



Issue: Resolution for Pool Repairs Bid Solicitation

Date: January 11, 2024

Submitted By: Matt Crouse, Director of Parks and Recreation

Background

In the summer of 2023 the pool developed a large leak that prevented the parks department from opening the pool for the 2023 aquatics season. The department worked diligently through the summer to repair the leak in hopes of salvaging a portion of the pool season, however, we were unsuccessful in fixing the leak in 2023. Staff approached council in September to hire Waters Edge Aquatic Design to work with staff to develop the necessary repair plans to replace all underground piping on our recirculation system, renovate the filters and piping within the pumphouse, and upgrade amenities at the pool such as more shade, increase in deck space, more play value in the pool, and a splash pad addition. This process has taken our engineering firm longer than anticipated to complete and we are excited to show you the concepts on how the pool will be repaired and improved to bring our community an updated aquatics experience and an updated pool that will serve our community for many years to come.

Analysis

The resolution before you gives the city authorization to proceed with bidding this project for the pool to be completed by the end of April and the splash pad to be completed by May 10th. This RFQ is a very large project and we are working as quick as possible to complete the project before the opening of the pool on May 25th, 2024.

As mentioned this is a very large project, however there are many notable upgrades and elements of the project that are worth mentioning:

- Replacement of all recirculation piping above and below ground (this is the primary leak repair).
- Added concrete pool deck, this increase in deck space will provide more patron space at the pool.
- Renovations to the filtration system. This will revitalize the filters and replace all filter media, piping, ect. to ensure the filters are ready for another 20 plus years of service.
- Add shade structures to the pool area.
- Addition of a water play structure in the newly created wet deck space within the zero-depth area of the pool.
- Addition of a splash pad to be installed just west of the current pool area.



The scope of work provided for the project will encompass the entire project and all necessary adjacent work to make these repairs and upgrades. It is our hope to provide an updated aquatics center with more amenities and play value with this repair project.

Recommendation

With an approving vote tonight we will advertise this project for the next two weeks. This will also time for interested construction companies time to review the documents, contract, and the overall project to provide us pricing for the completion of this work. Your approval will allow the city administrator the ability to sign all related contracts for this work so that work can begin as soon as possible. It is staff's recommendation to approve this resolution so we can begin moving forward to get these repairs completed in time for the 2024 aquatic season.

Respectfully,

Matt Crouse
Director, Parks and Recreation

RESOLUTION NO. 2024-02

A RESOLUTION OF THE COUNCIL OF THE CITY OF NIXA AUTHORIZING THE CITY ADMINISTRATOR TO SOLICIT QUALIFICATIONS FOR SERVICES RELATED TO THE REPAIR OF THE NIXA AQUATICS CENTER.

WHEREAS Chapter 2, Article V, Division 1, of the Nixa City Code authorizes the City Administrator to purchase supplies, materials, equipment, and services on behalf of the City when a competitive procurement method is utilized; and

WHEREAS Section 2-165 of the Nixa City Code requires the City Administrator to obtain an authorizing resolution from the City Council prior to soliciting for purchases totaling \$10,000.00 or more; and

WHEREAS City staff is seeking authorization to solicit proposals for repairs at the Nixa Aquatics Center; and

WHEREAS the City Council desires to authorize City staff to undertake the purchase described herein.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF NIXA, AS FOLLOWS, THAT:

SECTION 1: The City Administrator, or designee, is hereby authorized, pursuant to Section 2-165 of the Nixa City Code, to undertake the purchase described in "Resolution Exhibit A," which said Exhibit is attached hereto and incorporated herein by this reference.

SECTION 2: The City Administrator and the officers of the City are hereby authorized to do all things necessary or convenient to carry out the terms and intent of this Resolution.

SECTION 3: This Resolution shall be in full force and effect from and after its final passage by the City Council and after its approval by the Mayor, subject to the provisions of section 3.11(g) of the City Charter.

[Remainder of page intentionally left blank. Signatures follow on next page.]

RESOLUTION NO. 2024-02

ADOPTED BY THE COUNCIL THIS 17th DAY OF January, 2024.

ATTEST:

PRESIDING OFFICER

CITY CLERK

APPROVED BY THE MAYOR THIS _____ DAY OF _____, 2024.

ATTEST:

MAYOR

CITY CLERK

APPROVED AS TO FORM:

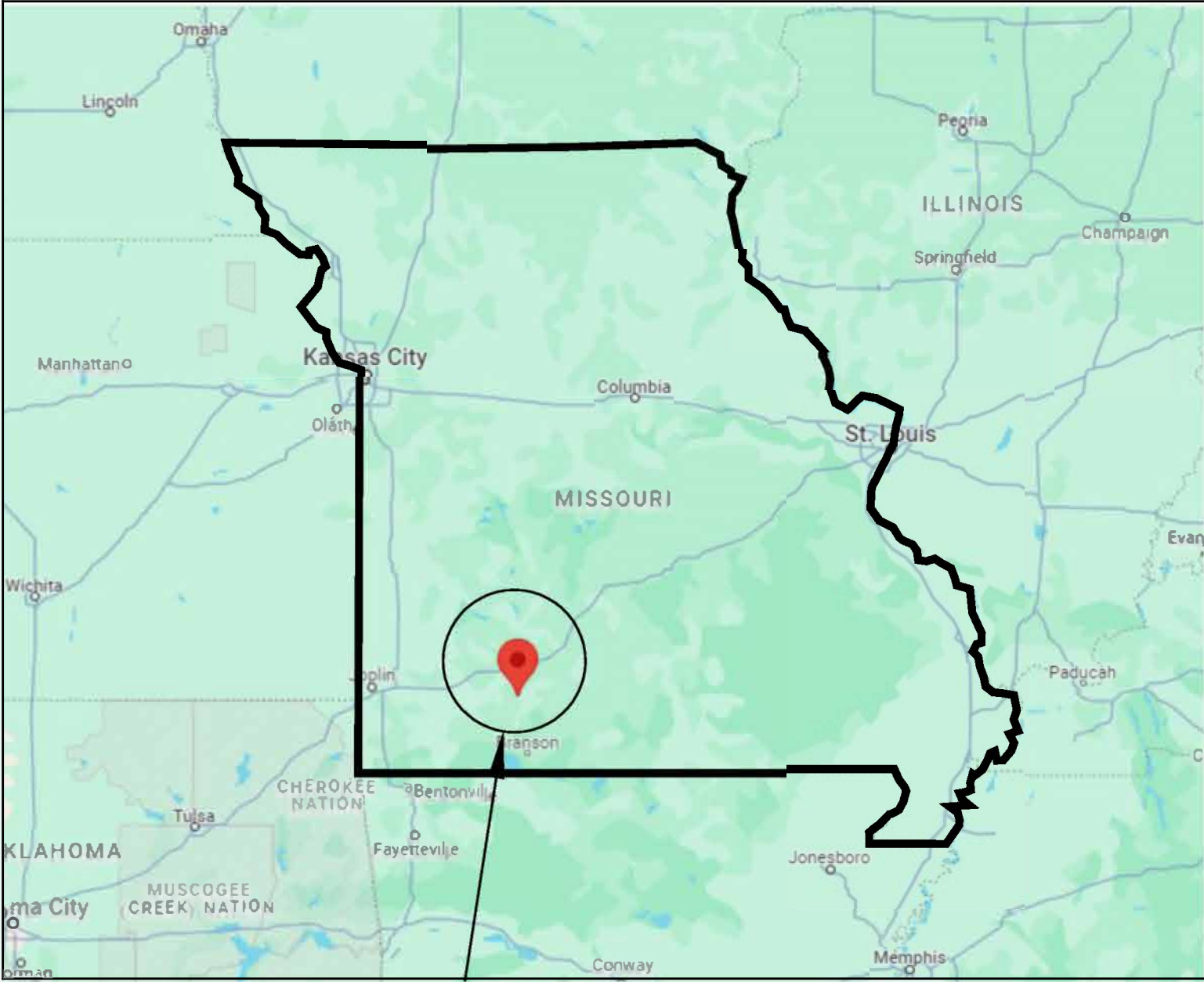
CITY ATTORNEY

NIXA, MISSOURI

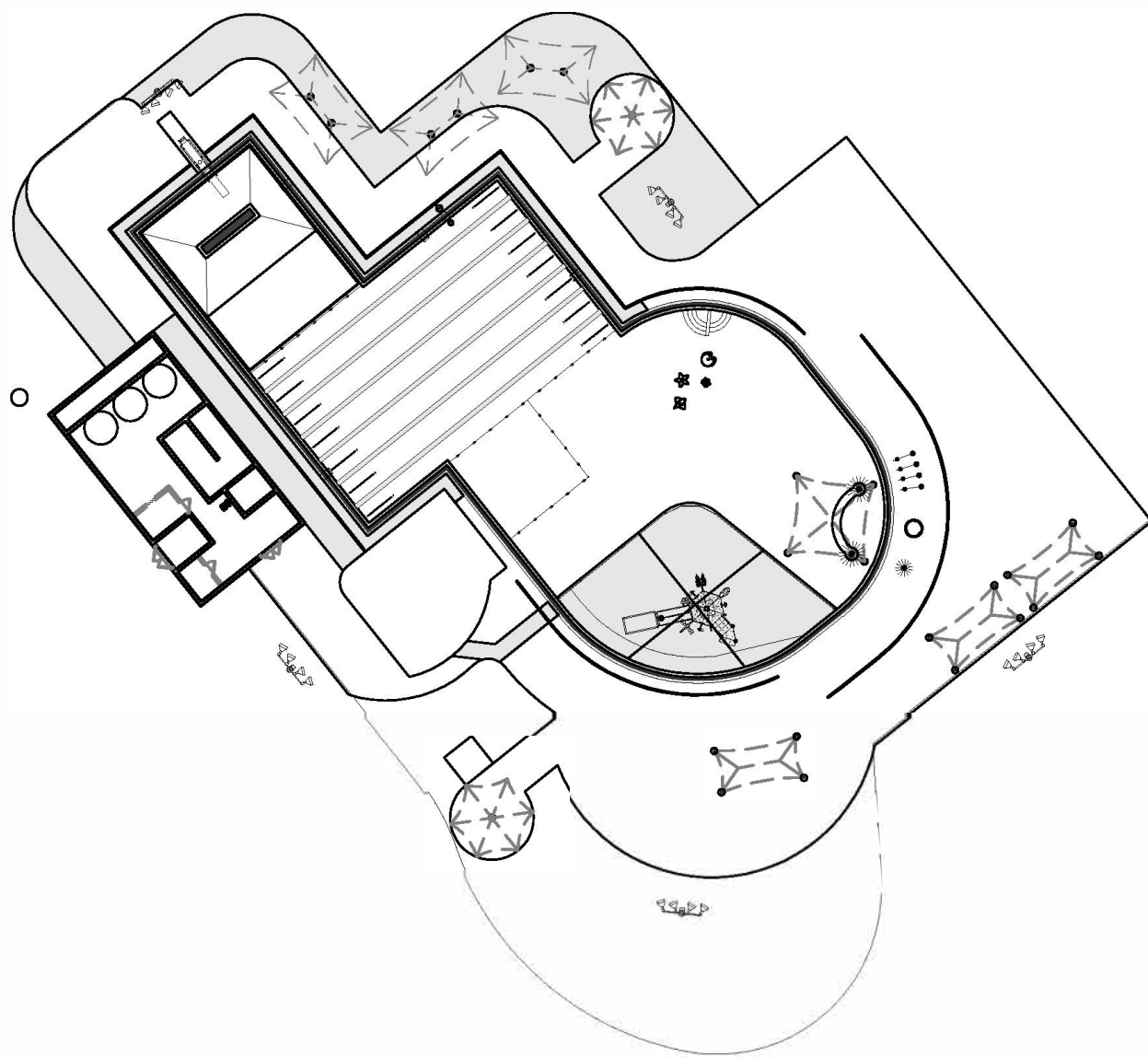
Aquatic Center

Improvements

2024



PROJECT LOCATION
701 North Taylor Way
Nixa, MO 65714




SHEET INDEX

- COVER SHEET
- SP-D1 POOL DEMO PLAN
- SP-P1 POOL PLAN
- SP-P2 POOL FLOOR PLAN
- SP-P3 POOL WALL AND DECK PLAN
- SP-P4 POOL SECTIONS
- SP-P5 POOL AREA DETAILS
- SP-PM1 POOL MECHANICAL PLAN

OWNER

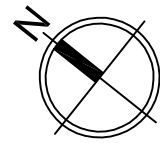
City of Nixa
701 North Taylor Way
Nixa, MO 65714
Tel (417) 725-5486



AQUATICS

Waters Edge Aquatic Design
1153 Southwest Blvd., Suite 202
Kansas City, KS 66103
Tel (913) 438-4338
www.WeDesignPools.com





NIXA, MISSOURI
Pool
Improvements

Revisions:
Description Date

Seal:



KYLE McCAWLEY-ENGINEER
LICENSE #2009012200

Date: 01-17-24 Job #: 23-523

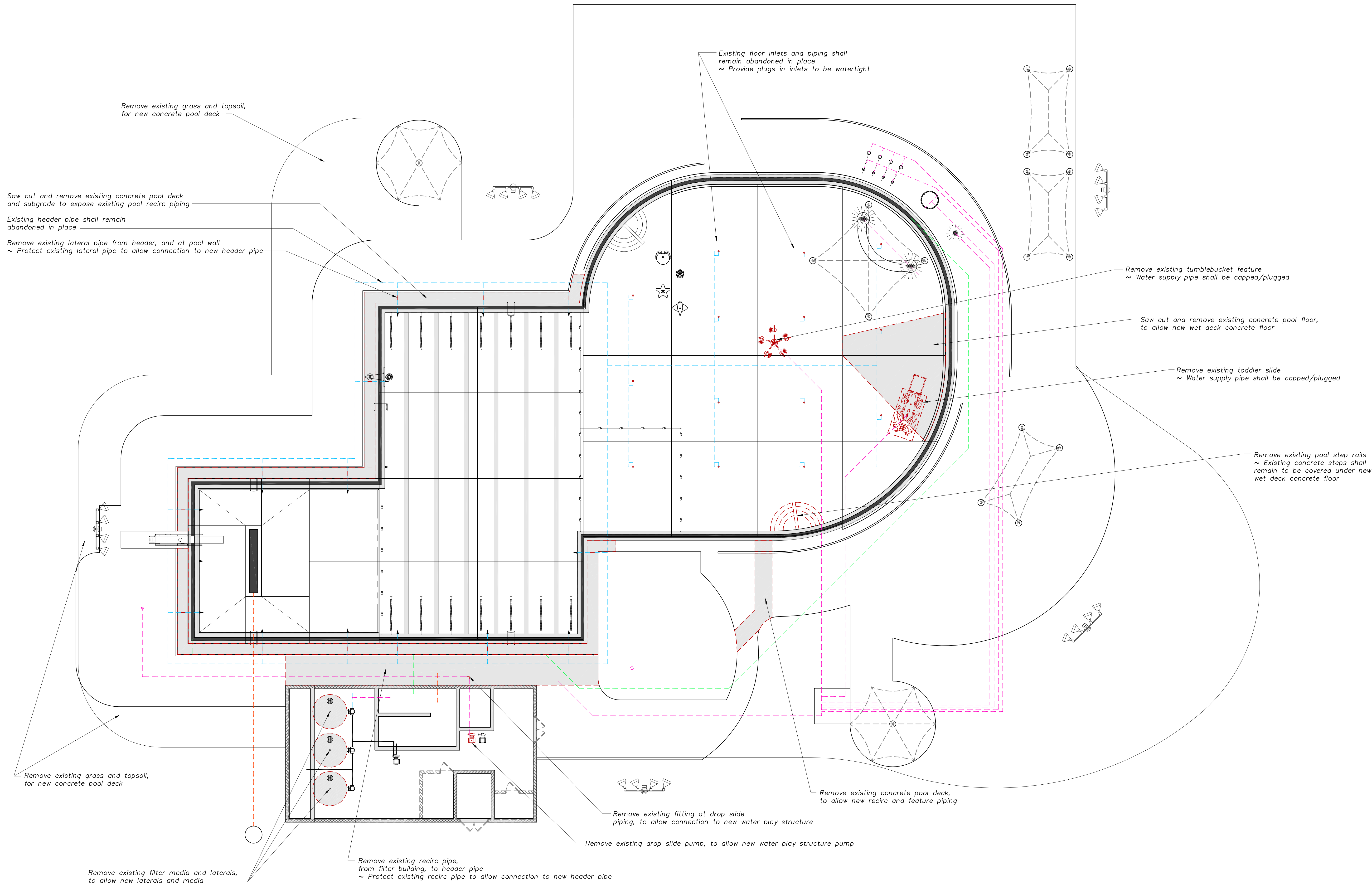
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Issue: CONSTRUCTION DOCUMENTS

POOL
DEMO
PLAN

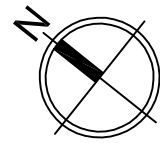
SP-D1

Waters Edge Aquatic Design
© 2024



0 4' 8' 16' 32'
3/32" = 1'-0"

A POOL DEMO PLAN
Scale: 3/32"=1'-0"



New concrete pool deck
~ Slope uniformly down towards edge of deck
~ Min. 1% and max. 2%
~ Provide saw cuts from corners, for square panels, and at 12'-0" max. spacing
~ See Detail D-SP-P5

New concrete pool deck
~ Slope uniformly between existing trench drain and pool gutter wall
~ Provide saw cuts from corners, for square panels, and at 4'-0" max. spacing
~ See Detail D-SP-P5

Pool deck at existing pool deck
~ See Detail C-SP-P5

22'-0" x 14'-0" sunshade
~ See Detail A-SP-P5

22'-0" x 14'-0" sunshade
~ See Detail A-SP-P5

22'-0" x 14'-0" sunshade
~ See Detail A-SP-P5

Barrier at wet deck - post with netting
~ See Detail B-SP-P5

Wet deck concrete floor
and construction joints

Water play structure

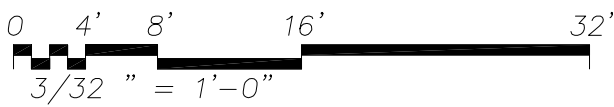
Barrier at wet deck - post with netting
~ See Detail B-SP-P5

New concrete pool deck
~ Slope uniformly down towards edge of deck
~ Min. 1% and max. 2%
~ Provide saw cuts from corners and at 12'-0" max. spacing
~ See Detail D-SP-P5

New concrete pool deck
~ Slope uniformly between adjacent pool deck
~ Provide saw cuts from corners, for square panels, and at 6'-0" max. spacing
~ See Detail D-SP-P5

New concrete pool deck
~ Slope uniformly between existing trench drain and filter building
~ Provide saw cuts from corners, for square panels, and at 8'-0" max. spacing
~ See Detail D-SP-P5

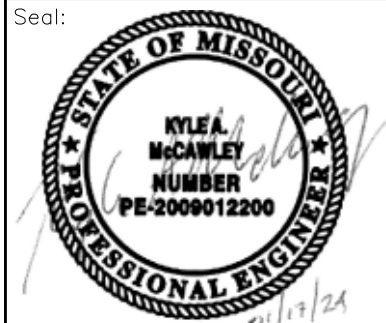
Metallic items shall be electrically bonded per NEC 680-26



A POOL PLAN
Scale: 3/32"=1'-0"

NIXA, MISSOURI Pool Improvements

Revisions:
Description Date



KYLE MCRAWLEY-ENGINEER
LICENSE #2009012200

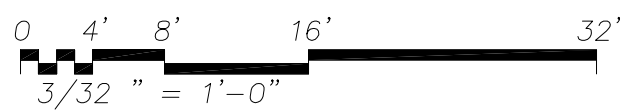
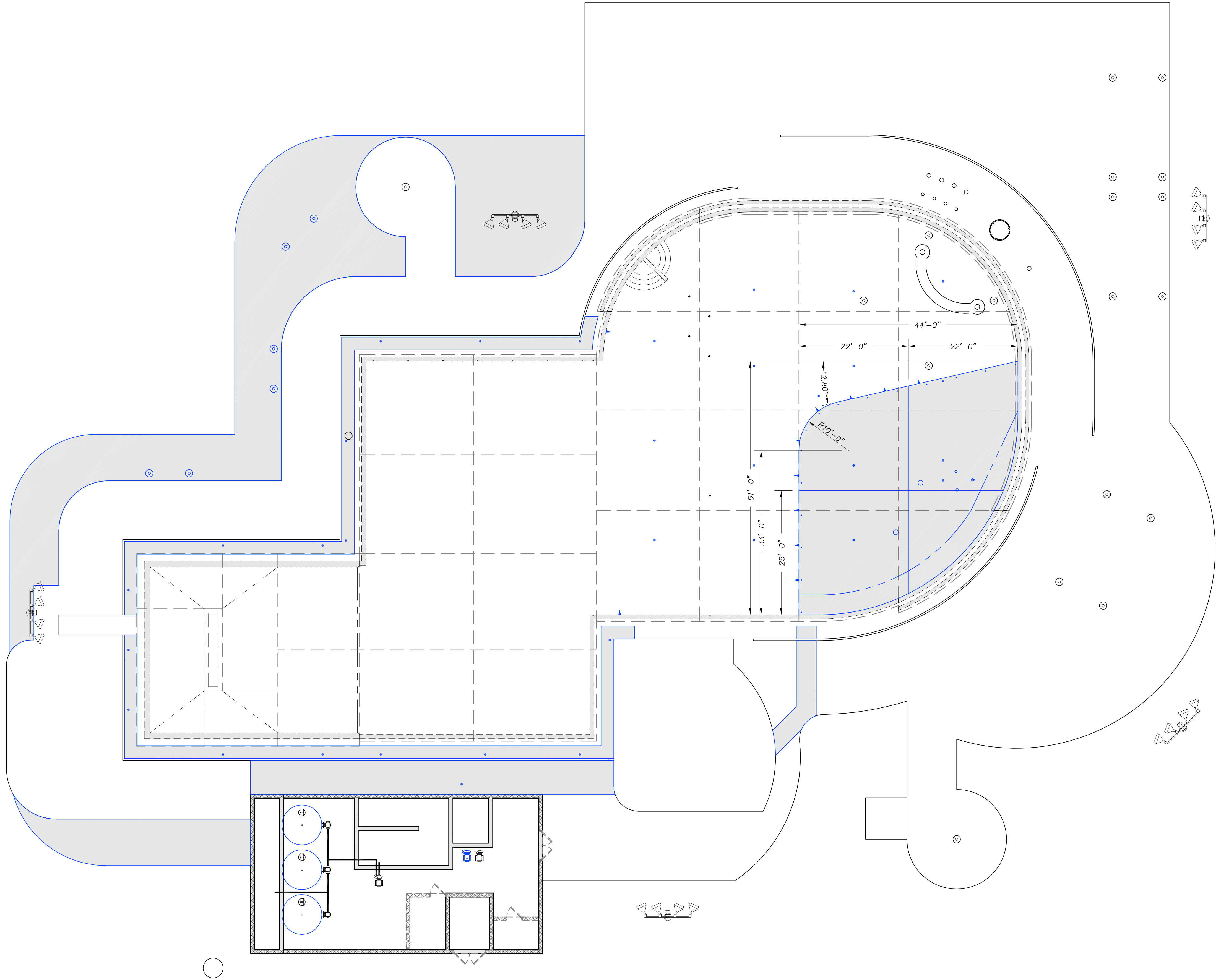
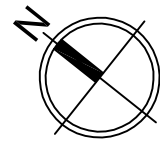
Date: 01-17-24 Job #: 23-523

Drawn: Checked:

Issue: CONSTRUCTION DOCUMENTS

POOL
PLAN

SP-P1



A POOL FLOOR PLAN
Scale: 3/32"=1'-0"

GENERAL SHEET NOTES

1. All El.'s shown El. (-)x.x', are distances down from indicated Water El.
2. All El.'s shown El. (+)x.x', are distances up from indicated Water El.

NIXA, MISSOURI
Pool
Improvements

#	Description	Date
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KYLE MC-CAWLEY-ENGINEER
LICENSE #2009012200

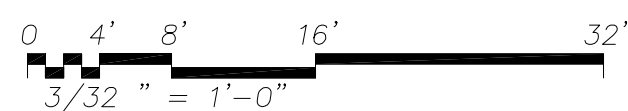
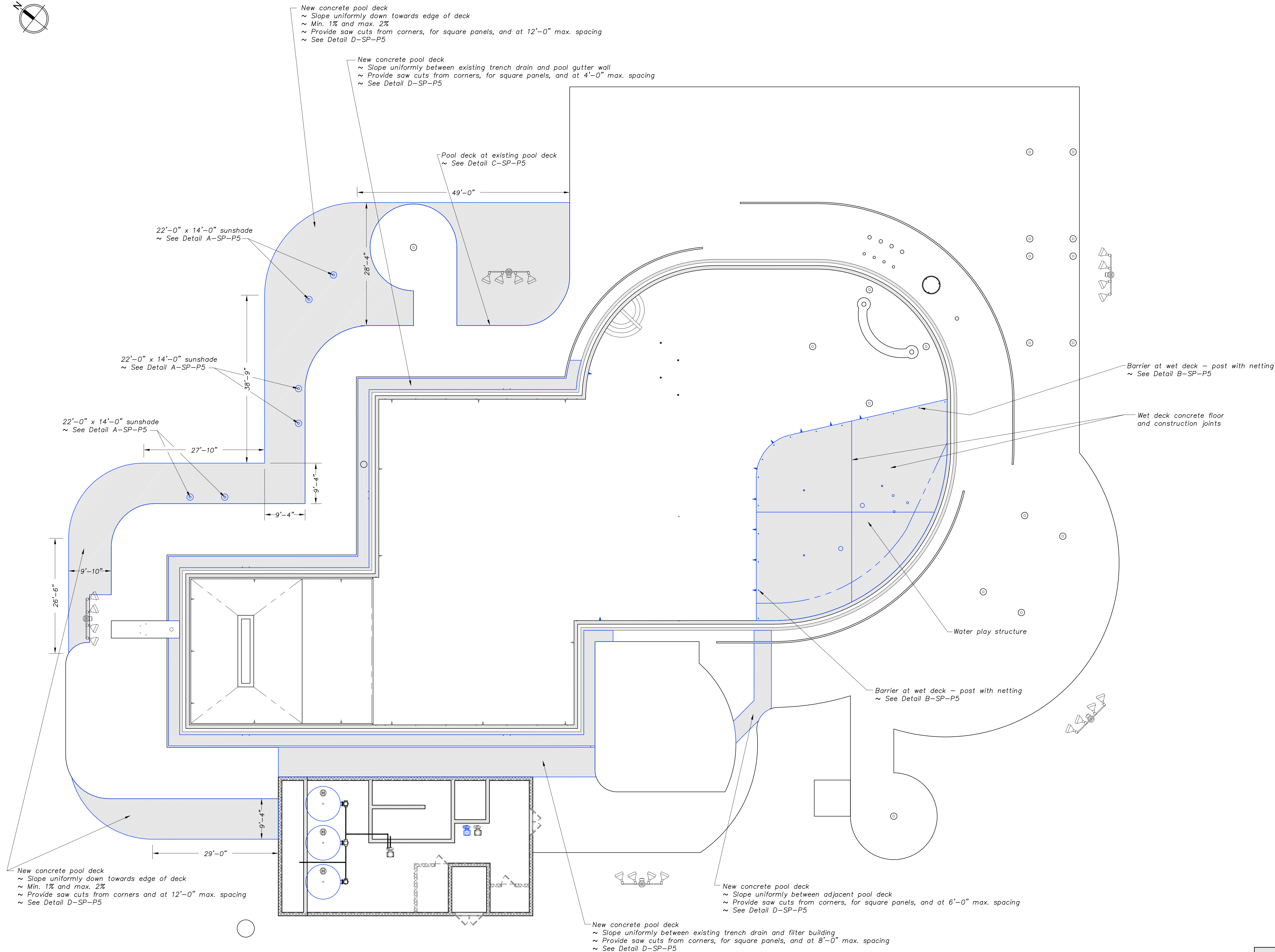
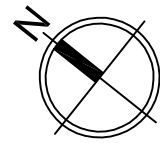
Date: 01-17-24 Job #: 23-523

Drawn: Checked:

Issue: CONSTRUCTION DOCUMENTS

**POOL
FLOOR
PLAN**

SP-P2



A POOL WALL AND DECK PLAN
Scale: 3/32"=1'-0"

GENERAL SHEET NOTES

- All El.'s shown El. (-)xxx', are distances down from indicated Water El.
- All El.'s shown El. (+)xxx', are distances up from indicated Water El.
- All curved pool walls shall be uniformly curved ~ Curved pool walls shall not be chorded

NIXA, MISSOURI
Pool
Improvements

#	Description	Date
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Seal:



KYLE McCAWLEY-ENGINEER
LICENSE #2009012200

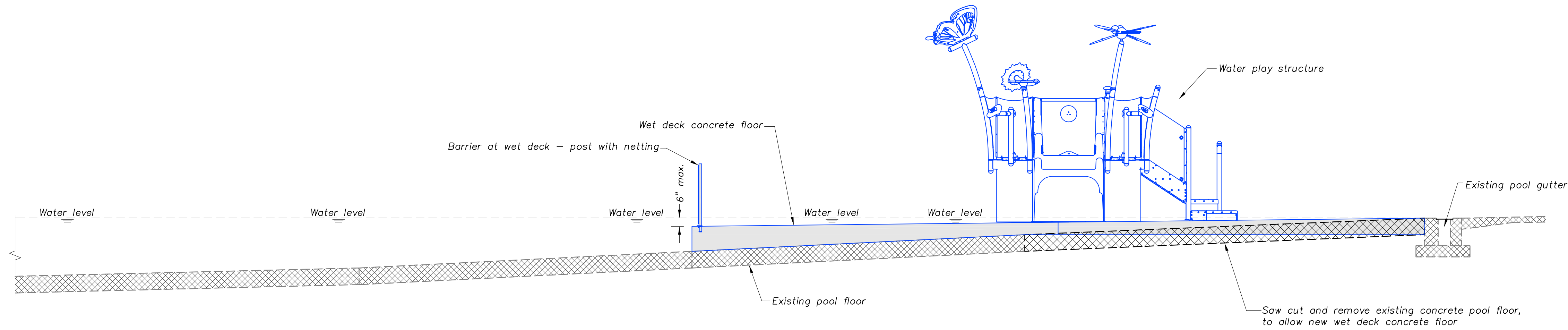
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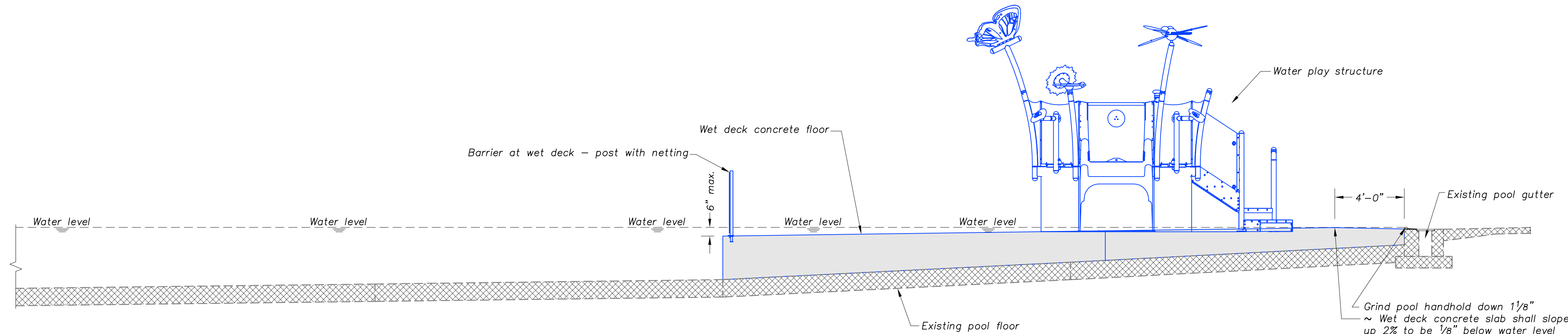
Issue: CONSTRUCTION DOCUMENTS

POOL
WALL
AND DECK
PLAN

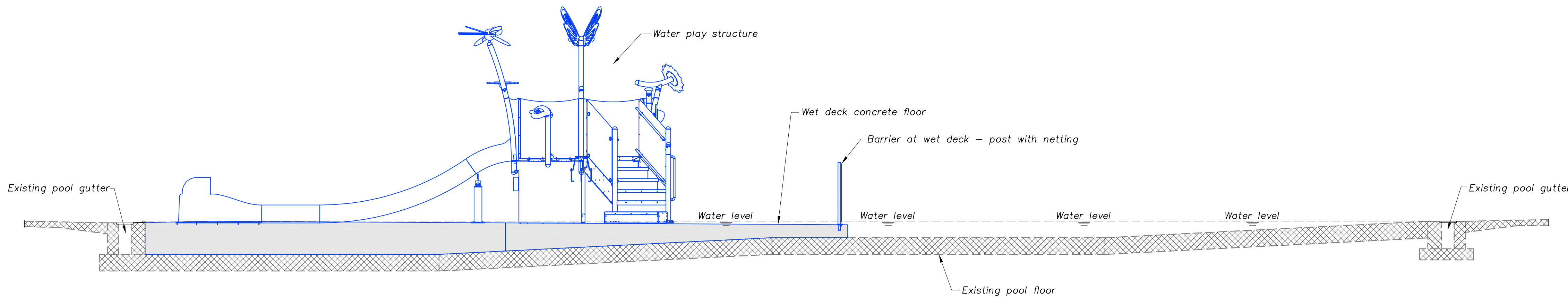
SP-P3



A POOL SECTION
Scale: 1/4"=1'-0"



B POOL SECTION
Scale: 1/4"=1'-0"



C POOL SECTION
Scale: 1/4"=1'-0"

NIXA, MISSOURI
Pool
Improvements

#	Description	Date
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KYLE McCAWLEY-ENGINEER
LICENSE #2009012200

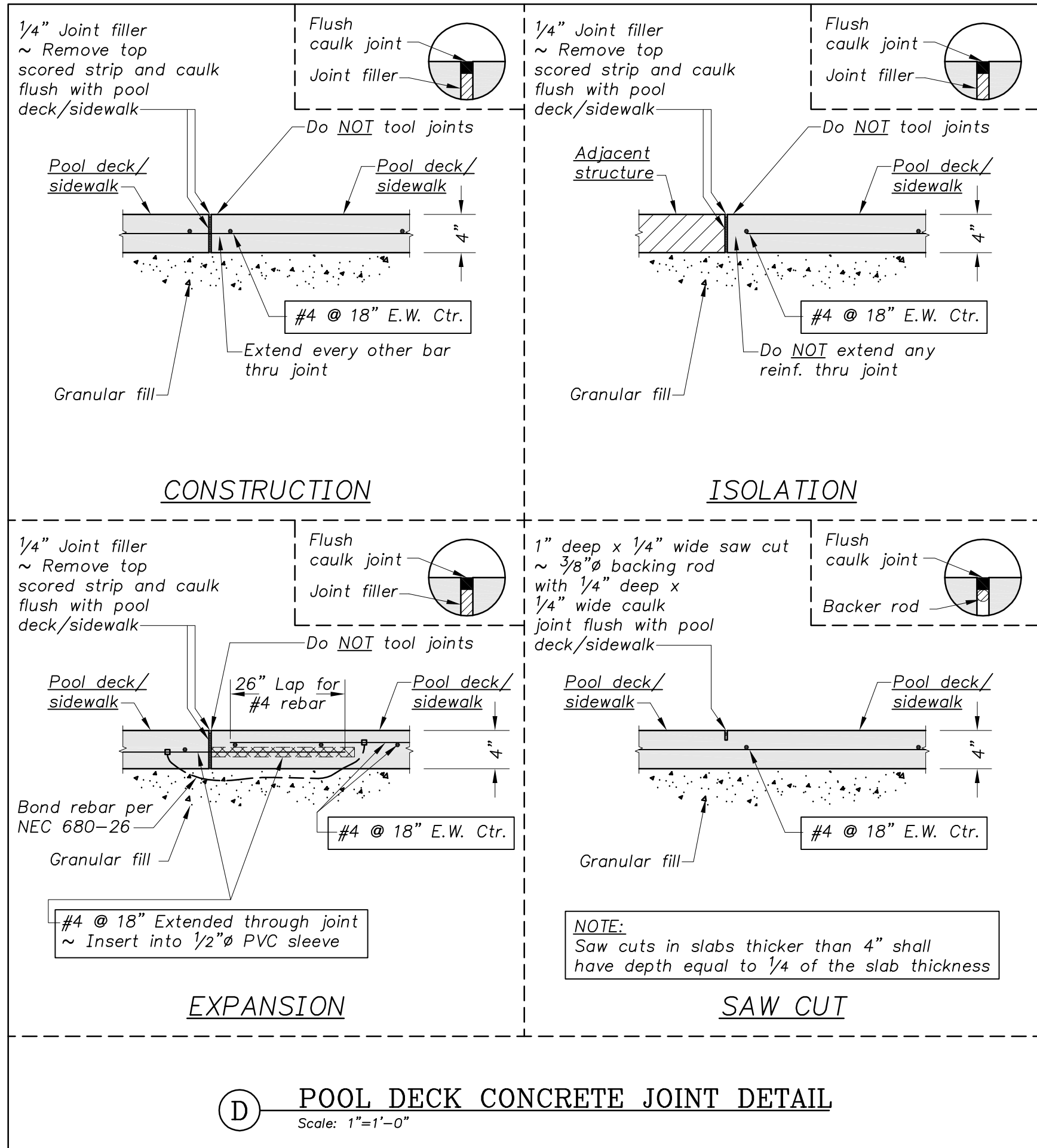
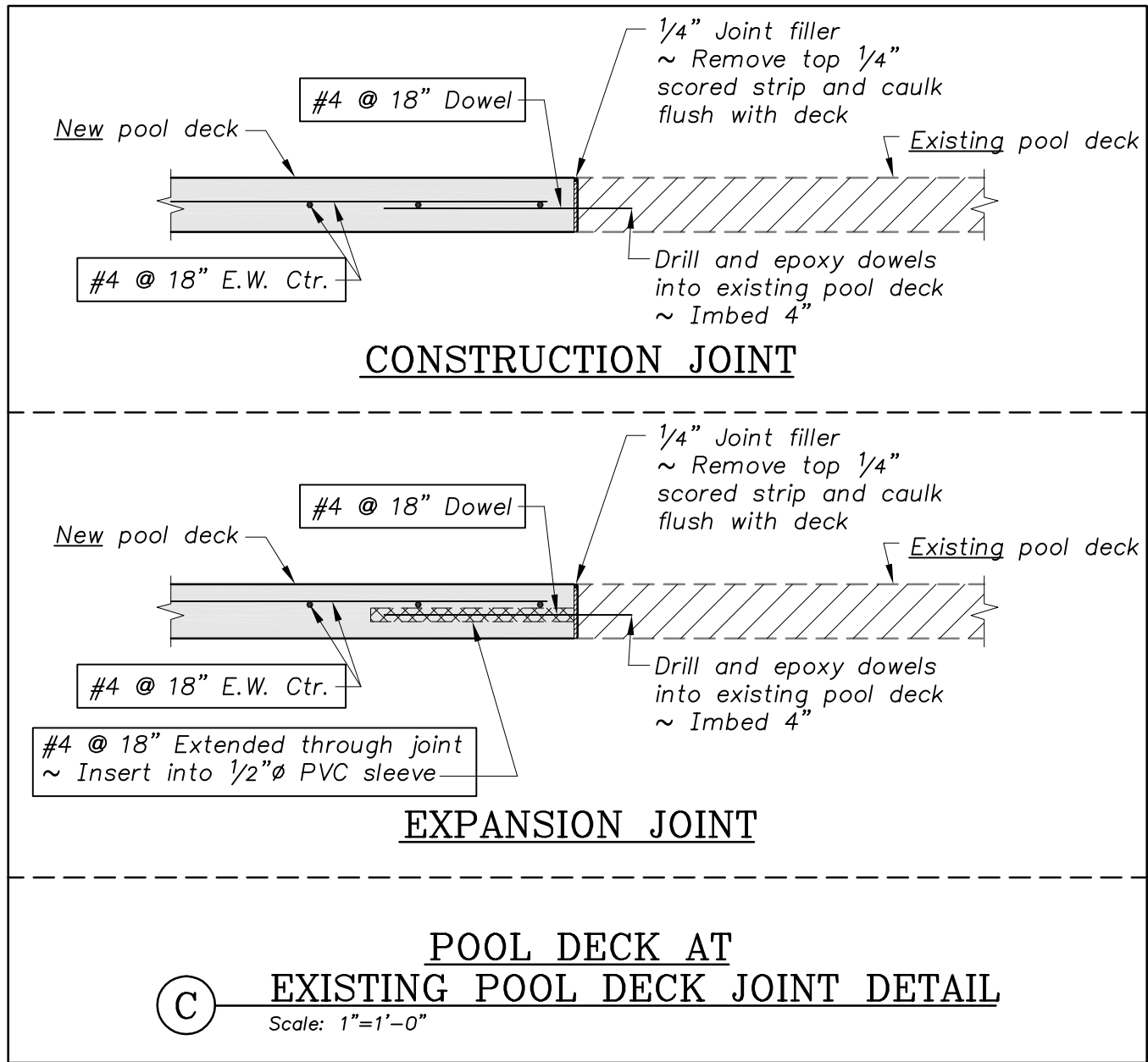
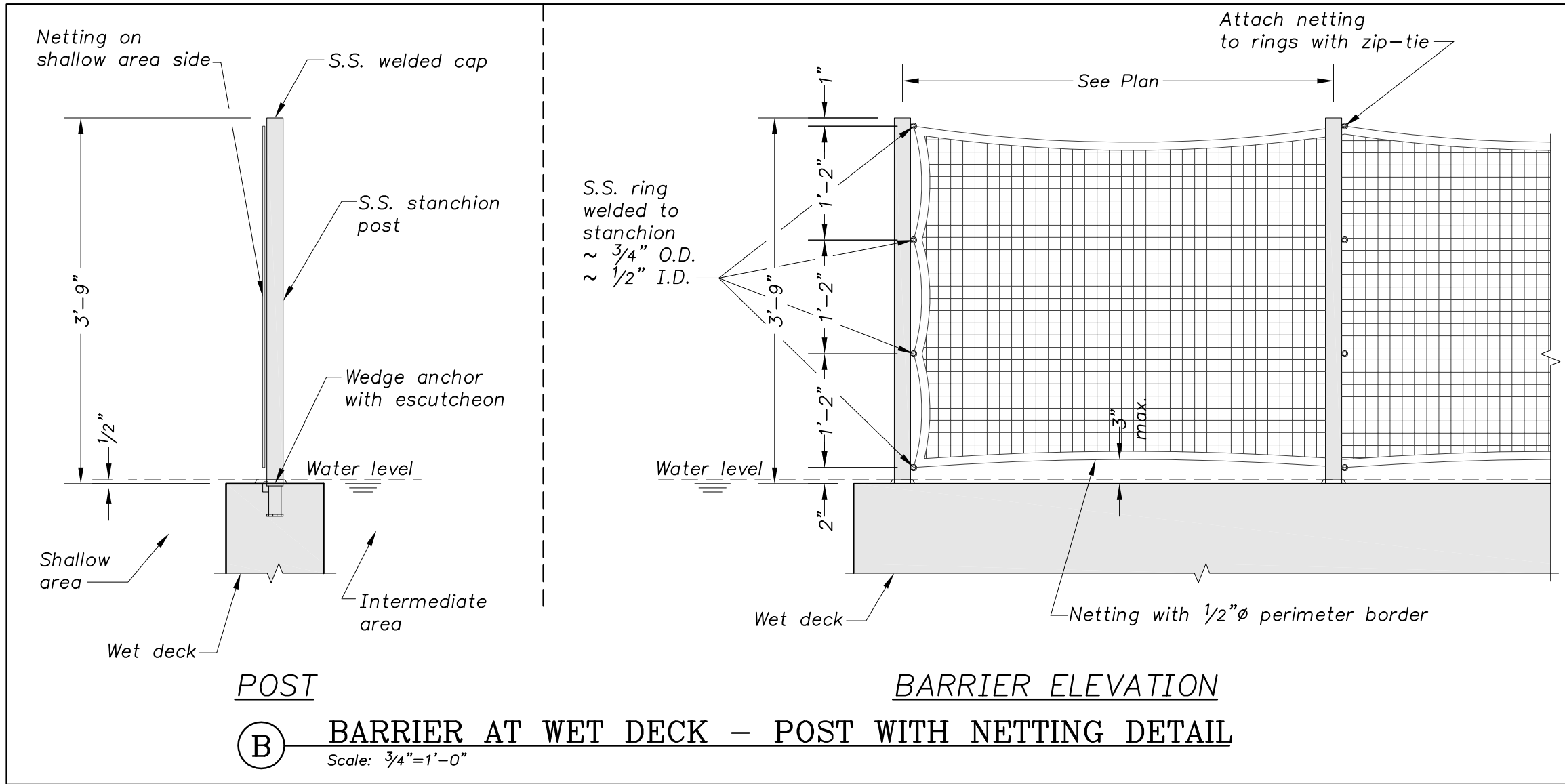
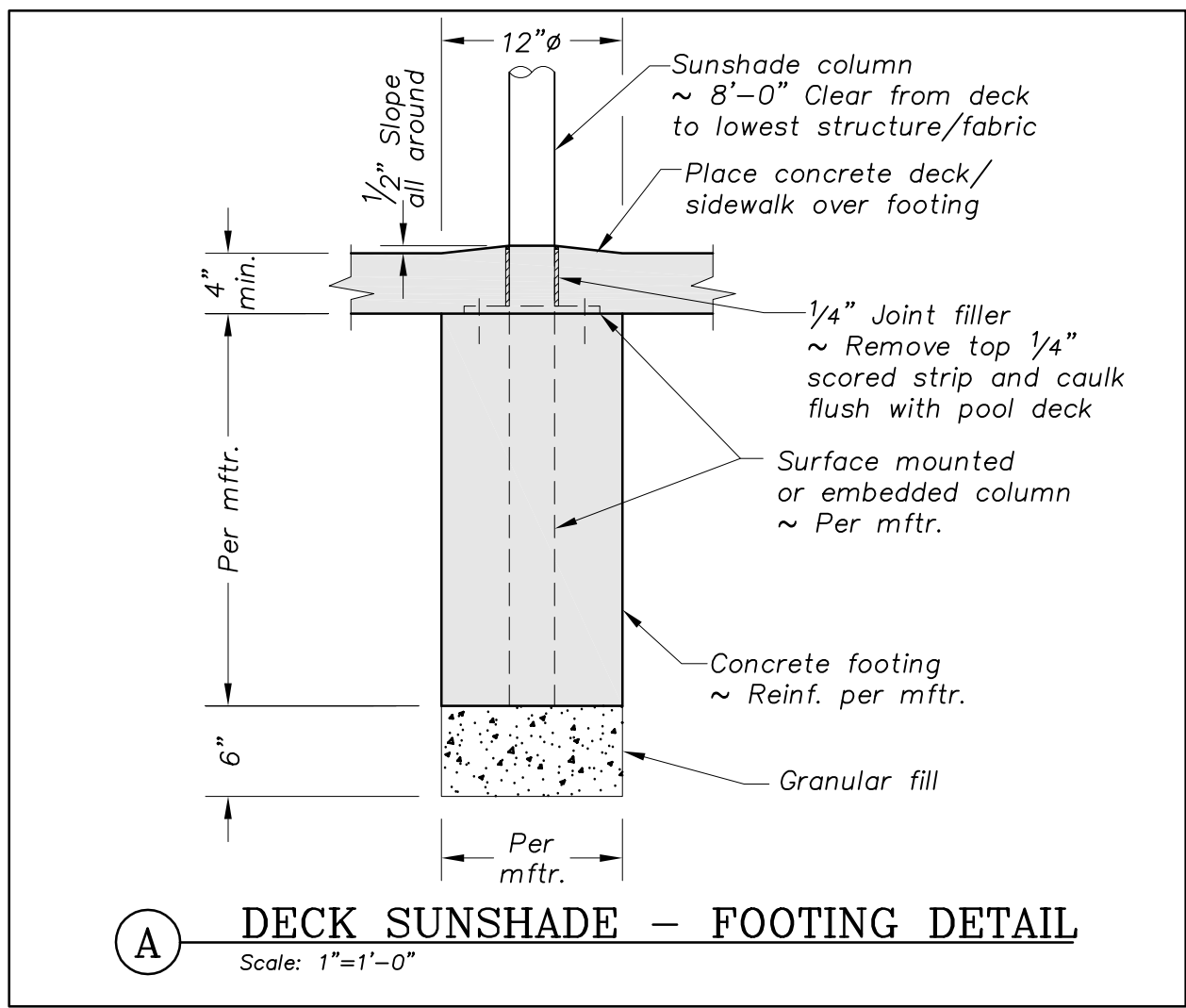
Date: 01-17-24 Job #: 23-523

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Issue: CONSTRUCTION DOCUMENTS

POOL
SECTIONS

SP-P4



NIXA, MISSOURI
Pool
Improvements

#	Description	Date



KYLE McCAWLEY-ENGINEER
LICENSE #2009012200

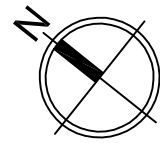
Date: 01-17-24 Job #: 23-523

Drawn: SRS Checked: KAM

Issue: CONSTRUCTION DOCUMENTS

POOL
AREA
DETAILS

SP-P5



NIXA, MISSOURI
Pool
Improvements

Revisions:
Description Date

Seal:



KYLE McCAWLEY—ENGINEER
LICENSE #2009012200
Date: 01-17-24 Job #: 23-523

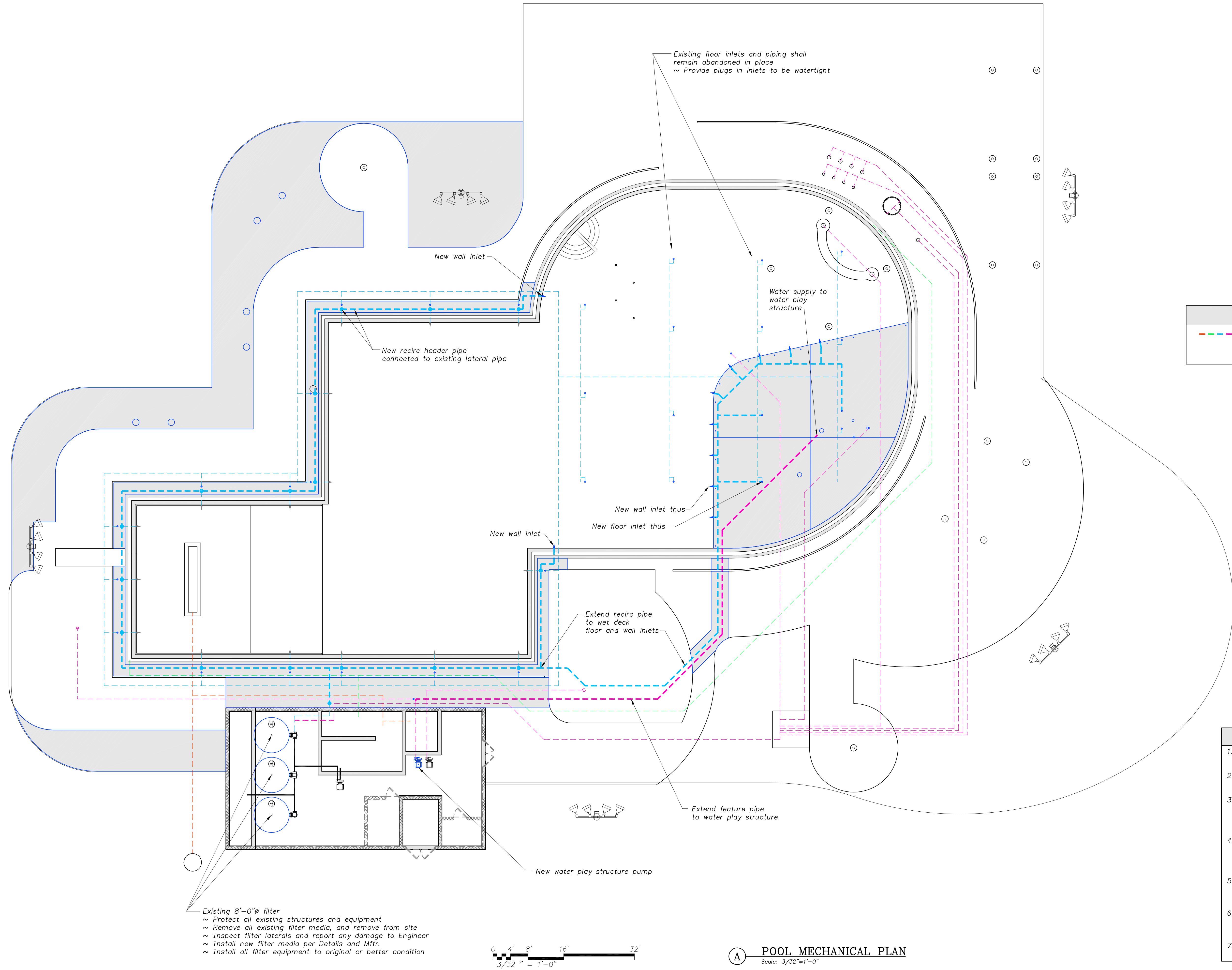
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Issue: CONSTRUCTION DOCUMENTS

POOL
MECHANICAL
PLAN

SP-PM1

Waters Edge Aquatic Design
© 2024



PIPE TYPE NOTES

Pool system piping
(main drain gutter recirc features)
shall be: Sch 80 PVC

GENERAL SHEET NOTES

- All El.'s shown Inv. El. (-)xxx', are distances down from indicated Water El.
- All El.'s shown Inv. El. (+)xxx', are distances up from indicated Water El.
- All pipes shall slope to drain
~ Slope shall be uniform between Inv. El.'s shown, unless otherwise required to prevent piping conflicts
- Inv. El.'s at structures, adjacent to equipment (basket strainers, pumps, etc.), are approximate and may vary per mfr.
~ Contractor shall verify
- All piping through concrete structures shall be cast-in-place
~ No pipe sleeves or coring allowed
- Coordinate all items with piping
~ Example...fence post footings, shade column footings, etc.
- Tee fitting sizes shall match that of the largest connecting pipe size

A POOL MECHANICAL PLAN
Scale: 3/32"=1'-0"

SECTION 00 01 03
WEAD CERTIFICATIONS PAGE

Project Name: Nixa Aquatic Center Renovation

I hereby certify that the following engineering documents were prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Missouri.

Specifications covered by this seal:

Division 00: 00 01 03, 00 01 11

Division 01: 01 10 00, 01 25 00, 01 30 05, 01 40 00, 01 60 00, 01 70 00, 01 78 00

Division 02: 02 41 00

Division 05: 05 43 00, 05 45 00

Division 07: 07 90 10

Division 09: 09 96 10

Division 13: 13 11 14, 13 11 55, 13 11 85, 13 11 90, 13 11 92, 13 11 94, 13 14 30

Division 31: 31 23 16, 31 23 23

Division 32: 32 92 21

Division 33: 33 41 00, 33 49 10

Engineer's Name: Kyle A. McCawley

Date: January 17, 2025

Certification Number: 2009012200

License Expiration Date: December 31, 2025

END OF SECTION



SECTION 00 01 10
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- B. 01 25 00 - Substitution Procedures
- C. 01 30 00 - Administrative Requirements
- D. 01 40 00 - Quality Requirements
- E. 01 60 00 - Product Requirements
- F. 01 70 00 - Execution and Closeout Requirements
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2.21 Division 28 -- Electronic Safety and Security

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END OF SECTION

SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Nixa Aquatic Center Renovation
- B. Owner's Name: City of Nixa, MO.
- C. Engineer's Name: Waters Edge Aquatic Design, LLC.
- D. The Project consists of the Renovation of a outdoor aquatic center, consisting of recirculation piping, additional concrete deck, new shallow water area. Water features include water spray features, water play structure and other related items. Site work includes walks, fencing, concrete deck, and other site related work.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in City of Nixa documentation

1.03 WORK BY OWNER

- A. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Date of Substantial Completion. Some items include:
 - 1. Play struction.
 - 2. Spray pad features, manifold, and manifold cabinet.

1.04 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. Arrange use of site and premises to allow:
 - 1. Work by Others.
 - 2. Work by Owner.
- C. Provide access to and from site as required by law and by Owner:
- D. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
- E. Limit disruption of utility services to hours the building is unoccupied.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.
- D. Limit each request to a single proposed substitution item.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Submittal Time Restrictions:
 - 1. Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.
- B. Submittal Form (before award of contract):
 - 1. Submit substitution requests by completing the form attached to this section. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submittal Form (after award of contract):
 - 1. Submit substitution requests by completing the form attached to this section. See this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.04 RESOLUTION

- A. Engineer may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

- B. Engineer will notify Contractor in writing of decision to accept or reject request.

3.05 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Electronic document submittal service.
- C. Progress meetings.
- D. Submittals for review, information, and project closeout.
- E. Number of copies of submittals.
- F. Requests for Interpretation (RFI) procedures.
- G. Submittal procedures.

1.02 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Engineer:
 - 1. Requests for Interpretation (RFI).
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 - 1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
 - 2. Contractor and Engineer are required to use this service.
 - 3. It is Contractor's responsibility to submit documents in allowable format.
 - 4. Subcontractors, suppliers, and Engineer's consultants will be permitted to use the service at no extra charge.
 - 5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 - 6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.

7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Submittal Service: The selected service is:
- C. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Engineer and Contractor participating; further training is the responsibility of the user of the service.
- D. Project Closeout: Engineer will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PROGRESS MEETINGS

- A. Attendance Required:
 1. Contractor.
 2. Owner.
 3. Engineer.
 4. Contractor's superintendent.
 5. Major subcontractors.
- B. Agenda:
 1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Maintenance of progress schedule.
 7. Corrective measures to regain projected schedules.
 8. Planned progress during succeeding work period.
 9. Maintenance of quality and work standards.
 10. Effect of proposed changes on progress schedule and coordination.
 11. Other business relating to work.
- C. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, Owner, participants, and those affected by decisions made.

3.03 REQUESTS FOR INTERPRETATION (RFI)

- A. Definition: A request seeking one of the following:
 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
 2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
- C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 1. Prepare a separate RFI for each specific item.
 - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 - b. Do not forward requests which solely require internal coordination between subcontractors.
 2. Prepare using software provided by the Electronic Document Submittal Service.
- D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.

1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
 - a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Engineer, and any of its consultants, due to processing of such RFIs.
- E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
 1. Official Project name and number, and any additional required identifiers established in Contract Documents.
 2. Owner's, Engineer's, and Contractor's names.
 3. Discrete and consecutive RFI number, and descriptive subject/title.
 4. Issue date, and requested reply date.
 5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
 6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
- F. Review Time: Engineer will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.

3.04 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Engineer for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.05 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.

5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Engineer's knowledge as contract administrator or for Owner.

3.06 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
 1. Project record documents.
 2. Operation and maintenance data.
 3. Warranties.
 4. Bonds.
 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.07 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Engineer.
 1. After review, produce duplicates.
 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.08 SUBMITTAL PROCEDURES

- A. General Requirements:
 1. Use a separate transmittal for each item.
 2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
 3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 7. Provide space for Contractor and Engineer review stamps.
 8. When revised for resubmission, identify all changes made since previous submission.
 9. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
 10. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
- B. Product Data Procedures:
 1. Submit only information required by individual specification sections.
 2. Collect required information into a single submittal.
 3. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:

1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

3.09 SUBMITTAL REVIEW

- A. Submittals for Review: Engineer will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Engineer will acknowledge receipt and review. See below for actions to be taken.
- C. Engineer's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
- D. Engineer's and consultants' actions on items submitted for review:
 1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "Approved", or language with same legal meaning.
 - b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
 2. Not Authorizing fabrication, delivery, and installation:
- E. Engineer's and consultants' actions on items submitted for information:
 1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. References and standards.
- C. Testing and inspection agencies and services.
- D. Control of installation.
- E. Mock-ups.
- F. Tolerances.
- G. Manufacturers' field services.
- H. Defect Assessment.

1.02 RELATED REQUIREMENTS

- A. Document 00 72 00 - General Conditions: Inspections and approvals required by public authorities.
- B. Section 01 21 00 - Allowances: Allowance for payment of testing services.
- C. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- D. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Testing Agency Qualifications:
 - 1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer of the testing agency proposed for acceptance by Engineer and Owner.
- C. Design Data: Submit for Engineer's knowledge as contract administrator or for the Owner, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.
- D. Test Reports: After each test/inspection, promptly submit two copies of report to Engineer and to Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Engineer, provide interpretation of results.
 - 2. Test reports are submitted for Engineer's knowledge as contract administrator or for the Owner, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

- E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Engineer, in quantities specified for Product Data.
 - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.
- F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- G. Manufacturer's Field Reports: Submit reports for Engineer's benefit as contract administrator or for Owner.
 - 1. Submit report in duplicate within 30 days of observation to Engineer for information.
 - 2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.
- H. Erection Drawings: Submit drawings for Engineer's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.
 - 2. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

1.05 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.06 Testing and Inspection Agencies and Services

- A. Contractor shall employ and pay for services of an independent testing agency to perform specified testing; payment for cost of services will be derived from allowance specified in Section 01 21 00; see Section 01 21 00 and applicable sections for description of services included in allowance.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Contractor Employed Agency:
 - 1. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
 - 2. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

- A. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Engineer will use accepted mock-ups as a comparison standard for the remaining Work.
- D. Where mock-up has been accepted by Engineer and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Engineer.

3.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

- A. See individual specification sections for testing required.
- B. Testing Agency Duties:
 - 1. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Engineer and Contractor of observed irregularities or non-compliance of Work or products.
 - 6. Perform additional tests and inspections required by Engineer.
 - 7. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.

4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 4. Notify Engineer and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Engineer.
- F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.
- G. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Engineer. Payment for re testing will be charged to the Contractor by deducting testing charges from the Contract Price.

3.05 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment, and _____ as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of Engineer, it is not practical to remove and replace the work, Engineer will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations.
- E. Procedures for Owner-supplied products.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Document 00 72 00 - General Conditions: Substitutes and "or-equal" procedures.
- B. Section 01 10 00 - Summary: Identification of Owner-supplied products.
- C. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- D. Section 01 40 00 - Quality Requirements: Product quality monitoring.
- E. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
- D. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

PART 2 PRODUCTS

2.01 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.02 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 25 00 - Substitution Procedures.
- B. See section 00 72 00 for substitute and "or-equal" procedures.
- C. Submittal Procedure:

3.02 OWNER-SUPPLIED PRODUCTS

- A. See Section 01 10 00 - Summary for identification of Owner-supplied products.
- B. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.
- C. Contractor's Responsibilities:
 - 1. Review Owner reviewed shop drawings, product data, and samples.
 - 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
 - 3. Handle, store, install and finish products.
 - 4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide off-site storage and protection when site does not permit on-site storage or protection.

- G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- H. Comply with manufacturer's warranty conditions, if any.
- I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- K. Prevent contact with material that may cause corrosion, discoloration, or staining.
- L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Cutting and patching.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Water loss testing.
- H. Demonstration and instruction of Owner personnel.
- I. Operation.
- J. Winterization requirements.
- K. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- B. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- C. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- D. Section 07 84 00 - Firestopping.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
 - 3. For competitive lap swimming lanes, submit a certificate, signed by the Land Surveyor, that the dimensions (length, width, and depth) of the lap swimming areas are in conformance with Contract Documents.
 - 4. Submit surveys and survey logs for the project record.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.

1.04 QUALIFICATIONS

- A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Engineer. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- B. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.05 PROJECT CONDITIONS

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- F. Noise Control:
 - 1. Take reasonable measures to avoid unnecessary noise. Such measures shall be appropriate for the normal ambient sound levels in the area during working hours. All construction machinery and vehicles shall be equipped with practical sound-muffling devices, and operated in a manner to cause the least noise consistent with efficient performance of the Work.
 - 2. During construction activities on or adjacent to occupied buildings, and when appropriate, erect screens or barriers effective in reducing noise in the building and conduct operations to avoid unnecessary noise which might interfere with the activities of building occupants.
- G. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Engineer four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Engineer of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Control datum for survey is that indicated on drawings.
- E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

- F. Promptly report to Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.
- H. Utilize recognized engineering survey practices.
- I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations, and other structures.
- J. Periodically verify layouts by same means.
- K. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-complying work.
- C. Execute cutting and patching including excavation and fill to complete the work, to uncover work to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit Products together to integrate with other work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.
- J. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
- K. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
- L. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

3.07 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Engineer and Owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 WATER LOSS TESTING

- A. After the pool has been filled and is operational, perform a water loss test on all water holding structures (pool basins, surge pits, backwash pits, etc...) and piping systems. All testing shall be performed in company with the Owner and/or Engineer.
- B. Testing procedures shall be as follows:
 - 1. Run the pool recirculation system as well as all water feature systems under normal operating conditions.
 - 2. Where exposed for viewing, check all water holding structures and piping systems for visible leaks. Report any leaks along with recommended repair procedures to the Engineer for review and approval. Upon approval, make the necessary repairs.
 - 3. Turn off all pool water make-up systems.
 - 4. Verify the water level in the surge tank is at normal operating level. Measure and record the surge tank water level from the top of the pit down to water level.
 - 5. Place a five-gallon bucket within the pool structure on level ground (this could be on a step or on the pool bottom).
 - 6. Fill the bucket with water to the exact level of the surrounding pool water.
 - 7. Mark the inside and outside of the bucket with a permanent marker at the water level.
 - 8. Run the pool recirculation system as well as all water feature systems under normal operating conditions for a 24-hour period with the bucket in place.
 - 9. After 24-hours, measure and record the surge tank water level from the top of the pit down to water level. Compare the results of the water level with that taken at the start of testing. Report these values to the Engineer for review. A substantial difference in these values indicate water loss.
 - 10. Compare the water level in the bucket with the pool water level. Report these values to the Engineer. If the water level in the bucket and the pool water level are the same and the surge tank measurements above are not substantially different, then the test passed. If the pool water level is below the level of the water in the bucket, the test failed and a leak is present.
 - 11. Repeat the above steps with the recirculation system and water feature systems turned off. Report all measurements to the Engineer. If the difference between the level of water in the bucket and the level of the pool water is less than that measured with the recirculation system on, then the leak is likely in the recirculation system. If the difference between the level of water in the bucket and the level of the pool water is the same as that measured with the recirculation system on, then the leak is most likely in the pool structure.
- C. If testing indicates water loss or leakage, locate the source of water loss and report the source(s) and recommended repair procedures to the Engineer for review and approval. Once the repair procedures are approved, make the necessary repairs and perform the water loss testing procedures again.

3.11 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- B. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

3.12 OPERATION

- A. For a period of 15 days after substantial completion, operate the pool recirculation, filtration, and chemical feed systems.
- B. Operation shall include, but not necessarily limited to, the following:

1. Operation of the pool recirculation systems.
 2. Backwashing the filters when required.
 3. Maintaining appropriate levels of free available chlorine in the pool at all times.
 4. Adjusting the pool water chemistry to maintain ideal water balance conditions. This includes monitoring and adjusting total alkalinity, calcium hardness, and pH.
 5. Operation of all recirculation and feature pumps including adjusting flows as required for each system.
- C. Maintain appropriate operating records.
- D. After substantial completion, routine pool maintenance (e.g. vacuuming the pool, cleaning the pool decks, cleaning the bathhouse, etc...), will be the responsibility of the Owner.
- E. The Owner will be responsible for verifying the pool water chemistry to ensure it is appropriate during all times the facility is in use.

3.13 WINTERIZATION

- A. Provide a qualified person who is knowledgeable about the Project to perform winterization and instruction of owner personnel.
- B. Winterize the facility for the first season and instruct the Owner's personnel on the winterization of all equipment and piping systems. Provide written instructions on winterizing all facilities, including pools and bathhouse, and provide training of staff on winterizing procedures.

3.14 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.15 FINAL CLEANING

- A. Use cleaning materials that are nonhazardous.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and _____.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.16 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Engineer when work is considered ready for Engineer's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Engineer's Substantial Completion inspection.

- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Engineer's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Engineer.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Engineer when work is considered finally complete and ready for Engineer's Substantial Completion final inspection.
- H. Complete items of work determined by Engineer listed in executed Certificate of Substantial Completion.

END OF SECTION

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

1.02 RELATED SECTIONS

- A. Conditions of the Contract: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 30 05 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 70 00 - Execution Requirements: Contract closeout procedures.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Engineer with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Engineer's comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.

- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record, at each product section, description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 3. Field changes of dimension and detail.
 - 4. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designation.
 - 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture Protection and Weather-Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Provide a listing in Table of Contents for design data, with tabbed fly sheet, and space for insertion of data.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and any special operating instructions.
- C. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

- D. Provide servicing and lubrication schedule, and list of lubricants required.
- E. Include manufacturer's printed operation and maintenance instructions.
- F. Include sequence of operation by controls manufacturer.
- G. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- H. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- I. Additional Requirements: As specified in individual product specification sections.

3.05 OPERATION AND MAINTENANCE MANUALS

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- B. Prepare data in the form of an instructional manual.
- C. Binders: Commercial quality, 8-1/2 x 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.
- F. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- H. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
- I. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions, arranged by systems and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - a. List of equipment.
 - b. Parts list for each component.
 - c. Operating instructions.
 - d. Maintenance instructions for equipment and systems.
 - e. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
- J. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Engineer, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.

- D. Retain warranties and bonds until time specified for submittal.

END OF SECTION

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Building demolition excluding removal of hazardous materials and toxic substances.
- B. Selective demolition of built site elements.
- C. Selective demolition of building elements for alteration purposes.
- D. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 10 00 - Summary: Description of items to be salvaged or removed for re-use by Contractor.
- C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- D. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- E. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- F. Section 31 23 23 - FILL AND BACKFILL FOR SPRAY GROUNDS: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
 - 2. Identify demolition firm and submit qualifications.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

- A. Remove other items indicated, for salvage and relocation.
- B. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 22 00.
- C. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.

3. Provide, erect, and maintain temporary barriers and security devices.
 4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 5. Do not close or obstruct roadways or sidewalks without permit.
 6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Protect existing structures and other elements that are not to be removed.
1. Provide bracing and shoring.
 2. Prevent movement or settlement of adjacent structures.
 3. Stop work immediately if adjacent structures appear to be in danger.

3.03 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
1. Verify that construction and utility arrangements are as indicated.
 2. Report discrepancies to Engineer before disturbing existing installation.
 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Remove existing work as indicated and as required to accomplish new work.
1. Remove items indicated on drawings.
- C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 3. Verify that abandoned services serve only abandoned facilities before removal.
 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
- D. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.

2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

3.05 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 05 43 00

SLOTTED CHANNEL FRAMING FOR SPRAY GROUNDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Continuous slot, bolted metal framing channels and all associated fittings and hardware.

1.02 RELATED SECTIONS

- A. Section 03 30 05 - Cast-In-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 05 45 00 - Anchors for Concrete and Masonry; Anchorage.
- C. Section 13 11 90 - Piping, Valves, and Related Items: Pipe supports.

1.03 REFERENCES

- A. MFMA - Metal Framing Manufacturers Association
- B. ANSI/NFPA 70- National Fire Protection Association (National Electrical Code); 2002
- C. AISI - American Iron and Steel Institute

1.04 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. Submit drawings of strut and accessories including clamps, brackets, hanger rods, and fittings.
- C. Submit manufacturer's product data on strut channels including, but not limited to, types, materials, finishes, gauge thickness, and hole patterns. For each different strut cross-section, submit cross sectional properties including Section Modulus (Sx) and Moment of Inertia (Ix).

1.05 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of bolted metal framing of the types required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. MFMA Compliance: Comply with the latest revision of MFMA Standards Publication Number MFMA-3, "Metal Framing Standards Publication".
- C. NEC Compliance: Comply with the latest revision NFPA 70 - Article 352 "Surface Metal Raceways and Surface Nonmetallic Raceways".
- D. UL Compliance: Comply with UL "Standard for Surface Metal Raceway and Fittings", UL 5.
- E. Bolted framing channels and fittings shall have the manufacturers name, part number, and material heat code identification number stamped in the part itself for identification. Material certification sheets and test reports must be made available by the manufacturer upon request.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver strut systems and components carefully to avoid breakage, denting, and scoring finishes. Do not install damaged equipment.
- B. Store strut systems and components in original cartons and in clean dry space; protect from weather and construction traffic.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Cooper B-Line; 509 West Monroe Street, P.O. Box 326, Highland, Illinois 62249; Tel: (800) 851-7415; www.cooperindustries.com.
- B. Unistrut Corporation; 1140 West Thorndale Avenue, Itasca, Illinois 60143; Tel: (800) 468-9510; Fax: (630) 773-4210.

2.02 STRUT CHANNELS AND COMPONENTS

- A. General: Strut shall be 1-5/8 inches wide in varying heights and welded combinations as required to meet load capacities and designs indicated on the drawings.

- B. Materials and Finish: Material and finish specifications for each strut type are as follows:
1. Stainless Steel:
 - a. All strut, fittings and hardware shall be made of AISI Type 304 stainless steel.
 2. Fiberglass:
 - a. All FRP shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions.
 - b. Fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.
 - c. Resins shall be vinyl ester with chemical formulations as necessary to provide the corrosion resistance, strength and other physical properties as required.
 - d. All finished surfaces of FRP items and fabrications shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.
 - e. All pultruded structural shapes shall be further protected from ultraviolet (UV) light with 1) integral UV inhibitors in the resin and 2) a synthetic surfacing veil to help produce a resin rich surface.
 - f. All fittings and hardware shall be made of AISI Type 304 stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 INSTALLATION

- A. Install strut in accordance with MFMA-102 'Guidelines for the Use of Metal Framing'; in accordance with equipment manufacturer's recommendations, and with recognized industry practices.
- B. All nuts and bolts shall be tightened to the following torque values:
1. Bolt Size 1/4 - 20: 6 ft-lbs.
 2. Bolt Size 5/16 - 18: 11 ft-lbs.
 3. Bolt Size 3/8 - 16: 19 ft-lbs.
 4. Bolt Size 1/2 - 13: 50 ft-lbs.

END OF SECTION

SECTION 05 45 00

CONCRETE-MASONRY ANCHORS FOR SPRAY GROUNDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cast-in-place anchor bolts, epoxy grouted anchor bolts, threaded rod anchors, adhesive anchors, expansion anchors, self-threading bolt anchors, and screw anchors to be installed in hardened concrete and masonry.
- B. Adhesive for the adhesive anchors.

1.02 RELATED SECTIONS

- A. Section 13 11 63 - Miscellaneous Metals.

1.03 REFERENCES

- A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1997a.
- B. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 1998.
- C. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength; 1997.
- D. ASTM A 385 - Standard Practice for Providing High-Quality Zinc Coatings (Hot Dip); 2000.
- E. ASTM A 615 - ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.
- F. ASTM B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 1998e1.
- G. ASTM F 593 - Standard Specifications for Stainless Steel Bolts, Hex Cap Screws, and Studs; 1998.
- H. ASTM F 594 - Standard Specifications for Stainless Steel Nuts; 1998.

1.04 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's specifications and technical data, including installation instructions, and catalog cuts.

PART 2 PRODUCTS

2.01 GENERAL

- A. Anchor Sizes:
 - 1. Unless otherwise specified or indicated on the drawings, all anchor bolts shall be cast-in-place bolts, shall have a diameter of at least 3/4 inch, and shall be straight headed, straight with embedded nut with or without a plate, or L-shaped.
 - 2. Epoxy grouted anchor bolts, threaded rod anchors which are epoxy grouted, and adhesive anchors for equipment or structural framing shall be at least 3/4 inch in diameter.
 - 3. All cast-in place anchors in grout-filled masonry shall be at least 1/2 inch but not more than 3/4 inch in diameter.
 - 4. All expansion anchors shall be at least 1/2 inch in diameter.
- B. Anchor Finishes:
 - 1. Anchor bolts and threaded rod anchors for buried service and in splash zones shall be hot-dip galvanized.
 - 2. Anchor bolts, threaded rod anchors, adhesive anchors, and expansion anchors for immersed service shall be stainless steel.
 - 3. Expansion anchors and adhesive anchors for buried service and in splash zones or wet areas shall be stainless steel.
 - 4. All other anchor bolts, threaded rod anchors, adhesive anchors, and expansion anchors shall be carbon steel unless otherwise specified or indicated on the drawings.

2.02 ANCHOR BOLTS AND NUTS

- A. Carbon Steel: ASTM A 307.
- B. Stainless Steel: Bolts, ASTM F 593, Alloy Group 1 or 2; nuts, ASTM F 594, Alloy Group 1 or 2.
- C. Galvanized Steel: Carbon steel bolts and nuts; hot-dip galvanized, ASTM A 153 and A 385.

2.03 FLAT WASHERS

- A. ANSI B 18.22.1; of the same material as anchor bolts and nuts.

2.04 REINFORCING BARS

- A. ASTM A 615, Grade 60, deformed.

2.05 THREADED ROD ANCHORS AND NUTS

- A. Carbon Steel: ASTM A 307 or A 36.
- B. Stainless Steel: Bolts, ASTM F 593, Alloy Group 1 or 2; nuts, ASTM F 594, Alloy Group 1 or 2.
- C. Galvanized Steel: Carbon steel bolts and nuts; hot-dip galvanized, ASTM A 153 and A 385.

2.06 ADHESIVE ANCHORS FOR CONCRETE AND GROUT FILLED MASONRY

- A. Products:
 - 1. Hilti "HIT HY 200"; Tel: (800) 879-8000.
 - 2. ITW Ramset/Redhead "Epcon C6 System"; Tel: (630) 350-0370; www.ramset-redhead.com.
 - 3. Powers Fasteners, Inc. "Power-Fast"; Tel: (914) 235-6300; www.powers.com.
- B. Threaded Rod Anchors: As specified for threaded rod anchors and nuts.
- C. Adhesive:
 - 1. Two-component liquid, moisture-insensitive epoxy adhesive with viscosity appropriate for the location and application.
 - 2. Components shall be packaged at the factory in a dual-chambered cartridge.

2.07 ADHESIVE ANCHORS FOR HOLLOW MASONRY

- A. Products:
 - 1. Hilti "HIT HY 200"; Tel: (800) 879-8000.
 - 2. ITW Ramset/Redhead "Epcon C6 System"; Tel: (630) 350-0370; www.ramset-redhead.com.
 - 3. Powers Fasteners, Inc. "Power-Fast"; Tel: (914) 235-6300; www.powers.com.
- B. Threaded Rod Anchors: As specified for threaded rod anchors and nuts.
- C. Adhesive:
 - 1. Two-component liquid, moisture-insensitive epoxy adhesive with viscosity appropriate for the location and application.
 - 2. Components shall be packaged at the factory in a dual-chambered cartridge.
- D. Screen Tubes: As recommended by the manufacturer.

2.08 EXPANSION ANCHORS FOR CONCRETE

- A. Products:
 - 1. Hilti "Kwik-Bolt II"; Tel: (800) 879-8000.
 - 2. ITW Ramset/Red Head "Trubolt Wedge Anchor"; Tel: (630) 350-0370; www.ramset-redhead.com.
 - 3. Powers Fasteners, Inc. "Power-Stud Anchor"; Tel: (914) 235-6300; www.powers.com.

2.09 SELF-THREADING BOLT ANCHORS

- A. Products:
 - 1. Specified Product: Powers Fasteners, Inc. "Wedge-Bolt"; Tel: (914) 235-6300; www.powers.com.
 - 2. Acceptable Product: ITW Ramset/Red Head "LDT Anchors" with "GRD2000" coating; Tel: (630) 350-0370; www.ramset-redhead.com.

- B. Anchor shall consist of a one-piece unit made from hardened carbon steel featuring a finished hex head formed with an integral washer, a double lead thread, and a chamfered tip.
- C. Anchors shall be designed to be installed in a hole that is pre-drilled using a special matched tolerance bit.
- D. The anchor shall have a ratchet teeth on the underside of the hex washer head that engage the fixture.
- E. Installation shall consist of screwing or tightening the anchor into the pre-drilled hole.
- F. The head of the anchor shall be stamped with both the diameter and the length of the anchor.
- G. The anchors shall be plated according to ASTM B 633, SC1, Type III.

2.10 SCREW ANCHORS

- A. Products:
 - 1. ITW Ramset/Red Head "Tapcon" with "Climaseal" coating; Tel: (630) 350-0370; www.ramset-redhead.com.
 - 2. Powers Fasteners, Inc. "Tapper" with "Perma-Seal" coating; Tel: (914) 235-6300; www.powers.com.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 ANCHORS

- A. Anchor bolts shall be cast in place and, when acceptable to the Engineer or indicated on the drawings, may be epoxy grouted anchor bolts, threaded rod anchors, or adhesive anchors. Anchor bolts, threaded rod anchors, and adhesive anchors which are to be epoxy grouted shall be clean and free of coatings that would weaken the bond with the epoxy.
- B. Two nuts, a jam nut, and a washer shall be furnished for anchor bolts, threaded rod anchors, and adhesive anchors indicated on the drawings to have locknuts; two nuts and a washer shall be furnished for all other anchor bolts, threaded rod anchors, and adhesive anchors.
- C. Anti-seize thread lubricant shall be liberally applied to projecting, threaded portions of stainless steel anchor bolts, threaded rod anchors, and adhesive anchors immediately before final installation and tightening of the nuts.
- D. Anchor Bolts:
 - 1. Anchor bolts shall be delivered in time to permit setting before the structural concrete is placed.
 - 2. Anchor bolts which are cast-in-place in concrete shall be provided with sufficient threads to permit a nut to be installed on the concrete side of the concrete form or the supporting template.
 - 3. Installation of anchor bolts is covered in Section 13 11 15.
- E. Threaded Rod Anchors:
 - 1. When acceptable to the Engineer, threaded rod anchors may be used in locations where cast-in-place anchor bolts are specified.
 - 2. Adhesive for threaded rod anchors shall be as specified in Section 13 11 15.
 - 3. The embedment depth for threaded rod anchors shall be at least 15 rod diameters.
- F. Adhesive Anchors:
 - 1. When adhesive anchors are indicated on the drawings, only an acceptable adhesive anchor system shall be used. Alternative anchoring systems may be used only when acceptable to the Engineer. An acceptable adhesive anchor system may be used as an alternative in locations where epoxy grouted anchor bolts and threaded rod anchors are specified or indicated. The embedment depth for adhesive anchors shall be at least 15 rod diameters.

2. Adhesive for adhesive anchors shall be statically mixed in the field during application. All proportioning and mixing of the components shall be in accordance with the manufacturer's recommendations.
3. When acceptable to the Engineer, adhesive anchors shall be anchored in holes drilled into hardened concrete or grout filled masonry. Diameter of holes shall be 1/16 inch larger than the outside diameter of the rod. Holes shall be prepared for insertion of the anchors by removing all dust and debris using procedures recommended by the adhesive manufacturer.
4. Adhesive anchors and holes shall be clean, dry, and free of grease and other foreign matter at the time of installation. The adhesive shall be placed, the rods shall be set and positioned, and the adhesive shall be finished, all in accordance with the recommendations of the material manufacturer. Care shall be taken to ensure that all spaces and cavities are filled with adhesive, without voids, and remain filled with adhesive until completion of the curing period. Adhesive shall be cured in accordance with the recommendations of the adhesive manufacturer.

3.03 EXPANSION ANCHORS

- A. When expansion anchors are indicated on the drawings, only an acceptable expansion anchor shall be used. Alternative anchoring systems may be used only when acceptable to the Engineer. Expansion anchors shall be installed in conformity with the manufacturer's recommendations for maximum holding power, but in no case shall the depth of the hole be less than six bolt diameters. The minimum distance between the center of any expansion anchor and an edge or exterior corner of concrete shall be at least six times the diameter of the bolt. Unless otherwise indicated on the drawings, the minimum distance between the centers of expansion anchors shall be at least 12 times the diameter of the bolt.
- B. Nuts and washers for expansion anchors shall be as specified for anchor bolts.
- C. Anti-seize thread lubricant shall be liberally applied to threaded stainless steel components of expansion anchors immediately before installation.

3.04 SELF-THREADING BOLT ANCHORS AND SCREW ANCHORS

- A. Pre-drill a hole using a special matched tolerance bit as recommend by the manufacturer.
- B. Install by screwing or tightening the anchor into the pre-drilled hole per manufacturer's instructions.

END OF SECTION

SECTION 07 90 10
JOINT SEALERS FOR SPRAY GROUNDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sealants and joint backing.
- B. Joint filler.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 05 - Cast-in-Place Concrete: Sealants required in conjunction with concrete slabs.

1.03 REFERENCE STANDARDS

- A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2011.
- B. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2011a.
- C. ASTM C 1247 - Standard Test Methods for Durability of Sealants Exposed to Continuous Immersion in Liquids; 1998.
- D. ASTM D1667 - Standard Specification for Flexible Cellular Materials--Poly(Vinyl Chloride) Foam (Closed-Cell); 2005 (Reapproved 2011).

1.04 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics.
- C. Manufacturer's Installation Instructions: Indicate special procedures.

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years experience.

1.06 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.07 COORDINATION

- A. Coordinate the work with all sections referencing this section.

PART 2 PRODUCTS

2.01 SEALANTS

- A. Nonsag Polyurethane Sealant: ASTM C920, Grade NS, Class 25, Uses NT, M, A, G, O; multi component, chemical curing, non-staining, non bleeding, non-sagging type.
 - 1. Color: Colors as selected by Engineer, including custom colors.
 - 2. Product:
 - a. Sikaflex 2C NS EZ Mix manufactured by Sikaflex.
 - b. MasterSeal NP 2 manufactured by BASF.
 - 3. Movement Capability: Plus and minus 25 percent.
 - 4. Service Temperature Range: -20 to 180 degrees F.
 - 5. Shore A Hardness Range: 20 to 35.
 - 6. Applications: Use for:
 - a. Control joints in pool deck.
- B. Two-Part Polysulfide Rubber Sealant: ASTM C 920, Grade NS, Class 25, Uses NT, M, G, A ; multi component, chemical curing, non-staining, non bleeding, non-sagging type. Also, exceeds the test requirements of ASTM C 1247 for sealants exposed to continuous immersion in liquids and NSF Standard 61, Section 6 for Joining and Sealing Materials.
 - 1. Color: Colors as selected by Engineer, including custom colors.

2. Products:
 - a. Deck-O-Seal Gun Grade manufactured by W.R. Meadows.
 - b. Synthacalk GC-2+ manufactured by Pecora.
 - c. Equivalent product recommended for continuous submersion in swimming pools.
3. Movement Capability: Plus and minus 25 percent.
4. Shore A Hardness Range: 25-30.
5. Applications: Use for:
 - a. Joints in swimming pool gutter.
 - b. Joints subject to submersion.
 - c. Joints in and adjacent to wet decks, spray grounds, etc.

2.02 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Filler: Polyethylene closed-cell backing expansion joint type compatible with sealant and utilizing peel-off top feature. Height equal to slab thickness.
 1. Product: Sonolastic Expansion Joint Filler manufactured by Sonneborn or equivalent.
- D. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
 1. Product: Sonolastic Closed-Cell Backer-Rod manufactured by Sonneborn or equivalent.
- E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Remove protective coatings or finishes that could interfere with adhesion.
- C. Clean and prime joints in accordance with manufacturer's instructions.
- D. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- E. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Install bond breaker where joint backing is not used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. All caulk joint surfaces shall be straight and flush with adjacent surfaces. Tooling of joints other than as indicated above shall not be allowed unless otherwise noted.

3.04 CLEANING

- A. Clean adjacent soiled surfaces.

3.05 PROTECTION

- A. Protect sealants until cured.

END OF SECTION

SECTION 13 11 14
WATERSTOP FOR SPRAY GROUNDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Provisions of waterstops embedded in concrete and spanning control, expansion, and/or construction joints to create a continuous diaphragm to prevent fluid migration.
- B. Waterstops for pipe penetrations.

1.02 RELATED SECTIONS

- A. Section 03 30 05 - Cast-in-Place Concrete.

1.03 REFERENCES

- A. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension; 1998a.
- B. ASTM D 624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers; 2000.
- C. ASTM D 2240 - Standard Test Method for Rubber Property-Durometer Hardness; 2000.

1.04 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. Samples: Submit two waterstop samples, each 6 inches long.
- C. Product Data: Submit data of complete physical properties.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Store waterstops under cover and elevated above grade to protect from oil, dirt, sunlight, and premature exposure to water.

PART 2 PRODUCTS

2.01 HYDROPHILIC WATERSTOPS

- A. Manufacturers and Products:
 - 1. Construction Joints:
 - a. Greenstreak "Hydrotite" profile number CJ-0725-3K.
 - b. Applications: Use at all construction joints where called for on the drawings.
 - 2. Penetrations:
 - a. Greenstreak "Hydrotite" profile number DSS-0420.
 - b. Applications: Use at all pipe or other penetrations through water holding concrete structures.
- B. The waterstop shall be a combination of chloroprene rubber and chloroprene rubber modified to impart hydrophilic properties.
- C. The waterstop shall have a delay coating to inhibit initial expansion due to moisture present in fresh concrete.
- D. Performance requirements as follows:
 - 1. Chloroprene Rubber:
 - a. Tensile Strength, ASTM D 412: 1,300 psi minimum.
 - b. Ultimate Elongation, ASTM D 412: 400 percent minimum.
 - c. Hardness (Shore A), ASTM D 2240: 50 plus or minus 5.
 - d. Tear Resistance, ASTM D 624: 100 lb/inch minimum.
 - 2. Modified Chloroprene (Hydrophilic) Rubber:
 - a. Tensile Strength, ASTM D 412: 350 psi minimum.
 - b. Ultimate Elongation, ASTM D 412: 600 percent minimum.
 - c. Hardness (Shore A), ASTM D 2240: 52 plus or minus 5.
 - d. Tear Resistance, ASTM D 624: 50 lb/inch minimum.

- e. Expansion Ratio, Volumetric Change - Distilled Water @ 70 degrees F: 3 to 1 minimum.

2.02 ACCESSORIES

- A. Hydrophilic Waterstops:
 - 1. Provide Greenstreak Rubber Adhesive to secure "Hydrotite" to smooth, dry concrete.
 - 2. Provide Greenstreak "Epoxy 7300" two component epoxy gel to secure "Hydrotite" to rough, wet (or dry) concrete.
 - 3. Provide "Leakmaster LV-1" single component hydrophilic sealant to secure "Hydrotite" to rough, dry concrete.
 - 4. Provide cyanacrylate adhesive (super glue) for all splices.
 - 5. Provide "Leakmaster LV-1" as addition to cyanacrylate adhesive at all splices for added insurance.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Hydrophilic Waterstop:
 - 1. Cut coil ends square (or at proper angle for mitered corners) with shears or sharp blade to fit splices together without overlaps.
 - 2. Splices shall be sealed using cyanacrylate adhesive (super glue) and "Leakmaster LV-1".
 - 3. Seal watertight any exposed cells of "Hydrotite" using "Leakmaster LV-1".
 - 4. Follow approved manufacturer recommendations.
- B. PVC and Hydrophilic Intersections:
 - 1. Maintain continuity of waterstops at all intersections and transitions.
 - 2. Joinery between PVC and "Hydrotite" shall be sealed using "Leakmaster LV-1".
 - 3. Follow approved manufacturer recommendations.

END OF SECTION

SECTION 13 11 15
CAST-IN-PLACE CONCRETE FOR SPRAY GROUNDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Elevated concrete slabs.
- C. Floors and slabs on grade.
- D. Concrete reinforcement.
- E. Joint devices associated with concrete work.
- F. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 13 11 14 - Waterstops.

1.03 REFERENCE STANDARDS

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).
- B. ACI 224R - Control of Cracking in Concrete Structures; 2001.
- C. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2010.
- D. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (errata 2007).
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
- F. ACI 304.2R - Placing Concrete by Pumping Methods; 1991.
- G. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001 (Reapproved 2008).
- H. ACI 309R - Guide for Consolidation of Concrete; American Concrete Institute International; 1987.
- I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2011.
- J. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2012.
- K. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1999a.
- L. ASTM C 31 - Making and Curing Concrete Test Specimens in the Field; 2000.
- M. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2011a.
- N. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2012.
- O. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2011b.
- P. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2010a.
- Q. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.
- R. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.
- S. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2010b.
- T. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method; 1997.

- U. ASTM C 1064 - Test Method for Temperature of Freshly Mixed Portland Cement Concrete; 1999.
- V. PS 1 - Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce); 1995.

1.04 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Submit data on formwork, reinforcing, and reinforcing accessories.
 - 2. Submit data on all concrete materials including cement and fine and coarse aggregates. Testing shall be completed by an independent testing agency and shall be less than 12 months old. The costs for material tests shall be paid for by the Contractor.
 - 3. Submit data on all admixtures and concrete accessories.
 - 4. Submit concrete mix design.
- C. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.
- D. Fabrication details of the tool proposed to be used to form the top pool gutter wall and lip including written instructions, descriptions, and/or illustrations showing how the tool will be used and how the vertical and horizontal dimensions will be controlled.

1.05 DESIGN OF FORMWORK

- A. Design and engineering of formwork, as well as its construction shall be the responsibility of the Contractor and shall comply with chapters 2 and 3 of ACI-347, and applicable requirements of the controlling local building code.

1.06 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Acquire cement from same source and aggregate from same source for entire project.
- C. Cold Weather Concreting: Cold weather concreting shall comply with ACI 306R.
 - 1. The temperature of concrete at the time of placement shall be as follows:
 - a. Section size (minimum dimension) less than 12 inches: 55 to 75 degrees F.
 - b. Section size (minimum dimension) 12 to 36 inches: 50 to 70 degrees F.
 - 2. The concrete temperature shall be maintained above the minimum identified above for a period of 6 days after placement.
- D. Hot Weather Concreting: Except as modified herein, hot weather concreting shall comply with ACI 305R.
 - 1. At air temperatures of 90 degrees F or above, concrete shall be kept as cool as possible during placement and curing. The temperature of the concrete when placed in the work shall not exceed 90 degrees F.
 - 2. Plastic shrinkage cracking due to rapid evaporation of moisture shall be prevented. Concrete shall not be placed when the evaporation rate (actual or anticipated) equals or exceeds 0.2 pound per square foot per hour, as determined by Figure 2.1.5 in ACI 305R.
- E. Concrete materials shall be selected and concrete shall be proportioned, handled, placed, and cured in a manner that will minimize shrinkage and cracking in accordance with Chapters 3 and 8 of ACI 224R. Concrete temperatures shall be controlled both before and after placement to minimize cracking. Any rise in concrete temperature caused by environmental conditions that will be conducive to excessive shrinkage shall be controlled with blankets or other acceptable means of insulation.

1.07 MOCK-UP

- A. Construct a mock-up panel for each type of concrete surface finish for review and acceptance by Engineer.
 - 1. Panel Size: Sufficient to illustrate finish required.
 - 2. Mock-up panels shall include, but not necessary limited to, illustrating the following:

- a. Pool bottom including roughened construction joint, keyway placement, horizontal and vertical waterstop placement, placement of reinforcing, and broom finish.
 - b. Pool deck and sidewalk broom finish.
 - c. Pool bathhouse and filter building floor finish.
 - d. Pool gutter wall including reinforcing placement, waterstop placement, horizontal and vertical control methods for construction of the top of gutter, repair of tie holes, and grout cleaned finish including sandblasting and rubbing.
- B. Accepted mock-up panel is considered basis of quality for the finished work. Keep mock-up exposed to view for duration of concrete work.
- C. Mock-up shall not remain as part of the Work.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
 2. Prefabricated: Simplex "Industrial Steel Frame Forms", Symons "Steel Ply", or Universal "Uni-form".
 3. Plywood: Product Standard PS 1, waterproof, resin-bonded, exterior type Douglas fir, Panel Grade Designation B-B (concrete form), Class I.
 4. Fiberboard: ANSI/AHA A135.4, Class 1, tempered, water-resistant, concrete form hardboard.
 5. Lumber: Straight, uniform width and thickness, and free from knots, offsets, holes, dents, and other surface defects.
 6. Chamfer Strips: Clear white pine, surface against concrete planed or Vinylex Corporation chamfer strips made from plastic material.
 7. Radius Formers: Vinylex Corporation radius formers made from plastic material.
 8. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
 - a. Burke "Spectrum Release Agent", L&M Chemical "Debond", Master Builders "Pro Cote", Nox-Crete "Chembeton", or Symons "Thrift Kote".
 9. Form Ties: Cone snap type, with 1-1/2 inch long cone and waterproofing washer, that will leave no metal within 1-1/2 inches of concrete surface.

2.02 SPECIAL CONCRETE TOOLS & ACCESSORIES

- A. Slab Finish Strip:
1. Galvanized Steel: ASTM A 653/A 653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.
 2. Size: 20-inches wide by length required with 1-inch break.
 3. Use: For use during concrete finishing process to create straight line separation between slabs and to protect adjacent concrete slabs from fresh concrete.

2.03 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M Grade 60 (420).
1. Deformed billet-steel bars. Use plain billet-steel bars only where indicated on the drawings.
 2. Finish: Unfinished, unless otherwise indicated.
- B. Reinforcement Accessories:
1. Tie Wire: Annealed, minimum 16 gage.
 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 3. Precast Concrete Reinforcement Supports: Concrete supports that are not less than 4 inches square having a compressive strength equal to or greater than the specified

compressive strength of the concrete being placed may be used for supporting reinforcing from the ground per ACI 301.

4. Provide stainless steel or all-plastic (no plastic-tipped components allowed) components for placement within 1-1/2 inches of surfaces exposed to weather or water.

2.04 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I - Normal Portland type.
 1. Acquire all cement for entire project from same source.
 2. Portland Limestone Cement (Type PLC or IL) per ASTM C595 and ASTM C1157 shall be allowed.
- B. Fly Ash: Shall not be allowed.
- C. Fine and Coarse Aggregates: ASTM C 33, unless modified herein.
 1. Acquire all aggregates for entire project from same source.
 2. Fine Aggregate:
 - a. Clean natural sand. Artificial or manufactured sand will not be acceptable.
 - b. Shall not contain any materials that are deleteriously reactive with the alkalies in the cement.
 - c. Sulfate Soundness Test: ASTM C 88.
 - 1) Fine aggregate subjected to five cycles of the soundness test shall have a weighted average loss not greater than 10 percent when sodium sulfate is used or 15 percent when magnesium sulfate is used.
 - d. Organic Impurities Test: ASTM C 40.
 - 1) Fine aggregate shall be free of injurious amounts of organic impurities.
 - 2) Aggregates subjected to the test for organic impurities and producing a color darker than the standard shall be rejected.
 - e. Limits for Deleterious Substances:
 - 1) Clay lumps and friable particle, ASTM C 142: 3.0 percent.
 - 2) Materials finer than No. 200 sieve, ASTM C 117: 5.0 percent.
 - 3) Coal and lignite, ASTM C 123: 0.2 percent.
 - f. Sieve Analysis (percent passing), ASTM C 136:
 - 1) 3/8 inch: 100
 - 2) No. 4: 95 to 100
 - 3) No. 8: 80 to 100
 - 4) No. 16: 50 to 85
 - 5) No. 30: 25 to 60
 - 6) No. 50: 15 to 30
 - 7) No. 100: 3 to 10
 - g. Fineness Modulus, ASTM C 136: Shall not be less than 2.3 nor more than 3.1.
 3. Coarse Aggregate:
 - a. Crushed rock, washed gravel, or other inert granular material, having ASTM C 33 Class Designation 5S and as modified herein.
 - b. Shall not contain any materials that are deleteriously reactive with the alkalies in the cement.
 - c. Upper Limits for Deleterious Substances and Physical Property Requirements:
 - 1) Clay lumps and friable particles, ASTM C 142: 2.0 percent.
 - 2) Chert (less than 2.40 sp gr SSD), ASTM C 123: 0.5 percent.
 - 3) Material finer than No. 200 sieve, ASTM C 117: 1.0 percent.
 - 4) Coal and lignite, ASTM C 123: 0.2 percent.
 - 5) Abrasion, ASTM C 131: 50.
 - 6) Soundness Test, ASTM C 88:
 - (a) Magnesium sulfate (5 cycles): 18 percent.
 - (b) Sodium sulfate: 12 percent.
 - d. Grading Requirements:

- 1) Type A Concrete Mix Design: ASTM C 33, Table 2 Size Number: 67, which has the following gradation (percent passing):
 - (a) 1 inch: 100
 - (b) 3/4 inch: 90 to 100
 - (c) 3/8 inch: 20 to 55
 - (d) No. 4: 0 to 10
 - (e) No. 8: 0 to 5
 - 2) Type B Concrete Mix Design: ASTM C 33, Table 2 Size Number: 8, which has the following gradation (percent passing):
 - (a) 1/2 inch: 100
 - (b) 3/8 inch: 85 to 100
 - (c) No. 4: 10 to 30
 - (d) No. 8: 0 to 10
 - (e) No. 16: 0 to 5
 4. Percentage of Fine to Total Aggregates: The ratio of fine to total aggregates, based on solid volumes (not weights), multiplied by 100 shall be based upon the following coarse aggregate sizes:
 - a. For 1 inch maximum coarse aggregate size: Ratio of fine to total aggregates is 30% to 46%.
 - b. For 1/2 inch maximum coarse aggregate size: Ratio of fine to total aggregates is 40% to 55%.
- D. Water: Clean and not detrimental to concrete.

2.05 CHEMICAL ADMIXTURES

- A. No calcium chloride or admixture containing chloride from sources other than impurities in admixture ingredients will be acceptable. Admixtures classified as Class 1 or Class 2 in ACI 212R or containing any lignosulfonic acids ("lignins") or their salts will not be acceptable.
- B. Air Entrainment Admixture: ASTM C 260.
 1. Products:
 - a. Grace "Daravair" or "Darex".
 - b. BASF "MB-VR" or "MB-AE 90".
 - c. Sika Chemical "AER".
 2. An air-entraining admixture shall be included in all concrete.
- C. Chemical Admixtures: ASTM C 494/C 494M, Type A - Water Reducing, Type B - Retarding, and Type D - Water Reducing and Retarding.
 1. Provide products manufactured by Grace, BASF, or Sika.
 2. A water reducing admixture shall be included in all concrete.
 3. A retarding admixture may be used only when approved by Engineer.

2.06 ACCESSORY MATERIALS

- A. Manhole Steps:
 1. Products:
 - a. H. Bowen "BOWCO No. 93813".
 - b. M.A. Industries "PS2-PF".
 2. Steel-reinforced plastic; 1/2 inch deformed steel bar, ASTM A 615, Grade 60 minimum, totally encapsulated in copolymer polypropylene, ASTM D 4101.
- B. Non-Shrink, Non-Metallic Grout: ASTM C 1107, Grades A, B, C; premixed compound consisting of non-metallic aggregate and portland cement.
 1. Minimum Compressive Strength at 28 Days: 7,000 psi.
 2. Products:
 - a. Carter Waters "CW 100 Precision Grout".
 - b. BASF "Masterflow 713 Plus".
 - c. Dayton Superior "1107 Advantage Grout".
 - d. Sonneborn "SonogROUT 10K".

- C. Epoxy Grout for Reinforcing Bars and Threaded Rod Anchors:
 - 1. Adhesive: Moisture-insensitive.
 - a. For Floors and Horizontal Surfaces:
 - 1) Low Viscosity Products:
 - (a) Hilti "HIT RE 500".
 - (b) Master Builders "Brutem AB (Parts A & B)".
 - (c) Sika "Sikadur 35, Hi-Mod LV" or "Sikadur 35, Hi-Mod LV LPL".
 - 2) Medium Viscosity Products:
 - (a) Master Builders "Concresive Liquid LPL".
 - (b) Sika "Sikadur 32, Hi-Mod" or "Sikadur 32, Hi-Mod LPL".
 - b. For Vertical Surfaces and Overhead Applications: Nonsag consistency.
 - 1) Master Builders "Concresive 1441".
 - 2) Sika "Sikadur 31, Hi-Mod Gel".
- D. Epoxy Grout for Headed Anchor Bolts:
 - 1. Adhesive: Moisture-insensitive; Master Builders "Ceilcote 648CP".
 - 2. Aggregate: As recommended by the epoxy grout manufacturer.
- E. Moisture-Retaining Cover: ASTM C 171; clear polyethylene, white polyethylene, white burlap-polyethylene sheet, or low permeability and high moisture retention non-staining natural cellulose fabric with a non-perforated reflective (white) polyethylene coating.
 - 1. UltraCure NCF by Sika Greenstreak, St. Louis, MO. 800-325-9504; usa.sika.com.

2.07 BONDING AND JOINTING PRODUCTS

- A. Waterstops: See Section 13 11 14.
- B. Joint Filler: As specified in Section 07 90 10.
- C. Backer Rod: As specified in Section 07 90 10.
- D. Sealant and Primer: As specified in Section 07 90 10.

2.08 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Engineer for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- D. Normal Weight Concrete, Type A:
 - 1. Type A concrete shall be used at all locations unless noted otherwise.
 - 2. Compressive Strength: The minimum acceptable compressive strength, when tested in accordance with ASTM C 39, shall be as follows:
 - a. 7 days: 3,000 psi.
 - b. 28 days: 4,000 psi.
 - 3. Cement Content: Minimum 530 lb per cubic yard.
 - 4. Water-Cement Ratio: Maximum 0.462 by weight.
 - 5. Total Air Content: 6 percent plus or minus 1 percent, per ASTM C 173.
 - 6. Slump: 3 inches plus or minus 1 inch.
 - 7. Maximum Aggregate Size: 1 inch.
- E. Normal Weight Concrete, Type B:
 - 1. Type B concrete shall be used only at specific locations shown.
 - 2. Compressive Strength: The minimum acceptable compressive strength, when tested in accordance with ASTM C 39, shall be as follows:
 - a. 7 days: 3,000 psi.
 - b. 28 days: 4,000 psi.

3. Cement Content: Minimum 628 lb per cubic yard.
4. Water-Cement Ratio: Maximum 0.462 by weight.
5. Total Air Content: 6 percent plus or minus 1 percent, per ASTM C 173.
6. Slump: 6 inches plus or minus 1 inch.
7. Maximum Aggregate Size: 1/2 inch.

2.09 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.
 1. Delivery Tickets:
 - a. A delivery ticket shall be prepared for each load of ready-mixed concrete and a copy of the ticket shall be handed to the Contractor by the truck operator at the time of delivery before unloading at the site.
 - b. Copies of delivery tickets shall be given to the Engineer upon request.
 - c. Tickets shall indicate the following:
 - 1) Name and location of the concrete supplier.
 - 2) Serial number of ticket.
 - 3) Date.
 - 4) Truck number.
 - 5) Name of purchaser.
 - 6) Project name and location.
 - 7) Numerical sequence of the delivery.
 - 8) Specific class or designation of the concrete.
 - 9) Amount of concrete in cubic yards.
 - 10) Time loaded or of first mixing of cement and aggregates.
 - 11) Reading of revolution counter at the first addition of water.
 - 12) Type and brand and amount of cement.
 - 13) Type and brand and amount of admixtures.
 - 14) Information necessary to calculate the total mixing water added by the producer. Total mixing water includes free water on the aggregates, water, and ice batched at the plant.
 - 15) Maximum size of aggregate.
 - 16) Weights of fine and coarse aggregate.
 - 17) Outdoor temperature in the shade at the time at which the cement was added.
 - 18) Signature or initials of ready-mix representative.
 2. Water from the truck water system or elsewhere shall not be added after the initial introduction of mixing water for the batch.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Verify that forms are clean before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
- E. In locations where new concrete is doweled to existing work, drill holes and epoxy dowels in existing concrete.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Unless otherwise indicated on the drawings, the details of fabrication shall conform to ACI 318.
- B. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.
- D. For all items subject to corrosion, including tie wires, provide the same concrete cover as is required for reinforcement under the same condition.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Concrete placed by pumping methods shall be done in accordance with ACI 304.2R.
- D. Mixing Time: The time from initial introduction of mixing water to discharge shall not exceed the following computation: Time = 1 hour at concrete temperature of 75 degrees F +/- 15 minutes per 5 degree F drop/rise in concrete temperature. Examples follow:
 - 1. At concrete temperature of 50 degrees F, the time to discharge shall not exceed 2 hours and 15 minutes.
 - 2. At concrete temperature of 60 degrees F, the time to discharge shall not exceed 1 hours and 45 minutes.
 - 3. At concrete temperature of 70 degrees F, the time to discharge shall not exceed 1 hours and 15 minutes.
 - 4. At concrete temperature of 80 degrees F, the time to discharge shall not exceed 45 minutes.
- E. Notify Engineer not less than 24 hours prior to commencement of placement operations.
- F. Before concrete is placed, forms, reinforcement, waterstops, anchor bolts, and embedments shall be rigidly secured in proper position; all dirt, mud, water, and debris shall be removed from the space to be occupied by concrete; all surfaces encrusted with dried concrete from previous placements shall be cleaned.
- G. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- H. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

- A. Locate joints as indicated on the drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
- D. Prior to concrete placement, the subgrade shall be well-dampened.
- E. All exterior pool walls and interior pool floor slabs shall be in place and shall have obtained the design compressive strength prior to backfilling.
- F. Conveying Concrete:
 - 1. Methods of conveying concrete to the point of final deposit shall prevent segregation or loss of ingredients.
 - 2. The free drop of concrete shall be limited to 5 feet.
 - 3. Drop chutes shall be used for placement of concrete in walls. Drop chutes shall be positioned in walls 5 feet or less from wall corners and at 10 feet maximum centers.
 - 4. After placement in the forms, concrete shall not be moved laterally more than 5 feet.
- G. Consolidation/Compaction:

1. Consolidate in accordance with ACI 309R.
 2. For proper consolidation/compaction, concrete shall be placed in approximately horizontal layers not to exceed 24 inches. Each layer of concrete shall be plastic when covered with the following layer, and the rate of vertical rise of the concrete in the forms shall be not less than 24 inches per hour.
 3. During and immediately after placement, concrete shall be thoroughly compacted and worked around all reinforcement and embedments and into the corners of the forms.
 4. The number and type of vibrators shall be acceptable to the Engineer.
 5. When using internal vibrators, the "field of action" shall overlap. When placing concrete in lifts, the vibrator shall penetrate the previous lift by a few inches.
 6. The use of "jitterbug" tampers to compact concrete flatwork will not be permitted.
- H. Placement of Concrete on Slopes: Place, consolidate, and finish concrete from the bottom of the slope to the top of the slope.
- I. Separate slabs on grade from vertical structure surfaces with joint filler.
- J. Place joint filler in floor slab pattern placement sequence where indicated. Set top to required elevations. Secure to resist movement by wet concrete.
- K. Install joint devices in accordance with manufacturer's instructions.
- L. Apply sealants in joint devices in accordance with Section 07 90 10.
- M. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- N. Place concrete continuously between predetermined expansion, control, and construction joints.
- O. Do not interrupt successive placement; do not permit cold joints to occur.
- P. Place floor slabs in checkerboard or saw cut pattern indicated.
- Q. Saw cut joints within 12 hours after placing. Unless noted otherwise, use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.
- R. Screed floors and slabs on grade to slope as indicated, maintaining surface flatness of maximum 1/4 inch in 10 ft.

3.06 Tolerances:

- A. As specified in ACI 301 unless noted otherwise.
- B. All concrete areas shall slope to drain. Water shall not be allowed to pond at any location.
- C. Pool Gutter Tolerance: Levelness of the pool gutter shall be plus or minus 1/16 inch in 10 feet.
- D. Lap Swimming Lanes: The lap swimming lane length tolerance shall meet the requirements of competitive swimming organization standards (e.g. FINA, US Swimming, or National Federation of State High School Association).

3.07 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
1. Tie holes in formed surfaces shall be cleaned, wetted, and filled with non-shrink grout.
 2. The patches shall be finished flush and shall match the texture of the adjacent concrete.
- B. Unexposed form finish including pit interiors and pool gutter channels: Rub down or chip off fins or other raised areas 1/8 inch or more in height.
- C. Exposed form finish including, but not necessary limited to, pool walls, foundations & footings above grade, and retaining walls: Rub down or chip off and smooth all fins, offsets, or other raised areas 1/8 inch or more in height. Provide finish as follows:
1. Grout Cleaned Finish: Grout cleaned finish shall conform to Paragraph 5.3.3.4.b of ACI 301. Grout cleaning shall not result in an overall plastering of the concrete surface, but shall produce a smooth, uniform surface free of marks, voids, surface glaze, and cement dust.
 - a. Sandblast surface to expose air voids, sand aggregate, and to remove all form marking. Abrasive blast to scarify bare concrete to an ICRI CSP 5 surface profile and

- no more than an ICRI CSP 6 profile. Sandblast material shall be No. 4 Flint rock particles or "Black Beauty" or "Black Magic" (a boiler/coal slag).
 - b. Mix 1 part portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint.
 - c. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout and apply the grout uniformly with brushes or a spray gun.
 - d. Immediately after applying the grout, scrub the surface vigorously with a cork float or stone to coat the surface and fill all air bubbles and holes.
 - e. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, burlap, or other means.
 - f. After the surface whitens from drying (about thirty minutes at normal temperatures), rub vigorously with clean burlap to provide a uniform sandy textured surface. For lazy river walls, the top 18 inches of the wall shall be rubbed sufficiently to provide a relatively smooth surface.
 - g. The finish shall be kept damp for at least 36 hours after final rubbing.
- D. Finishing Unformed Surfaces:
- 1. General:
 - a. Buried concrete blocking and encasement will require no finishing except as necessary to obtain the required surface elevations or contours.
 - b. The unformed surfaces of all other concrete shall be screeded and given an initial float finish followed by additional floating, and troweling where required.
 - c. Water shall not be applied to the concrete during finishing operations.
 - 2. Screeding: Screeding shall produce a concrete surface conforming to the proper elevation and contour, with all aggregates completely embedded in mortar.
 - 3. Floating:
 - a. Bull Floating: Screeded surfaces shall be given an initial float finish immediately following screeding and shall be completed before any excess moisture or bleeding water is present on the surface. Any piece of coarse aggregate which is disturbed by the float or which causes a surface irregularity shall be removed and replaced with mortar. Initial floating shall produce a surface of uniform texture and appearance, with no unnecessary working of the surface.
 - b. Initial floating shall be followed by a second floating at the time of initial set (when foot pressure will mark concrete to about 1/4 inch depth). Do no floating with bleed water present. If conditions permit, wait out the bleeding period before floating. If not, remove bleed water before starting floating operations per ACI 302.1R. The second floating shall produce a finish of uniform texture and color.
 - c. Floating shall be done with hand floats or suitable mechanical compactor-floats.
 - 4. Finishing: Finish to requirements of ACI 302.1R, and as follows:
 - a. Pool Basin Floor Slabs: Broom finish to provide a uniform medium to heavy non-slip surface. Brooming shall be done after the second floating and at right angles to the normal direction of traffic.
 - b. Top of Pool Walls: Broom finish to provide a uniform medium to heavy non-slip surface. Broom parallel to the inside face of the pool walls.
 - c. Surge Tanks or Wet Pits: Light broom finish. Brooming shall be done after the second floating.
 - d. Pump Pits: Broom finish to provide a uniform medium non-slip surface. Brooming shall be done after the second floating.
 - e. Concrete Decks and Walks: Broom finish to provide a uniform medium non-slip surface. Brooming shall be done after the second floating and at right angles to the normal direction of traffic.
- E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

3.08 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal concrete: Not less than 7 days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:
 - 1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than seven days by water ponding, water-saturated sand, water-fog spray, saturated burlap, or low permeability and high moisture retention non-staining natural cellulose fabric with non-perforated reflective (white) polyethylene coating.
 - 2. Final Curing: Begin after initial curing but before surface is dry.
 - a. Moisture-Retaining Cover: Seal in place with waterproof tape or adhesive.
- E. Concrete shall be protected against freezing for at least 8 days after placement.

3.09 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. All concrete required for testing shall be furnished by, and at the expense of, the Contractor.
- D. Submit proposed mix design of each class of concrete to testing firm for review prior to commencement of concrete operations.
- E. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- F. When concrete is pumped, sampling at both the truck discharge and point of final placement shall be required to determine if any changes in the slump, air content, and other significant mix characteristics occur. All concrete characteristics at the point of placement shall meet the specified requirements.
- G. Compressive Strength Tests:
 - 1. Compression test specimens shall be made, cured, stored, and delivered to the laboratory in accordance with ASTM C 31 and C 39.
 - 2. One set of concrete test cylinders shall be cast for each concrete pour unless approved otherwise by Engineer. A set of test cylinders shall consist of four cylinders, two to be broken and to have compressive strengths averaged at 7 days, and two to be broken and to have compressive strengths averaged at 28 days.
 - 3. One additional test cylinder shall be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.
 - 4. Each set of compression test cylinders shall be marked or tagged with the date and time of day the cylinders were made, the location in the work where the concrete represented by the cylinders was placed, the number of the delivery truck or batch, the air content, the slump, and the concrete temperature.
- H. Air Content:
 - 1. Air content shall be determined in accordance with ASTM C 231.
 - 2. An air content test shall be made on concrete from each batch of concrete from which concrete compression test cylinders are made.
 - 3. The Contractor shall provide all equipment and supplies necessary for the testing.
- I. Slump:
 - 1. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

2. Pumped Concrete:
 - a. The slump of concrete that is discharged into the pump may exceed the specified value by the amount of slump loss in the pumping system, up to a maximum of 1 inch.
 - b. The slump loss shall be determined by tests made at each end of the pumping system.
 - c. If tests indicate a loss greater than 1 inch, Contractor shall modify the pumping system as required to reduce the slump loss to 1 inch or less.
- J. Concrete Temperature:
 1. A concrete temperature test shall be made on concrete from the first batch of concrete mixed each day and on concrete from each batch of concrete from which concrete compression test cylinders are made.
 2. Concrete temperature shall be determined in accordance with ASTM C 1064.

3.10 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Engineer and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- C. In water retaining structures, crack widths that exceed ACI 224R requirements of 0.004 inches shall be treated with an appropriate injection system, which is acceptable to the Engineer.
- D. Repair or replacement of defective concrete will be determined by the Engineer. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- E. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

END OF SECTION

SECTION 13 11 85
EQUIPMENT FOR SPRAY GROUNDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pumps.
- B. Flow measuring devices.

1.02 RELATED SECTIONS

- A. Section 05 45 00 - Anchors for Concrete and Masonry: Mounting hardware for pumps.
- B. Section 13 11 55 - Swimming Pool Accessories.
- C. Section 13 11 90 - Pool Piping, Valves, and Related Items: Filter face piping.

1.03 REFERENCES

1.04 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. Pumps and Motors: The data and specifications for each unit shall include, but shall not be limited to, the following:
 - 1. Pumps:
 - a. Name of manufacturer.
 - b. Type and model.
 - c. Rotative speed.
 - d. Size of suction nozzle.
 - e. Size of discharge nozzle.
 - f. Net weight of pump.
 - g. Complete performance curves showing capacity versus head, NPSH required, pump efficiency, and BHP.
 - 2. Motors:
 - a. Name of manufacturer.
 - b. Type and model.
 - c. Type of bearing and lubrication.
 - d. Rated size of motor, HP.
 - e. Temperature rating.
 - f. Full load rotative speed.
 - g. Net weight.
 - h. Efficiency at full, 3/4, and 1/2 load.
 - i. Full load current.
 - j. Locked rotor current.
- C. Product Data: Manufacturer's catalog data, detail sheets, and specifications.
- D. Shop Drawings: Prepared specifically for this project; show dimensions of swimming pool equipment and interface with other products.
- E. Manufacturer's Instructions: Indicate installation methods and procedures.
- F. Operating and Maintenance Data: Operating and maintenance instructions, parts lists, and wiring diagrams.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Perform in accordance with applicable codes and health department regulations , as required for location of project.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 10 years of documented experience.

- C. Supplier's Field Representative: Individual specializing in the start-up and training of the equipment specified in this section, with not less than 5 years experience.
- D. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of experience.
- E. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver materials and equipment to project site in manufacturer's original packaging..
- B. Store all materials and equipment under cover and elevated above grade or as instructed by manufacturer.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 SUPPLIERS

- A. Swimming Pool Supply Company, 5292 N.W. 111th Street Drive, Grimes, Iowa 50111. Tel: (515) 986-3931; Fax: (515) 986-3805.
- B. United Industries, Inc., 202 E. Cleveland, PO Box 58, Sterling, Kansas 67579. Tel: (800) 835 3272; Fax: (800) 500-3115; www.swimtime.com.
- C. Spectrum Pool Products, 7100 Spectrum Lane, Missoula, Montana 59808. Tel: (800) 776-5309; Fax: (800) 728-7143; www.spectrumproducts.com.
- D. Recreation Supply Company, P.O. Box 2757, Bismarck, ND 58502. Tel: (800) 437-8072; Fax: (701) 255-7895; www.recsupply.com.

2.02 END SUCTION CENTRIFUGAL PUMPS

- A. Approved Manufacturer: Pentair Pools, Integral strainer pump: Tel: (800) 831-7133, www.pentairpool.com.
- B. Pump Schedule:
 - 1. Features pump: Model EQ500
- C. Pumps shall be high performance end suction pump meeting the following:
 - 1. Housing: Thermoplastic
 - 2. Shaft: Stainless Steel
 - 3. Performance Criteria: As indicated on the drawings
 - 4. Pumps shall be NSF-50 certified
- D. Motor:
 - 1. Size and Speed: As indicated on drawings
 - 2. Voltage/Phase: As indicated on the drawings.
 - 3. VFD: As indicated on the drawings.
- E. General:
 - 1. Self-priming
 - 2. Pump shall be able to be connected to water feature controller.
 - 3. IntelliFlo and IntelliPro pumps shall be provided with Intellicom system when required to be connected to remote Start-Stop-Timers.

2.03 FLOW MEASURING DEVICES

- A. Indicator Arm Flowmeter:
 - 1. Specified Manufacturer: H2flow Controls, Inc.; Model FlowVis Flowmeter; www.h2flow.net.
 - 2. Features:
 - a. Direct reading in gallons per minute (gpm).
 - b. NSF 50 Approved.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Coordinate with other trades for proper installation of plumbing and electrical services.
- B. Verify that required utilities are in correct location and are of correct capacities for specified products.
- C. Verify equipment rough-in before proceeding with work.

3.02 INSTALLATION

- A. Install swimming pool equipment specified in this section in accordance with manufacturer's printed installation instructions; comply with standards required by authorities having jurisdiction.
- B. Schedule installation to ensure that utility connections are achieved in an orderly and expeditious manner.
- C. Install equipment plumb, level, square, and straight, without distortion; securely anchor.

3.03 STARTING EQUIPMENT AND SYSTEMS

- A. Adjust for proper operation within manufacturer's published tolerances.
- B. Provide supplier's field representative to prepare, start, adjust, and demonstrate proper operation of equipment to Owner's designated staff.

3.04 CLEANING

- A. Touch up minor damaged surfaces caused by installation.
- B. Replace damaged components as directed by Engineer.
- C. Clean all equipment.
- D. Protect installed equipment from subsequent construction operations.

END OF SECTION

SECTION 13 11 90
PIPING AND VALVES FOR SPRAY GROUNDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
- B. Polyvinyl chloride (PVC) pipe.
- C. Saddles.
- D. Pipe hangers and supports.
- E. Valve keys.
- F. Valve extension stems and stem guides.
- G. Valve boxes.
- H. Valves.
- I. Strainers.
- J. Compound pressure gauges.

1.02 RELATED REQUIREMENTS

- A. Section 05 43 00 - Slotted Channel Framing (Strut Systems): Pipe support material.
- B. Section 05 45 00 - Anchors for Concrete and Masonry: Pipe support anchors.
- C. Section 13 11 94 - Pool Mechanical Identification.

1.03 REFERENCE STANDARDS

- A. ASME B16.5 - Pipe Flanges and Flanged Fittings; 1996.
- B. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2011 (ANSI/ASME B31.9).
- C. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2010.
- D. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 1997a.
- E. ASTM D 1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds; 1999a.
- F. ASTM D 2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 1999.
- G. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).
- H. ASTM F 593 - Standard Specifications for Stainless Steel Bolts, Hex Cap Screws, and Studs; 1998.
- I. ASTM F 656 - Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings; 1996a.
- J. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).
- K. ASTM F 593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2001.
- L. ASTM F 594 - Standard Specification for Stainless Steel Nuts; 2001.
- M. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005 (ANSI/AWWA C651).

- N. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.

1.04 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. Product Data/ Submittals:
 - 1. Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
 - 2. For PVC piping, provide manufacturer's recommended installation procedures, including solvent weld jointing procedures.
- C. Project Record Documents: Record actual locations of piping and valves.
- D. Training and certification documentation as indicated below.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Training and Certification: PVC Pipe Installer.
 - 1. PVC piping installers must be trained by manufacturer to install and join piping. Submit written certification from manufacturer for each individual performing pipe installation, prior to installing pipe.
- C. Valves: Manufacturer's name and pressure rating marked on valve body.
- D. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.
- E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with local plumbing code.
- B. Conform to applicable code for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.08 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PIPE

- A. PVC Pipe, Schedule 80:
 - 1. Pipe: ASTM D 1785, Cell Classification 12454-B, bearing NSF seal.
 - 2. Fittings: ASTM D 2467, Cell Classification 12454-B, bearing NSF seal.
 - a. All fittings for pipe diameters less than 16" shall be molded. Fabricated fittings will not be allowed unless approved by Engineer. Contractor shall be responsible for verifying that the use of fabricated fittings will not affect critical dimensional requirements.
 - b. For pipe diameters of 16" or greater: Fabricated fitting are allowed.
 - 3. Push-on Joints: ASTM F 477 elastomeric gaskets.

4. Solvent Weld Joints:
 - a. Solvent Cement: ASTM D 2564.
 - b. Primer: ASTM F 656.
 5. Flanges: Diameter and drilling shall conform to ANSI/ASME B16.5, Class 150.
 6. Flange Hardware:
 - a. Bolts: Stainless steel, ASTM F 593, Alloy Group 1 or 2; chamfered or rounded ends projecting 1/8 to 3/8 inch beyond outer face of nut.
 - b. Nuts: Stainless steel, ASTM F 594, Alloy Group 1 or 2.
 - c. Flat Washers: Stainless steel, ANSI B18.22.1.
 7. Flange Gaskets: Full face, 1/8 inch thick, chemical resistant elastomeric material suitable for the specified service.
- B. PVC Heavy Wall Sewer Pipe, SDR 26:
1. Pipe: ASTM D 3034 SDR 26.
 2. Fittings: PVC.
 3. Joints: Push-on, using ASTM F 477 elastomeric gaskets.

2.02 ADAPTER FLANGE FOR PVC PIPE

- A. Van Stone Style:
1. Specified Manufacturer: Spears Manufacturing Company: www.spearsmfg.com.
 2. Two-piece design with rotating flange ring in socket or spigot configuration.
 3. Conformance Standards:
 - a. Socket and Spigot: ASTM D 2467.
 - b. Bolt Hole Pattern: ASME B16.5.
 - c. Material: ASTM D 1784; PVC Cell Classification 12454-B.

2.03 SPECIAL REINFORCED FITTINGS

- A. Specified Manufacturer: Spears Manufacturing Company: www.spearsmfg.com.
- B. All threaded plastic connections and threaded plastic-to-metal transition connections shall be made with Spears Special Reinforced (SR) Fittings.
- C. All fittings shall be Schedule 80 PVC, conforming to ASTM D 2467.
- D. All fittings shall be approved for potable water service.

2.04 FLANGES, UNIONS, AND COUPLINGS

- A. A union or a flanged connection shall be provided within 2 feet of each threaded end valve unless the valve can be easily removed from the piping.
- B. Unions for Pipe Sizes 3 Inches and Under:
1. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- C. Flanges for Pipe Size Over 1 Inch:
1. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- D. Dielectric Fittings:
1. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
 2. Insulating Material: Suitable for system fluid, pressure, and temperature.
 3. Dielectric Unions:
 - a. Manufacturers:
 - 1) Capitol Manufacturing Co.
 - 2) Central Plastics Company.
 - 3) Eclipse, Inc.
 - 4) Epco Sales, Inc.
 - 5) Hart Industries, International, Inc.
 - 6) Watts Industries, Inc.; Water Products Div.
 - 7) Zurn Industries, Inc.; Wilkins Div.

- b. Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 degrees F.
- 4. Dielectric Flanges:
 - a. Manufacturers:
 - 1) Capitol Manufacturing Co.
 - 2) Central Plastics Company.
 - 3) Epco Sales, Inc.
 - 4) Watts Industries, Inc.; Water Products Div.
 - b. Factory-fabricated, companion-flange assembly, for 150-psig minimum working pressure as required to suit system pressures.
- 5. Dielectric-Flange Kits:
 - a. Manufacturers:
 - 1) Advance Products & Systems, Inc.
 - 2) Calpico, Inc.
 - 3) Central Plastics Company.
 - 4) Pipeline Seal and Insulator, Inc.
 - b. Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - c. Separate companion flanges and steel bolts and nuts shall have 150-psig minimum working pressure where required to suit system pressures.
- 6. Dielectric Couplings:
 - a. Manufacturers:
 - 1) Calpico, Inc.
 - 2) Lochinvar Corp.
 - b. Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 degrees F.
- 7. Dielectric Nipples:
 - a. Manufacturers:
 - 1) Perfection Corp.
 - 2) Precision Plumbing Products, Inc.
 - 3) Sioux Chief Manufacturing Co., Inc.
 - 4) Victaulic Co. of America.
 - b. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 degrees F.

2.05 PVC SADDLES

- A. Specified Manufacturer: Spears Manufacturing Company: www.spearsmfg.com.
- B. All plastic saddle fittings shall be clamp-on type with O-ring seal constructed from PVC Schedule 80.
- C. All O-rings shall be EPDM.
- D. All saddles shall be piloted at O-ring area for positive positioning in pipe.
- E. All bolt clamping hardware shall be stainless steel.
- F. All threaded saddle outlets shall be Steel Reinforced (SR) design.
- G. Saddles shall have a maximum internal pressure rating of 235 psi for pipe sizes through 4 inch, 200 psi for 6 inch pipe, and 150 psi for 8 through 12 inch pipe at 73 degrees F.

2.06 PIPE SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
- B. Automatic Locking Tube/Pipe Support:

1. Specified Manufacturer: Litchfield International, Inc.; Product "CLIC" Pipe Hangers; Tel: (800) 345-2542; www.li-clic.com.
 2. Description: Pipe clamp that allows lateral mounting adjustments and automatic locking mechanism.
 3. Material: Polyamide Nylon PA 12.
 4. Sizes: For pipe sizes up to 4 inches.
 5. Accessories: As required for a complete installation.
 6. Anchoring: See Section 05 45 00.
- C. Floor Mount Horizontal Strap:
1. Specified Manufacturer: Cooper B-Line; 509 West Monroe Street, P.O. Box 326, Highland, Illinois 62249; Tel: (800) 851-7415; www.cooperindustries.com.
 2. Materials:
 - a. Channel:
 - 1) B-Line Type BFV22SH.
 - 2) Material: Fiberglass.
 - b. Post Base:
 - 1) B-Line Type B280FL.
 - 2) Material: Steel.
 - 3) Finish: Hot-dipped galvanized.
 - 4) Anchoring Hardware: Self threading bolt anchors as specified in Section 05 45 00.
 - c. Pipe Strap:
 - 1) B-Line Series BFP2400.
 - 2) Material: Fiberglass.
 - d. Hardware:
 - 1) Material: Stainless steel type 304 per ASTM F 593.
 - 2) Nut: B-Line Systems, Inc.; Model N225WO.
 3. See Section 05 43 00 - Slotted Channel Framing (Strut Systems).
- D. Floor Mount Saddle:
1. Specified Manufacturer: Material Resources; Tel: (877) 693-0727; Fax: (503) 693-0636.
 2. Provide Model S92 as shown on drawings.
 3. Materials:
 - a. Saddle Strap: ASTM A 36.
 - b. Collar/Base Cups: ASTM A 53 D.O.M. tubing.
 - c. Thread Stud: ASTM A 36, rolled thread, grade ASTM A 307.
 - d. Base Plate: ASTM A 36 sheet steel, 1/4 inch thickness.
 4. Fabrication:
 - a. All Welds: 100 percent MIG welding, electrode E70XX.
 - b. Saddles: Formed to ductile iron or IPS steel radius.
 5. Finish: Corrosion resistant, hot-dipped galvanized.
- E. Floor Mount Vertical Clamp:
1. Specified Manufacturer: Cooper B-Line; 509 West Monroe Street, P.O. Box 326, Highland, Illinois 62249; Tel: (800) 851-7415; www.cooperindustries.com.
 2. Materials:
 - a. Channel:
 - 1) B-Line Type BFV22SH.
 - 2) Material: Fiberglass.
 - b. Post Base:
 - 1) B-Line Type B280FL.
 - 2) Material: Steel.
 - 3) Finish: Hot-dipped galvanized.
 - 4) Anchoring Hardware: Self threading bolt anchors as specified in Section 05 45 00.

- c. Pipe Clamp:
 - 1) B-Line Series BFP2400.
 - 2) Material: Fiberglass.
 - 3. See Section 05 43 00 - Slotted Channel Framing (Strut Systems).
- F. Floor Mount Vertical Strap:
 - 1. Specified Manufacturer: Cooper B-Line; 509 West Monroe Street, P.O. Box 326, Highland, Illinois 62249; Tel: (800) 851-7415; www.cooperindustries.com.
 - 2. Materials:
 - a. Channel:
 - 1) B-Line Type BFP22SH.
 - 2) Material: Fiberglass.
 - b. Post Base:
 - 1) B-Line Type B280FL.
 - 2) Material: Steel.
 - 3) Finish: Hot-dipped galvanized.
 - 4) Anchoring Hardware: Self threading bolt anchors as specified in Section 05 45 00.
 - c. Pipe Strap:
 - 1) B-Line Series BFP2400.
 - 2) Material: Fiberglass.
 - d. Hardware:
 - 1) Material: Stainless steel type 304 per ASTM F 593.
 - 2) Nut: B-Line Systems, Inc.; Model N225WO.
 - 3. See Section 05 43 00 - Slotted Channel Framing (Strut Systems).
- G. Clamp-Hanger:
 - 1. Specified Manufacturer: Cooper B-Line; 509 West Monroe Street, P.O. Box 326, Highland, Illinois 62249; Tel: (800) 851-7415; www.cooperindustries.com.
 - 2. Materials:
 - a. Pipe Clamp:
 - 1) B-Line Series B386.
 - 2) Material: Steel.
 - 3) Finish: Hot-dipped galvanized.
 - b. Pipe Hanger:
 - 1) B-Line Series B1400.
 - 2) Material: Steel.
 - 3) Finish: Hot-dipped galvanized.
 - 3. See Section 05 43 00 - Slotted Channel Framing (Strut Systems).
- H. Dual Split Clamp:
 - 1. Specified Manufacturer: Cooper B-Line; 509 West Monroe Street, P.O. Box 326, Highland, Illinois 62249; Tel: (800) 851-7415; www.cooperindustries.com.
 - 2. Materials:
 - a. Split Pipe Clamp:
 - 1) B-Line Series B3198R.
 - 2) Material: Stainless steel type 304.
 - 3. See Section 05 43 0 - Slotted Channel Framing (Strut Systems).
- I. Parallel Strut Strap:
 - 1. Specified Manufacturer: Cooper B-Line; 509 West Monroe Street, P.O. Box 326, Highland, Illinois 62249; Tel: (800) 851-7415; www.cooperindustries.com.
 - 2. Materials:
 - a. Channel Support:
 - 1) B-Line Type BFP22SH.
 - 2) Material: Fiberglass.
 - b. Pipe Strap:

- 1) B-Line Series BFP2400.
 - 2) Material: Fiberglass.
 - c. U-Bolt:
 - 1) B-Line Series B3501.
 - 2) Material: Steel.
 - 3) Finish: Hot-dipped galvanized.
 - d. Hex Nut:
 - 1) Size: As required.
 - 2) Material: Steel.
 - 3) Finish: Hot-dipped galvanized.
 3. See Section 05 43 00 - Slotted Channel Framing (Strut Systems).
- J. Perpendicular Strut Strap:
 1. Specified Manufacturer: Cooper B-Line; 509 West Monroe Street, P.O. Box 326, Highland, Illinois 62249; Tel: (800) 851-7415; www.cooperindustries.com.
 2. Materials:
 - a. Channel Support:
 - 1) B-Line Type BFV22SH.
 - 2) Material: Fiberglass.
 - b. Pipe Strap:
 - 1) B-Line Series BFP2400.
 - 2) Material: Fiberglass.
 - c. Band:
 - 1) Size: As required.
 - 2) Material: Stainless steel.
 3. See Section 05 43 00 - Slotted Channel Framing (Strut Systems).
- K. Truss Mount Horizontal Strap:
 1. Specified Manufacturer: Cooper B-Line; 509 West Monroe Street, P.O. Box 326, Highland, Illinois 62249; Tel: (800) 851-7415; www.cooperindustries.com.
 2. Materials:
 - a. Pipe Strap:
 - 1) B-Line Series BFP2400.
 - 2) Material: Fiberglass.
 3. See Section 05 43 00 - Slotted Channel Framing (Strut Systems).
- L. Wall Mount Bracket:
 1. Manufacturers: Cooper B-Line; 509 West Monroe Street, P.O. Box 326, Highland, Illinois 62249; Tel: (800) 851-7415; www.cooperindustries.com.
 2. Adjustable Strut Bracket: B-Line Systems, Inc.; Model B3064-1-HDG.
 - a. Material: Steel.
 - b. Finish: Hot-dip galvanized after fabrication in accordance with ASTM A 123.
 - c. Dimensions:
 - 1) Vertical Arm: 15 inches.
 - 2) Horizontal Arm: 12 inches.
 - d. Design Load: 1,200 pounds.
 3. Pipe Clamp:
 - a. Pipe Clamp: B-Line Systems, Inc.; Model B2400-HDG.
 - b. Material: Steel.
 - c. Finish: Hot-dip galvanized after fabrication in accordance with ASTM A 123.
 4. Hardware:
 - a. Material: Stainless steel type 304 per ASTM F 593.
 - b. Nut: B-Line Systems, Inc.; Model N225WO.
 - c. Hex Head Cap Screws: B-Line Systems, Inc.; Model HHCS.
 5. Anchoring Hardware: As specified in Section 05 45 00.
- M. Wall Mount Strap:

1. Specified Manufacturer: Cooper B-Line; 509 West Monroe Street, P.O. Box 326, Highland, Illinois 62249; Tel: (800) 851-7415; www.cooperindustries.com.
 2. Materials:
 - a. Channel:
 - 1) B-Line Type B-FV22SH.
 - 2) Material: Fiberglass.
 - b. Pipe Strap:
 - 1) B-Line Series BFP2400.
 - 2) Material: Fiberglass.
 - c. Anchoring Hardware: As specified in Section 05 45 00.
 3. See Section 05 43 00 - Slotted Channel Framing (Strut Systems).
- N. Clevis Hangers:
1. Specified Manufacturer: Cooper B-Line; 509 West Monroe Street, P.O. Box 326, Highland, Illinois 62249; Tel: (800) 851-7415; www.cooperindustries.com.
 2. Materials:
 - a. Hot-dipped galvanized steel, adjustable, clevis
 - b. Hot-dipped galvanized or Type 304 stainless steel heavy duty ceiling flange.
 - c. Anchoring Hardware: As specified in Section 05 45 00.
- O. Plumbing Piping - Water:
1. Conform to ASME B31.9.
 2. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.07 VALVE KEY

- A. Material: Rolled steel.
- B. The valve key shall be made up of an extension rod, a wrench nut at the bottom, and at the top a "T" handle.
- C. The wrench nut shall fit over the 2 inch square nut of the valve stem being raised.
- D. Length: The length of the valve key shall be as required to operate the valve(s) at a height of 3 feet above grade (operating level).

2.08 VALVE EXTENSION STEMS AND STEM GUIDES

- A. Manufacturers:
1. Specified Manufacturer: Trumbull Industries, Inc.; Tel: (800) 677-1799; www.trumbull.com.
 2. Acceptable Manufacturers:
 - a. M & H; Tel: (256) 237-3521; www.mh-valve.com.
 - b. Clow; Tel: (800) 829-2569; www.clowvalve.com.
 - c. Waterman Industries, Inc.; Tel: (800) 331-0808; www.watermanusa.com.
- B. Extension Stems:
1. Material: Type 304 stainless steel.
 2. The extension stem shall be made up of an extension rod, a wrench nut coupling at the bottom, and at the top a 2 inch square wrench nut or handwheel as indicated on the drawings.
 3. The wrench nut coupling shall fit over the 2 inch square nut of the valve stem being raised and shall be held to the nut by a set screw threaded in the wrench nut coupling.
 4. The wrench nut or handwheel and wrench nut coupling shall be pinned to the extension rod which is drilled to receive steel pins.
 5. The wrench nut and wrench nut couplings shall be stainless steel, Type 316.
- C. Stem Guides:
1. Stem guides shall be installed as wall brackets to support extension stems.
 2. Valve stem guides shall be fully adjustable and made of Type 316 stainless steel.
 3. The guide shall be bronze bushed where the extension stem passes through.

2.09 VALVE BOXES - PLASTIC

- A. Specified Manufacturer: Rainbird; www.rainbird.com.
- B. Rugged, UV-resistant thermoplastic construction.
- C. Slotted body to facilitate installation of piping.

2.10 PVC BALL VALVES

- A. Manufacturers:
 - 1. Spears Manufacturing Company: www.spearsmfg.com.
 - 2. Nibco, Inc; Model U-45TB: www.nibco.com.
 - 3. Hayward Industries, Inc.: www.haywardflowcontrol.com.
- B. Construction:
 - 1. True Union type constructed from PVC Type I Cell Classification 12454 conforming to ASTM D 1784.
 - 2. O-rings shall be EPDM.
 - 3. All valves shall have Safe-T-Shear stem and double stop polypropylene handle.
 - 4. All valve union nuts shall have Butress threads.
 - 5. All valve seal carriers shall be Certified for potable water use by NSF International.
 - 6. All 1/2 inch through 2 inch valves shall be pressure rated at 235 psi and all 2-1/2 inch through 6 inch valves shall be pressure rated at 150 psi for water at 73 degrees F.

2.11 PVC BUTTERFLY VALVES

- A. Manufacturers:
 - 1. Specified Manufacturer: Spears Manufacturing Company; Style Wafer or Lug: www.spearsmfg.com.
 - 2. Acceptable Manufacturers:
 - a. ASAH/AMERICA: www.asahi-america.com.
 - b. Hayward Industries, Inc.: www.haywardflowcontrol.com.
 - c. Nibco, Inc: www.nibco.com.
- B. Construction:
 - 1. Valve body and disc shall be constructed from PVC Type I Cell Classification 12454 conforming to ASTM D 1784.
 - 2. Valve seats and O-rings shall be EPDM. Seat shall be a non-liner type interlocked to valve body.
 - 3. Lug Style: Bolt hole patterns shall conform to ANSI/ASME B16.5 CL 150.
 - 4. Wafer Style: Designed for mounting between two flanges having bolt hole pattern that conform to ANSI/ASME B16.5 CL 150.
 - 5. Disc shall be offset design with Type 316 stainless steel stem.
 - 6. Lever operated valves shall be equipped with high impact polypropylene handle having built-in lockout capability.
 - 7. Gear operated valves shall be equipped with position indicator and high impact polypropylene handwheel.
 - 8. All submerged valves shall have submersible gear operators.
 - 9. Valves shall be pressure rated at 150 psi for water at 73 degrees F.

2.12 BRASS SOLENOID VALVES

- A. 3/4 to 2 Inch:
 - 1. Specified Manufacturer: Granzow; Model W; www.granzow.com.
 - 2. Description: Two-way, internally piloted, normally closed or normally open (as indicated on the drawings), solenoid valve.
 - 3. Sealing Material: FKM (Viton).
 - 4. Pipe Size: As indicated on the drawings.
 - 5. Materials of Construction:
 - a. Body: Brass.
 - b. Armature Tube: Stainless Steel 300.

- c. Fixed Core: Stainless Steel 400.
- d. Plunger: Stainless Steel 400.
- e. Spring: Stainless Steel 300.
- f. Shading Ring: Copper.
- g. Orifice: Brass.
- 6. Provide with nickel plated finish.
- 7. Coil Specifications:
 - a. BDU Molding Material: PET - Black polyester - Class F (312 degrees F).
 - b. Power/Voltage: 8 watt/110-120 volt or 8 watt/24 volt as indicated on the drawings.
- 8. Electrical Connection:
 - a. Rating: NEMA 4.
 - b. Provide with 1/2" conduit connector.

2.13 PVC BALL CHECK VALVES

- A. Manufacturers:
 - 1. Specified Manufacturer: Spears Manufacturing: www.spearsmfg.com.
 - 2. Acceptable Manufacturer: Hayward Industries, Inc.: www.haywardflowcontrol.com.
- B. Application: For use on PVC piping systems where called for on the drawings; sizes 6" and smaller.
- C. Construction:
 - 1. Constructed from PVC Type I Cell Classification 12454 conforming to ASTM D 1784.
 - 2. Industrial grade.
 - 3. All valve seals shall be standard O-ring type EPDM.
 - 4. Fully serviceable with replaceable components.
 - 5. Sizes 1/2 inch to 2 inch shall be pressure rated to 235 psi, sizes 2-1/2 inches to 6 inches and all flanged shall be pressure rated to 150 psi for water at 73 degrees F.
 - 6. NSF certified for potable water use.

2.14 PVC INDUSTRIAL SWING CHECK VALVES

- A. Manufacturers:
 - 1. Specified Manufacturer: Spears Manufacturing: www.spearsmfg.com.
 - 2. Acceptable Manufacturer: ASAHI/AMERICA: www.asahi-america.com.
- B. Application: For use on PVC piping systems; sizes 8" and smaller.
- C. Construction:
 - 1. Flanged swing check type constructed from PVC Type I Cell Classification 12454 conforming to ASTM D 1784.
 - 2. All valve seals shall be standard O-ring type EPDM.
 - 3. All valve components shall be replaceable.
 - 4. All valves shall have O-ring sealed drain plug.
 - 5. All valves shall have external counter balance.
 - 6. All 3/4 inch to 4 inch valves shall be pressure rated at 150 psi, all 6 inch valves at 100 psi, and all 8 inch valves at 70 psi for water at 73 degrees F.

2.15 AIR RELEASE VALVES

- A. Specified Manufacturer: A.R.I. USA, Inc.; Model S-050 V: Tel: (559) 269-9653; www.ariususa.com.
- B. Materials of Construction:
 - 1. Body: Reinforced Nylon.
 - 2. Discharge Outlet: Polypropylene.
 - 3. Rolling Seal: EPDM.
 - 4. Clamping Stem: Reinforced Nylon.
 - 5. Float: Foamed Polypropylene.
 - 6. O-Ring: NBR 70.
 - 7. Base: Reinforced Nylon.

- C. Size: As noted on Drawings.
- D. For air release only valves provide with vacuum guard to allow air discharge only, preventing air intake.

2.16 Y STRAINERS - CLEAR PVC

- A. Manufacturers:
 - 1. Specified Manufacturer: Spears Manufacturing: www.spearsmfg.com.
 - 2. Acceptable Manufacturer: Hayward Industrial Products, Inc.; www.haywardindustrial.com.
- B. Size 1/2 inch to 4 inch.
- C. Features:
 - 1. Clear PVC construction.
 - 2. Seal Material: EPDM.
 - 3. Replaceable 1/32 inch Type 316 stainless steel perforated screen and O-ring sealed drain plugs.
 - 4. Easy screen access.
 - 5. All threaded Y-strainers shall have special reinforced (SR) threads.
 - 6. Horizontal or vertical installation.
- D. Pressure Rating:
 - 1. Size 1/2" to 2": Rated to 150 psi.
 - 2. Size 3" to 4": Rated to 90 psi.

2.17 COMPOUND PRESSURE GAUGES

- A. Manufacturers:
 - 1. Ashcroft; Model 1009AW.
- B. Provide with "PLUS" performance option - liquid filled performance in a dry gauge.
- C. Accuracy: 1% full-scale accuracy ASME grade 1A.
- D. Construction:
 - 1. Case & Ring Material: 304 stainless steel.
 - 2. Connection: Bronze.
 - 3. Tube Material: Stainless steel.
 - 4. Window: Polycarbonate.
- E. Sensing Element: Bourdon tube.
- F. Dial Standard: psi.
- G. Dial: Brushed aluminum.
- H. Dial Size: 3-1/2 inch.
- I. Lower Connection: 1/4 inch NPT.
- J. Range: 30" Hg VAC to 60 psi.
- K. Smallest Gradation: 1 psi.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. In all piping except air and gas piping, insulating fittings shall be provided to prevent contact of dissimilar metals, including but not limited to, contact of copper, brass, or bronze pipe, tubing, fittings, valves, or appurtenances, or stainless steel pipe, tubing, fittings, valves, or appurtenances with iron or steel pipe, fittings, valves, or appurtenances. Insulating fittings shall also be provided to prevent contact of copper, brass, or bronze pipe, tubing, fittings, valves or appurtenances with stainless steel pipe, tubing, fittings, valves, or appurtenances.
- C. To prevent thread galling, apply anti-galling lubricant to all stainless steel hardware.
- D. Route piping in orderly manner and maintain gradient. Install piping free of sags, bends, and kinks. Route parallel and perpendicular to walls.
- E. Install fittings in changes in direction and branch connections in hard drawn copper tube.
- F. All piping within structures shall be arranged, and facilities provided, for complete drainage.
- G. Tee fitting sizes shall match that of the largest connecting pipe size.
- H. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- I. All piping serving metering equipment shall be uniformly graded so that air traps are eliminated and complete venting is provided.
- J. Taps for pressure gauge connections on the suction and discharge of pumping units shall be provided with a nipple and a ball type shutoff valve.
- K. Buried PVC piping shall be "snaked" in the trench and shall be kept as cool as possible during installation. PVC pipe shall be kept shaded and shall be covered with backfill immediately after installation.
- L. All chemical piping shall be installed so that lines are readily accessible for cleaning. Tees shall be provided at changes in direction in all chemical piping except chlorine piping, with extra openings plugged, to facilitate cleaning. Teflon thread tape or teflon thread sealer shall be applied to the threads of the plugs so that they can be easily removed. At each point where hose or reinforced plastic tubing is connected to rigid piping, a quick-disconnect coupling shall be provided.
- M. Group piping whenever practical at common elevations.
- N. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- O. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 19.
- P. Establish elevations of buried water supply piping outside the building to ensure not less than 3.5 ft of cover.
- Q. Provide support for utility meters in accordance with requirements of utility companies.
- R. Excavate in accordance with Section 31 23 16.
- S. Backfill in accordance with Section 31 23 23.
- T. Install bell and spigot pipe with bell end upstream.
- U. Install valves with stems upright or horizontal, not inverted, unless indicated on the plans.
- V. Install water piping to ASME B31.9.
- W. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- X. All pipes passing through structures shall be cast-in-place unless specifically noted otherwise on Drawings.
- Y. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- Z. Pipe Hangers and Supports:
 1. Install in accordance with ASME B31.9.
 2. Support Schedule 40 PVC and CPVC piping as scheduled following:
 - a. 1/4" Diameter: Every 3'-0" minimum.
 - b. 1/2" Diameter: Every 3'-6" minimum.
 - c. 3/4" Diameter: Every 4'-0" minimum.
 - d. 1" Diameter: Every 4'-6" minimum.
 - e. 1-1/4" Diameter: Every 4'-6" minimum.
 - f. 1-1/2" Diameter: Every 5'-0" minimum.
 - g. 2" Diameter: Every 5'-0" minimum.
 - h. 2-1/2" Diameter: Every 5'-6" minimum.
 - i. 3" Diameter: Every 6'-6" minimum.
 - j. 4" Diameter: Every 6'-6" minimum.
 - k. 6" Diameter: Every 7'-6" minimum.
 - l. 8" Diameter: Every 8'-6" minimum.
 - m. 10" Diameter: Every 9'-0" minimum.
 - n. 12" Diameter: Every 9'-6" minimum.
 3. Support Schedule 80 PVC and CPVC piping as scheduled following:
 - a. 1/4" Diameter: Every 4'-0" minimum.
 - b. 1/2" Diameter: Every 4'-6" minimum.
 - c. 3/4" Diameter: Every 4'-6" minimum.
 - d. 1" Diameter: Every 5'-0" minimum.
 - e. 1-1/4" Diameter: Every 5'-0" minimum.
 - f. 1-1/2" Diameter: Every 5'-6" minimum.
 - g. 2" Diameter: Every 6'-0" minimum.
 - h. 2-1/2" Diameter: Every 6'-0" minimum.
 - i. 3" Diameter: Every 7'-0" minimum.
 - j. 4" Diameter: Every 7'-6" minimum.
 - k. 6" Diameter: Every 9'-0" minimum.
 - l. 8" Diameter: Every 9'-6" minimum.
 - m. 10" Diameter: Every 10'-0" minimum.
 - n. 12" Diameter: Every 11'-6" minimum.
 - o. 14" Diameter: Every 12'-6" minimum.
 4. Place hangers within 12 inches of each horizontal elbow.
 5. Provide copper plated hangers and supports for copper piping.
- AA. Auxiliary Drill & Tap Connections:
 1. Sch 80 fittings may be drilled and tapped for auxiliary connections provided the following limitations are adhered to in order to ensure proper fitting and joint integrity are maintained.
 - a. 1/8" and 1/4" tapped connections may be made only on 2" and larger nominal size fittings. 1/2" tapped connections may be made only on 4" and larger fittings. 3/4" tapped connections may be made only on 6" and larger fittings.
 - b. Tapped connections must be located in the double-walled solvent cement joint between the fittings and pipe. Do not tap through the fitting wall at any other location.
 - c. Tap center must be located at the lower 1/3 of the fittings socket depth. Do not locate tap center in the upper 2/3 of the joint or at the very bottom of the socket.
 - d. Drill appropriate pilot hole squarely through the fitting and pipe wall using moderate speed to prevent distortion of the plastic material. Hand tapping is recommended to likewise prevent distortion and possible thread damage. Do not use a drill for tapping.
 - e. Tap dry or with water only. Do not use any cutting oils in the tapping process. These can induce stress cracking in plastics.
 - f. Threaded connections must be made using a thread sealant as approved by the pipe manufacturer. The use of thread sealants not approved by the pipe manufacturer may cause stress cracking in plastics.

3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install ball or butterfly valves for throttling, bypass, or manual flow control services.
- E. Provide plug valves in natural gas systems for shut-off service.

3.05 TOLERANCES

- A. When pipe elevations are shown on the Drawings, the pipe shall uniformly slope between the given elevations. If Contractor believes additional change in direction fittings are required in order to achieve the slopes shown, then Contractor shall notify Engineer prior to installation.
- B. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.
- C. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.06 PRESSURE AND LEAKAGE TESTING

- A. All specified tests shall be made by and at the expense of the Contractor in the presence, and to the satisfaction of the Engineer.
- B. Each piping system shall be tested for at least 1 hour and with no loss of pressure.
- C. Piping shall be tested at the following pressures:
 - 1. Swimming Pool Recirculation Piping:
 - a. Test Pressure: 1-1/2 times working pressure but not less than 50 psi.
 - b. Test Medium: Water.
 - 2. Water Supply:
 - a. Test Pressure: 1-1/2 times working pressure but not less than 120 psi.
 - b. Test Medium: Water.
 - 3. Gas Supply:
 - a. Test Pressure: 1-1/2 times working pressure but not less than 60 psi.
 - b. Test Medium: Compressed air.
 - 4. Other Piping:
 - a. Test Pressure: 1-1/2 times working pressure but not less than 50 psi.
 - b. Test Medium: Suitable fluid or gas.
- D. Compressed air or pressurized gas shall not be used for testing plastic piping unless specifically recommended by the pipe manufacturer.
- E. Leakage may be determined by loss-of-pressure, soap solution, chemical indicator, or positive and accurate method acceptable to the Engineer. All fixtures, devices, or accessories which are to be connected to the lines and which would be damaged if subjected to the specified test pressure shall be disconnected and the ends of the branch lines plugged or capped as required during the testing.
- F. All necessary testing equipment and materials, including tools, appliances and devices, shall be furnished and all tests shall be made by and at the expense of the Contractor and at the time directed by the Engineer.
- G. All joints in piping shall be tight and free of leaks. All joints which are found to leak, by observation or during any specified test, shall be repaired, and the tests repeated.

3.07 CLEANING

- A. The interior of all pipe, valves, and fittings shall be smooth, clean, and free of blisters, loose mill scale, sand, dirt, and other foreign matter when installed. Before being placed in service, the interior of all lines shall be thoroughly cleaned, to the satisfaction of the Engineer.

3.08 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.09 SERVICE CONNECTIONS

- A. Provide new sanitary and storm sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
- C. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 11 inch wg or as required for the equipment. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

END OF SECTION

SECTION 13 11 92
PLUMBING SPECIALTIES FOR SPRAY GROUNDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hose bibbs.
- B. Drain valves.
- C. Backflow preventers.
- D. Water meter for pool fill or water make-up.
- E. Emergency eye/face wash and shower.

1.02 RELATED REQUIREMENTS

- A. Section 13 11 90 - Piping, Valves, and Related Items for Pools.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 HOSE BIBBS

- A. Hose Bibbs:
 - 1. Specified Manufacturer: Woodford Manufacturing Company; Model Y24: Tel: (719) 574-1101; Fax: (719) 574-7621; www.woodfordmfg.com.
 - 2. Automatic draining with anti-siphon vacuum breakers.
 - 3. Vacuum Breaker - Anti-Siphon: Nidel Model 34HF with 3/4 inch male hose thread, approved under ASSE Standard 1011.
 - 4. Packing: EPDM.
 - 5. Packing Nut: Adjustable brass nut with deep stem guard.
 - 6. Valve Seat: Standard "O" size washer.
 - 7. Handles: Furnished with metal wheel handle.
 - 8. Inlets: 3/4 inch, unless noted otherwise.
 - 9. Finish: Rough brass.

2.02 DRAIN VALVES

- A. Specified Manufacturer: Woodford Manufacturing Company; Model 21CP: Tel: (719) 574-1101; Fax: (719) 574-7621; www.woodfordmfg.com.
- B. Exterior Finish: Brass.
- C. Packing: Teflon impregnated packing.
- D. Packing Nut: Adjustable brass nut with deep stem guard.
- E. Valve Seat: Standard "O" size washer.
- F. Handles: Furnished with polycarbonate wheel handle.

2.03 REDUCED PRESSURE BACKFLOW PREVENTERS

- A. Sizes: 1/4" to 2":
 - 1. Specified Manufacturer: Watts Regulator Company; Series 009QT: www.wattsregulator.com.

2. The assembly shall meet the requirements of ASSE 1013 and AWWA C-511-97.
3. The assembly shall have a bronze body with bronze internal parts and stainless steel springs.
4. The assembly shall consist of a pressure differential relief valve located in a zone between two positive seating check valves.
5. Backsiphonage protection shall include provision to admit air directly into the reduced pressure zone via a separate channel from the water discharge channel, or directly into the supply pipe via a separate vent.
6. The assembly shall include two tightly closing, quarter-turn, full port, resilient seated, bronze body, ball valve shutoffs before and after the assembly, bronze body test cocks and a bronze protective strainer upstream of the No. 1 shutoff valve.

2.04 AUTO FILL VALVE

- A. Specified Manufacturer: Zoro Tools, Inc.: Tel: (855) 289-9676; www.zoro.com.
- B. Materials of Construction:
 1. Body: Bronze.
 2. Valve: Bronze.
 3. Rod: Brass.
 4. Float: Plastic.
- C. Size: As noted on Drawings.
- D. Max Pressure: 125 psi.
- E. Max Temperature: 80 deg F.

2.05 WATER METER FOR WATER FILL OR WATER MAKE-UP

- A. Manufacturer: Dwyer Instruments, Inc.; Series WNT: Tel: (219) 879-8000; www.dwyer-inst.com.
- B. Wetted Materials:
 1. Body: Brass.
 2. Couplings: Brass.
 3. Measuring Chamber: ABS Plastic.
- C. Flow Range (for 1" model): 50 gpm max; 3-50 gpm nominal; 0.75 gpm transitional.
- D. Accuracy: +/-3% transitional flow; +/-1.5% nominal flow.
- E. Temperature Limit: 122 degrees F.
- F. Pressure Limit: 150 psi.
- G. Totalizing Display Maximum: 9,999,999.99 gal.
- H. Output Signal: Pulse output with frequency proportional to flow rate.
- I. Pulse Options: 0.1 gal, 1 gal, 10 gal, 100 gal per pulse.
- J. Electrical Rating: 0.01A @ 24 VAC/DC.
- K. Electrical Connections: Color-coded lead wires 4.5 feet long.
- L. Mounting Orientation: Horizontal with register facing up.
- M. Agency Approvals: NSF/ANSI 61.
- N. Size: As indicated on drawings.

2.06 EMERGENCY EYE/FACE WASH AND SHOWER

- A. Specified Manufacturer: Guardian Equipment; Model G1993: Tel: (312) 447-8100.
 1. Application:
 - a. All PVC and PVC-coated combination eye/face wash and shower safety station.
 2. Shower:
 - a. Head: 10"-diameter orange ABS plastic.
 - b. Valve:
 - 1) 1" IPS PVC-coated brass stay-open ball valve.

- 2) Chrome-plated brass ball.
 - 3) Teflon seals.
 - 4) Stainless steel actuating arm and 29" stainless steel pull rod.
 - c. Spray head assembly: Internal flow control and filter to remove impurities from water.
3. Eye/Face Wash:
 - a. Bowl: 11-3/4" orange ABS plastic.
 - b. Valve:
 - 1) 1/2" IPS PVC-coated brass stay-open ball valve.
 - 2) Chrome-plated brass ball.
 - 3) Teflon seals.
4. Pipe and Fittings: Schedule 80 PVC.
5. Supply: 2" IPS socket weld top female inlet.
6. Waste: 2" IPS socket weld female outlet.
7. Sign: Furnished with ANSI-compliant identification sign.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved potable water protection devices on all plumbing lines where contamination of domestic water may occur.
- F. A reduced pressure zone backflow preventer shall be installed at each cross connection to prevent backsiphonage and back-pressure backflow of hazardous materials into the potable water supply.
- G. Pipe relief from backflow preventer to nearest drain with approved air-gap.
- H. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories sinks washing machine outlets _____.
- I. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch minimum, and minimum 18 inches long.

SECTION 13 11 94
MECHANICAL IDENTIFICATION FOR SPRAY GROUNDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe Markers.

1.02 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Champion America, Inc.: www.Champion-America.com.
- C. Kolbi Pipe Markers, Inc.: www.kolbipipemarkers.com.
- D. Marking Services Inc. (MSI): www.markserv.com.
- E. Seton Identification Products: www.seton.com/aec.

2.02 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved letters.

2.03 VALVE TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved letters. Tag size minimum 1-1/2 inch diameter.
- B. Valve Tag Securing Devices: Plastic zip tie; provide one securing device for each tag.

2.04 PIPE MARKERS

- A. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Identify all pumps, pool heaters, pool filters, surge pits, and backwash pits with plastic nameplates. Small devices may be identified with tags if approved by Engineer.
- E. Identify all valves in exposed pool recirculation piping and remote pits with tags.
- F. Identify exposed piping with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service and flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

3.03 SCHEDULES

A. Nameplates:

1. Pool Filters:
 - a. Identification: "POOL NAME" Filter No. "#" (e.g. Main Pool Filter No. 1, Main Pool Filter No. 2, Wading Pool Filter No. 1, Wading Pool Filter No. 2).
 - b. Background:
 - 1) Size: As required.
 - 2) Color: Aqua.
 - c. Lettering:
 - 1) Color: White.
 - 2) Height: 1 inch.
2. Pool Heaters:
 - a. Identification: "POOL NAME" Pool Heater (e.g. Main Pool Heater, Wading Pool Heater).
 - b. Background:
 - 1) Size: As required.
 - 2) Color: Red.
 - c. Lettering:
 - 1) Color: White.
 - 2) Height: 1 inch.
3. Pumps:
 - a. Identification: "PUMP NAME" Pump (e.g. Main Pool Recirculation Pump, Water Features Pump, Water Slide Pump, etc...)
 - b. Background:
 - 1) Size: As required.
 - 2) Color: Black.
 - c. Lettering:
 - 1) Color: White.
 - 2) Height: 1/2 inch.
4. Surge and Backwash Pits:
 - a. Surge Pits:
 - 1) Identification: "POOL NAME" Surge Pit (e.g. Main Pool Surge Pit, Wading Surge Pit).
 - 2) Background:
 - (a) Size: As required.
 - (b) Color: Olive Green.
 - 3) Lettering:
 - (a) Color: White.
 - (b) Height: 1 inch.
 - b. Backwash Pits:
 - 1) Identification: Backwash Pit.
 - 2) Background:
 - (a) Size: As required.
 - (b) Color: Dark Brown.
 - 3) Lettering:
 - (a) Color: White.
 - (b) Height: 1 inch.

B. Valve Tags:

1. Identification: Each valve tag shall have the words identified below. Valve tags with codes or abbreviations are not acceptable.
 - a. Air Release Valve: Located on all ball valves used to release air from hydraulic system.

- b. Automatic Air Release Valve: Located on top of filters and at high points of piping system to automatically release air.
 - c. Backwash Isolation Valve: Located on the filter face piping to backwash filter.
 - d. Backwash Throttling Valve: Located on the pipe run from the filter face piping to the backwash pit.
 - e. Bypass Valve: Located on a pump discharge pipe to bypass water flow back into a wet pit.
 - f. Check Valve: Locate on all check valves.
 - g. Drain Valve or Drain Plug: Locate on all valves or plugs used for drainage.
 - h. Filter Effluent Valve: Located on discharge side of filters.
 - i. Filter Influent Valve: Located on filter face piping directly before filter.
 - j. Isolation Valve: Located before and after equipment including pumps, strainers, pool heater, etc.
 - k. Manual Fill Valve: Locate on valve used to fill pool and pit.
 - l. Pool Drain Valve: Used to drain water out of the pool basin, generally through the main drain.
 - m. Pool Heater Throttling Valve: Located on the pool heater discharge.
 - n. Recirculation Throttling Valve: Located on recirculation piping after the filters.
 - o. Solenoid Valve: Valve that is electrically operated.
 - p. "WATER FEATURE NAME" Throttling Valve (e.g. Open Flume Slide Throttling Valve, Drop Slide Throttling Valve, Bubbler): Located on individual water feature valves downstream of pump.
 - q. Other: Provide valve tags for all other valves not specifically identified above. Verify wording with Engineer.
2. Background:
- a. Size: As required.
 - b. Color: To match color of pipe markers for the respective pipe - see pipe marker schedule below.
3. Lettering:
- a. Color: To match color of pipe markers for the respective pipe - see pipe marker schedule below.
 - b. Height: 1/4 inch.
- C. Pipe Markers: Unless otherwise required by local codes, the color codes for pool piping shall be as follows.
1. Air Release Piping: All piping used to manually or automatically release air.
- a. Identification: "POOL NAME" Air Release (e.g. Main Pool Air Release, Wading Pool Air Release).
 - b. Background:
 - 1) Size: As required.
 - 2) Color:
 - (a) Piping on filter influent piping or top of filters: Olive Green.
 - (b) Piping on filter effluent piping: Aqua.
 - c. Lettering:
 - 1) Color: White.
 - 2) Height: 1/2 inch.
2. Chemical Controller Sample Lines:
- a. Chemical Controller Return: Sample coming from the pool chemical controller.
 - 1) Identification: "POOL NAME" Chemical Controller Return (e.g. Main Pool Chemical Controller Return, Wading Pool Chemical Controller Return).
 - 2) Background:
 - (a) Size: As required.
 - (b) Color: Aqua.
 - 3) Lettering:
 - (a) Color: White.

- (b) Height: 1/2 inch.
- b. Chemical Controller Supply: Sample line going to the pool chemical controller.
 - 1) Identification: "POOL NAME" Chemical Controller Supply (e.g. Main Pool Chemical Controller Supply, Wading Pool Chemical Controller Supply).
 - 2) Background:
 - (a) Size: As required.
 - (b) Color: Aqua.
 - 3) Lettering:
 - (a) Color: White.
 - (b) Height: 1/2 inch.
- 3. Chemical Piping:
 - a. Identification: "POOL NAME" - "CHEMICAL NAME" (e.g. Main Pool - Muriatic Acid, Main Pool - Sodium Hypochlorite).
 - b. Background:
 - 1) Size: As required.
 - 2) Color:
 - (a) Chlorine (gas or solution): Yellow.
 - (b) Soda Ash: White.
 - (c) Acid: Pink.
 - (d) Caustic: Yellow with Green Band.
 - c. Lettering:
 - 1) Color: Black.
 - 2) Height: 1/2 inch.
- 4. Domestic Water:
 - a. Deck Hose Bibb Supply: Locate on exposed pool deck hose bibb supply pipes where exposed for distances of greater than 5' or when pipe penetrates multiple structures.
 - 1) Identification: Pool Deck Hose Bibb.
 - 2) Background:
 - (a) Size: As required.
 - (b) Color: Dark Blue.
 - 3) Lettering:
 - (a) Color: White.
 - (b) Height: 1/2 inch.
 - b. Pool Fill: Locate on all manual pool fill piping.
 - 1) Identification: "POOL NAME" Fill (e.g. Main Pool Fill, Wading Pool Fill).
 - 2) Background:
 - (a) Size: As required.
 - (b) Color: Dark Blue.
 - 3) Lettering:
 - (a) Color: White.
 - (b) Height: 1 inch.
 - c. Water Make-Up: Locate on all automatic pool water make-up piping.
 - 1) Identification: "POOL NAME" Water Make Up (e.g. Main Pool Water Make Up, Wading Pool Water Make Up).
 - 2) Background:
 - (a) Size: As required.
 - (b) Color: Dark Blue.
 - 3) Lettering:
 - (a) Color: White.
 - (b) Height: 1/2 inch.
 - d. Water Service: Locate on potable water service piping only where exposed for distances of greater than 3' or when pipe penetrates multiple structures.
 - 1) Identification: Water Service.
 - 2) Background:

- (a) Size: As required.
 - (b) Color: Dark Blue.
 - 3) Lettering:
 - (a) Color: White.
 - (b) Height: 1 inch.
- 5. Filter Backwash: Filter backwash piping.
 - a. Identification: Filter Backwash.
 - b. Background:
 - 1) Size: As required.
 - 2) Color: Dark Brown.
 - c. Lettering:
 - 1) Color: White.
 - 2) Height: 2 inch.
- 6. Gutter Return Piping: Locate on gutter return piping only where the pipe is exposed for distances of greater than 5'. If less than 5' of pipe is exposed, locate on penetrating wall(s) immediately above the pipe.
 - a. Identification: "POOL NAME" Gutter (e.g. Main Pool Gutter, Wading Pool Gutter).
 - b. Background:
 - 1) Size: As required.
 - 2) Color: Olive Green.
 - c. Lettering:
 - 1) Color: White.
 - 2) Height: 2-1/2 inch.
- 7. Main Drain Piping: Locate on main drain piping only where the pipe is exposed for distances of greater than 5'. If less than 5' of pipe is exposed, locate on penetrating wall(s) immediately above the pipe.
 - a. Identification: "POOL NAME" Main Drain (e.g. Main Pool Main Drain, Wading Pool Main Drain).
 - b. Background:
 - 1) Size: As required.
 - 2) Color: Black.
 - c. Lettering:
 - 1) Color: White.
 - 2) Height: 2-1/2 inch.
- 8. Pool Heater Piping:
 - a. Pool Heater Return: Piping from the pool heater.
 - 1) Identification: "POOL NAME" Heater Return (e.g. Main Pool Heater Return, Wading Pool Heater Return).
 - 2) Background:
 - (a) Size: As required.
 - (b) Color: Aqua.
 - 3) Lettering:
 - (a) Color: White.
 - (b) Height: 1 inch.
 - b. Pool Heater Supply: Piping going to the pool heater.
 - 1) Identification: "POOL NAME" Heater Supply (e.g. Main Pool Heater Supply, Wading Pool Heater Supply).
 - 2) Background:
 - (a) Size: As required.
 - (b) Color: Aqua.
 - 3) Lettering:
 - (a) Color: White.
 - (b) Height: 1 inch.

9. Pool Overflow: Piping used to carry pool overflow water. Locate at top of exposed overflow piping and when pipe penetrates multiple structures.
 - a. Identification: "POOL NAME" Overflow (e.g. Main Pool Overflow, Wading Pool Overflow).
 - b. Background:
 - 1) Size: As required.
 - 2) Color: Light Brown.
 - c. Lettering:
 - 1) Color: White.
 - 2) Height: 2 inch.
10. Pool Recirculation Piping:
 - a. Filter Effluent Piping: Piping after pool filters.
 - 1) Identification: "POOL NAME" Filter Effluent (e.g. Main Pool Filter Effluent, Wading Pool Filter Effluent).
 - 2) Background:
 - (a) Size: As required.
 - (b) Color: Aqua.
 - 3) Lettering:
 - (a) Color: White.
 - (b) Height: 2 inch.
 - b. Filter Influent Piping: Piping between pool recirculation pump and filter.
 - 1) Identification: "POOL NAME" Filter Influent (e.g. Main Pool Filter Influent, Wading Pool Filter Influent).
 - 2) Background:
 - (a) Size: As required.
 - (b) Color: Olive Green.
 - 3) Lettering:
 - (a) Color: White.
 - (b) Height: 2 inch.
11. Sump Pump Discharge Piping:
 - a. Backwash Sump Pump Discharge Piping: Exposed piping on backwash sump pump discharge.
 - 1) Identification: Backwash Sump Pump.
 - 2) Background:
 - (a) Size: As required.
 - (b) Color: Dark Brown.
 - 3) Lettering:
 - (a) Color: White.
 - (b) Height: 1/2 inch.
 - b. Sump Pump Discharge Piping: Exposed piping on sump pump discharge piping to storm sewer.
 - 1) Identification: Sump Pump.
 - 2) Background:
 - (a) Size: As required.
 - (b) Color: Light Brown.
 - 3) Lettering:
 - (a) Color: White.
 - (b) Height: 1/2 inch.
12. Water Feature Piping: Piping to water features.
 - a. Identification: "WATER FEATURE NAME" (e.g. Open Flume Water Slide, Drop Slide, Bubbler).
 - b. Background:
 - 1) Size: As required.
 - 2) Color: Olive Green.

- c. Lettering:
 - 1) Color: White.
 - 2) Height: 1/2 inch on small pipe, 2 inch on large pipe.

END OF SECTION

SECTION 13 14 30
WATER PLAY STRUCTURE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water Play Structures.

1.02 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's descriptive literature for specified systems, including all components.
- C. Shop Drawings:
 - 1. Indicate component connection details and details of interface with adjacent construction.
 - 2. Foundations: Foundation design shall be certified and sealed by a Professional Engineer registered in the State where the structure is being constructed.
- D. Certificates: Certify that products of this section meet or exceed specified requirements.
- E. Manufacturer's Instructions: Indicate installation instructions for specified equipment, including each component.
- F. Operation and Maintenance Data: Submit manufacturer's operation and maintenance instructions and parts lists for specified equipment.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience.
- C. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

1.04 WARRANTY

- A. The complete system shall be warranted from the manufacturer for a period of not less than one year.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Delivery: Deliver materials to site in manufacturer's original, unopened packaging.
- B. Storage: Store all equipment and materials under cover and elevated above grade.
- C. Protection: Protect equipment and materials to prevent damage.

PART 2 PRODUCTS

2.01 WATER PLAY STRUCTURE

- A. Manufacturers:
 - 1. Waterplay Manufacturing Inc.; 1451 B. Ellis St., Kelowna, BC V1Y 2A3: Tel: (800) 590-5552 or (250) 712-3393; Fax: (250) 861-4814; www.waterplay.com.
- B. General: The water play structure shall be suitable for installation in public swimming facilities and specifically designed for use by children and adults.
- C. Product:
 - 1. Model: WaterPlay, DisCOVERY Series G100, Grasslands Model 0010-9076.
 - 2. Length/Width: 35' x 18'9" (10.68 m x 5.7m)
 - 3. Total Height: 13'
 - 4. Top Deck Height: 4' (1.22 m)
 - 5. Total Water Flow: 199 GPM
- D. Materials:

1. All materials shall be structurally sound and suitable for safe play. Durability shall be insured on all mild steel parts by the use of galvanization.
 2. Main piping of the structure shall be of 6-inch and 4-inch pipe. All piping to be either stainless steel and mild steel schedule 40 pipe.
 3. All steel components from the pool floor to a height of two feet (minimum) shall be Type 304 stainless steel.
 4. All parts not required to be structural may be fabricated from PVC and suitably protected from ultraviolet deterioration.
 5. All required nozzles shall be stainless steel, brass, or galvanized steel.
 6. All dissimilar metals are to be isolated with dielectric fittings.
- E. Manifold System:
1. The water play structure shall have integrated into it's overall design a manifold system for regulating the water flows and pressures to each individual effect.
 2. The manifold shall be constructed of PVC pipe and shall utilize stainless steel disc butterfly valves, bronze gate valves and/or PVC ball valves.
 3. The manifold system shall be easily accessible at all times for adjustment.
 4. Each valve shall be permanently labeled as to the effect it controls.
- F. Hardware (Connectors): Primary structural fasteners (bolts, nuts, washers and screws) shall be stainless steel.
- G. Decks and Stairs:
1. All decks and stairs shall be fiberglass and shall have an integral slip resistant finish on the exposed surface.
 2. All corners shall be rounded with no exposed square edges allowed.
 3. Each fiberglass panel shall be structurally capable of supporting a minimum load of 100 pounds per square foot.
- H. Handrails:
1. Materials:
 - a. The play system handrails shall be fabricated from mild steel which is then hot-dipped galvanized and painted with a polyurethane coating.
 - b. Pickets shall be manufactured from 5/8-inch steel round bar.
 - c. The handrail frame shall be manufactured from 1.25 inch by 1.25 inch steel square tubing.
 2. Dimensions:
 - a. The minimum height from the play system deck to the top of the handrail shall be 48 inches.
 - b. The maximum picket opening shall be 3.5 inches.
 - c. The maximum height from the top of the play system deck to the bottom of the handrail shall be 1 inch.
- I. Tunnel Slides:
1. Slide sections shall be molded of ultra-violet stabilized, linear low density polyethylene with a minimum of 0.250 inch wall thickness.
 2. Slide section openings shall be 27-inch in diameter.
 3. Slide shall attach to the appropriate structural handrail utilizing stainless steel hardware.
 4. Each slide will be supported at the base with at least one 180 degree saddle and pipe support.
- J. Crawl Tunnels:
1. The tunnel body shall be 27-inch diameter, fabricated from fiberglass or molded polyurethane.
- K. Side Panels/Skirt Panels:
1. All areas below platforms and stairs less than 5'-6" high shall be completely sealed off from the public and secured with 3/8 inch reinforced PVC or fiberglass panels.
 2. All panels shall be ultra-violet protected with an epoxy finish.

- L. Valves:
 - 1. Effect Control Valves: All butterfly valves shall be fabricated of stainless steel with aluminum bronze disc, stainless steel shaft and EPDM seat.
 - 2. Handwheel Operated Valves:
 - a. Wheels and connecting hardware shall be specifically fabricated so as to provide minimum opportunity for injury during rotation.
 - b. The handwheels shall be flexible (impact resistant) and fabricated from cast urethane not to exceed a hardness value of 95A (90%).
 - 3. Rope Operated Valves:
 - a. All rope operated valves shall be self-closing with a stainless steel actuator.
 - b. The bodies and/or operating parts shall be either PVC or brass.
 - c. The supply pipe shall be capable of withstanding a 175 pound live load.
- M. Water Blasters:
 - 1. Operation:
 - a. All water blasters shall be manufactured with a hand operated pump mechanisms so water flow may be controlled completely by the operator.
 - b. This pump mechanism must be encased inside of a stainless steel housing.
 - c. The internal pump components shall be easily accessible for maintenance and replacement.
 - d. Water blasters shall receive water from a supply basin that is to be filled by a self-closing spigot valve operated as another interactive.
 - 2. Mounting:
 - a. The water blaster shall be mounted on a swivel base allowing the operator to control pan and tilt functions.
 - b. The swivel base shall employ mechanisms to limit the degree of pan and tilt, thus controlling the trajectory of the individual water blaster.
 - c. The water blaster shall be mounted so the nozzle trajectory is above a height of six feet at a distance of fifteen feet away.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that required utilities are in correct location and are of correct capacities for specified products.
- B. Verify equipment rough-in before proceeding with work.

3.02 INSTALLATION AND OPERATING MANUALS

- A. The manufacturer shall furnish the purchaser with at least two sets of complete installation and operating manuals. The installation manual shall illustrate a step-by-step procedure for assembly of the entire system. The operating manual shall describe the start-up procedure and day to day operation of the feature.
- B. Install all equipment in accordance with shop drawings and manufacturer's printed installation instructions; comply with standards required by authorities having jurisdiction.
- C. Schedule installation to ensure that utility connections are achieved in an orderly and expeditious manner.
- D. Install equipment plumb, square, and straight, without distortion; securely anchor.

3.03 INTERFACE WITH OTHER WORK

- A. Coordinate with other trades for proper installation of plumbing and electrical services.

3.04 STARTING EQUIPMENT AND SYSTEMS

- A. Provide manufacturer's field representative to prepare and start equipment.
- B. Adjust for proper operation within manufacturer's published tolerances.
- C. Demonstrate proper operation of equipment to Owner's designated representative.

3.05 ADJUSTING AND CLEANING

- A. Adjust equipment, including water requirements, for smooth operation.
- B. Touch up minor damaged surfaces caused by installation.
- C. Replace damaged components as directed by Engineer.

3.06 CLEANING AND PROTECTION

- A. Clean all pieces of equipment.
- B. Protect installed equipment from subsequent construction operations.
- C. Do not permit traffic over unprotected surfaces.

END OF SECTION

SECTION 13 31 51
SHADE STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial prefabricated shade structures.

1.02 RELATED SECTIONS

- A. Section 03 30 05 - Cast-In-Place Concrete: footings.

1.03 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 1996.
- B. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary; American Concrete Institute International; 1999.
- C. ASTM A 135 - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2001.
- D. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 1999.
- E. ASTM E 8 - Test Methods for Tension Testing of Metallic Materials; 2004.
- F. CRSI (DA4) - Manual of Standard Practice; Concrete Reinforcing Steel Institute; 1997, 26th Edition.

1.04 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's descriptive literature for specified systems, including all components.
- C. Shop Drawings: Indicate layout heights, component connection details, and details of interface with adjacent construction.
- D. All shop drawings shall be certified and sealed by a Professional Engineer registered in the State where the shade structure is being constructed.
- E. Selection Samples: Two sets of color chips representing manufacturer's full range of available colors.
- F. Certificates:
 - 1. Contractor's certification that manufacturer of products of this section meet specified qualifications.
 - 2. Manufacturer's certification that installer of this section is approved.
- G. Manufacturer's printed installation instructions for specified systems, including each component.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum five (5) years of documented experience producing systems of the types specified in this section.
- B. Installer Qualifications: Minimum three (3) years documented experience installing systems of the types specified in this section, and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store system components in accordance with manufacturer's instructions until installation.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Warrant that the equipment sold will conform in kind and quality to the specifications listed and will be free of defects in workmanship or materials. Shade manufacturer shall further warrant the following:

1. LIMITED 20 YEAR WARRANTY on all upright posts, and support structure frames against failure due to rust-through corrosion.
2. LIMITED 10 YEAR WARRANTY on all fabrics and stitching threads against degradation, cracking or material breakdown resulting from ultra-violet exposure.
3. LIMITED 1 YEAR WARRANTY for structural failure of any part not covered by one of the above warranties.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Specified Manufacturer: Shade Systems, Inc.: Tel: (800) 609-6066, Fax: (954) 971-1208; www.shadesystemsinc.com.
- B. Acceptable Manufacturers: As long as the shade manufacturer meets all minimum requirements in this section, the following manufacturers will be approved.
 1. Hendee Enterprises, Inc.: Tel: (800) 231-7275 or (713) 796-2322, Fax: (713) 796-0494; www.hendee.com.
 2. Solar Shade USA, LLC: Tel: (660) 679-5123; Fax: (660) 679-6231.
 3. Superior Shade, Inc.: Tel: (888) 829-8997; Fax: (770) 834-2764; www.superiorshadeinc.com.
- C. Unless otherwise specified for an individual product or material, supply all products specified in this section from the same manufacturer.

2.02 GENERAL

- A. All materials shall be structurally sound and appropriate for safe use.
- B. Product durability shall be ensured by the use of corrosion-resistant metals such as stainless steel, and coatings such as zinc-plating, galvanizing, and powder-coating on steel parts, subject to the project specific requirements below.
- C. Fabrics used shall include UV-stabilizers and fire retardants for longevity and safety.

2.03 DESIGN

- A. Styles: Square.
- B. Size and Height: As indicated on the Drawings.
- C. Engineering Data: Structures are engineered to meet or exceed the requirements of the International Building Code (IBC), and the following standard specifications:
 1. Wind Speed (Frame Only): 150 miles per hour.
 2. Wind Speed (Frame with Canopy): 90 miles per hour.
 3. Live Load: None.
 4. Snow Load: None.

2.04 WELDMENTS

- A. All tubing members shall be factory-welded by Certified Welders to American Welding Society (AWS) specifications and to the highest standards of quality workmanship.
- B. Weldments shall be finished with a zinc-rich galvanized coating.
- C. No field welding shall be permitted.

2.05 POSTS, STRUCTURAL FRAME TUBING, AND HARDWARE

- A. All tubing used shall be cold-formed and milled per ASTM A 135 and ASTM A 500.
- B. Material testing shall be in accordance with ASTM E 8.
- C. Minimum yield shall be 40,000 psi with a minimum tensile strength of 45,000 psi on all posts.
- D. All tubing shall be pre-cut to appropriate lengths, and all outside surfaces shall be galvanized, with an interior corrosion-resistant zinc-rich coating.
- E. Support pipes shall be schedule 40 hot-dip galvanized steel.
- F. Finish: All steel posts and structural frame tubing shall have a powder coat finish.

- G. All fastening hardware shall be stainless steel.

2.06 POLYESTER POWDER-COATING PROCESS

- A. All steel shall receive a powder coating.
- B. All powder-coated parts shall be completely cleaned and a hot zinc phosphate pretreatment with non-chromic sealer shall be applied.
- C. Powder-coating shall be electrostatically applied and oven-cured at 375 to 425 degrees Fahrenheit.
- D. Polyester powders shall meet or exceed ASTM standards for Adhesion, Hardness, Impact, Flexibility, Overbake Resistance, and Salt Spray Resistance.

2.07 FOOTINGS

- A. Footings shall be designed and constructed to local building codes and good construction practices and shall meet the requirements of Section 03 30 05.
- B. Columns shall be provided as direct embedment unless shown otherwise on the Drawings.
- C. Concrete shall meet the requirements of Section 03 30 05.
- D. Reinforcing:
 - 1. Reinforcing shall meet the requirements of Section 03 30 05.
 - 2. All reinforcing steel shall be designed, detailed, fabricated, and place in accordance with ACI 301, ACI 318, and CRSI Manual of Standard Practice.

2.08 ROOFING

- A. Structural frames shall be designed for use with shade fabric.
- B. Fabric shall be attached to frame using a vinyl covered minimum 1/4 inch diameter galvanized cables, pre-cut to fixed lengths with ends looped at the factory and pre-inserted into canopy hems.
- C. A separate cable shall be provided for each side of the structure for precision tensioning and ease of installation.
- D. Cable fasteners shall be zinc-plated copper for maximum corrosion resistance.
- E. Continuous one-piece cables, cables which are not independent per side and pre-looped and clamped at the factory, and/or cables which must be tensioned with the use of turnbuckles or tools not provided by the manufacturer are not acceptable.

2.09 TURN-N-SLIDE FASTENING SYSTEM

- A. Fastening system shall consist of the Turn-N-Slide fastening device factory installed at each roof rafter corner. The Turn-N-Slide features a concealed mechanism which allows the attachment hook at each rafter corner to move along a track in the rafter. Such moving hook allows the looped ends of each cable to slide over the hook when the hook is at its upper position, and then by turning the concealed fastener within the rafter, moves the hook outward (toward end of the rafter), thereby tensioning the cables and securing the fabric at the proper tautness.
- B. A locking cap shall be secured at the end of each rafter with a vandal-resistant bolt (special wrench provided by the manufacturer) to prevent unauthorized access to the Turn-N-Slide mechanism.
- C. To remove the canopy, the cap is removed, and the mechanism rotated counter-clockwise. The hook moves inward (toward peak of roof), thereby de-tensioning the cables, and allows fast removal of the canopy.

2.10 SHADE FABRIC

- A. Knitted of monofilament and tape construction high density polyethylene with Ultra Violet (U.V.) stabilizers and flame retardant.
- B. UV-Block Factor varies by standard color offered from 91% to 99%.

- C. Fabric Characteristics:
 - 1. Nominal Thickness: 0.057 inches.
 - 2. Fabric Mass: Min. 337 g/m2.
 - 3. Light Fastness: 7-8 (Blue Wool Scale).
 - 4. Weather Fastness: 4-5 (Grey Scale Test).
 - 5. Tear Resistance:
 - a. Warp 210N.
 - b. Weft 276N.
 - 6. Breaking Force:
 - a. Warp 786N.
 - b. Weft 1544N.
 - 7. Bursting Pressure: Mean 3125kPa.
 - 8. Bursting Force: Mean 1775N.
- D. All hems and seams shall be double row lock stitched using exterior grade UV-stabilized polyethylene GORE TENARA® sewing thread.
- E. Flammability: Shade fabric shall be treated with fire retardants, and pass the requirements established under the NFPA 701 Test Method 2 test standards for flammability, including the accelerated water leaching protocol.
- F. Colors: Selected from manufacturer's full range of available colors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are as indicated on shop drawings.
- B. Installer's Examination:
 - 1. Have installer of this section examine conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable.
 - 2. Beginning construction activities of this section before unacceptable conditions have been corrected is prohibited.
 - 3. Beginning construction activities of this section indicates installer's acceptance of conditions.

3.02 PREPARATION

- A. Ensure that adjacent surfaces, structures, and finishes are protected from damage by construction activities of this section.

3.03 INSTALLATION

- A. Install systems specified in accordance with shop drawings and manufacturer's installation instructions.
- B. Placing of concrete for post bases is specified in Section 03 30 05.

3.04 CLEANING

- A. Remove dust or other foreign matter from component surfaces; clean finishes in accordance with manufacturer's instructions.

3.05 PROTECTION OF INSTALLED PRODUCTS

- A. Ensure that finishes and structure of installed systems are not damaged by subsequent construction activities.
- B. If minor damage to finishes occurs, repair damage in accordance with manufacturer's recommendations; provide replacement components if repaired finishes are unacceptable to Engineer.

END OF SECTION

SECTION 31 23 16
EXCAVATION FOR SPRAY GROUNDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavating for pool volume below grade, building volume below grade, footings, slabs-on-grade, paving, and site structures.

1.02 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring. General requirements for dewatering of excavations and water control.
- B. Section 31 22 00 - Grading: Soil removal from surface of site.
- C. Section 31 22 00 - Grading: Grading.
- D. Section 31 23 23 - FILL AND BACKFILL FOR SPRAY GROUNDS: Fill materials, backfilling, and compacting.
- E. Section 33 41 00 - SUBDRAINAGE FOR SPRAY GROUNDS: Filter aggregate and filter fabric for foundation drainage systems.

1.03 PROJECT CONDITIONS

- A. Protect plants, lawns, rock outcroppings, and other features to remain.
- B. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 31 22 00 for topsoil removal.
- C. Locate, identify, and protect utilities that remain and protect from damage.
- D. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Engineer.

3.02 EXCAVATING

- A. Classification of Excavated Materials: No classification of excavated materials will be made. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the work, regardless of the type, character, composition, or condition thereof.
- B. Blasting: Blasting or other use of explosives for excavation will not be permitted.
- C. Excavate to accommodate new structures and construction operations.
- D. Notify Engineer in writing of unexpected subsurface conditions. Do not further disturb such condition or perform any Work in connection therewith until receipt of written order to do so.
- E. Design any excavation slopes or temporary shoring.
- F. Slope height, slope inclination, and excavation depths, including utility trench excavations, should in no case exceed those specified in federal, state, or local safety regulations, such as OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations.
- G. Do not interfere with 45 degree bearing splay of foundations.
- H. Dewatering:

1. Dewatering equipment shall be provided to remove and dispose of all surface water and groundwater entering excavations, trenches, or other parts of the work.
 2. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.
 3. All excavations for concrete structures or trenches which extend down to or below groundwater shall be dewatered by lowering and keeping the groundwater level beneath such excavations 12 inches or more below the bottom of the excavation. For Contractor's convenience and at Contractor's cost, Contractor may stabilize saturated soils using means other than dewatering, with prior approval of Engineer. Other methods may include over-excavation and/or application of fill materials. Under no circumstance shall Contractor employ fill materials that results in open voids in the subgrade, which could be later filled in with silts and fines causing settlement of the subgrade.
 4. Surface water shall be diverted or otherwise prevented from entering excavations or trenches to the greatest extent possible without causing damage to adjacent property.
 5. The Contractor shall be responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipe or conduit shall be left clean and free of sediment.
- I. Provide temporary means and methods, as required, to remove all water from excavations until directed by Engineer. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
- B. Provide for visual inspection of load-bearing excavated surfaces by Engineer before placement of foundations.

3.04 PROTECTION

- A. Divert surface flow from rains or water discharges from the excavation.
- B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.
- D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION

SECTION 31 23 23
FILL AND BACKFILL FOR SPRAY GROUNDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Filling, backfilling, and compacting for pool volumes below grade, building volume below grade, footings, slabs-on-grade, paving, site structures, and utilities within the building.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 31 22 00 - Grading: Removal and handling of soil to be re-used.
- C. Section 33 41 00 - Subdrainage: Filter fabric for drainage systems.
- D. Section 03 30 05 - Cast-in-Place Concrete

1.03 REFERENCE STANDARDS

- A. ASTM C 33 - Standard Specification for Concrete Aggregates; 1999a.
- B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.
- C. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
- D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.
- E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
- F. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.
- G. ASTM D 4253 - Standard Test Methods for Maximum Index Density and Unit Weight Soils Using a Vibratory Table; 2000.
- H. ASTM D 4254 - Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density; 2000.
- I. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 2009.
- J. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2008.
- K. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2004.

1.04 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. Soil Samples: 10 pounds sample of each type of fill; submit in air-tight containers to testing laboratory.
- C. Materials Sources: Submit name of imported materials source.
- D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
- E. Compaction Density Test Reports.
- F. Testing shall be completed by an independent testing agency and shall be less than 12 months old. The costs for material tests shall be paid for by the Contractor.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Provide sufficient quantities of fill to meet project schedule and project requirements. When necessary, store materials on site in advance of need.

- B. When fill materials are stored on site:
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.
- C. Verify that survey bench marks and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. General Fill: Imported borrow meeting all of the following requirements:
 - 1. Free of lumps larger than 3 inches, rocks larger than 2 inches, organics and debris.
 - 2. Conforming to ASTM D 2487 Group Symbol SC, CL, ML, SM, or GC.
- B. Structural Fill: Imported borrow meeting all of the following requirements:
 - 1. Free of lumps larger than 1.5 inches, rocks larger than 1.5 inches, organics, and debris.
 - 2. Fill shall consist of low-plasticity cohesive material or granular material containing at least 18 percent fines.
 - 3. Low-plasticity cohesive fill shall have a liquid limit (LL) less than 40 and a plasticity index (PI) between 10 and 20 in accordance with ASTM D 4318 by the wet preparation method.
 - 4. Conforming to ASTM D 2487 Group Symbol CL.
- C. Concrete for Fill: See Section 03 30 00; compressive strength of 2,500 psi.
- D. Granular Fill: Granular fill for compacted backfill shall be free-draining, poorly graded, clean, angular crushed stone; free of shale, clay, friable material and debris.
 - 1. Gradation: Comply with ASTM C 33, Table 2 Grading Requirements for Coarse Aggregate, size No. 57 or 67 aggregate.
 - 2. The fraction passing the No. 200 sieve shall not exceed 5 percent.
- E. Underdrain Aggregate - Pea Gravel : Natural stone; washed, free of clay, shale, organic matter.
 - 1. Graded in accordance with ASTM C 136, within the following limits:
 - a. Minimum Size: 3/8 inch.
 - b. Maximum Size: 3/4 inch.
- F. Topsoil: See Section 31 22 00.

2.02 ACCESSORIES

- A. Geotextile Fabric:
 - 1. Manufacturers and products:
 - a. Contech C60NW.
 - b. Propex Geotex 601.
 - c. Mirafi 160N.
 - 2. Properties:
 - a. Tensile Strength (Grab), ASTM D 4632: 160 lbs.
 - b. Apparent Opening Size, ASTM D 4751: 70 US Standard Sieve.
 - c. Water Flow Rate, ASTM D 4491: 110 gpm/sq. ft.

2.03 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. All fill materials shall be approved by Engineer.
- C. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance . The costs for material tests shall be paid for by the Contractor.
- D. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Identify required lines, levels, contours, and datum locations.

- B. See Section 31 22 00 for additional requirements.
- C. Verify subdrainage, piping, dampproofing, or waterproofing installation has been inspected.
- D. Verify structural ability of unsupported walls to support imposed loads by the fill.
- E. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

- A. Proof roll subgrade surface with a loaded tandem-axle dump truck, with a minimum gross weight of 25 tons, to identify soft spots. Construction equipment equipped with flotation tires, such as scrapers, skid-steers, and pay loaders, are not suitable for use in proof rolling.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill.
- C. In areas to accept fill, the top 10 inches of the ground surface shall be scarified, moisture conditioned to -1 to 3 percent of the material's optimum moisture content. The scarified soils should then be recompacted to at least 95 percent of the material's standard Proctor dry density (ASTM D 698).
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Fill up to subgrade elevations unless otherwise indicated.
- C. Employ a placement method that does not disturb or damage other work.
- D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- E. In areas where a finer material is placed over or beside a coarser material and migration of one into the other can occur, such as when structural fill, general fill, or topsoil is placed over or beside granular fill, geotextile fabric shall be placed over or beside the granular fill or coarser material to separate the fill materials and prevent migration.
- F. Fill at Pool Walls: Carefully place and compact fill materials along pool walls in order to protect piping and conduit from damage due to material and equipment loading.
- G. Upon completion of excavation and filling operations, care shall be taken to prevent subgrade disturbance and maintain the subgrade moisture content prior to construction of foundations and slabs. If the subgrade becomes saturated, desiccated, or disturbed, the affected material shall be removed and replaced, or these materials shall be scarified, moisture-conditioned as necessary, and recompacted prior to construction of foundations or slabs. If two (2) days elapses or a significant weather event occurs between subgrade preparation and further construction, subgrades shall be retested prior to placement of structures.
- H. Compaction Method:
 - 1. The method of compaction and the equipment used shall be appropriate for the material to be compacted and the work location.
 - 2. Sheep's foot roller, smooth drum rollers, pneumatic tired rollers, jumping jacks, vibratory equipment, small rollers, tampers, or other appropriate equipment shall be used for compaction.
 - 3. Compaction using loaded trucks, bulldozer tracks, backhoe buckets, or similar construction equipment shall not be allowed.
- I. Moisture content, at the time of compaction, shall be controlled to between 1 percent below and 3 percent above the optimum moisture content.
- J. For cohesionless fill materials, where the percent passing the No. 200 sieve is less than 10 percent and the moisture-density curve indicates only slight sensitivity to changing moisture content, compaction requirements should be changed to 75 percent relative density as determined by ASTM D 4253 and ASTM D 4254.
- K. General Fill:
 - 1. Deposit in uniform layers not exceeding 8 inches in uncompacted thickness.

2. Compact to 95 percent of maximum density at 1 percent below and 3 percent above the optimum moisture content, as determined by ASTM D 698 when that test is appropriate.
- L. Structural Fill:
 1. Deposit in uniform layers not exceeding 8 inches in uncompacted thickness.
 2. Compact to 98 percent of maximum density at 1 percent below and 3 percent above the optimum moisture content, as determined by ASTM D 698 when that test is appropriate.
- M. Granular Fill:
 1. Granular material shall be deposited in uniform layers not exceeding 8 inches in uncompacted thickness.
 2. The granular backfill shall be compacted with a suitable vibratory roller or platform vibrator to at least 98 percent of the materials standard Proctor dry density (ASTM D 698).
- N. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- O. Correct areas that are over-excavated.
 1. Load-bearing foundation surfaces: Fill with concrete.
 2. Other areas: Use structural fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.
- P. Reshape and re-compact fills subjected to vehicular traffic.
- Q. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Engineer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 FILL AT SPECIFIC LOCATIONS, UNLESS NOTED OTHERWISE ON DRAWINGS

- A. General Fill: Use in landscape areas only.
- B. Structural Fill: Use under all structures, where indicated, including but not necessarily limited to, slabs-on-grade, footings, and foundations.
- C. Granular Fill: Use under all structures and at all other locations where indicated on the Drawings.
- D. Underdrain Aggregate: Use for the subdrainage system only.
- E. Buried Conduits and Piping in Trenches :
 1. Where pipe or conduit is not located under a structure:
 - a. Bedding: Use granular fill up to top of pipe or conduit.
 - b. Cover with general fill.
 - c. Fill up to subgrade elevation.
 2. Where pipe or conduit is located under a structure:
 - a. Bedding: Use granular fill up to top of pipe or conduit.
 - b. Place separation geotextile fabric over granular fill.
 - c. Cover with structural fill.
 - d. Fill up to subgrade elevation.

3.05 TOLERANCES

- A. Top Surface of General Filling: Plus or minus 1 inch from required elevations, unless noted otherwise on the drawings.

3.06 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
- B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.
- C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor") or ASTM D1557 ("modified Proctor").

- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- E. Frequency of Tests: As noted below unless requested otherwise by Engineer.
 - 1. All Areas Except Under Pavements:
 - a. Fill Materials: At least one (1) test per fill type per 1,000 cubic yards of fill placed. Each test shall include sieve, P.I., and moisture density relationship when appropriate for the fill type. Provide other testing required to determine conformance.
 - b. Compaction: At least one (1) field density test for each 2,000 square feet of fill lift, but no less than three (3) tests per lift.
 - 2. Under Pavements:
 - a. Fill Materials: At least one (1) test per fill type per 2,500 cubic yards of fill placed. Each test shall include sieve, P.I., and moisture density relationship when appropriate for the fill type. Provide other testing required to determine conformance.
 - b. At least one (1) field density test per 5,000 square feet of fill lift, but no less than three (3) tests per lift.
- F. Backfill operations shall be monitored full time by the testing and inspection agency.
- G. Proof roll compacted fill at surfaces that will be under slabs-on-grade and paving.

3.07 CLEANING

- A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 32 92 21

SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preparation of subsoil.
- B. Placing topsoil.
- C. Fertilizing.
- D. Seed installation.
- E. Maintenance.

1.02 RELATED SECTIONS

- A. Section 31 22 00 - Grading: Topsoil material.
- B. Section 31 22 00 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

1.03 DEFINITIONS

- A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. Invoices and Analysis Labels: Submit a copy of the supplier's invoices for all seed, mulch, and fertilizer, showing the quantity purchased for the project, and representative labels bearing the grower's, manufacturer's, or vendor's guaranteed statement of analysis to assure compliance with specified requirements for quality and application rates.
- C. Planting Schedule: Submit a proposed planting schedule indicating dates for each type of landscape work during optimum seasons for such work. Once accepted, dates shall be revised only as approved in writing, after documentation of reasons for delays has been submitted.

1.05 QUALITY ASSURANCE

- A. Personnel and Equipment:
 - 1. Employ only experienced personnel who are familiar with, and regularly engaged in, the type of work required.
 - 2. Provide adequate supervision by a qualified supervisor at all times when construction is in progress.
 - 3. Use equipment of proper size and capacity to perform the work as specified and within the limits disturbed by construction.

1.06 TIME AND CONDITIONS

- A. Seeding work shall progress as rapidly as portions of the site become available, working within seasonal limitations.
- B. Seeding dates shall be defined as late summer and early fall, generally between the dates of August 15 and September 30, or in mid to late winter or early spring, from as soon as the ground can be worked to April 20.
- C. Perform planting activities only during periods within the planting season, when weather and soil conditions are suitable. Planting activities shall not be done during periods of severe drought, high winds, excessive moisture, or frozen ground, as determined by the Engineer. Seeding work in any areas shall not be started until all earthwork has been substantially completed. Backfill and fills shall be allowed to settle, topsoil shall be spread and bound, and finish grading and mechanical compaction shall be completed and accepted before commencing work in any area.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Packaged materials shall be delivered in containers showing weight, analysis, and name of manufacturer. Materials shall be protected from deterioration during delivery and while they are stored at the site.

1.08 GUARANTEE AND ACCEPTANCE

- A. Seeded areas shall be uniform in density; reasonably free of weeds, disease, or other visible imperfections; and at least 2 inches tall and growing for acceptance.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: Type as specified in Section 31 23 23.
- B. Seed:
 - 1. Seed shall comply with seed laws and noxious weed restrictions of the State and applicable State Rules and Regulations pertaining to the sale and shipment of seed. Seed shall be furnished in sealed standard containers of the vendor bearing the date of last germination, which shall be within 6 months prior to planting. Seed which has become wet, moldy, or otherwise damaged in transit or storage will not be acceptable.
 - 2. Seed shall be turf type tall fescue, shall be Blue Tag Certified, and shall contain at least three fescue cultivars in the mixture. Each cultivar shall have a minimum visual quality average of 5.5 or higher according to Table 1, page 2 of the 2003 Kansas State University Turfgrass Research Report.
- C. Mulch:
 - 1. Materials acceptable for mulching shall include wheat straw, oat straw, and other small stemmed straws that are acceptable to the Engineer, including sweet clover hay, prairie hay, smooth brome grass hay, cane and sorghum hay, soybean hay, or sudan grass hay. Sawdust, wood chips shredded wood, peat moss, or pulverized corn cobs may be used with the Engineer's permission.
 - 2. Prairie hay shall consist chiefly of the Bluestem grasses, Switchgrass, Indiangrass and other desirable native perennial grasses which are normally growing in Bluestem pastures.
 - 3. Mulching material shall be baled, dry, and unweathered, and shall show no signs of discoloration or mold damage. Mulching material shall be free of field bindweed, Johnson grass, hoary cress, Russian knapweed, or other weeds declared noxious by the State Board of Agriculture.
- D. Wood Cellulose Fiber: Wood cellulose fiber shall be prepared from virgin wood fibers containing no substance or factor which might inhibit germination or growth of grass seed. Mulch shall be dyed an appropriate color, preferably green, to allow visual monitoring of its application and shall contain a tacking agent either combined with the product or added in the tank when making the slurry. The wood cellulose fibers shall have the property of becoming evenly dispersed and suspended when agitated in water. When sprayed uniformly on the surface of the soil, the fibers shall form a blotter-like ground cover which readily absorbs water and allows infiltration to the underlying soil. Weight specifications from suppliers, and for all applications, shall refer only to air dry weight of the fiber, at a standard equivalent of 12 percent nominal moisture content. The mulch material shall be supplied in packages having a gross weight not in excess of 100 pounds and shall be marked by the manufacturer to show the air dry weight content.
- E. Fertilizer:
 - 1. Fertilizer shall be pelleted or granulated, uniform in composition, free flowing, suitable for application with approved equipment, fully labeled according to state fertilizer laws, and bearing the name, trade name or trademark, and warranty of the producer.
 - 2. Fertilizer shall have an analysis in a 1-1-1 (N-P₂O₅-K₂O) ratio of available nitrogen, phosphorous, and potassium such as a 10-10-10 or 12-12-12, in percent by weight, in order to supply a specified number of pounds of the pure chemical per acre.

- F. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this section.

3.02 SEQUENCE

- A. Unless otherwise requested in writing and acceptable to the Engineer, the sequence of work shall be clearing, grading, application of fertilizer, tilling, seeding, covering and firming, mulching, stabilizing mulch, cleanup, protection, and maintenance.

3.03 PREPARATION

- A. Clearing: Prior to grading and tilling, vegetation that may interfere with operations shall be mowed, grubbed, and raked. The collected material shall be removed from the site. The surface shall be cleared of stumps, stones, roots, cable, wire, and other materials that might hinder the work or subsequent maintenance.
- B. Prepare subgrade in accordance with Section 31 23 23. Establish grades shall be maintained in a true and even condition. Eroded areas and areas having inadequate drainage, as indicated by ponding of water, shall be filled. Ruts, deep tracks, dead furrows, and ridges shall be eliminated.
- C. Place topsoil in accordance with Section 31 23 23.

3.04 FERTILIZING

- A. Apply fertilizer uniformly at the rate necessary to provide 43 pounds of each pure chemical per acre, such as 430 pounds of 10-10-10 or 360 pounds of 12-12-12.
- B. Apply fertilizer no more than 24 hours before the tilling operation.

3.05 TILLAGE

- A. After spreading the fertilizer, areas to be seeded shall be tilled in order to incorporate the fertilizer, break up soils compacted by construction, and promote rooting.
- B. The finished operation should result in a well-aggregated soil to retain moisture and protect the seed against temperature fluctuations.
- C. Except in compacted, crusted, loose, and smooth areas, the soil shall be tilled to a depth of not less than 2 inches. In all other areas, the soil shall be tilled to a depth of not less than 6 inches. In small, inaccessible areas or on steep embankments, the minimum depth of tilling shall be 2 inches. Tilling may be required to be performed by hand methods.
- D. After tilling, the seedbed shall be smoothed by harrowing or dragging methods to eliminate clods and voids.
- E. All areas shall be brought to finished grade within a tolerance of plus or minus 0.1 foot according to the grading plan or to match existing ground surface.
- F. If the surface is not acceptable to the Engineer, the unacceptable portions shall be reworked.
- G. The finished surface shall be even and uniform, with no dirt clods, rocks, or other debris.
- H. If, in the opinion of the Engineer, the soil additives have not been thoroughly mixed, the Contractor shall recultivate the site at his own expense.

3.06 APPLICATION OF SEED

- A. Seeding equipment calibration tests shall be made in the presence of the Engineer to determine the equipment setting required to broadcast the seed at the specified rates. Markers shall be used to assure that no skips in planting occur. If unplanted skips and areas are noted after germination and growth of the grass, the unplanted areas shall be seeded at no additional costs to the Owner. The seeder shall be kept at least half full during seeding operations to ensure uniform distribution of the seed mixture over all the areas seeded and shall be adjustable so that the seeds can be planted and covered not to exceed 1/4 inch deep.

- B. On steep slopes and rocky terrain or other areas where seed drills cannot be operated, the seed shall be broadcast by a hand-held cyclone spreader or suitable walk behind equipment.
- C. Seed shall be applied at the following rates for the mixture stipulated below.
 - 1. General Seed Mixture: Total 10 pounds of bulk seed per 1,000 sq. ft.

3.07 COVERING AND FIRING

- A. Unless a cultipacker type seeder is used, the seed shall be covered with a shallow-set spike tooth harrow or a chain, plank, or brush drag, depending on soil conditions.
- B. The depth of cover shall not exceed 1/4 inch.
- C. In small areas or on steep slopes, covering may need to be performed by hand methods.
- D. After covering, the areas shall be firmed by rolling or with the use of cultipacker.

3.08 APPLICATION OF MULCH

- A. Mulch shall be spread uniformly in a continuous blanket at the rate of 1-1/2 tons per acre (approximately 1-1/2 inches deep, loose measurement).
- B. Mulch shall be spread by hand or with a blower type mulch spreader.
 - 1. Blower type mulch spreaders shall be so adjusted and operated that excessive breakage of the mulch material is avoided.
 - 2. If excessive breakage of the mulch cannot be accomplished with the blower, the mulch shall be spread by hand methods.
- C. Care shall be exercised to ensure that all wire from the bales is collected as it is removed from the bale.
- D. Mulch shall be started at the windward side of relatively flat areas, or at the upper part of a steep slope, and continued uniformly until the area is covered.
- E. The mulch shall not be bunched.

3.09 STABILIZING MULCH

- A. All mulching materials shall be stabilized by anchoring or by applying wood cellulose fibers.
- B. The mulch shall be anchored to the soil to a depth of 2 to 3 inches by a mulch puncher or straight serrated coulter disk mulch anchor machine designed to force the mulch into the soil surface. The machine shall be weighted and operated in such a manner as to secure the mulch firmly in the ground to form a soil-binding mulch and to prevent loss or bunching by wind. The coulters shall be at least 10 inches in diameter. Two or more passes may be required to anchor the mulch to the satisfaction of the Engineer. No mulch shall be placed unless it can be anchored on the same day.
- C. Mulch shall be stabilized by applying wood cellulose fiber over the mulch at the rate of 700 pounds per acre. The wood cellulose fiber shall be mixed with water and applied by standard hydraulic mulching equipment consisting of a mixing tank and pump powered spray gun.
- D. Wood cellulose fiber mulch shall be spread in a uniform, visible coat, using the green color of the wood pulp as a guide. The slurry shall be applied in a sweeping motion, in an arched stream so as to fall like rain, allowing the wood pulp to build until a good coat is achieved and the material is spread at the required rate per acre. Care shall be taken to ensure that there shall be no overspray on structures, utilities, pavement, concrete, trees, plantings, and other items of construction.

3.10 PROTECTION

- A. Seeded areas shall be protected against traffic. If necessary, barricades or warning signs shall be erected. Such protective devices shall be maintained until acceptance of the as specified herein.

3.11 CLEANUP

- A. After completion of the construction operations, the entire area shall be cleared of excess soil and waste material, including, but not limited to, stones, stumps, roots, brush, wire, grade

stakes, and all objects that might be a hindrance to maintenance operations or affect the visual appearance of the site. All roads over which hauling operations have been conducted, regardless of the type of surfacing, shall be kept clean, and soil clods and debris left on the surface shall be removed. The wheels of vehicles shall be cleaned to avoid leaving soil upon the surface of roads, walks, and other surfaced areas.

3.12 MAINTENANCE

- A. All seeded areas shall be maintained until acceptance of the work as specified herein. Maintenance shall include mowing, watering, reseeding, repair of erosion damage, and replacement of mulch.
1. Watering: In the absence of adequate rainfall, watering shall be done daily and as often as necessary to keep the seedbed moist at all times. Watering shall continue until acceptance.
 2. Reseeding: Prior to acceptance, seeded areas that show signs of substantial desiccation, as evidenced by loss of color and distinct yellowing or by lack of germination, shall be considered failed and shall be reseeded and continue to be reseeded until acceptable cover is obtained. Reseeding operations shall be as originally specified.
 3. Maintenance of Grades: Original grades of seeded areas shall be maintained after commencement of planting operations and until acceptance. Any damage to the finished surface from construction operations shall be repaired within reasonable time. In the event erosion occurs from either watering operations or rainfall, such damage shall be repaired within a reasonable time. Ruts, ridges, tracks, and other surface irregularities shall be corrected, and reseeded where required.
 4. Maintenance of Mulch: Mulch shall be maintained until covered with growing grass seedlings. Material that has been removed from the site by wind or other causes shall be replaced and secured.
 5. Mowing:
 - a. All seeded areas shall be mowed immediately prior to Engineer's or Owner's inspection for acceptance. Mowing is required to facilitate visual assessment of acceptability of the work. Not more than one-third of the grass leaf shall be removed. Prior to mowing, debris that would interfere with mowing, such as paper or cardboard, cans, bottles, and any other wastes that detract from the general appearance of the site, shall be collected and removed.
 - b. Mowing equipment shall be rotary type, in good operating condition, properly adjusted, and sharp. Extra care shall be taken when mowing around trees and shrubs to prevent damage to bark. Any trees or shrubs with damaged bark as a result of mowing or other maintenance operations shall be replaced by the Contractor at his expense. Grass clippings in amounts that would smother the growing grass shall be collected and removed.

END OF SECTION

SECTION 33 41 00
SUBDRAINAGE FOR SPRAY GROUNDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Building Perimeter, Retaining Wall, and Under-Slab Drainage Systems.
- B. Underdrain aggregate and fabric and bedding.

1.02 RELATED REQUIREMENTS

- A. Section 31 23 16 - EXCAVATION FOR SPRAY GROUNDS: Excavating for subdrainage system piping and surrounding filter aggregate.
- B. Section 31 23 23 - Fill and Backfill: Backfilling over underdrain aggregate, up to subgrade elevation.

1.03 REFERENCE STANDARDS

- A. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 2009.
- B. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2008.
- C. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2004.
- D. ASTM F 949 - Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings; 1993.

1.04 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

- A. Manufacturers:
 - 1. Specified Manufacturer: Contech; Product A-2000.
- B. Polyvinyl Chloride Pipe: ASTM F 949; 4 inch diameter; with required fittings.
 - 1. Features:
 - a. Pipe Stiffness: 46 psi.
 - b. Smooth interior.
 - c. Double wall design.
 - d. Positive gasketed jointing system.
 - 2. Perforation Dimensions:
 - a. Slot Dimension (inches): 1.062L by 0.031W.
 - b. Centers: 0.42 inches.
 - c. Perforation Open Area: 1.90 square inches per linear foot.
- C. Use perforated pipe at subdrainage system; unperforated through sleeved walls and where not under pervious fill.

2.02 AGGREGATE

- A. Underdrain Aggregate Material: As specified in Section 31 23 23.

2.03 ACCESSORIES

- A. Pipe Couplings: Solid PVC.
- B. Filter Fabric:
 - 1. Manufacturers and products:
 - a. Contech C60NW.
 - b. Propex Geotex 601.
 - c. Mirafi 160N.

2. Properties:
 - a. Tensile Strength (Grab), ASTM D 4632: 160 lbs.
 - b. Apparent Opening Size, ASTM D 4751: 70 US Standard Sieve.
 - c. Water Flow Rate, ASTM D 4491: 110 gpm/sq. ft.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

3.02 PREPARATION

- A. Hand trim excavations to required elevations. Correct over-excavation with structural fill.
- B. Remove large stones or other hard matter that could damage drainage piping or impede consistent backfilling or compaction.

3.03 INSTALLATION

- A. Place filter fabric on compacted impervious fill prior to installation of pipe. Allow adequate material to allow for required overlap over top of pipe.
- B. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions.
- C. Install 4 inches of underdrain aggregate over fabric unless shown otherwise on the drawings.
- D. Place drainage pipe on underdrain aggregate.
- E. Lay pipe to slope gradients noted on drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- F. When pipe elevations are shown on the Drawings, the pipe shall uniformly slope between the given elevations. If Contractor believes additional change in direction fittings are required in order to achieve the slopes shown, then Contractor shall notify Engineer prior to installation.
- G. Place pipe with perforations facing down. Mechanically join pipe ends.
- H. Install pipe couplings and fittings.
- I. Install underdrain aggregate at sides and top of pipe. Provide underdrain aggregate top cover compacted thickness of 4 inches unless shown otherwise on the drawings.
- J. Place filter fabric over levelled top surface of underdrain aggregate cover prior to subsequent backfilling operations.
- K. Place underdrain aggregate in maximum 4 inch lifts, consolidating each lift.
- L. Refer to Section 31 23 23 for compaction requirements. Do not displace or damage pipe when compacting.
- M. Place fill materials indicated on drawings over underdrain assembly and compact.

3.04 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspection and testing.
- B. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.05 PROTECTION

- A. Protect pipe, filter fabric, and aggregate cover from damage or displacement until backfilling operation begins.

END OF SECTION

SECTION 33 49 10
WET PIT FOR SPRAY GROUNDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Precast wet pit for spray ground.

1.02 RELATED SECTIONS

- A. Section 03 03 05 - Cast-in-Place Concrete.
- B. Section 31 23 23 - Fill and Backfill.

1.03 REFERENCES

- A. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2000.
- B. ASTM C 361 - Standard Specification for Reinforced Concrete Low-Head Pressure Pipe; 1999.
- C. ASTM C 478 - Standard Specification for Precast Reinforced Concrete Manhole Sections; 1997.
- D. ASTM C 497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile; 1998.
- E. ASTM C 990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants; 2000.
- F. ASTM D 2240 - Standard Test Method for Rubber Property-Durometer Hardness; 2000.
- G. ASTM D 4101 - Standard Specification for Propylene Plastic Injection and Extrusion Materials; 1999.

1.04 SUBMITTALS

- A. See Administrative Requirements, for submittal procedures.
- B. Drawings and data covering precast concrete sections and castings.
- C. Data submitted for steel-reinforced plastic manhole steps shall include verification of the type and grade of steel used for reinforcement, typical chemical analysis of the steel, type and classification of the plastic, and reports of acceptance tests performed in accordance with ASTM C 478, Section 12.6, and C 497, Section 10.
- D. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.
- E. Shop Drawings: Indicate manhole locations and elevations and pipe sizes and elevations of penetrations.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Precast concrete sections shall not be delivered to the job until representative concrete control cylinders have attained a strength of at least 80 percent of the specified minimum.
- B. Precast concrete sections shall be handled carefully and shall not be bumped or dropped. Hooks shall not be permitted to come in contact with joint surfaces.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Barbour Concrete Company; Tel: (816) 796-3344; Fax: (816) 796-3518.

2.02 MATERIALS

- A. Cast-in-Place Concrete: Materials, handling, forms, finishing, curing, and other work as specified in Section 03 03 05.

- B. Precast wet pit for spray ground: Precast structure with base and sections. Rectangular dimensions as shown on the drawings. Designed to resist hydrostatic uplift.
 - 1. Minimum Wall Thickness: 1/12 of inside diameter, plus 1 inch.
 - 2. Reinforcement: ASTM C 478.
- C. Nonshrinking Grout:
 - 1. Manufacturers:
 - a. Grace "Supreme".
 - b. L&M "Crystex".
 - c. Master Builders "Masterflow 713 Grout" or "Set Grout".
 - d. Five Star Products "Five Star Grout".
- D. Resilient Manhole/Pipe Connectors:
 - 1. Manufacturers:
 - a. A-Lock Products, Inc.; "Z-LOK Connector"; Tel: (800) 822-2565; Fax: (215) 547-5260; www.a-lok.com.
 - b. Dura-Tech, Inc.; "Dura-Seal III".
- E. Mastic Fill: Butyl rubber compatible with resilient connector material.
- F. Gaskets:
 - 1. Mastic:
 - a. Manufacturers:
 - 1) Hamilton-Kent "Kent-Seal No. 2".
 - 2) Sheller-Globe "Tac-Tite".
 - 3) K.T. Snyder "Ram-Nek".
 - b. Gaskets shall meet the requirements of ASTM C 990.
 - c. Cross-sectional area as recommended by manhole manufacturer.
 - 2. Rubber:
 - a. ASTM C 361, Section 6.9.1, except gasket shall be synthetic, with hardness of 40 plus or minus 5 when measured by ASTM D 2240, Type A durometer.
 - b. Natural rubber will not be acceptable.
- G. Manhole Steps:
 - 1. Manufacturers:
 - a. H. Bowen "BOWCO No. 93813".
 - b. M.A. Industries "PS2-PF".
 - 2. Steel-reinforced plastic; 1/2 inch deformed steel bar, ASTM A 615, Grade 60 minimum, totally encapsulated in copolymer polypropylene, ASTM D 4101.

2.03 MANUFACTURE

- A. The first riser sections for use with cast-in-place bases shall be provided with horseshoe-shaped boxouts for connecting piping to be grouted in, or with circular openings with continuous, circular, resilient connectors cast into the riser wall. Boxouts for grouting, if used, shall have surfaces grooved or roughened to improve grout bond.
- B. Precast base sections shall be provided with circular openings, with continuous, circular, resilient connectors cast into the wall.
- C. Resilient connectors shall be installed in accordance with the manufacturer's recommendations, except that connectors shall be positioned so that sealing or resealing operations may be accomplished from inside the manhole.
- D. Precast sections may be provided with lifting notches on the inside faces of walls to facilitate handling. Lifting notches shall be not more than 3 inches deep; holes extending through the wall will not be acceptable.
- E. If precast concrete base sections are used, part of the concrete invert fill may be furnished with the precast unit; however, a rough surface shall be provided to improve bond with the final invert fill. At least the top 2 inches of the concrete invert fill shall be installed in the field.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Precast concrete sections shall be inspected when delivered and all cracked or otherwise visibly defective units shall be rejected.

3.02 CONSTRUCTION

- A. Tops:
 - 1. At the option of the Contractor, standard manholes may be constructed with cast-in-place concrete tops or precast concrete (developed) tops.
 - 2. If lifting notches are provided to facilitate handling, the lifting notches shall be filled with non-shrink grout as specified in Section 03 03 05.
- B. Bases:
 - 1. At the option of the Contractor, standard manholes may be constructed with cast-in-place concrete bases or precast concrete (developed) bases.
 - a. If cast-in-place concrete bases are used, concrete shall be placed on undisturbed earth, unless shown otherwise, in accordance with applicable requirements of the Section 03 03 05.
 - 1) When resilient connectors are used with cast-in-place bases, the concrete fill under the connecting pipe outside the manhole shall be deleted and shall be replaced with granular embedment material to undisturbed earth.
 - b. If precast concrete (developed) bases are used, the subgrade materials shall be excavated to undisturbed earth and to a uniform elevation which will permit at least 4 inches of granular embedment material, as specified in Section 31 23 23, to be installed and compacted. The surface of the granular material shall be carefully graded and the base section accurately set so that connecting pipes will be on proper line and grade. The elevation of the granular material shall be adjusted as required until proper grade and alignment of the base section has been attained.
 - 1) No wedging or blocking under precast concrete bases will be permitted.
 - 2. In no case shall the invert section through a manhole be greater than that of the outgoing pipe. The shape of the invert shall conform exactly to the lower half of the pipe it connects. Side branches shall be connected with a radius of curve as large as practicable. All inverts shall be troweled to a smooth, clean surface.
- C. Riser and Cone Sections:
 - 1. Circular precast sections shall be provided with a rubber or mastic gasket to seal joints between sections. Mastic gaskets shall be used only at temperatures recommended by the manufacturer. Lifting notches in manhole walls shall be filled with nonshrinking grout.
 - 2. Manhole steps shall be plant-installed and shall be driven into prepared holes or vibrated into green concrete, in accordance with the recommendations of the step manufacturer.
- D. Connecting Piping:
 - 1. The space between connecting pipes and the wall of precast sections shall be completely filled with nonshrinking grout, except where resilient connectors are provided.
 - 2. When resilient connectors are used, the connecting pipe shall be carefully adjusted to proper line and grade, and the bedding material shall be compacted under the haunches and to the spring line of the pipe for a distance of at least 6 feet from the manhole wall and to at least the minimum trench width. The pipe shall be installed in the resilient connector prior to backfilling outside the manhole and shall be resealed as required after completion of the manhole and backfill. All visible leakage shall be eliminated.

3. The connecting pipe for installation with resilient connectors shall be plain-end, square cut spigots and shall not protrude more than 1 inch inside the manhole wall. A clear distance of at least 1 inch from the end of each connecting pipe and around the pipe shall be provided when the concrete invert fill is installed. After completion of the manhole, the boxout shall be filled with mastic filler material, completely filling the space beneath the pipe and extending to at least the spring line. The filler material shall provide a smooth, uniform surface between the inside diameter of the pipe and the manhole invert.

END OF SECTION