinder lock for electric operation with interlock switch.
- L. Wall Mounting Condition:
- 1. Face-of-wall mounting.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify opening sizes, tolerances and conditions are acceptable.
- B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

#### **3.2 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

#### **3.3 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of electrical service with Section 16150. Complete wiring from disconnect to unit components.
- F. Install perimeter trim and closures.
- G. Instruct Owner's personnel in proper operating procedures and maintenance schedule.



### 3.4    ADJUSTING

- A.    Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.
- B.    Adjust hardware and operating assemblies for smooth and noiseless operation.

### 3.5    CLEANING

- A.    Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.
- B.    Remove labels and visible markings.
- C.    Touch-up, repair, or replace damaged products before Substantial Completion.

### 3.6    PROTECTION

- A.    Protect installed products until completion of project.

**END OF SECTION 083323**

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## **SECTION 084523 – FIBERGLASS-SANDWICH-PANEL ASSEMBLIES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes:
  - 1. Prefabricated fiberglass-sandwich-panel center-ridge skylight on existing roof curb.
    - a. Flat factory prefabricated structural insulated translucent sandwich panels; with glazed endwalls.
    - b. Aluminum installation system.
    - c. Aluminum flashing.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of components.
- B. Shop Drawings: Submit shop drawings. Include elevations and details.
- C. Color Charts: Submit manufacturer's color charts showing the full range of colors available for factory finished aluminum.
- D. Samples: Submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.
  - 1. Sandwich panels: 14-inch x 28-inch units.
  - 2. Factory finished aluminum: 5 inch long sections.
- E. Certificates: Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.
- F. Product Reports: Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project
  - 1. Reports required are:
    - a. International Building Code Evaluation Report.

- b. Flame Spread and Smoke Developed (UL 723) - Submit UL Card.
- c. Burn Extent (ASTM D 635).
- d. Color Difference (ASTM D 2244).
- e. Impact Strength (UL 972).
- f. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037).
- g. Bond Shear Strength (ASTM D 1002).
- h. Beam Bending Strength (ASTM E 72).
- i. Fall Through Resistance (ASTM E 661).
- j. Insulation U-Factor (NFRC 100).
- k. NFRC System U-Factor Certification (NFRC 700).
- l. Solar Heat Gain Coefficient (NFRC or Calculations)
- m. Condensation Resistance Factor (AAMA 1503).
- n. Air Leakage (ASTM E 283).
- o. Structural Performance (ASTM E 330).
- p. Water Penetration (ASTM E 331).
- q. Class A Roof Covering Burning Brand (ASTM E 108).
- r. Daylight Autonomy.

#### 1.4 QUALITY ASSURANCE

##### A. Manufacturer's Qualifications:

1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been in successful use for 10 years or longer.
2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by 14.14.001 SLOPED TRANSLUCENT METAL SKYLIGHT SYSTEM 084523-2 an accredited agency
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC 177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.

##### B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

#### 1.5 PERFORMANCE REQUIREMENTS

##### A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.

1. When requested, include structural analysis data signed and sealed by the qualified professional engineer responsible for its preparation.

2. Standard panel system shall have less than 0.01 cfM/ft<sup>2</sup> air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
3. Structural Loads: Provide skylight system capable of handling the following loads, with L/240 deflection:
  - a. 20 PSF live load.
  - b. 25 PSF snow load.
  - c. 15 PSF wind load.
  - d. 0 PSF drift load.

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver panel system, components and materials in manufacturer's standard protective packaging.
- B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

## 1.7 WARRANTY

- A. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work, which fails in materials or workmanship within 5 years of the date of delivery. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering and defects in accessories, insulated translucent sandwich panels and other components of the work.

## **PART 2 - PRODUCTS**

### 2.1 MANUFACTURER

- A. Basis-of-Design Manufacturer name and products are given to clarify the designer's intent and are not intended to limit selection of similar products from acceptable manufacturers.
  1. Manufacturer: Kalwall Corporation
  2. Product: 2-3/4" Pre-engineered translucent center ridge skylight system.

### 2.2 PANEL COMPONENTS

- A. Face Sheets:
  1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use. a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable. b. Face sheets shall not deform, deflect or drip when subjected to fire or flame.
  2. Interior face sheets:
    - a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than

50 and smoke developed no greater than 250 when tested in accordance with UL 723.

b. Burn extent by ASTM D 635 shall be no greater than 1 inch.

3. Exterior face sheets:

a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5 degrees facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.

b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4- inch diameter, 5 lb. free-falling ball per UL 972.

4. Appearance:

a. Exterior face sheets: Smooth 0.070 inch thick and super-weathering Crystal in color.

b. Interior face sheets: Smooth 0.045 inch thick and Crystal S-171 in color.

c. Face sheets shall not vary more than  $\pm 10\%$  in thickness and be uniform in color.

B. Grid Core:

1. Thermally broken I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16 inch

2. I-beam thermal break: Minimum 1 inch, thermoset fiberglass composite.

C. Laminate Adhesive:

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".

2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.

3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:

a. 50% Relative Humidity at 680 F: 540 PSI.

b. 1820 F: 100 PSI.

c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI.

d. Accelerated Aging by ASTM D 1037 at 1820 F: 250 PSI.

## 2.3 PANEL CONSTRUCTION

- A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
1. Thickness: 2-3/4 inches.
  2. Light transmission: 30%.
  3. Solar heat gain coefficient: 0.32.
  4. Panel U-factor by NFRC certified laboratory: 2-3/4-inch thermally broken grid 0.23 "U".
  5. Complete insulated panel system shall have NFRC certified U-factor of 0.31 "U".
  6. Grid pattern: Nominal size 12-inch x 24-inch shoji grid pattern.
- B. Standard panels shall deflect no more than 1.9 inches at 30 PSF in 10 foot span without a supporting frame by ASTM E 72.
- C. Standard panels shall withstand 12000 F fire for minimum one hour without collapse or exterior flaming.
- D. Thermally broken panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.
- E. Skylight System:
1. System shall pass Class A Roof Burning Brand Test by ASTM E 108.
  2. System shall meet the fall through requirements of OSHA 1910.23 as demonstrated by testing in accordance with ASTM E 661, thereby not requiring supplemental screens or railings.

## 2.4 BATTENS AND PERIMETER CLOSURE SYSTEM

- A. Closure System:
1. Extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
  2. Skylight perimeter closures at curbs shall be factory sealed to panels.
- B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.
- C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.
- D. Finish: Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected by the Architect from manufacturer's full range of standard colors.

## 2.5 STRUCTURAL SUPPORT

- A. Center Ridge Skylight: Self-supporting Center Ridge Skylight at 19 feet outside curb dimension span shall have concealed support integral with the installation system with exposed gussets at ridge. Aluminum curb cap extrusions and flashing shall be supplied by the skylight manufacturer.
- B. The skylight manufacturer shall provide integral gabled translucent panel endwalls at exposed ends of skylight assembly.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine substrates, supporting structure and installation conditions.
- B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Metal Protection:
  - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
  - 2. Where aluminum will contact concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

### 3.3 INSTALLATION

- A. Install the panel system in accordance with the manufacturer's installation recommendations and approved shop drawings.
  - 1. Anchor component parts securely in place by permanent mechanical attachment system.
  - 2. Accommodate thermal and mechanical movements.
  - 3. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.
- B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

### 3.4 FIELD QUALITY CONTROL

- A. Water Test: Test skylight system according to procedures in AAMA 501.2.
- B. Repair or replace work that does not pass testing or that is damaged by testing and retest the work.



3.5    CLEANING

- A.    Clean the panel system inside and outside, immediately after installation.
- B.    Comply with manufacturer's written recommendations.

**END OF SECTION 084523**

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## **SECTION 087100 – DOOR HARDWARE**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. This Section includes commercial door hardware for the following:
1. Swinging doors.
  2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
1. Mechanical door hardware.
  2. Electromechanical door hardware.
  3. Automatic operators.
  4. Cylinders specified for doors in other sections.
- C. Related Sections:
1. Division 08 Section “Fiberglass Reinforced Polyester (FRP) Doors with Aluminum Frames.”
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  2. ICC/IBC - International Building Code.
  3. NFPA 70 - National Electrical Code.
  4. NFPA 80 - Fire Doors and Windows.
  5. NFPA 101 - Life Safety Code.
  6. NFPA 105 - Installation of Smoke Door Assemblies.
  7. UL/ULC and CSA C22.2 – Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
  8. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards:
1. ANSI/BHMA Certified Product Standards - A156 Series
  2. UL10C – Positive Pressure Fire Tests of Door Assemblies

### 1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
  
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  - 3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
    - h. Warranty information for each product.
  - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
  
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
  - 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
    - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    - b. Complete (risers, point-to-point) access control system block wiring diagrams.
    - c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary Integrated Wiegand Access Control Products.
  - E. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified installer of Windstorm assemblies.
  - F. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
  - G. Informational Submittals:
    1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
  - H. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- D. Integrated Wiegand, Wireless, and IP-Enabled Access Control Products Supplier Qualifications: Integrated access control products and accessories are required to be supplied and installed through current members of the ASSA ABLOY "Authorized Channel Partner" (ACP) and "Certified Integrator" (CI) programs. Suppliers are to be

factory trained, certified prior to project bid, and a direct purchaser of the specified product. Installers are to be factory trained, certified prior to project bid, and are responsible for commissioning, servicing, and warranting the installed equipment specified for the project.

- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
  - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
  - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
  - 1. Function of building, purpose of each area and degree of security required.
  - 2. Plans for existing and future key system expansion.
  - 3. Requirements for key control storage and software.
  - 4. Installation of permanent keys, cylinder cores and software.
  - 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
  - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
  - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
  - 3. Review sequence of operation narratives for each unique access controlled opening.
  - 4. Review and finalize construction schedule and verify availability of materials.
  - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

## 1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

## 1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of the hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 4. Electrical component defects and failures within the systems operation.

- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
  - 1. Ten years for mortise locks and latches.
  - 2. Seven years for heavy duty cylindrical (bored) locks and latches.
  - 3. Five years for exit hardware.
  - 4. Twenty five years for manual surface door closer bodies.
  - 5. Two years for electromechanical door hardware.

## 1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

## **PART 2 - PRODUCTS**

### 2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
- C. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

### 2.2 HANGING DEVICES

- A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
  - 1. Acceptable Manufacturers:
    - a. McKinney Products (MK).



- b. Pemko Manufacturing (PE).

### 2.3 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years' experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C. Cylinders: Original manufacturer cylinders complying with the following:
  - 1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
  - 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  - 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
  - 4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
  - 5. Keyway: Match Facility Standard.
- D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
  - 1. Non-Interchangeable Cores: Core insert usable with patented cylinders.
- E. Patented Cylinders: ANSI/BHMA A156.5, Grade 1, certified patented cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.
  - 1. Acceptable Manufacturers:
    - a. Medeco (MC) – M3 Series.
    - b. No Substitution.
- F. Keying System: Each type of lock and cylinders to be keyed by the Owner's rep, Capital Lock, Inc – 608-256-5625.
- G. Key Quantity: Provide the following minimum number of keys:
  - 1. Change Keys per Cylinder: Three (3).
  - 2. Construction Keys (where required): Ten (10).
  - 3. Construction Control Keys (where required): Two (2).
  - 4. Permanent Control Keys (where required): Two (2).
- H. Construction Keying: Provide temporary keyed construction cores.

## 2.4 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
1. Acceptable Manufacturers:
    - a. Corbin Russwin Hardware (RU) – ML2000 Series.
    - b. Sargent Manufacturing (SA) – 8200 Series.
    - c. Yale Locks and Hardware (YA) – 8800FL Series.
- B. Lock Trim Design: As specified in Hardware Sets.

## 2.5 AUXILIARY LOCKS

- A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.5, Grade 1, certified small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.
1. Acceptable Manufacturers:
    - a. Corbin Russwin Hardware (RU) - DL4100 Series.
    - b. Sargent Manufacturing (SA) - 4870 Series.
    - c. Yale Locks and Hardware (YA) - 350 Series.

## 2.6 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
  2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
  3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
- B. Standards: Comply with the following:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
  2. Strikes for Bored Locks and Latches: BHMA A156.2.
  3. Strikes for Auxiliary Deadlocks: BHMA A156.5.
  4. Dustproof Strikes: BHMA A156.16.

## 2.7 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
  2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
    - a. Fire Exit Removable Mullions: Provide keyed removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions to be used only with exit devices for which they have been tested.
  3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
  4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is not acceptable except in any case where the door light extends behind the device as in a full glass configuration.
  5. Flush End Caps: Provide heavy weight impact resistant flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.
  6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with four threaded studs for thru-bolts.
    - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets. Provided free-wheeling type trim where indicated.
    - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
  7. Vertical Rod Exit Devices: Provide and install interior surface and concealed vertical rod exit devices as Less Bottom Rod (LBR) unless otherwise indicated.
  8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
  9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
  10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
  11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Mounting rails to be formed from smooth stainless steel, brass or bronze architectural materials no less than 0.072" thick, with push rails a minimum of 0.062"

thickness. Painted or aluminum metal rails are not acceptable. Exit device latch to be investment cast stainless steel, pullman type, with deadlock feature.

1. Acceptable Manufacturers:
  - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
  - b. Sargent Manufacturing (SA) - 80 Series.
  - c. Von Duprin (VD) - 35A/98 XP Series.

## 2.8 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
2. Standards: Closers to comply with UL-10C and UBC 7-2 for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
  - a. Where closers are indicated to have mechanical dead-stop, provide heavy duty arms and brackets with an integral positive stop.
  - b. Where closers are indicated to have mechanical hold open, provide heavy duty units with an additional built-in mechanical holder assembly designed to hold open against normal wind and traffic conditions. Holder to be manually selectable to on-off position.
  - c. Where closers are indicated to have a cushion-type stop, provide heavy duty arms and brackets with spring stop mechanism to cushion door when opened to maximum degree.
  - d. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics. Provide drop plates or other accessories as required for proper mounting.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt or security type fasteners as specified in the door Hardware Sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Acceptable Manufacturers:
  - a. Corbin Russwin Hardware (RU) - DC8000 Series.
  - b. Sargent Manufacturing (SA) - 351 Series.
  - c. Norton Door Controls (NO) - 7500 Series.

## 2.9 ARCHITECTURAL TRIM

### A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Metal Protection Plates: ANSI/BHMA A156.6 certified metal protection plates (kick, armor, or mop), beveled on four edges (B4E), fabricated from the following:
  - a. Stainless Steel: 300 series, .050-inch thick, with countersunk screw holes (CSK).
4. Fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets.
5. Metal Door Edging: Door protection edging fabricated from a minimum .050-inch thick metal sheet, formed into an angle or "U" cap shapes, surface or mortised mounted onto edge of door. Provide appropriate leg overlap to account for protection plates as required. Height to be as specified in the Hardware Sets.
6. Acceptable Manufacturers:
  - a. Rockwood Manufacturing (RO).
  - b. Trimco (TC).

## 2.10 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- C. Acceptable Manufacturers:
  1. National Guard Products (NG).
  2. Pemko Manufacturing (PE).
  3. Reese Enterprises, Inc. (RS).

## 2.11 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

## 2.12 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

### 3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

### 3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
  - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
  3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
  4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

### 3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

### 3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

### 3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

### 3.8 DOOR HARDWARE SCHEDULE

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. Manufacturer's Abbreviations:
- 2. PE - Pemko
  - 4. RO - Rockwood
  - 5. SI - Simplex
  - 6. MC - Medeco
  - 8. NO - Norton
  - 9. BO - Bommer
  - 10. 00 - Other

#### Hardware Schedule

##### Set: 1.0

1 Continuous Hinge (AL Doors)	<a href="#">CFM83SLIHD3 x Height Required</a>	CL	PE	
1 Storeroom CIPHR Lock	<a href="#">8148 Less Cylinder</a>	US26D	SI	
1 Removable Core	33N700006	26	MC	
1 Door Closer	<a href="#">CPS7500</a>	626	NO	w/ Hold Open and Integral Stop on Push Side of Door
1 Threshold	<a href="#">2009APKx Width</a>		PE	
1 Overhead Rain Drip	<a href="#">346C 4" plus Door width</a>		PE	
1 Gasketing	<a href="#">312CR LAR</a>		PE	
1 Sweep	<a href="#">315CN x Width</a>		PE	



**Set: 2.0**

2 Double Acting Spring Tension (AL Doors)	<a href="#">7113</a>	CL	BO
2 Door Push/Pull	<a href="#">RM2150 – 48”</a>	US26D	RO
1 Sweep	<a href="#">315CN x Width</a>		PE

**Set: 3.0**

1 All hardware	By door manufacturer		00
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**END OF SECTION 087100**

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## **SECTION 088400 – PLASTIC GLAZING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Impact, abrasion & UV resistant polycarbonate glazing
    - a. For vertical glazing applications at exterior walls.

#### **1.3 ACTION SUBMITTALS**

- A. General: Provide all action submittals in this specification section as separate line items within a single submittal to the Government for review. Submission of the action submittals separately will be deemed incomplete and rejected.
- B. Product Data: Catalog sheets, specifications, glazing details, and installation instructions for each type of sheet materials, and glazing materials specified.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors.
  - 1. Provide only color samples in shades of BLUE.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. O&M Data to be include in maintenance manuals.
- B. Warranties: Completed manufacturer's special warranties as described in the "Warranties" Article of this specification section

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver polycarbonate sheets on enclosed pallets.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store in dry, well-ventilated and covered areas at temperatures below 80 degrees F
- D. Handle polycarbonate sheets carefully to prevent damage; do not drop, slide, or drag. Avoid scratching or marring surfaces.

## 1.6    WARRANTY

- A.    Manufacturer's Special Warranty: Ten-year warranty against breakage, yellowing, loss of light transmission and coating delamination.

## **PART 2 - PRODUCTS**

### 2.1    MAUNFACTURER:

- A.    Basis-of- Design Manufacturer and Products Manufacturer names and products are given to clarify the designer's intent and are not intended to limit selection of similar products from acceptable manufacturers.

- 1.    Manufacturer: GE Structured Products
- 2.    Product: LEXAN MR-10

- B.    Characteristics:

- 1.    Abrasion& UV Resistant Plastic Glazing: Solid polycarbonate sheet with a silicone abrasion resistant coating and the following:
  - a.    Abrasion Resistant Coating: Interior and exterior sides.
  - b.    Thickness: 0.500 inches (12.7 mm).
  - c.    Color: Custom color (dark blue).

### 2.2    GLAZING GASKETS

- A.    Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM or silicone gaskets complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal.

### 2.3    GLAZING SEALANTS

- A.    General:

- 1.    Compatibility: Provide glazing sealants that are compatible with one another and with other materials they contact, including plastic glazing products and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- 2.    Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
- 3.    Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

### 2.4    FABRICATION

- A.    Sizes: Fabricate plastic glazing to sizes required for openings indicated. Allow for thermal expansion and contraction of plastic glazing without restraint and without withdrawal of edges from frames, with edge clearances and tolerances complying with plastic glazing manufacturer's written instructions.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Prior to start of installation, inspect existing conditions to ensure surfaces are suitable for installation of plastic glazing. Starting work indicates installers' acceptance of existing conditions.

### **3.2 INSTALLATION**

- A. Installation: Comply with manufacturer's installation instructions including but not limited to the following:
  - 1. Clean contact surfaces with material recommended by manufacturer.
  - 2. Remove factory-applied protective masking to allow engagement at edges.
  - 3. Cut material as recommended by manufacturer; sand edges smooth after cutting.
  - 4. Attach using mechanical and non-mechanical methods as recommended by the manufacturer for the particular application.
  - 5. Remove protective masking after glazing work is complete.

### **3.3 CLEANING AND PROTECTION**

- A. Cleaning: Use non-abrasive materials and methods acceptable to the manufacturer.
- B. Protection: Protect from damage during construction operations. Promptly repair any damaged or deteriorated surfaces

**END OF SECTION 088400**

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## **SECTION 089000 - LOUVERS AND VENTS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Drainable exterior wall-mounted HVAC louvers.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of louver, vent and accessory indicated.
- B. Shop Drawings: Show layouts of louver and vents in conjunction with metal wall panels, including plans, elevations, sections, details, and attachments metal wall panels and other work.

### **PART 2 - PRODUCTS**

#### **2.1 GENERAL**

- A. Reference mechanical drawings for basis-of-design manufacturers and products for louver types, size, material, air performance, accessories such as types of screens, blank-off panels, etc.

#### **2.2 FINISHES**

- A. Reference mechanical drawings for louver finish.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible.
- C. Protect metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

**END OF SECTION 089000**

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## **SECTION 096723 – SLIP-RESISTANT RESINOUS FLOORING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
1. Preparation of cast-in-place concrete floor for installation of slip-resistant resinous flooring system.
  2. Installation of industrial seamless epoxy/urethane slip-resistant resinous floor system and associated concrete joint filler.

#### **1.3 REFERENCES**

- A. Comply with the version of the following references used for basis-of-design product(s) or a more current version.
- B. ASTM INTERNATIONAL (American Society for Testing and Materials)
1. ASTM C 307: Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing
  2. ASTM C 531: Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing, and Polymer Concretes.
  3. ASTM C 579: Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
  4. ASTM C 679: Tack-Free Time of Elastomeric Sealants.
  5. ASTM C 884/C 884M: Thermal Compatibility between Concrete and Epoxy-Resin Overlay.
  6. ASTM D 1308: Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
  7. ASTM D 2240: Standard Test Method for Rubber Property – Durometer Hardness.
  8. ASTM D 262: Infrared Identification of Vehicle Solids from Solvent-Reducible Paints.
  9. ASTM D 2697: Standard Test Method for Volatile Contents of Coatings.
  10. ASTM D 3335: Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy.
  11. ASTM D 3718: Low Concentrations of Chromium in Paint by Atomic Absorption Spectroscopy.
  12. ASTM D 3925: Sampling Liquid Paints and Related Pigmented Coatings.
  13. ASTM D 412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
  14. ASTM D 4541: Pull-Off Strength of Coatings Using Portable Adhesion Testers.

15. ASTM D 4060: Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
16. ASTM D 6237: Painting Inspectors (Concrete and Masonry Substrates).
17. ASTM D 638: Standard Test Method for Tensile Properties of Plastics.
18. ASTM E 11: Wire Cloth and Sieves for Testing Purposes.
19. ASTM F 1869: Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

C. INTERNATIONAL CONCRETE REPAIR INSTITUTE (ICRI)

1. ICRI 03732: Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays

D. THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

1. SSPC-TU 2: Design, Installation, and Maintenance of Coating Systems for Concrete Used in Secondary Containment.

E. U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

1. 29 CFR 1910.1000: Air Contaminants
2. 29 CFR 1910.134: Respiratory Protection
3. 29 CFR 1926.59: Hazard Communications

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. Concrete Guidelines: Submit recommendations for correct preparation, finishing and testing of concrete subfloor surfaces to receive floor system.
- C. Color Chart: Manufacturer's color chart with full range of standard solid colors for selection by Government.
- D. Applicator Qualifications
  1. Pre-Qualification: Each offeror for this project shall be pre-qualified and approved in writing by the material manufacturer at the time product submittal.
  2. Applicator Experience: Contractor shall submit a list of three projects (with contact information) of similar size, scope and complexity. Contractor shall submit Letter attesting that Floor Contractor and Field Personnel have been properly trained to perform work per specifications and contract.

E. Sample Warranty

1.5 INFORMATIONAL SUBMITTALS

- A. Concrete Moisture Test Reports.
- B. Resinous Flooring Adhesion Test Reports.

## 1.6 CLOSEOUT SUBMITTALS

- A. Provide maintenance data for slip-resistant resinous flooring system as part of the Operation and Maintenance Manual as specified in Section 017823
- B. Provide manufacturer warranties with requirements specified in the "Warranty" article of this specification section as part of the Operation and Maintenance Manual as specified in Section 017823.

## 1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Manufacturer must have been in business for a minimum of (10)-ten years. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials
- B. Flooring System Installer's Qualifications:
  - 1. Minimum requirements for the installation contractor are as follows. Completed three or more projects of similar size, scope and complexity within the last two years. Submit documentation listing location of work, point of contact at job site, total square footage of applied materials, and listing of both materials and equipment used.
    - a. The flooring installer's qualifications must include successful completion of the flowing work performed on the resinous flooring installations.
      - 1) Prepping the concrete floor surface via diamond grinding. Shot blasting is not permitted.
      - 2) Routing out joints as required by the material manufacture including repair of floor joints, cracks, and spalling.
      - 3) Application of the entire resinous floor system.
      - 4) Installation of all joint sealants.
- C. Mockups: Apply mockups to verify selections made and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Apply full-thickness mockups on 120-inch- (3000-mm-) square floor area selected by the Contracting Officer's Representative.
  - 2. Simulate finished lighting conditions for the Contracting Officer's Representative review of mockups.
- D. Preinstallation Conference: Conduct conference at Project site with the Contracting Officer's Representative, General Contractor's Project Superintendent, Installer's Project Manager, Installer's Project Superintendent, and Manufacturer's Field Representative.

## 1.8 ENVIRONMENTAL CONDITIONS

- A. Permanent heat, light and ventilation shall be installed and operating during and after installation. Environmental temperatures must average a minimum of 65 degrees Fahrenheit for one full week proceeding, throughout, and 72 hours following application. Do not apply materials if relative humidity is above 85% (percent) or within 5° (3°) of dew point at time of application.

## 1.9 COATING HAZARDS

- A. Ensure that employees are trained in all safety plan aspects. Follow the coating manufacturer's written safety precautions throughout mixing, application, and curing of coatings. Comply with respiratory protection in 29 CFR 1910.135 and safe levels of airborne contaminants in 29 CFR 1910.1000.

## 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."
- B. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, batch or lot number, and date of manufacture. Do not store materials in direct sunlight.
- C. Storage:
  - 1. Store between 55-75°F (10°-25°C), do not store in direct sunlight or high heat conditions.
  - 2. Keep containers sealed until ready for use.
- D. Handling: Protect materials during handling and application to prevent damage or contamination.
- E. Condition materials for use to 60°-70°F (15-21°C) for 24 hours prior to application.

## 1.11 PATCH TEST DEMONSTRATION

- A. Prior to the submitted flooring system's approval, apply the complete flooring system to a 10 foot by 10 foot- (3 meter by 3 meter-) square concrete section as prepared in accordance with Part 3 "EXECUTION." Within this area, perform three adhesion tests using procedures as detailed in the Article entitled "ADHESION TESTING." If adhesion testing produces cohesive failures within the concrete, no less than 40 mils- (1 mm-) mils concrete removed over 95 percent of each pull-off coupon, and/or adhesion more than 400 psi- (2.75 MPa-), patch test adhesion is acceptable. If concrete surface preparation was insufficient, apply an additional coating system patch to properly prepared concrete followed by the above adhesion testing. If adhesion results are unacceptable for both the topcoat and the coatings below the grout coat, submit a new coating system manufactured by a different coating vendor. Apply new coating system to a patch and subject this patch to the above requirements for adhesion prior to approval. If customer dislikes non-skid application, adjustments to the specifications can be made. Grit additive is not permitted for non-skid floor. Immediately following "passing" adhesion results, remove urethane topcoats and grout coat by sanding, repair patch test holes

using epoxy mortar. Coarse scarification and/or pneumatic scabbling can be required to remove patch tests failing to meet adhesion requirements.

#### 1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of resinous flooring system that fail in materials or workmanship within specified warranty period.
  - 1. Special warranty includes but is not limited to system failures such as blisters (chemical), checks, softening, or lifting.
  - 2. Warranty Period: 5 years from date of Substantial Completion.

### **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer name and products are given to clarify the designer's intent and are not intended to limit selection of similar products from acceptable manufacturers.
  - 1. Manufacturer: Sika Corp., Industrial Flooring

#### 2.2 RESINOUS FLOORING MATERIALS

- A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, industrial-aggregate-filled, resin-based, monolithic floor surfacing designed to produce a seamless floor.
- B. System Characteristics:
  - 1. Wearing Surface: Textured for slip resistance.
  - 2. Finish: High gloss.
- C. Primer: Sikafloor® 107 Primer
  - 1. 100% solids, two component, low modulus, low viscosity primer.
  - 2. Apply at manufacturer's recommended thickness.
- D. Intermediate Wear Coat: Sikafloor® 264
  - 1. Hardness-Shore D: (ASTM D2240) 76 (7 days)
  - 2. Pull-Off Strength: (ASTM D4541) > 400 psi (2.76 MPa) (100% concrete failure)
  - 3. Flexural Strength: (ASTM C580) 2,900 psi (20 N/mm<sup>2</sup>) (28 days)
  - 4. Compressive Strength: (ASTM C579) 7,250 psi (50 N/mm<sup>2</sup>) (28 days)
  - 5. VOC Content: (ASTM D2369) ≤ 50 g/L
  - 6. Apply at manufacturer's recommended thickness.
  - 7. Sikafloor® 264 Color: Applicator to coordinate pigmented solid color intermediate and sealer coating with manufacturer such that coating does not compromise finish color Sikafloor® 315 topcoat.
- E. Broadcast Coat: Natural silica sand.

1. Provide natural silica sand approved by the resinous flooring manufacturer.
2. Coverage: Broadcast surface to saturation.

F. Sealer Coat: Sikafloor® 264

1. Hardness-Shore D: (ASTM D2240) 76 (7 days)
2. Pull-Off Strength: (ASTM D4541) > 400 psi (2.76 MPa) (100% concrete failure)
3. Flexural Strength: (ASTM C580) 2,900 psi (20 N/mm<sup>2</sup>) (28 days)
4. Compressive Strength: (ASTM C579) 7,250 psi (50 N/mm<sup>2</sup>) (28 days)  
VOC Content: (ASTM D2369) ≤ 50 g/L
5. Apply at manufacturer's recommended thickness.
6. Sikafloor® 264 Color: Applicator to coordinate pigmented solid color intermediate and sealer coatings with manufacturer such that coating does not compromise finish color Sikafloor® 315 topcoat.

G. Abrasion Resistant Aliphatic Polyurethane: Sikafloor® 315

1. Abrasion Resistance: (ASTM D4060); CS-17 Wheels 10-20 mgs./1,000 cycles (Taber Abraser , 1,000 gm load)
2. Hardness (ASTM D-3363 Pencil) 2H to 3H
3. Adhesion – Primed Concrete 350 psi (2.4 MPa) – concrete failure
4. Gloss (60°) 60-70
5. Coefficient Of Friction: (ASTM 2047) .60-.70
6. Dry Film Thickness: 2.88 mils @ 3.2 wet mil application thickness
7. Tensile Strength: (ASTM D2370) 2882 psi
8. Percent Elongation: (ASTM D2370) 2.29
9. Sikafloor® 315 Color: As selected by Contracting Officer's Representative from manufacturer's full range of standard colors.

## 2.3 ACCESSORIES

A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

B. Joint Material at Exposed Joints:

C. Joint Filler

1. Basis-of-Design Manufacturer name and products are given to clarify the designer's intent and are not intended to limit selection of similar products from acceptable manufacturers.
2. Manufacturer: Sika Corp., Industrial Flooring
3. Materials: As recommended by flooring system manufacturer.
  - a. Color: As selected by Contracting Officer's Representative from manufacturer's full range of standard colors.

## **PART 3 - EXECUTION**

### 3.1 GENERAL

- A. The resinous flooring installation shall not be performed no sooner than 30 days prior to substantial completion. The General Contractor shall provide tempered conditions in the room(s) to receive the resinous flooring system which comply with the minimum and maximum requirements for air temperature and humidity. The tempered conditions shall be maintained by the General Contractor for no less than 48 hours prior to the resinous floor system installation and no less than 48 hours after the installation is completed.

### 3.2 EXAMINATION

- A. Examine surfaces to receive resinous flooring. Notify General Contractor if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected (including fins, bugholes, curing compounds, cracks, skimming materials, slab exceeds 1/8" in 10', contaminants from other trades, etc.)
- B. Conduct Moisture Tests on the concrete slab utilizing a Tramex moisture meter. Do not proceed until the readings are 6% or less. Consult the manufacturer if readings exceed 6%.
- C. Do not apply to asphaltic or bitumen membranes, glazed or vitrified brick and tile, soft wood, aluminum, copper or fiberglass reinforced polyester/vinyl ester composites.

### 3.3 SURFACE PREPARATION

- A. Prepare concrete substrate in accordance with International Concrete Repair Institute (ICRI) Technical Guideline No. 03732 to CSP 3. Prepared surface shall be free of laitance and other bond-inhibiting contaminants.
- B. Roughen concrete substrates via diamond grinding. Use of shot-blast equipment is not permitted in this Government facility.

### 3.4 CONTROL JOINTS, CRACKS

- A. Provide repair and treatment of control joints and surface cracks utilizing manufacturer's standard materials and installation details.
- B. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

### 3.5 APPLICATION

- A. Repair concrete substrate as required using materials approved by the Manufacturer.
- B. Do not add thinners to materials. No thinners shall be approved or allowed.
- C. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum inter-coat adhesion.
  2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.

3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- D. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- E. Apply intermediate wear coats in thickness indicated for flooring system.
  1. Broadcast aggregates at rate recommended by manufacturer and, after resin is cured, remove excess aggregates to provide surface texture indicated.
- F. Apply sealer coats to fill voids in surface of final intermediate wear coat and to produce wearing surface indicated.
- G. Apply abrasion resistant topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

### 3.6 FIELD QUALITY CONTROL

- A. Core Sampling: At the direction of manufacturer's field service representative and at locations designated by manufacturer's field representative (as coordinated with Contracting Officer's Representative), take one core sample per 1000 sq. ft. (92.9 sq. m) of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring and correct deficiencies.
- B. Adhesion Testing
  1. Perform a minimum of three modified adhesion tests (ASTM D 4541) on the topcoat no less than forty-eight hours following application. Select three random flooring locations spaced a minimum of 20 feet between each location.
  2. Vertically core completely through the epoxy mortar flooring system and a minimum of 3/8 inch into concrete using a suitable drill fitted with a 1 inch diameter core bit.
  3. Throughout coring, employ a best effort to attempt to avoid fracturing and/or overheating both the mortar system and concrete as improper coring can affect adhesion results.
  4. Adhere directly to each cored surface's center a 3/4 inch diameter pull-off coupon.
  5. Lightly sand test area flooring surface prior to attaching pull-off coupons containing a grit-blasted anchor profile. When pull-off coupon adhesive has sufficiently cured, test adhesion and evaluate results.
  6. If testing produces cohesive failures within the concrete, no less than 40 mils concrete removal over 95 percent of each pull-off coupon, and/or adhesion more than 400 psi mortar system's adhesion is acceptable.
  7. If the above requirements are not satisfied, then perform one adhesion test per 100 square feet using the above procedures. Two additional tests will confirm results for each non-compliant area.
  8. Remove and rework all areas unable to meet adhesion requirements to sound material. Fill core holes using primer, sand-filled epoxy mortar, and urethane topcoat. Finish resulting repairs flush with adjacent coatings, displaying an equivalent appearance.



### 3.7    CLEANUP

- A.    Remove masking, draping, and other protection from adjacent surfaces.
- B.    Remove remaining materials and debris from job site and dispose of them in according with local rules and regulations. Leave area in clean condition free of debris.

### 3.8    PROTECTION

- A.    Erect suitable barriers and post legible signs at points of entry to prevent traffic and trades from entering the work area during application and cure period of the floor. Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor. No other trades are to be allowed on floor until it is accepted in writing by Contracting Officer's Representative at Substantial Completion of all interior work of the project.

**END OF SECTION 096723**

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## **SECTION 099113 – EXTERIOR PAINTING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Section includes:

1. The surface preparation and the application of paint systems on the following exterior substrates:
  - a. Concrete.
  - b. Steel.
  - c. Galvanized metal.
  - d. Wood.

#### **1.3 ACTION SUBMITTALS**

- A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.
- B. Product Data: For each type of product indicated.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.
1. Submit Samples on rigid backing, 200 mm (8 inches) square.
  2. Step coats on Samples to show each coat required for system.
  3. Label each coat of each Sample.
  4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

#### **1.4 QUALITY ASSURANCE**

- A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less 7 deg C (45 deg F).
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

## 1.6 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 10 and 35 deg C (50 and 95 deg F).
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 3 deg C (5 deg F) above the dew point; or to damp or wet surfaces.

## 1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
  - 1. Quantity: Furnish an additional 5 percent, but not less than 3.8 L (1 gal.) of each material and color applied.

## **PART 2 - PRODUCTS**

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers' products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Hallman Lindsay
  - 2. Sherwin-Williams Company (The)
  - 3. Benjamin Moore & Co.

### 2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: See Architectural Finish Schedule

## 2.3 PRIMERS/SEALERS

- A. Alkali-Resistant Primer: MPI #3.
  - 1. VOC Content: E Range of E1.
- B. Bonding Primer (Solvent Based): MPI #69.
  - 1. VOC Content: E Range of E1.
- C. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint system indicated.

## 2.4 METAL PRIMERS

- A. Alkyd Anticorrosive Metal Primer: MPI #79.
  - 1. VOC Content: E Range of E1.
- B. Quick-Drying Alkyd Metal Primer: MPI #76.
  - 1. VOC Content: E Range of E1.

## 2.5 WOOD PRIMERS

- A. Exterior Alkyd Wood Primer: MPI #5.
  - 1. VOC Content: E Range of E2.
- B. Exterior Oil Wood Primer: MPI #7.
  - 1. VOC Content: E Range of E2.

## 2.6 EXTERIOR ALKYD PAINTS

- A. Exterior Alkyd Enamel (Flat): MPI #8 (Gloss Level 1).
  - 1. VOC Content: E Range of E1.
- B. Exterior Alkyd Enamel (Semigloss): MPI #94 (Gloss Level 5).
  - 1. VOC Content: E Range of E1.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMU): 12 percent.
  - 3. Wood: 15 percent
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
  - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
  - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible printers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.

2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
  1. Use applicators and techniques suited for paint and substrate indicated.
  2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

### 3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Government reserves the right to invoke the following procedure at any time and as often as Government deems necessary during the period when paints are being applied:
  1. Government will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
  2. Testing agency will perform tests for compliance of paint materials with product requirements.
  3. Government may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Contracting Officer's Representative, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.6 EXTERIOR PAINTING SCHEDULE

#### A. Concrete Substrates

- 1. Clear Sealer System: MPI EXT 3.2G.
  - a. Prime Coat: Interior/exterior clear concrete floor sealer (solvent based).
  - b. Intermediate Coat: Interior/exterior clear concrete floor sealer (solvent based).
  - c. Topcoat: Interior/exterior clear concrete floor sealer (solvent based).

#### B. Steel Substrates:

- 1. Alkyd System: MPI EXT 5.1D.
  - a. Prime Coat: Alkyd anticorrosive metal primer.
  - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
  - c. Topcoat: Exterior alkyd enamel (semigloss).

#### C. Galvanized-Metal Substrates:

- 1. Alkyd System: MPI EXT 5.3B.
  - a. Prime Coat: Cementitious galvanized-metal primer.
  - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
  - c. Topcoat: Exterior alkyd enamel (semigloss).

#### D. Dressed Lumber Substrates: Including architectural woodwork, doors.

- 1. Alkyd System: MPI EXT 6.3B.
  - a. Prime Coat: Exterior alkyd wood primer.
  - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
  - c. Topcoat: Exterior alkyd enamel (semigloss).

**END OF SECTION 099113**



## **SECTION 099123 – INTERIOR PAINTING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes:

1. Surface preparation and application of paint systems on the following interior substrates.
  - a. Concrete masonry units (CMU)
  - b. Steel
  - c. Galvanized metal
  - d. Wood

#### **1.3 ACTION SUBMITTALS**

- A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.
- B. Product Data: For each product indicated.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
  1. Submit Samples on rigid backing, 200 mm (8 inches) square.
  2. Step coats on Samples to show each coat required for system.
  3. Label each coat of each Sample.
  4. Label each Sample for location and application.
- D. Product List: For each product indicated, including the following:
  1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  2. Printout of current "MPI" Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

#### **1.4 QUALITY ASSURANCE**

- A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

## 1.6 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 10 and 35 deg C (50 and 95 deg F).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 3 deg C (5 deg F) above the dew point; or to damp or wet surfaces.

## 1.7 EXTRA MATERIALS

- A. Furnish extra materials described below are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
  - 1. Quantity: Furnish an additional 5 percent, but not less than 3.8 L (1 gal) of each material and color applied.

## **PART 2 - PRODUCTS**

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers' products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Hallman Lindsay
  - 2. Sherwin Williams Company (The)
  - 3. Benjamin Moore & Co.

### 2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: See Architectural Finish Schedule.

### 2.3 BLOCK FILLERS

A. Interior/Exterior Epoxy Block Filler: MPI #116

1. VOC Content: E Range of E1.

### 2.4 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

1. VOC Content: E Range of E2.

B. Interior Alkyd Primer/Sealer: MPI #45.

1. VOC Content: E Range E2.

C. Interior Low Permeability Latex Primer/Sealer: MPI #61. (Vapor Barrier)

1. VOC Content: E Range E2.

D. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

### 2.5 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

1. VOC Content: E Range of E2.

### 2.6 WOOD PRIMERS

A. Interior Latex-Based Wood Primer: MPI #39.

1. VOC Content: E Range of E2.

### 2.7 LATEX PAINTS

A. Interior Latex (Eggshell): MPI #52 (Gloss Level 3).

1. VOC Content: E Range of E2.

B. Interior Latex (Satin): MPI #43 (Gloss Level 4).

1. VOC Content: E Range of E2.

### 2.8 EPOXY, HIGH-BUILD, LOW GLOSS

A. Epoxy, high-build, low gloss: MPI #108

### 2.9 ALKYD PAINTS

A. Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5).

1. VOC Content: E Range of E2.

## 2.10 ALIPHATIC COATING

- A. Aliphatic Finish Glaze Coat: MPI #174.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  1. Wood: 15 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
  1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
  2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
  1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Cementitious Materials: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

- E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Sand surfaces that will be exposed to view, and dust off.
  - 3. Prime edges, ends, faces, undersides, and backsides of wood.
  - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind moveable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 3. Paint from and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
  - 1. Mechanical Work:
    - a. Uninsulated metal piping.
    - b. Uninsulated plastic piping.
    - c. Pipe hangers and supports.
    - d. Tanks that do not have factory-applied final finishes.
    - e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
    - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

- g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
2. Electrical Work:
- a. Switchgear.
  - b. Panelboards.
  - c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

### 3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Architect reserves the right to invoke the following procedures at any time and as often as Architect deems necessary during the period when paints are being applied:
- 1. The Contractor will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
  - 2. Testing agency will perform tests for compliance with product requirements.
  - 3. Architect may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

### 3.5 CLEANING AND PROTECTION

- A. At the end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Contracting Officer's Representative, and leave in an undamaged condition.
- D. At completion of construction activities or other trades, touch up and restore damaged or defaced painted surfaces.

### 3.6 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
- 1. Institutional Low-Odor/VOC Latex System: MPI INT 3.1M.
    - a. Prime Coat: Institutional low-odor/VOC interior latex matching topcoat.
    - b. Intermediate Coat: Epoxy, matching topcoat.

- c. Topcoat: Epoxy, high-build, semi-gloss.
- B. CMU Substrates:
  - 1. Epoxy finish for wet environments:
    - a. Prime Coat: Interior/exterior epoxy block filler.
    - b. Intermediate Coat: Epoxy, high-build, low gloss, matching topcoat.
    - c. Topcoat: Epoxy, high-build, low gloss.
- C. Steel Substrates:
  - 1. Prime Coat: Alkyd anticorrosive metal primer.
  - 2. Intermediate Coat: Interior alkyd matching topcoat.
  - 3. Topcoat: Interior alkyd semigloss.
- D. Galvanized-Metal Substrates:
  - 1. Prime Coat: Cementitious galvanized-metal primer.
    - a. Prime Coat: Cementitious galvanized-metal primer.
    - b. Intermediate Coat: Interior alkyd matching topcoat.
    - c. Topcoat: Interior alkyd semigloss.
- E. Dressed Lumber Substrates: Including architectural woodwork, doors and wall base.
  - 1. Alkyd System: MPI INT 6.3B.
    - a. Prime Coat: Interior alkyd primer/sealer.
    - b. Intermediate Coat: Interior alkyd semigloss.
    - c. Topcoat: Interior alkyd semigloss.

**END OF SECTION 099123**

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## **SECTION 104413 - FIRE EXTINGUISHER CABINETS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes:
1. Semi-recessed fire extinguisher cabinets.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data.

### **PART 2 - PRODUCTS**

#### **2.1 FIRE-PROTECTION CABINETS**

- A. Manufacturers:
1. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:
    - a. Larsen; MP10 (4.54 klg (10 lb.) multi-purpose fire extinguisher).
  2. Color: Red
  3. Trim Style: Square trim semi-recessed.
  4. Door and Trim Material: Enameled steel.
  5. Door Glazing: Tempered float glass.
  6. Door Style: Vertical duo.
  7. Accessories: Mounting brackets Identification lettering.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install cabinets at 1372 mm (54 inches) above finished floor to top of cabinet.
- B. Identification: Apply decal(s) in white lettering to door with letters reading "FIRE EXTINGUISHER" vertically top to bottom.

### **END OF SECTION 104413**

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## **SECTION 104416 - FIRE EXTINGUISHERS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes:
  - 1. Portable fire extinguishers.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data.

#### **1.4 QUALITY ASSURANCE**

- A. Fire Extinguishers: NFPA 10 listed and labeled for the type, rating, and classification of extinguisher.

### **PART 2 - PRODUCTS**

#### **2.1 FIRE EXTINGUISHERS AND BRACKETS**

- A. Portable Fire Extinguishers:
  - 1. Multipurpose Dry-Chemical Type: UL-rated 4-A:60-B:C, 4.54 kg (10-lb) nominal capacity.
- B. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for fire extinguishers indicated, with plated or baked-enamel finish.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install mounting brackets in locations indicated at 1220 mm (48 inches) above finished floor to top of fire extinguisher.
- B. Install fire extinguishers on mounting brackets and in fire extinguisher cabinets where indicated.

### **END OF SECTION 104416**

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## **SECTION 105100 – LOCKERS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including the Solicitation and Division 00 and Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Section Includes:
1. Metal grid athletic lockers

#### **1.3 ACTION SUBMITTALS**

- A. General: Provide all action submittals in this specification section as separate line items within a single submittal to the Government for review. Submission of the action submittals separately will be deemed incomplete and rejected.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
  2. Rated capacities, construction details, material descriptions, dimensions of individual components, profiles, and finishes.
  3. Delivery, storage, handling, and installation instructions and recommendations.
  4. Maintenance instructions and recommendations.
- C. Color Sample Chart: Provide color sample chart of manufacturer's full range of standard colors for finished color selection of metal grid athletic lockers.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For adjusting, repairing and replacing components and accessories. O&M Data to be include in maintenance manuals.
- B. Warranties: Completed manufacturer's special warranties as described in the "Warranties" Article of this specification section

#### **1.5 QUALITY ASSURANCE**

- A. Locker construction shall include the following features:
1. Bolt-through construction.
  2. Modular construction, all parts repairable and replaceable.
- B. Manufacturer Qualifications: Minimum 5 years experience in manufacture of similar products in use in similar environments, including project size, and complexity, and with the production capacity to meet the construction and installation schedule.

- C. Installer Qualifications: Manufacturer's authorized representative, trained and approved for installation of units required for this Project.
- D. Source Limitations: Obtain components and accessories through one source from a single approved manufacturer.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original unopened containers with manufacturer's labels attached.
- B. Do not deliver lockers until spaces to receive them are clean, dry, and ready for their installation. Ship to jobsite only after roughing-in, painting and other finishing work has been completed, installation areas are ready to accept work.
- C. Handle and install materials to avoid damage.

#### 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install lockers until spaces are enclosed and weather tight, wet work in spaces is complete and dry, HVAC system is operating and maintaining ambient temperature at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify field measurements as indicated on Shop Drawings. Where measurements are not possible, provide control dimensions and templates.
- C. Coordinate installation and location of blocking and supports as requested.
  - 1. Verify openings, clearances, storage requirements and other dimensions relevant to the installation and final application.
  - 2. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

#### 1.8 WARRANTY

- A. Special Warranty: Submit manufacturer's written 10-year limited warranty to repair or replace components that fail in materials or craftsmanship during the warranty period. Failures include the following:
  - 1. Fracturing or breaking components including panels, shelves, or hardware resulting from normal wear and tear and use other than vandalism.
  - 2. Collapse or failure of metal grid locker components not resulting from overloading or vandalism.
  - 3. Delamination or other failures of bonding or assembly.
  - 4. Warping not resulting from leaks, flooding, or other uncontrolled moisture or humidity.
  - 5. Faulty operation of hardware.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturer and Product: Basis-of-Design Manufacturer's name is given to clarify the designer's intent and is not intended to limit selection of similar products from acceptable manufacturers.
1. Manufacturer: Wenger Corporation / JR Clancy
  2. Product: AirPro Metal Grid Athletic Lockers, Product #241B031
    - a. Lockers with lockable foot locker, integral bench seat, and apparel hooks.
- B. Characteristics:
1. Configuration: Include 5 to 7 inch (13 to 18 cm) clearance above floor for cleaning and legs at manufacturer's recommended intervals for support.
    - a. Wall mounted
    - b. Island mounted.
  2. Steel Tube Frame: 1-1/4 inch (31.75 mm) outside diameter, 16-gauge steel tube, with fully-welded corner joints.
  3. Integral Seat and Foot Locker: Laminate-clad composite wood panel seat and foot locker lid, 3/4 inch (19 mm) thick, with lockable seat security compartment, replaceable split pin hinge, and locking hasp for padlock by
  4. Door: None – Open frame.
  5. Shelf and Seat: 3/4 inch (19 mm) thick, formaldehyde free industrial grade composite wood with polyester, antimicrobial laminate finish.
  6. Apparel Hooks: One double and four single hooks, bolted to underside of locker shelf, sides, back, and frame faces (one side).
  7. Locker Size: 24 inch (610 mm) wide by 30.5 inch (775 mm) deep by 70 inch (1778 mm) high, mounted with top bracket at 78 inches (1980 mm) above finished floor.

### **2.2 ACCESSORIES**

- A. Garment Hooks:
1. One 10-gauge center hook.
  2. Four 12-gauge side single hooks.
- B. Identification Plates: 20-gauge steel, powder-coated paint. 12 inches (314 mm) wide by 2.125 inches (54 mm) high.
- C. Metal Locker Finishes: Color selected by Architect from manufacturer's standard range of colors and patterns.
1. Hardware and Exposed Fasteners Finish: As selected from manufacturer's full range.

## 2.3 MATERIALS

- A. Steel Tube: ASTM A501, hot-formed steel tubing.
- B. Steel Wire: ASTM C510, cold drawn steel wire
- C. Particleboard: To ANSI A208.1, minimum 43 lb/cu. ft. (689 kg/cu. m) density.
- D. Plywood: Exterior grade.
- E. Anchors and Fasteners:
  - 1. Factory Provided: Material, type, and size recommended by manufacturer for secure anchorage to substrate.

## 2.4 FABRICATION

- A. Fabricate components square, and rigid. Make exposed metal safe to touch and free of sharp ends or burrs.
- B. Form frames, panels, doors, and accessories from one-piece, or one rigid assembly, unless specifically shown on Shop Drawings.
- C. Factory preassemble metal components by welding all joints, and connections; with no bolts, nuts, screws, or rivets used in assembly, except as required for knock down shipping and attachment to mounting surfaces.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Examine installation areas and mounting surfaces with Installer present, for compliance with manufacturer's installation tolerances including required clearances, floor level, location of blocking and anchoring reinforcements, and other existing conditions that may affect installation or performance.
- C. Proceed with installation only after correction of unsatisfactory conditions.

### 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.3 INSTALLATION

- A. Condition lockers to average prevailing humidity conditions in installation areas before installation.



- B. Install components plumb, level, and true; using integral levelers and anchors in accordance with manufacturer's recommendations, shop drawings and other approved submittals.
- C. Fasten components to adjacent construction through back, near top and bottom. Fasten at indicated height using fasteners recommended by manufacturer. Comply with mounting height requirements for accessible components.
- D. Through-bolt adjacent units using connector bolts provided by manufacturer.
- E. Install hardware uniformly and precisely without binding.
  - 1. Adjust and align hardware so moving parts operate freely and contact points meet accurately.
  - 2. Allow for final adjustment after installation to ensure hardware operates smoothly without warping or binding and closes with uniform reveals.

### **3.4 CLEANING AND PROTECTION**

- A. Repair or replace defective work as directed by Architect upon inspection.
- B. Clean surfaces. Touch up marred finishes, or replace damaged components that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by manufacturer.
- C. Turn over operation and maintenance instructions to Owner. Instruct the Owner's personnel upon request.
- D. Protect installed products from damage, abuse, dust, dirt, stain, or paint until completion of project. Do not permit use during construction.

**END OF SECTION 105100**

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## **SECTION 107113 – EXTERIOR SUN CONTROL DEVICES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes fabricated exterior sun control devices.

#### **1.3 REFERENCE STANDARDS**

- A. AAMA 2603 - High Performance Organic Coatings on Architectural Extrusions and Panels.
- B. AAMA 2605 - High Performance Organic Coatings on Architectural Extrusions and Panels.
- C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- E. ASTM D822 - Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- F. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
- G. ASTM D2244 - Standard Test Method for Calculation of Color Differences From Instrumentally Measured Color Coordinates.

#### **1.4 ACTION SUBMITTALS**

- A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.
- B. Product Data: Submit copies of manufacturer's standard guide specifications, standard detail drawings, and installation procedures,
  - 1. Provide information pertaining to standard components, sizes, shapes, and hardware description
- C. Shop Drawings representing Designer's intent: Plans, elevations, sections, details with profiles, styles, part numbers, dimensions, materials, finishes, connections, method of anchorage, type of anchors and backing supports.

1. Differentiate between shop fabrication and field installation.
  2. Indicate substrates and adjacent work specified in related sections with which the exterior sun control devices must be coordinated.
  3. Indicate connections to building framing.
- D. Color Charts for Selection: Manufacturer's finish charts showing full range of standard colors and textures available for units with factory-applied finishes for selection by Architect.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Warranties: Completed manufacturer's special warranties as described in the "Warranties" Article of this specification section.

#### 1.6 QUALITY ASSURANCE

- A. Sunshade systems shall be manufactured by a firm with a minimum of 5 years of experience in the design, engineering, and fabrication of similar systems.
- B. Professional Engineer Qualifications: A professional engineer legally qualified to practice in jurisdiction where Project is located and experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of products that are similar to those indicated for this Project in material, design, and extent.
- C. Source Limitations: Obtain products through one source from a single manufacturer where alike in one or more respects regarding type, design, or factory-applied color finish.

#### 1.7 SEQUENCING AND SCHEDULING

- A. Field Measurements: Verify openings and adjacent construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

#### 1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

- B. Installer shall verify actual measurements/connections by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

## 1.9 WARRANTY

- A. Provide manufacturer's standard limited warranty for 70% fluoropolymer-based finish on aluminum substrates.
- B. Warranty Period: 10 years.
  - 1. Finish coating shall not peel, blister, chip, crack, or check.
  - 2. Chalking, fading or erosion of finish when measured by the following tests:
  - 3. Finish coating shall not chalk in excess of 8 numerical ratings when measured in accordance with ASTM D4214.
  - 4. Finish coating shall not change color or fade in excess of 5 NBS units as determined by ASTM D2244 and ASTM D822.
  - 5. Finish coating shall not erode at a rate in excess of .01 mils/year confirmed by Florida test samples.

## **PART 2 - PRODUCTS**

### 2.1 MANUFACTURER

- A. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:
  - 1. Airolite Co., (The); ASC8

### 2.2 PERFORMANCE REQUIREMENTS

- A. Sun control device supports: Design and furnish all supports required to design load of up to 60 pounds per square foot (2.87 kPa). The design load includes loads derived from wind, snow (including drift), seismic events, and the dead load of the sunshade. Sun Control members, blades, outriggers, fascia, and anchorages shall be demonstrated to withstand the specified design load.
- B. Sun control device shall be factory engineered to withstand wind loads, acting upwards and downwards.
  - 1. Minimum design loads shall be calculated to comply with ASCE - 7, or local requirements of Authority Having Jurisdiction.
- C. Sun control devices shall be factory engineered to withstand the thermal stress to which the louvers will be subjected.
  - 1. Base engineering on a surface design temperature change of 180 degrees F (82 degrees C).

- D. Sun control devices shall be designed to perform under conditions specified herein or required by site conditions with no permanent damage to or deforming of the louver blades or assembly, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.

### 2.3 AIRFOIL BLADE DESIGN

- A. Product: ASC8: 8 inches (203 mm) airfoil blade.
1. Blade Type: Airfoil.
  2. Blade Material: Extruded Aluminum (Alloy 6063-T5).
  3. Blade Material Thickness: 0.081 inch (2.06 mm).
  4. Blade Width: 8 inches (203.2 mm).
  5. Outrigger Length: 42 inches (1070 mm)
  6. Outrigger Material: Aluminum Plate (Alloy 6061-T6).
  7. Outrigger Material Thickness: 0.250 inch (6.35 mm).
  8. Fascia: 8 inches (203.2 mm) Rectangular Tube (standard).
  9. Mounting: Extruded Aluminum Tee as indicated.
  10. Construction: Mechanically Fastened (standard).

### 2.4 ALUMINUM FINISHES

- A. High-Performance Organic Coating Finish:
- B. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- C. Chemical Finishes: Cleaned with inhibited chemicals and acid-chromate-fluoride-phosphate conversion coating.
- D. Fluoropolymer Three-Coat Coating System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605. 2.0 mils (.05 mm) dry film thickness.
1. Color and Gloss: Metallic Aluminum
    - a. Appearance to match Anodized Clear Coat Aluminum.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine substrate conditions in areas to receive the work. Verify dimensions, tolerances, and interface with adjacent work. Do not proceed until any unsatisfactory conditions have been corrected.

- B. Upon receipt of sun control devices, thoroughly examine units for damage. Promptly report any observed damage to manufacturer in writing. Include digital photographs of any observed damage as well as a copy of the Bill of Lading disclosing the damage.

### 3.2 PREPARATION

- A. Prior to fabrication, field verify required dimensions.
- B. Coordinate sun control device installation with wall construction to ensure proper structural support is provided for attachment.

### 3.3 INSTALLATION

- A. Install in accordance with manufacturer's written instructions and recommendations for installation of the work.
- B. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated and fitted to the structure.
- C. Anchor sun control devices to wall supports as indicated on approved shop drawings, and as specified.
- D. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of galvanic action between metals.
- E. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.
- F. Set units level, plumb and true to line, with uniform joints.
- G. Sun Control Device installation:
  - 1. Layout and verify centerline dimensions prior to setting outriggers.
  - 2. Install the two outer most outriggers plumb and level to the substrate.
  - 3. Then, shoot a line from outrigger to outrigger to find the depth dimension of the outer line.
  - 4. Proceed with the installation by attaching the middle outrigger, shimming as required.
  - 5. Shims: Non-ferrous, as recommended by manufacturer. Verify centerline dimensions after shims are installed.
- H. Erection Tolerances:
  - 1. Variation from level: +/- 1/8 inch maximum in 20 foot runs, non-cumulative.
    - a. Maximum Offset from True Alignment between Adjacent Members Butting or In-Line: 1/16 inch.
- I. Do not field cut or trim units. Cut and trim component parts during erection only with the approval of the manufacturer, and in accordance with his recommendations. Restore finish completely. Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly as directed.

- J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

#### 3.4 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.
- C. Clean aluminum surfaces in accordance with recommendations found in AAMA 609 and 610. Do not use aggressive alkaline, TSP, acid cleaners, or abrasive cleaners on aluminum surfaces.

**END OF SECTION 107113**



## **SECTION 108113 - BIRD CONTROL DEVICES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes:
  - 1. Bird Control Netting
  - 2. Bird Control Spikes

#### **1.3 QUALITY ASSURANCE**

- A. Obtain all technical information on products and installation from the manufacturer.
- B. Utilize labor or installers who are knowledgeable in product installations.
- C. Installer shall visit the site to gather all information of existing site conditions.
- D. Single Source Responsibility: Spikes, Netting, and all parts / accessories of the bird netting shall be from one manufacturer.

#### **1.4 SUBMITTALS**

- A. Product Data: Submit all descriptive information from the manufacturer including catalogs, installation instructions and other descriptive material.
- B. Provide Warranty: Material and installation.
- C. Provide Samples: Each type product of bird spikes and netting used, including proposed fastening methods and hardware.
- D. Provide statement by official indicating that they are a certified installation company.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Protect products from damage before, during, and after installation.

#### **1.6 PROJECT CONDITIONS**

- A. Coordination: Furnish all anchor devices required to fasten system to and around existing building structure. Coordinate installation with existing conditions and within on-site tolerances.
- B. Visit site and field measure prior to fabrication and delivery of materials.

## 1.7 WARRANTY

### A. Bird Netting

1. Shall carry a minimum 10 year guarantee against U.V. breakdown for black netting.
2. Installation shall be guaranteed for 2 years.
3. Installation shall be performed by a Certified Authorized Installer.
  - a. Proof of Certification required.

## **PART 2 - PRODUCTS**

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
1. American Netting
  2. Avian
  3. Bird-B-Gone
  4. Bird-X
  5. Nixalite of America

### 2.2 BIRD CONTROL SPIKE MATERIALS

- A. Wires: Flat-tipped stainless steel wires.
- B. Base: UV stabilized polycarbonate resin.
- C. Strip Lengths: per manufacturer's standard.
- D. Width & Height: About 5" high (12.7 cm), 6" wide (15.2 cm).
- E. Points per Inch: No less than 20 flat-tipped wire points per piece.
- F. Application: Installed on all types of surfaces to deter nuisance level roosting problems caused by pigeons and seagulls. Not for the control of small birds or to deter heavy infestations of any bird species.
- G. Finish: Natural finish on stainless steel wire. Clear to opaque polycarbonate base.

### 2.3 BIRD CONTROL NETTING MATERIALS

#### A. Bird Control Netting

1.  $\frac{3}{4}$ " Heavy Duty Bird Netting
2. Material: U.V. stabilized knotted polyethylene net. Flame resistant (270°F melting point). Rot-proof, non-conductive and stable in sub zero temperatures.

3. Construction: comprised of 6 monofilaments, each 12/1000" thick with U.V. stabilizers added. Monofilaments are twisted together to produce a strong twine with 160-200 twists per meter.
4. Break Strength: ISO 1806 protocol mesh tested in excess of 40 lbs. Proof of Test Certification Required.
5. Sizes: As required.
6. Hardware: All metal hardware or products are galvanized or stainless steel.

## 2.4 MOUNTING SYSTEMS

### A. Bird Control Spikes

1. Install with manufacturer approved mounting hardware (screws) and adhesive. Install to ensure all mechanical fasteners heads are covered with adhesive.

### B. Bird Control Netting

1. Solid Steel: For corner attachments use Bird-B-Gone eye bolts with lock nuts and Bird-B-Gone multipurpose cable brackets with powder actuated fire-in-pins for intermediate attachments.
2. Steel I-Beams: For corner attachments, use eye bolts with lock nuts. For intermediate attachments, use the appropriate size Bird-B-Gone girder clips.
3. Sheet Metal: Use Bird-B-Gone multipurpose cable brackets with self-tapping screws for both corner and intermediate attachments.
4. Brick, Concrete and Stone: For corner attachments, use Bird-B-Gone expanding corner net bolts. For intermediate attachments, use one of the following Bird-B-Gone attachments: open or closed net loop, net spike, split pin with anchor rivet or multipurpose cable bracket.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine the installation area and note any detrimental or hazardous work conditions. Notify contracting officer or inspector of the detrimental work conditions.
- B. Do not proceed with installation until conditions are corrected.

### 3.2 SURFACE PREPARATION

- A. Surface should be thoroughly cleaned and free of bird droppings, nesting materials, rust peeling paint or other debris.
- B. Remove or repair articles that may damage after installation, including overhanging foliage, brush and loose parts on the structure.
- C. Field verify all dimensions and quantities before installation begins.

### 3.3 BIRD CONTROL SPIKE INSTALLATION

- A. Install Bird Spike Composite in accordance with manufacturer's estimating and installation guidelines. Protect all surfaces.
- B. Protect the entire surface, not just the outside edges. Adjust length of spike base by snapping the composite base strip apart at the Quick Part Seams (notches on the base strip between the wires).
- C. Wires of Bird Spike Composite to be flush with or overhanging the outside edge of all surfaces. At open end of a surface, overhang the first spike on the base at least 1/2" (1.2 cm). Use the alignment notch in the base strip to align the spikes that meet end-to-end.
- D. Do not allow gaps between spikes that meet end-to-end. Do not allow gaps between the spikes and other objects such as walls or beams.
- E. Fasten Bird Spike Composite to the surface with the optional mounting hardware or adhesive (purchased separately).

### 3.4 BIRD CONTROL NETTING INSTALLATION

- A. Install as recommended by the manufacturer. Bird Control Netting shall fit the area to be protected perfectly so pest birds cannot enter the protected area, and so the netting blends with the architecture.
- B. Correct mesh sizes shall be provided to ensure exclusion of the correct pest bird.
- C. Install tightly and securely to ensure a long lasting installation that is visually hard to see.

### 3.5 INSPECTION

- A. Visually inspect for any signs of poor installation, including loose screws, fasteners or un-removed debris.
- B. Immediately correct and repair as necessary.

**END OF SECTION 108113**