

Bid No. DS080916

Date: 8/17/16

Procurement Division
330 2nd Ave South, Room 552
Minneapolis, MN 55401

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AN AFFIRMATIVE ACTION EMPLOYER

ADDENDUM NO. 1
“BIDS FOR PLAYGROUND SITE DEMOLITION, GRADING AND SURFACING”

Please see attached information to update and clarify the original specifications.

THE BID DUE DATE IS CHANGED TO AUGUST 23RD, 2016 AT 10:30 AM

Please consider any changes and/or corrections as part of the original bid specifications and submit your bid accordingly.

Receipt of this addendum SHOULD be acknowledged on the Bid Form.

Finance and Property Services – Procurement Division
City of Minneapolis

Addendum #1 – Powderhorn Park Playground Improvements

PROJECT: **Request for Formal Quote / Bid: Playground Site Demolition, Grading, Surfacing**
BY: Kate Lamers - Owner Representative
DATE: August 16, 2016
OWNER: Minneapolis Park and Recreation Board

The additions, omissions, clarifications, and corrections herein shall be made to the Project Manual and Contract Plans and Specifications for the project, and shall be included in the scope of work and proposals to be submitted. References made to Plans shall be used as a general guide only. Bidder shall determine the work affected by the Addendum items.

ADDENDA ITEMS (Only significant items are listed, see reissued documents for all changes.)All changes to the Quote Set have been noted in this addendum. The following drawings have been reissued with changes and Sheets L1.2, L1.3, and L1.4. See reissued documents for changes noted below.

- A. Changed Part 1 – Conditions of the Contract to add: “Minneapolis Park and Recreation Board has the right to reject all quotes/bids.”
- B. Changed 1.1 General Conditions: L. to add: “MPRB will allow access to a water source on the outside of the south side of the recreation center building. MPRB staff begins at 6 am on Monday through Friday and will be available to help with water access. Contractor is responsible for hoses, connections, etc.”
- C. Added 1.1 General Conditions: T: “Contractor is responsible for removing all cut earthwork from the site that is not reused as a drainage layer.”
- D. Added to Part 3 - Proposal Form: Base Pricing Schedule:

Deduct Alternate #1 – Provide price to be deducted if concrete pathways within the play areas are not included in the quote set.

Add Alternate #1 – Provide price to be added if concrete pathways within the play areas are delayed until June/July 2017.

- 1. Specification 32 12 00 Concrete Work has been added to the Quote Set.
- 2. Window A showing the construction route has been added to sheet L1.2.
- 3. A bar scale has been added to the following sheets: L1.2 – Demolition and Erosion Control, L1.3-Grading and Drainage Plan, L1.4 – Site Installation Plan

Dimensions have been added to sheet L1.4 – Site Installation Plan

AutoCAD base drawings are available upon request.

- 4. Note 3 has been amended on page L1.3: PLAY CONTAINERS TO BE FILLED WITH A MINIMUM OF 12 INCHES OF ENGINEERED WOOD FIBER MULCH MANUFACTURED AND CERTIFIED TO BE USED AS A PLAYGROUND SAFETY SURFACING. ENGINEERED WOOD FIBER MULCH SHALL MEET OR EXCEED THE ASTM’S CURRENT “STANDARD SPECIFICATION FOR IMPACT ATTENUATION OF SURFACE SYSTEMS UNDER AND AROUND PLAYGROUND EQUIPMENT” AND THE ASTM’S CURRENT “STANDARD SPECIFICATION FOR DETERMINATION OF ACCESSIBILITY OF SURFACE SYSTEMS UNDER AND AROUND PLAYGROUND EQUIPMENT”. MULCH SHALL BE SOFTSTEP BY WOODCHIPS OF PRINCETON INC (SYLVA CORPORATION),

WOODCARPET BY ZEAGER BROTHERS, FIBAR SYSTEMS BY THE FIBAR GROUP, OR OTHER APPROVED EQUAL. SUBMIT MULCH SPECIFICATIONS, PROOF OF ASTM AND IPEMA CERTIFICATION TO OWNER FOR APPROVAL. 12 INCH DEPTH SHOULD REFLECT THE INSTALLED AND COMPACTED DEPTH.

5. Note 5 has been amended on page L1.3: COORDINATE SITE INSTALLATION WORK WITH THE INSTALLATION OF THE PLAYGROUND FOOTINGS, EQUIPMENT, AND POURED IN PLACE RUBBER WITH THE PLAYGROUND CONTRACTOR. PLAYGROUND EQUIPMENT, EQUIPMENT FOOTINGS, AND INSTALLATION AND POURED PLACE RUBBER WILL BE PROVIDED BY A SEPARATE PLAYGROUND CONTRACTOR AND IS NOT INCLUDED IN THIS QUOTE SET.
6. Note 6 has been amended on page L1.3: 6. PROVIDE A PROJECT SCHEDULE TO OWNER. PROJECT SHOULD BE COMPLETE IN THE FALL OF 2016. CONCRETE INSTALLATION SHOULD ALLOW TIME FOR THE PLAYGROUND CONTRACTOR TO INSTALL THE POURED IN PLACE RUBBER BY MID OCTOBER. DO NOT PROCEED WITH CONCRETE INSTALLATION WITHOUT WRITTEN APPROVAL BY OWNER. DEPENDING ON THE WEATHER, CONCRETE AND PIP INSTALLATION MAY BE DELAYED UNTIL THE SPRING OF 2017.

SEE ADDENDUM NO. 1 FOR ADD ALTERNATE PRICING FOR FALL CONCRETE INSTALLATION AND SPRING CONCRETE INSTALLATION.

Attachments: Sheets L1.2, L1.3, L1.4, Section 32 12 00 Concrete Work

End of Addendum 1

SECTION 32 12 00 CONCRETE WORK

PART 1 - GENERAL

01 CONDITIONS OF THE CONTRACT

Bidding Requirements, Conditions of the Contract apply to the Work of this Section.

02 SCOPE

A. The work in this Section consists of furnishing all labor, equipment, materials, and performing all operations required for Cast in Place Concrete in strict accordance with the Construction Drawings. Included in this Specification, but not limited to, are:

1. Cast in Place Concrete
 - a. Concrete walks/slabs
 - b. Concrete pedestrian ramps
2. Reinforcing
3. Control and Expansion Joints
4. Sealant Backing and Sealant
5. Formwork

04 ALTERNATES

Refer to Part 3 – Base Pricing for alternates that may pertain to this Section.

05 STORAGE AND HANDLING

- A. Follow *Minnesota Concrete Flatwork Specifications* and any local covenants, as well as the following:
1. Aggregate Storage: Store aggregates so that segregation and inclusion of foreign materials are prevented. Do not use the bottom 12 inches of aggregate piles in contact with the ground.
 2. Cementitious Materials: Store cement, slag cement, and fly ash in suitable moisture-proof enclosures. Do not use cementitious materials that have become caked or lumpy.
 3. Admixtures: Store in suitable weather-tight enclosures that will preserve quality.
 4. Reinforcing Steel: Store off ground on timbers or other supports.

06 DEFINITIONS

- A. Project Manager, or Owner's Representative, is defined as the individual, firm, or corporation delegated with the responsibility for the supervision of the construction.
- B. Contractor, or contracting authority, is defined as the individual, firm, or corporation contracting for and undertaking execution of the prescribed work.

07 MEASUREMENT AND PAYMENT

- A. Concrete Pavement and Sidewalk Connections
1. Measurement: 4" thick concrete pavement/sidewalk will be paid for within the lump sum quote.
 4. Includes: Price to include, but is not limited to: final trimming of subgrade or subbase, bevelling, dowel bars and reinforcement, joint sawing, coving of sawed joints edges to create a rounded appearance, sealing of expansion/construction joints, surface curing and pavement protection, safety fencing, and boxouts for fixtures.

PART 2 - MATERIALS

01 PRODUCTS

- A. Cement: Cement shall be from MN/DOT-certified sources only and be listed on the MN/DOT approved products list and follow MN/DOT 3101.B.
- B. Supplementary Cementitious Materials (SCM) Fly Ash:
1. Fly ash shall be from certified sources only and be listed on the MN/DOT-approved list under MN/DOT 3103.
 2. Slag cement (ground granulated blast furnace slag or GGBFS): Slag cement shall be from certified

sources only and be listed on the MN/DOT-approved list under MN/DOT 3102.

C. Fine Aggregate for Concrete

1. Fine aggregate gradation shall comply with ASTM C33 or MND/OT 3126. The quality requirements shall comply with MN/DOT 3126.
2. The fine aggregate shall be washed.
3. The quantity of deleterious substances, as determined by mass (weight), shall not exceed the following limits:
 - a. Coal and lignite: 0.3%.
 - b. Other deleterious substances such as shale, alkali, mica, soft and flaky particles, cumulative total: 2.5%.
4. For any fine aggregate used in curb and gutter, sidewalks, or driveway entrances: the maximum allowable expansion at 14 days is 0.300.
5. For any fine aggregate used in concrete pavement, the maximum allowable expansion at 14 days is defined in Table 1 below.
 - a. If the fine aggregate has been previously tested by MN/DOT, use the highest expansion result of any of the tested fine aggregate and cement combinations to determine necessary mitigation in accordance with the 14-day fine aggregate expansion limits in Table 1 for concrete pavements. The contractor may contact MN/DOT to access the list of previously tested fine aggregate sources or review the concrete engineering website for the latest test results.
 - b. If the fine aggregate has not been previously tested by MN/DOT, the fine aggregate shall be tested by an independent testing laboratory in accordance with ASTM 1260, to determine the necessary mitigation based on the proposed fine aggregate and cement combination in accordance with the 14-day fine aggregate expansion limits in Table 1.
6. The fine aggregate shall comply with MN/DOT 3126 gradation requirements as shown in Table 2, unless otherwise reviewed by the engineer. The fineness modulus of the delivered fine aggregate shall not deviate by more than 0.20 from the submitted gradation, unless otherwise reviewed by the engineer.

| Table 1 Fine Aggregate ASR Mitigation Requirements for Concrete Pavements | |
|--|---|
| 14-day Fine Aggregate Expansion Limits | |
| ≤ 0.150 | Use of the fine aggregate is acceptable with or without a mitigator |
| > 0.150 – 0.250 | Mitigate the fine aggregate with 35 percent ground-granulated blast furnace slag or at least 20 percent fly ash |
| > 0.250 – 0.300 | Mitigate the fine aggregate with 35 percent ground-granulated blast furnace slag or 30 percent fly ash in accordance with 3115, modified with at least 66.0 percent SiO ₂ + Fe ₂ O ₃ + Al ₂ O ₃ on a dry weight basis and at least 38.0 percent SiO ₂ |
| > 0.300 | The fine aggregate will not be acceptable for use in concrete pavement |

| Table 2 Concrete Fine Aggregate Gradation | |
|--|------------------------|
| Sieve Size | Percent Passing |
| 9.50 mm (3/8") | 100 |
| 4.75 mm (#4) | 95-100 |
| 2.36 mm (#8) | 80-100 |
| 1.18 mm (#16) | 55-85 |
| 0.60 mm (#30) | 30-60 |
| 0.30 mm (#50) (A) | 5-30 |
| 0.15 mm (#100) | 0-10 |
| 0.075 mm (#200) | 0-2.5 |

D. Coarse Aggregate for Concrete

1. Coarse aggregate shall be crushed rock, washed gravel, or other inert granular material meeting ASTM

- C33 Class 4S Quality requirements or MN/DOT 3137 except as modified in Table 3 or Table 4.*
2. Coarse aggregate gradation shall comply with ASTM C67 or MN/DOT 3137 requirements for the individual classification.
 3. Table 4 can only be used with a bid item for Enhanced Coarse Aggregate Quality. The intent is to use this coarse aggregate specification when it is desired to have less than 20 popouts per square yard.
- E. Water Requirements: Mixing water used in the production of concrete shall meet ASTM C1602 / C1602M or MN/DOT 3906.
- F. Admixtures: Unless otherwise acceptable to the engineer, all admixtures shall be from one manufacturer and shall be compatible. All admixtures shall be on the MN/DOT-approved/qualified list according to MN/DOT 3113.
- G. Reinforcement Bars and Dowel Bars: Comply with the requirements of ACI 301, Section 3.2 (all reinforcing and dowel bars shall be grade 60 unless noted otherwise) or according to MN/DOT 3301 and 3302.
- H. Joint Fillers and Sealers
1. Preformed isolation/expansion joint fillers and sealers: Comply with ASTM D1751, preformed, resilient, non-extruding, asphalt impregnated joint filler, ½-inch thick unless otherwise indicated.
 2. Liquid Membrane Curing Compound: Comply with MN/DOT 3753 Clear Membrane Curing Compound.

| Table 3 Coarse Aggregate for General Use | | |
|--|---|--|
| Quality Test | | Maximum Percent by Weight |
| (a) | Shale: | |
| | Fraction retained on the ½-inch sieve | 0.4 |
| | Fraction retained on the No. 4 sieve, as a percentage of the total material | 0.7 |
| (b) | Soft iron oxide particles (paint rock and ochre) | 0.3 |
| (c) | Total spall materials*: | |
| | Fraction retained on the ½-inch sieve | 1.0 |
| | Fraction retained on the No. 4 sieve, as a percentage of the total material | 1.5 |
| (d) | Soft particles | 2.5 |
| (e) | Clay balls and lumps | 0.3 |
| (f) | Sum of (c) total spall materials, (d) soft particles, and (e) clay balls and lumps† | 3.5 |
| (g) | Slate | 3.0 |
| (h) | Flat or elongated pieces‡ | 15.0 |
| (i) | Quantity of material passing No. 200 sieve: | |
| | Class A and Class B aggregates# | 1.5 |
| | Class C and Class D aggregates§ | 1.0 |
| (j) | Los Angeles Rattler, loss on total sample | 40.0 |
| (k) | Soundness of magnesium sulfate** | 15.0 |
| <p>* Includes the percentages retained by shale and soft iron oxide particles, plus other iron oxide particles, unsound cherts, pyrite, and other materials with similar characteristics.</p> <p> Exclusive of shale, soft iron oxide particles, and total spall materials.</p> <p>† Sum of the total spall materials, soft particles, and clay balls and lumps. For total spall materials, use the percent in the total sample retained on the No. 4 sieve.</p> <p>‡ Thickness less than 25 percent of the maximum width. Length greater than three times the maximum width.</p> <p># Each individual fraction at the point of placement consists of dust from the fracture and is free of clay or shale.</p> <p>§ For each individual fraction at the point of placement.</p> <p>** Loss at five cycles for any fraction of the coarse aggregate. Do not blend materials from multiple sources to obtain a fraction meeting the sulfate soundness requirement.</p> | | |

| Table 4 Enhanced Coarse Aggregate Quality Specification | | |
|--|---|------------------------------|
| Quality Test | | Maximum Percent by Weight |
| (a) | Shale: | |
| | Fraction retained on the ½-inch sieve | 0.2 |
| | Fraction retained on the No. 4 sieve, as a percentage of the total material | 0.3 |
| (b) | Soft iron oxide particles (paint rock and ochre) | 0.2 |
| (c) | Total spall materials*: | |
| | Fraction retained on the ½-inch sieve | 1.0 |
| | Fraction retained on the No. 4 sieve, as a percentage of the total material | 0.5 |
| (d) | Soft particles | 2.5 |
| (e) | Clay balls and lumps | 0.3 |
| (f) | Sum of (c) total spall materials, (d) soft particles, and (e) clay balls and lumps† | 2.5 |
| (g) | Slate | 3.0 |
| (h) | Flat or elongated pieces‡ | 15.0 |
| (i) | Quantity of material passing No. 200 sieve: | |
| | Class A and Class B aggregates# | 1.5 |
| | Class C and Class D aggregates§ | 1.0 |
| (j) | Los Angeles Rattler, loss on total sample | 40.0 |
| (k) | Soundness of magnesium sulfate** | 15.0 |
| (l) | Absorption for Class B aggregate | 1.75 |
| (m) | Carbonate in Class C and Class D aggregates by weight | 30.0 |
| <p>* Includes the percentages retained by shale and soft iron oxide particles, plus other iron oxide particles, unsound cherts, pyrite, and other materials with similar characteristics.</p> <p> Exclusive of shale, soft iron oxide particles, and total spall materials.</p> <p>† Sum of the total spall materials, soft particles, and clay balls and lumps. For total spall materials, use the percent in the total sample retained on the No. 4 sieve.</p> <p>‡ Thickness less than 25 percent of the maximum width. Length greater than three times the maximum width.</p> <p># Each individual fraction at the point of placement consists of dust from the fracture and is free of clay or shale.</p> <p>§ For each individual fraction at the point of placement.</p> <p>** Loss at five cycles for any fraction of the coarse aggregate. Do not blend materials from multiple sources to obtain a fraction meeting the sulfate soundness requirement.</p> | | |

02 CONCRETE MIXES

A. Mix Design

1. Prepare design mixes for each type and strength of concrete in accordance with ACI 301 by the field experience method or, if available, by laboratory trial batch methods. Mix proportions shall produce consistent and workable concrete that can be easily worked into forms and around reinforcement without segregation or excessive bleeding.

- a. Field experience method: If field test data is available, in accordance with ACI 301, submit for acceptance the mixture proportions along with the field test data.
- b. Trial batch method: Use an AMRL-accredited laboratory for preparing and reporting proposed mix designs.
2. Ensure compatibility of all material combinations. If the concrete materials are not producing a workable concrete mixture, a change in the material may be required. Changes will be at no additional cost to the contracting authority.
3. Proportion normal mixtures to provide concrete with the following properties:
 - a. Minimum compressive strength (28 days): 4000 psi.
 - b. Minimum cement content: 400 pounds.
 - c. Minimum cementitious content: 530 pounds.
 - d. Maximum cementitious content: 658 pounds.
 - e. Maximum water-cementitious materials ratio at point of placement:
 - For machine placement: 0.42
 - For hand placement: 0.45
 - f. Slump limit: As needed for proper placement; 5-inch maximum. No minimum as long as proper consolidation is being performed.
 - g. Early-strength concrete mixes shall be designed to reach opening compressive strength of 3000 psi at a predetermined time (i.e., 48 hours, 24 hours, etc.).
4. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content of 6.5 percent plus or minus 1.5 percent.
5. If calcium chloride is to be used, limit the water-soluble, chloride-ion content in hardened concrete to 0.08 percent by weight of cementitious materials.
6. Chemical admixtures: Use admixtures according to manufacturer's written instructions. Contractors may use the following approved admixtures at their discretion as listed on the MN/DOT-approved products list:
 - a. Type A, water-reducing and mid-range water-reducing admixtures
 - b. Type B, retarding/hydration stabilizer admixtures
 - c. Type C, accelerating admixtures
 - d. Type D, water-reducing and retarding admixtures
 - e. Type S, viscosity-modifying admixtures
 - f. Admixtures containing more than 0.15 percent chloride ions, by weight of admixture, are not permitted.
7. Supplementary cementitious materials: No ternary mixes (combination of three or more cementitious materials) will be allowed. Limit percentage by weight of supplementary cementitious materials according to ACI 301 requirements for concrete exposed to deicing chemicals as follows:
 - a. Fly ash: 30 percent maximum, OR
 - b. Slag cement: 35 percent maximum.

PART 3 - EXECUTION

01 PERSONEL

- A. The concrete contractor, or subcontractor, shall have at least one person with a current ACI concrete flatwork technician or flatwork finisher certification; this person must be onsite for all concrete pours.
- B. All process control and quality control testing shall be performed by either MN/DOT- or ACI- certified personnel.

03 MIXING EQUIPMENT

- A. Batching and Mixing Equipment
 1. General
 - a. Weighing and proportioning equipment: Comply with ASTM C94.
 - b. Mixing equipment: Comply with ASTM C94.
 - c. Material bins: Involves any structure in which materials are stored. Each part of any bin, including foundations and supports, must be adequate to withstand any stress to which it might be subjected to while in use.
 2. Batching
 - a. Batching plants shall be NRMCA- or MN/DOT-certified with a current MN/DOT concrete plant contact report form 2163. Provide copy of current calibrations and approvals.
 - b. Coordinate the batch plant operation with the placement operation in order to ensure a steady supply of concrete.

- c. Operate the batch plant and trucks to minimize dust, noise, or truck nuisances as part of the quality control plan.
- 3. Mixing (Ready-mixed Concrete)
 - a. Ensure the concrete is uniform in composition and consistency. If non-uniform, concrete producers must take corrective action.
 - b. Ready-mixed concrete is defined as concrete proportioned in a central plant and mixed in a stationary mixer for transportation in trucks without agitation; proportioned at a central plant, and only partially mixed in a stationary mixer for transportation and finish mixing in a transit mixer; or proportioned at a central plant and then mixed in a transit mixer prior to or during transit.
 - c. When necessary to add additional mixing water at the site of placement, mix the batch at least an additional 50 revolutions of the drum at mixing speed or five minutes, whichever is faster.
 - d. All methods: Deliver each truck load of concrete with a computerized certificate of compliance showing plant name, contractor, project data, batch quantities and total yardage, w/cm, mix designation, time batched, and water available to add on-site. Give a record of the certificates of compliances for each pour to the contracting authority.
 - e. Ensure the methods of delivering and handling the concrete are such that objectionable segregation or damage to the concrete will not occur, and concrete placement will occur with a minimum of rehandling.
 - f. Thoroughly clean the truck compartment in which concrete is transported, and flush with water to ensure that hardened concrete will not accumulate. Discharge the flushing water from the truck compartment to the designated discharge point before it is charged with the next batch.
 - g. Delivery requirements: Place concrete into the work in accordance with the following:
 - i. Type 1 concrete: within 90 minutes of batching, and
 - ii. Type 3 concrete: within 90 minutes of batching when all admixtures are added at the plant at the manufacturer's recommended dosage rates listed on the Approved Products list.
 - iii. In any case, do not add additional mixing water once the concrete is 60 minutes old.
 - iv. Mix the load a minimum of five minutes or 50 revolutions at mixing speed after addition of any admixture.
 - v. The contractor may transport Type 3 concrete in non-agitating equipment if the concrete is discharged within 45 minutes of batching.
 - vi. Batch time starts when the batch plant or the transit mix truck adds the cement to the other batch materials.
- B. Concrete Washout Guidance
 - 1. These specifications will be governed by the Minnesota Pollution Control Agency's written guidance in February 2009. This document, which details the NPDES/SDS Construction Stormwater permit requirements, is titled "wq-strm2-24 February 2009."

04 CONCRETE PLACEMENT EQUIPMENT

- A. Slipform Construction
 - 1. Place concrete using a slipform paver or combination of pavers designed to spread, consolidate, screed, and float-finish the freshly placed concrete with minimum hand-fining. Provide a slipform paver with a non-oscillating extrusion plate with an adjustable angle of entry.
 - 3. If no jointing plan is shown in the plans, the contractor will provide a jointing plan to be approved by the engineer.
 - 4. Consolidate the full width and depth of concrete pavement placed by a single pass of a series of internal vibrators. Operate full-width vibrators from 3,600 VPM to 7,000 VPM (60 Hz to 117 Hz) in concrete, and from 4,150 VPM to 8,000 VPM (70 Hz to 133 Hz) when checked in air. Deliver the vibrator impulses directly to the concrete and operate at an intensity to consolidate the concrete uniformly throughout the entire depth and width of the concrete. The contractor may increase the vibrator frequency as approved by the engineer. Perform additional testing as directed by the engineer at no additional cost to the contracting authority. If the vibrator fails, suspend operations and remove unconsolidated concrete.
 - 5. Provide an electronic monitoring device meeting the following characteristics and requirements to display the operating frequency of each individual internal vibrator for concrete pavement placed by the slipform method:
 - Contains a readout display near the operator's controls; visible to the paver operator and to the engineer,
 - Operates continuously as the paving machine operates,
 - Displays all the vibrator frequencies with manual and automatic sequencing for each of the individual vibrators, and

- Records the following at least every 25 feet [7.62 m] of paving or at least every five minutes of time:
 - a. Clock time,
 - b. Station location,
 - c. Paver track speed, and
 - d. Operating frequency of individual vibrators.

Provide an electronic copy containing the record of data after the completion of the concrete paving operation. Provide vibration data daily as directed by the engineer.

6. Regulate the rate of progress of the vibratory equipment and the duration of the application to fully, but not excessively, vibrate the concrete. If the forward progress of the paver stops, suspend the operation of vibrators.
 7. Attach vibrators to spreading or finishing equipment. Do not allow vibrators to come in contact with preset dowel basket assemblies, the grade, pavement reinforcement, or side forms. Do not allow the operation of vibrators to cause separation or segregation of the mix ingredients, including the downward displacement of large aggregate or the accumulation of laitance on the concrete surface. The contractor may reduce the vibration frequency within the specified range if reducing the forward progress of the paver to avoid segregation of the concrete mix. Connect the power to all vibrators so that they cease when the machine motion is stopped. Stop paving operations if a vibrator fails to operate within the range specified above.
 8. Operate the slipform paver with a continuous forward movement, and coordinate all operations of mixing, delivering, and spreading concrete to provide uniform progress with minimal stopping and starting of the paver.
 9. At the contractor's option: equip the paver with automatic grade control capable of maintaining the elevation shown on the plans at both sides of the paver. Control the elevation of one side and control the crown, or control the elevation of each side independently. The contractor may elect to use stringless paving, as long as he meets the required grade and cross slope.
 10. Tightly stretch a wire or string line set parallel to the established grade for the pavement surface to achieve the grade reference. Set the control reference and support the line at intervals to maintain the established grade and alignment.
- B. Fixed-Form Construction
1. Place concrete using one or more machines to spread, screed, and consolidate between previously-set side forms. Vibrate these areas using hand-held or machine-mounted internal vibrators.
 2. Use a tachometer or similar device to demonstrate to the engineer that the paving equipment vibration meets the requirements in this section.
 3. Use hand-held vibrators to consolidate concrete adjacent to side forms and fixed structures. Operate the hand-held vibrators at a speed of at least 3,600 VPM (60 Hz). Do not allow the vibrator head to contact the joints, load transfer devices, reinforcement, grade, or side forms. If the vibrator fails, suspend operations and remove unconsolidated concrete.
 4. Continue vibration to achieve adequate consolidation, without segregation, for the full depth and width of the area placed.
 5. Provide an adequate number and capacity of machines to perform the work at a rate equal to the concrete delivery rate.
 6. Strike off concrete with a vibrating screed, laser screed, or a roller/clary screed as reviewed by the engineer. Finish small or irregular areas that are inaccessible to finishing equipment using other methods as reviewed by the engineer.
 7. Discontinue any operation that displaces the side forms from the line or grade or that causes undue delay, as determined by the engineer, due to mechanical difficulties.
- C. Hand-Finishing Equipment: Provide all finishing tools necessary for proper finishing of the concrete including straightedges for checking and correcting finished concrete surfaces.
- D. Forms
1. Rigid forms: Steel, minimum thickness of five gage and height at least equal to design thickness of pavement with base width at least 6 inches.
 - a. Minimum section length of 10 feet and joint connections designed to allow horizontal and vertical adjustment with locking device to hold abutting sections firmly in alignment.
 - b. Bracing, support, and staking must prevent deflection or movement of forms.
 2. Flexible forms: Use steel, plastic, or wood flexible forms for curves with a radius less than 100 feet.

- a. Bracing, support, and staking must prevent deflection or movement of forms.
 - b. Ensure that forms used to shape back of curbs at returns have height at least equal to design thickness of pavement and curb height.
 - c. Forms must be free from scale and surface irregularities.
- E. Curing Equipment: Before application, agitate the curing compound as received in the shipping container to obtain a homogenous mixture. Protect membrane-curing compounds from freezing before application. Handle and apply the membrane-curing compound in accordance with the manufacturer's recommendations. An airless spraying machine is required to have the following:
- 1. A recirculating bypass system that provides for continuous agitation of the reservoir material,
 - 2. Separate filters for the hose and nozzle, and
 - 3. Multiple or adjustable nozzle system that provides for variable spray patterns.
- F. Concrete Saws: Use power-operated concrete saws capable of cutting hardened concrete without damage.
- G. Joint Sealing Equipment: Use equipment capable of cleaning the joint and heating and installing sealant in joints according to manufacturer's recommendations.

05 CONSTRUCTION

- A. Removal of Pavement: Comply with plans.
- B. Final Subgrade/Subbase Preparation
- 1. General
 - a. Meet the requirements of the plans for subgrade construction, subgrade treatment, and subbase construction.
 - b. Trim the subgrade or subbase to the final grade for placement of concrete.
 - c. Unless otherwise ordered by the engineer, the subgrade or subbase, at time of placing concrete for concrete pavement, must be in a uniformly moist but not muddy condition to a depth of not less than 1 inch.
 - 2. Subgrade and subbase loading
 - a. Travel of construction traffic including concrete delivery trucks on a subgrade or subbase must be with written approval by the engineer. In such cases, watering of the subgrade or subbase must be limited to just ahead of the paving machine.
 - b. Enter and exit from side streets to minimize repetitive loading on the subgrade or subbase by concrete trucks.
 - c. Do not allow loads in excess of the legal axle load on the completed subgrade or subbase.
 - d. Partially loaded trucks may be required.
 - 3. Paving suspended
 - a. Suspend the paving operation where subgrade or subbase stability has been lost.
 - b. Do not place concrete on a subgrade or subbase that has become unstable, bears ruts or tire marks of equipment, or that is excessively softened by rain until such subgrade or subbase has been reconsolidated and reshaped to correct the objectionable condition.
 - c. If necessary, scarify to a minimum depth of 6 inches, aerate, and recompact at no additional cost to the contracting authority. Meet the compaction requirements of the plans.
 - 4. Maintenance of subgrade or subbase: Maintain the completed subgrade or subbase during subsequent construction activities.
- C. Surface Fixture Adjustment
- 1. Adjust manhole frames and other fixtures within area to be paved to conform to finished surface. Comply with plans for manhole adjustments and water fixture adjustments.
 - 2. Clean outside of fixture to depth of pavement before concrete placement.
 - 3. Construct boxouts if necessary for later adjustment of fixtures. See plans for the size and shape of the boxout.
- D. Setting of Forms: When forms are used, meet the following requirements:
- 1. Ensure forms have sufficient strength to support paving operations being used.
 - 2. Set base of forms at or below subgrade elevation with top of forms at pavement surface elevation. With engineer approval, extra height forms may be used to shape the back of integral curb and edge of pavement; set base at or below subgrade elevation with top of form at top of curb elevation.
 - 3. Place and secure forms to required grade and alignment. Do not vary the top face of the form from a true plane by more than 1/8 inch in 10 feet, and do not vary the vertical face from a true plane by more than 1/4

- inch in 10 feet.
4. If the soil supporting the forms is softened by rain or standing water so that the forms are inadequately supported, or if voids occur under the forms, remove forms. Rework subgrade to proper elevation and density, and reinstall forms.
 5. Ensure forms are free of latent concrete and coated with release agent before concrete is placed.
 6. In the event of rain, remove and reset the forms as necessary to permit drainage.
- E. Removal of Forms
1. Do not remove side forms of pavement and back forms on integrant curb earlier than 12 hours after placing the concrete, unless otherwise approved by the engineer. Remove forms without exerting shock or strain, including temperature variations, on the pavement or curb. Cure concrete in accordance with Section 3.07 of this specification.
- F. Paving Protection
1. In the area adjacent to the curbs and pavement edge, immediately place backfill of soil or aggregate according to the plans, without vibration (according to Section 3.09.C), after the forms are removed, to prevent soil erosion during a rain event. Construct dams or other protection to ensure that no saturation or erosion of the subgrade under or near the pavement occurs. This may include check dams, pumping, etc.
- G. Reinforcement Protection
1. Ensure bars are clean, straight, free from distortion and rust, and are firmly secured in position as specified in the contract documents. Place all bars in approved storage to prevent damage; do not distribute along the work site except as needed to avoid delay in paving.
- H. Placing Reinforcement: Provide and place reinforcement meeting the following requirements and characteristics:
1. Provide epoxy-coated reinforcement in accordance with MN/DOT Specification 2472, "Metal Reinforcement."
 2. Provide and place reinforcement bars including keyway bars, tie bars, taper steel, and stopper bars.
 3. Place keyways as shown on the plans. Keyways are not recommended for pavements 7 inches or less.
 4. Provide and place supplemental pavement reinforcement as shown on the plans.
 5. Provide and place reinforcement bars on chairs, in stakes, utilizing tie bar basket assemblies or by appropriate equipment for pressing the bars to the specified location.
 6. For slipform paving, stake the tie bar steel to the roadbed, or use a mechanical device attached to the spreader or paver to place tie bar steel required for L1T joints as shown on the plans. Space and press the tie bar steel to the depth and location shown on the plans. Do not place tie bars over a dowel bar assembly.
 7. Place supplemental pavement reinforcement bar mats for reinforced pavement over culverts when necessary and in accordance with the most current MN/DOT Standard Plate 1070 as designated in the plans.
 - a. When reinforced pavement is specified, assemble bar mats accordingly, and firmly fasten together at all bar intersections.
 - b. Place, secure, and tie mats for a continuous mat as specified in the contract documents. Displacement during concrete placement operations is not allowed.
 - c. Use chairs to ensure proper placement of bar mats.
- I. Drill and Grout Tie Bars and/or Dowel Bars in Existing Pavement
1. When anchoring in existing concrete, use either a MN/DOT-approved epoxy system according to the manufacturer's instructions, or provide and place a bonding grout into the drilled hole by using the steel to push the epoxy or grout into the drilled hole and placing the grout or epoxy around the edge of the steel. The bonding grout shall consist of two parts Portland cement and one part sand, mixed with sufficient water to form slurry with the consistency of thick cream. The contractor shall mix the grout mechanically.
- J. Concrete Pavement Placement
1. Dump or discharge concrete without causing grade displacement or damage to the existing asphalt or bond breaker layer. Repair damage to the grade, existing asphalt, or bond breaker layer as approved by the engineer. Provide protection for turning concrete trucks.
 2. Maintain the grade in a moist condition until placement of concrete.
 3. Construct mainline pavement in a single layer of concrete. Place the concrete pavement in one complete pass of the paving machine to minimize the need for hand-finishing.
 4. Coordinate paving operations for mixing, delivering, spreading, and extruding the concrete to provide uniform progress of the paver. Use sufficient trucks to ensure a steady forward progress of the paver. If

the forward movement of the paver stops for a period long enough to create a cold joint or honeycombing, construct a header joint in accordance with Section 3.05. "Constructing Joints" of this specification.

5. Do not add water to the surface of the concrete to aid in finishing.
 6. When placing concrete on asphalt or asphalt bond beakers, comply with the following:
 - a. Do not place concrete on an asphalt surface with an asphalt surface temperature greater than 120 °F.
 - b. Maintain the asphalt surface in a moist condition as necessary and at a surface temperature not greater than 120 °F before placing the concrete. The engineer will allow the contractor to apply water, whitewash of hydrated lime and water, or both to cool the asphalt surface, or other methods allowed by the engineer.
 - c. Before placing concrete on a milled asphalt surface, clean the milled surface by sweeping and patch as shown on the plans or as directed by the engineer.
 7. When placing concrete adjacent to in-place concrete pavement, protect the following:
 - a. All ends of transverse joints $\frac{3}{4}$ inch or wider to the satisfaction of the engineer. The engineer will allow sawing through the existing joint when sawing the newly placed concrete.
 - b. The in-place pavement to prevent damage.
 - c. Do not allow the edges of the pavement, including longitudinal joints, to deviate from the line shown on the plans by greater than $\frac{1}{2}$ inch at any point.
- M. Finishing
1. Grade and crown: Strike off the surface to the true section by the screed promptly after concrete has been placed and vibrated. Finish the surface true to crown and grade.
 2. Watering the surface: Do not add water to the surface of the concrete to aid in finishing.
 3. Floats: Finish surface with wood or magnesium floats; finish from both sides simultaneously if pavement is placed to full width with one pass of paving machine.
 4. Straightedging
 - a. After the longitudinal floating has been completed and the excess water has been removed, and while the concrete is still plastic, test the pavement surface for trueness.
 - b. Immediately fill any depressions found with freshly mixed concrete, strike off, consolidate, and refinish.
 - c. Check surface longitudinally while concrete is still plastic; correct any surface deviations greater than $\frac{1}{4}$ inch in 10 feet.
 5. Surface treatment
 - a. Surface treatment: Unless otherwise specified, texture the finished surface with an artificial turf or broom to produce a minimum depth of texture of 0.8 mm.
 - Remove the artificial turf or brooms from the pavement surface at regular intervals and clean with water to remove accumulated concrete from the fabric in order to maintain a consistent finished texture.
 6. Edge finish: Before the concrete has taken its initial set, finish all edges of the pavement with an 1/8-inch-radius edging tool.
- N. Curing – See Section 3.07 of this specification for curing requirements.
- O. Construction of Joints
1. General
 - a. Construct joints of the type and dimensions and at the locations specified in the contract documents.
 - b. Place longitudinal joints coincident with or parallel to the pavement centerline.
 - c. Place all transverse joints at right angles to the centerline and extend the full width of the pavement.
 - d. Place all joints perpendicular to the finished grade of the pavement and do not allow the alignment across the joint to vary from a straight line by more than 1 inch.
 - e. Exercise care in placing, consolidating, and finishing the concrete at all joints.
 2. Sawn control joints
 - a. Submit a jointing plan to the engineer for approval prior to placing concrete.
 - b. Saw all concrete pavements and use a coving stone or other mechanical tool to create a rounded edge to all sawed joints.
 - c. Mark joint locations with a string line before sawing. Ensure straight, uniform lines.
 - d. Begin transverse joint sawing as soon as the concrete has hardened sufficiently to allow sawing without raveling or moving of aggregate. Saw joints before uncontrolled cracking takes place.
 - e. Provide either wet-cut saws referred to as a "conventional concrete saw," or a lighter weight dry-cut saw, referred to as an "early entry concrete saw," to establish joints sooner than the conventional saw.
 - f. Saw all joints in a single cutting operation for a specific joint. Make saw cuts true to line and to the dimensions specified in the contract documents. Extend transverse joints in the pavement through the

- g. Discontinue sawing a joint if a crack develops ahead of the saw and rout open the crack for sealing.
 - h. If necessary, continue the sawing operations both day and night. Night operations will require the approval of local agencies in regard to any noise regulations.
 - i. The concrete must be capable of supporting the sawing operations to allow the use of an early green concrete saw.
 - j. Repair or replace pavement with uncontrolled or random cracking at no additional cost to the contracting authority. Use repair methods approved by the engineer. Repair or replace at the direction of the engineer.
 - k. Use wet sawing for dust control when specified in the contract documents.
 - l. Where boxouts occur in pavement, construct joints as shown on the plans.
- 3. Contraction joints
 - a. Place longitudinal and transverse construction joints where specified in the contract documents, at boxouts, and at headers.
 - b. Locate and place forms for boxouts on grade prior to paving as shown on the plans.
 - c. If concrete placement is delayed for more than 60 minutes or at the end of each day, construct a header transverse construction joint within 5 feet of a planned transverse contraction joint.
 - d. Finish the edges of the pavement at construction joints with an 1/4-inch-radius edging tool.
 - e. If a random crack occurs away from the planned joint location, repair the crack with one of the following techniques.
 - i. If the pavement is undoweled and the random crack is at least 3 feet from the planned joint: Rout and seal the random crack and epoxy the planned joint closed if it has not cracked open.
 - ii. If the pavement is undoweled and the random crack occurs within 3 feet of the planned joint and the planned joint has cracked open: Repair with a full – depth joint repair.
- 4. Isolation/expansion joints
 - a. Install isolation joints as specified in the contract documents.
 - b. Prevent movement of or damage to joint assembly when placing concrete.
 - c. Use supplemental vibration equipment for proper consolidation of the concrete.
 - d. After the surface finishing has been completed, finish the edge of the joint with a 1/4- inch edging tool.
- 5. Constructing headers
 - a. Construct construction headers, temporary headers, and permanent headers as shown on the plans.
 - b. The engineer will not allow incorporating any concrete accumulated in the grout box of the paver into the pavement. Construct all headers such that the concrete contained in the grout box is removed from the project. Use any approved construction header method as shown in the Standard Details.
 - c. Use internal vibration to consolidate the concrete along header joints before final finishing.
- P. Joint sealing
 - 1. Timing
 - a. Unless otherwise allowed or reviewed by the engineer, before any portion of the pavement is opened to the contractor's equipment or to general traffic, clean and seal joints that require sealing.
 - b. The engineer may limit the wheel loads and axle loads of equipment operating on the pavement during this operation prior to the age of seven days and/or until a strength of 3000 psi is achieved. If the contractor wants to proceed sooner, he will need to perform additional strength tests to determine the pavement strength.
 - 2. Cleaning: Perform joint sealing as shown on the plans and in accordance with the following:
 - a. Seal joints after the engineer inspects and approves the joints.
 - b. Perform joint sealing on surface dry concrete after cleaning the joints of debris, dirt, dust, and other foreign matter, including accumulations of concrete.
 - c. Lightly sandblast the joint walls before final compressed air cleaning.
 - d. Immediately before sealing the joints, clean the joints with a jet of compressed air under pressure of at least 85 psi.
 - e. Seal transverse integrant curb joints with the same joint sealer used to seal the pavement joints.
 - f. Seal joints in accordance with the tolerances shown on the plans.
 - g. Provide backer rod material compatible with the sealer as shown on the plans.
 - h. Remove and replace sealer at joints filled above the permissible level shown on the plans at no additional cost to the department.
 - i. Handle and place joint sealer material as recommended by the manufacturer and in accordance with the following requirements.

06 SIDEWALK CONSTRUCTION

- A. Joint Construction
 - 3. The contractor shall saw the joints in walking surfaces as approved by the engineer. Sawn joints will receive a coving stone or other mechanical tool to create a rounded edge to all sawed joints. The radius of the coving shall be ¼ inch.
 - 4. Extend contraction joints to a depth of at least 1/3 of the walk thickness. If saw cutting, provide a minimum of ½-inch-wide contraction joints.
 - 5. Provide isolation/expansion material in accordance with MN/DOT 3702, "Prefomed Joint Fillers," that is, ½-inch wide and equal in depth to the full thickness of the walk.
 - 6. Modify joint construction if a fixed object or structure extends through the walk, as directed by the engineer. Place isolation/expansion material ½-inch thick adjacent to fixed objects to separate the object from the abutting concrete edges.

07 CURING OF ALL CONCRETE

- A. An airless spraying machine is required for curing all concrete. Airless sprayers may be used for small and irregular areas provided they have the ability to mix the curing compound in the container and maintain open nozzles.
- B. Apply the curing compound in accordance with the following:
 - 1. Apply liquid curing compound in a fine spray to form a continuous, uniform film on the horizontal surface and vertical edges of pavement, curbs, and back of curbs immediately after surface moisture has disappeared, but no later than 30 minutes after finishing. With approval of the engineer, the timing of cure application may be adjusted due to varying weather conditions and concrete mix properties to ensure acceptable macro texture is achieved and bleed has evaporated.
 - Use MN/DOT-approved 3753 clear liquid curing compound for all concrete surfaces at an application rate of 150 square feet per gallon.
 - 2. Ensure liquid curing materials are well agitated in the supply drum or tank immediately before transfer to the sprayer. Keep curing materials well agitated during application.
 - 3. If forms are used, apply to pavement edges and back of curbs within 30 minutes after forms are removed.
 - 4. Failure to comply with these curing specifications will result in a monetary deduction of at least \$50.00 per cubic yard or 50 percent of the contractor-provided invoice amount for the concrete in question
 - 5. If the curing compound is damaged during the curing period, immediately repair the damaged area by respraying.
 - 6. If the engineer determines that the initial or corrective spraying may result in unsatisfactory curing, the engineer may require the contractor to use the blanket curing method, at no additional cost to the contracting authority.

08 CONCRETE PROTECTION – INCLUDE THESE PLANS IN THE CONTRACTOR'S QUALITY CONTROL PLAN

- A. Protection Against Rain and Vandalism: Protect the concrete from damage due to rain and vandalism. Have available materials for protection of the edges and surface of concrete. Should any damage result, the engineer will suspend operations until corrective action is taken.
- B. Protection Against Cold Weather
 - 1. If the National Weather Service forecast for the construction area predicts air temperatures of 36 °F or less within the next 24 hours and the contractor wishes to place concrete, submit a cold weather protection plan.
 - 2. Protect the concrete from damage including freezing due to cold weather. Should any damage result, the engineer will suspend operations until corrective action is taken.
 - 3. Cold Weather Protection Plan: Submit in writing to the engineer a proposed time schedule and plans for cold weather concrete protection that provide provisions for adequately protecting the concrete during placement and curing. Do not place concrete until the engineer accepts the contractor's cold weather protection plans.
- C. Protection Against Hot Weather
 - 1. If the National Weather Service forecast for the construction area during concrete placement is such that the combined factors of temperature, wind, and humidity are detrimental to concrete placement, develop a hot weather protection plan.

2. The definition of hot weather conditions is defined in the *PCA Design and Control of Concrete Mixtures* as when the rate of evaporation of bleed water per hour exceeds 0.2 lb. of water per square foot per hour. A chart published by ACI and PCA can be used to predict the bleed water rate.
3. Hot Weather Protection Plan: Submit in writing to the engineer a proposed time schedule and plans for hot weather concrete protection that provide provisions for adequately protecting the concrete during placement and curing. Do not place concrete until the engineer accepts the contractor's hot weather protection plans.

09 USE OF PAVEMENT

- A. Opening Pavement and Driveways to Traffic
 1. Do not open a new pavement slab to general public traffic or operate paving or other heavy equipment on it until the concrete has attained an age of seven days or it has reached a minimum compressive strength of 3,000 psi, as reviewed by the engineer.
 2. If the pavement joints are widened, seal the joints before operating paving or other heavy equipment and allowing general public traffic on the pavement.
 3. Cast the compressive strength control specimens in accordance with ASTM C31, "Making and Curing Concrete Test Specimens in the Field." Cure the control specimens in the same manner and under the same conditions as the pavement represented. The engineer will test the control specimens in accordance with Concrete Sampling and Testing, Table 5 or 6.
 4. Perform operations on new pavement as reviewed by the engineer and in accordance with the following:
 - a. When moving on and off the pavement, construct a ramp to prevent damage to the pavement slab.
 - b. Operate the paving equipment on protective mats to prevent damage to the pavement surface and joints. Before placing the protective mats, sweep the pavement surface free of debris.
 - c. Operate equipment on a slab without causing damage. If damage results, suspend operations and take corrective action as reviewed by the engineer. Do not operate the equipment wheels or tracks within 4 inches of the slab edge.
- B. Opening of Sidewalks and Medians to Pedestrian Traffic
 1. Normal pedestrian foot traffic can walk on the finished concrete as soon as practical without causing damage to the fine broom finish.
 2. Construction traffic shall not be allowed for three days or until the concrete reaches a compressive strength of 3000 psi.
- C. Backfill Construction – Operating Vibratory Equipment
 1. Protect newly placed concrete from damage by adjacent vibratory or backfilling operations for a minimum of 24 hours.
 2. Do not perform vibratory operations and backfilling until 72 hours after placing the concrete or after the concrete reaches a compressive strength of at least 3000 psi.

10 CONTRACTOR MINIMUM REQUIRED QUALITY TESTING REQUIREMENTS

- A. Submittals: Follow these *Minnesota Concrete Flatwork Specifications* and any local covenants, as well as the following:
 1. All submittals of drawings; manufacturers' certificates of compliance, recommendations, and test data, reports, catalog data sheets; and other data shall be in accordance with the submittals section, unless otherwise specified herein.
 2. Two weeks prior to commencing any concrete placement, submit a concrete mix design for each different source of aggregate if requested by the Owner.
 3. Provide quality control plan if requested by the Owner. A quality control plan may include the following if requested:
 - a. Traffic control plan.
 - b. A list of all process control or quality control testing technicians.
 - c. Concrete placement plan.
 - d. Concrete washout guidance plan.
 - e. Pre-pour meeting dates for pours over 500 cubic yards.
 - f. Procedure for placing dowel bars and reinforcement.
 - g. Concrete curing plan.
 - h. Rain and Vandalism protection plan.
 - i. Cold weather protection plan.
 - j. Hot weather protection plan.
 - k. Submit to the engineer an organizational chart listing names and phone numbers of individuals and

- alternates responsible for mix design, quality control administration, and inspection.
- I. Submit the smoothness profiler information, including which machine and operator, when specified by the engineer for concrete pavement.

11 CONCRETE SAMPLING AND TESTING REQUIREMENTS

- A. If requested by the Owner, turn in all test results to the engineer or Owner’s Representative weekly using MN/DOT’s weekly concrete report.
- B. All costs for testing shall be at the expense of the Contractor.
- C. The testing rates shown in this section are minimums. Take all samples in a random manner using an appropriate random number generator. Take as many tests as necessary to ensure quality control.
- D. If any field test fails, reject the concrete, or if the producer makes adjustments to the load to meet requirements, record the adjustments on the certificate of compliance and the weekly concrete report. Retest the load and record the adjusted test results. Make sure the load is tested before it gets into the work.
- E. All people performing field testing of plastic concrete will carry either a current MN/DOT or ACI Concrete Field 1 concrete testing certification. Gradations and moistures shall be done by people carrying a current MN/DOT Concrete Plant 1 or an ACI Aggregate Testing Technician Level 1 certification.
- F. All concrete shall come from a MN/DOT-certified ready-mix plant, and all people performing plant testing will carry a current MN/DOT Concrete Plant 1 certification.
- G. The results of each field test of plastic concrete shall be recorded on the Certificate of Compliance ticket and shall be noted whether it is a Quality Control test or a Quality Assurance test.
- H. Contractor and Contracting Authority Testing Tables
 - 1. Include the cost for all contractor testing in any of the tables in the price bid for concrete pavement, curb and gutter, and sidewalks.
 - 2. The contractor must inform the engineer or owner’s representative at the pre-construction meeting who will be performing the tests.

| Table 6 Minimum Testing Rates for Curb and Gutter, Sidewalks, and Pavements | | | |
|--|---|---|---|
| Test Type | MnDOT Spec of ASTM No. | Contractor | Contracting Authority’s Representative |
| Gradation | 3126 3137 ASTM D75 C702 C702 C117 | Coarse and fine: 1 per 400 yd ³ or as directed by the engineer | At their discretion |
| Moisture Content | 2461 | 1 per 400 yd ³ | At their discretion |
| Aggregate Quality | 3126 3137 | Minimum of 1 per project – use of MnDOT test results for the same 30-day time period is acceptable | At their discretion |
| Coarse Aggregate Testing (% Passing 200) | 3137 ASTM C117 | Minimum of 1 per project – use of MnDOT test results for the same 30 -day time period is acceptable | At their discretion |
| Air Content | ASTM C231 | Test first load each day per mix, then 1 test per 100 yd ³ | At their discretion |
| Slump | ASTM C 143 | Test first load each day per mix, then 1 test per 200 yd ³ , slump test not required for slipform placement | At their discretion |

| | | | |
|-----------------------------|-------------|---|--|
| Temperature | ASTM C 1064 | Record temperature each time air content, slump, or strength test specimen is performed/fabricated | At their discretion |
| Compressive Strength | ASTM C 31 | Test first load each day per mix, then 1 test per 100 yd ³ , minimum of 1 per day if production is more than 50 yd ³ . Record slump, temperature, and air content for each cylinder | Making of additional cylinders is at their discretion. 28-day compressive testing is the responsibility of the engineer or owner's representative |
| Concrete Pavement Thickness | | Probe at a rate of 1 per 500 linear feet of pavement | Observation of probing or coring at their discretion. |

J. Air Content

1. Evaluate air content of the concrete according to ASTM C231, the pressure meter; ASTM C138, using the gravimetric unit weight method; or ASTM C 173, the volumetric method.
2. For concrete paving, once per day run an air test in front of the paver and then run an air test immediately behind the paver to aid in identifying air loss through the paver. A test result between 5 percent and 8 percent behind the paver will be considered compliant. This test will represent all concrete from the back of the paver back to the last documented complying test. Make immediate adjustments to the mix production and placement process to bring the air content back within tolerance. Do not use succeeding loads below the lower target air content tolerance by more than 0.5 percent. Test each subsequent load until air content is within tolerance for two consecutive loads. For all incorporated, non-complying concrete that is out of tolerance, the engineer will review and determine if removal and replacement is required or if a price adjustment according to Table 7 will be applied.

| Table 7 | |
|---|---|
| Air Content Penalties Target of 6.5% with a Range of 5% – 8% | |
| Air Content, % | Adjusted Contract Unit Price for the Type of Concrete Placed |
| > 10.0 | The contracting authority will pay 75 percent of the contract unit price for the concrete represented for material placed as approved by the engineer. |
| >8.0 – 10.0 | The contracting authority will pay 95 percent of the contract unit price for the concrete represented for material placed as approved by the engineer. |
| 5.0 – 8.0 | The contracting authority will pay 100 percent of the contract unit price for the concrete represented, for material placed as approved by the engineer. |
| >4.0 – <5.0 | The contracting authority will pay 75 percent of the contract unit price for the concrete represented for material placed as approved by the engineer. |
| >3.5 – 4.0 | The contracting authority will pay 25 percent of the contract unit price for the concrete represented and placed as reviewed, by the engineer. If the engineer, in conjunction with the concrete engineer, determines the surface is exposed to freeze-thaw cycling, coat the concrete with an approved epoxy penetrant sealer from the MN/DOT Approved Products list. |
| ≤ 3.5 | Remove and replace concrete in accordance with “Conformity with Plans and Specifications” and “Unacceptable and Unauthorized Work” as reviewed by the engineer. If the engineer will determine if the concrete can remain in place, the engineer will not pay for the concrete. If the engineer determines the surface is exposed to salt-brine freeze-thaw cycling, coat with an approved epoxy penetrant sealer from the MN/DOT Approved Products list. |

K. Pavement Thickness

1. Thickness requirements: Provide pavement with a finished pavement thickness as shown on the plans or as modified, in writing, by the engineer.
2. Procedure: Construct pavement to the thickness shown on the plans. On each project and on each pavement, evaluate pavement thickness in accordance with the following:
 - a. The contracting authority defines plan thickness lot (PTL) as concrete pavement of the same thickness added together lineally. Establish a separate PTL for each concrete plan thickness on the project. The contracting authority defines a subplot as the rate at which an individual measurement is taken over a given length. The contracting authority considers a subplot as one lane wide, measured in accordance with the following:
 - i. From the pavement edge to the adjacent longitudinal joint,
 - ii. From one longitudinal joint to the next, or
 - iii. In the absence of a longitudinal joint, between pavement edges.
 - b. The engineer will divide the PTL into sublots of 500 lineal lane feet to determine the QCP locations. The engineer will add partial sublots less than 500 feet to the previous lot. The engineer will consider partial sublots equal to or greater than 500 lineal lane feet as individual sublots. If the PTL for the entire project is less than 500 lineal lane feet, the engineer will consider the PTL as an individual subplot. The engineer will identify the QCP thickness measurement locations in accordance with the following:
 - i. Determine the longitudinal locations using random numbers multiplied by length of the subplot.
 - ii. Determine the transverse offset locations using a random number multiplied by the width of the traffic lane, ramp, or loop at the determined longitudinal location.
 - iii. Adjust the location to ensure the contractor takes no measurements within 1 foot of the pavement edge and takes no measurements within 2 feet of any transverse or longitudinal joint or other obstructions.
 - c. Contractor QCP Probing Equipment and Probing Method: Provide the following equipment as approved by the engineer to perform QCP probing:
 - i. Probing rod meeting the following characteristics and requirements:
 - Non-flexing,
 - Length capable of completely penetrating the pavement for measuring,
 - Utilizes a circular or square top plate,
 - Contains a centrally located hole in the top plate with a diameter allowing for easy maneuvering along the length of the probing rod, and
 - Fitted with a locking device fixing the angle between the top plate and the probing rod at 90 degrees when locked.
 - ii. Work bridge meeting the following characteristics and requirements:
 - Spans the full width of the freshly laid concrete,
 - Supports a person, and
 - Height above the concrete allows for the use of the probing device.
 - iii. Tape measure accurate to nearest $\frac{1}{8}$ inch and with a length capable of measuring the depth of penetration of the probing device into the plastic concrete pavement.
 - d. Contractor Quality Control Probing (QCP)
 - i. Measure the pavement thickness of freshly finished concrete pavement.
 - ii. Place the base plates at the randomly selected locations and anchor the plates to prevent movement during concrete placement. Mark the locations of the base plates to ensure ease of locating the plates after the paver has passed,
 - iii. Position the bridge at the selected locations to reach and locate each point,
 - iv. Assemble the probing device. Keeping the probing rod perpendicular to the pavement surface, insert the rod into the plastic concrete until the rod strikes the base plate,
 - v. Slide the top plate down the probing rod until it contacts the pavement surface, then lock to the probing rod,
 - vi. Withdraw the probing device, and
 - vii. Measure the length of the probing rod inserted into the plastic concrete from the underside of the top plate to the end of the probing rod. Record this measurement to the nearest $\frac{1}{8}$ inch.
 - viii. Provide daily summary reports listing the results of the day's QCP thickness measurements and additional probing results to the engineer.
 - e. Non-conforming thickness
 - i. The contracting authority will base acceptance of the pavement thickness and price adjustment for deficient thickness on the QCP measurements.
 - ii. The contracting authority defines the tolerance limit for pavement thickness as the plan thickness lot (PTL) minus $\frac{1}{2}$ inch. If the QCP measurement shows a thickness deficiency greater than PTL minus $\frac{1}{2}$ inch, take additional probings at the location of the deficient QCP. If any QCP reading shows a thickness deficiency greater than PTL minus $\frac{1}{2}$ inch, consider the pavement defective and take exploratory QCP measurements to isolate the defective area.
 - iii. The contracting authority defines the defective pavement area as the entire area surrounding the

- deficient QCP reading within a traffic lane and between acceptable QCP readings. The contracting authority considers the pavement acceptable in the remaining areas as the increment where the probing shows a thickness deficiency no greater than PTL minus ½ inch.
- iv. For QCP readings showing a pavement thickness greater than the PTL minus ½ inch to 1 inch, the contractor may leave the pavement in place with a monetary deduction of \$20 per square yard for the defective pavement area, as approved by the engineer.
 - v. For readings showing a pavement thickness greater than PTL minus 1 inch, the engineer will determine whether the contractor will remove and replace concrete pavement or leave the pavement in place at no cost to the contracting authority and apply a monetary deduction of \$20 per square yard for the defective pavement area.
 - vi. The engineer will consider the pavement thickness as conforming provided the deficiency of the final average PTL does not exceed PTL minus 0.10 inch. If the final average PTL is deficient by more than the PTL minus 0.10 inch, the contracting authority will pay for the pavement in the PTL at the contract unit price less the monetary deductions in accordance with Table 9, excluding areas of defective pavement.

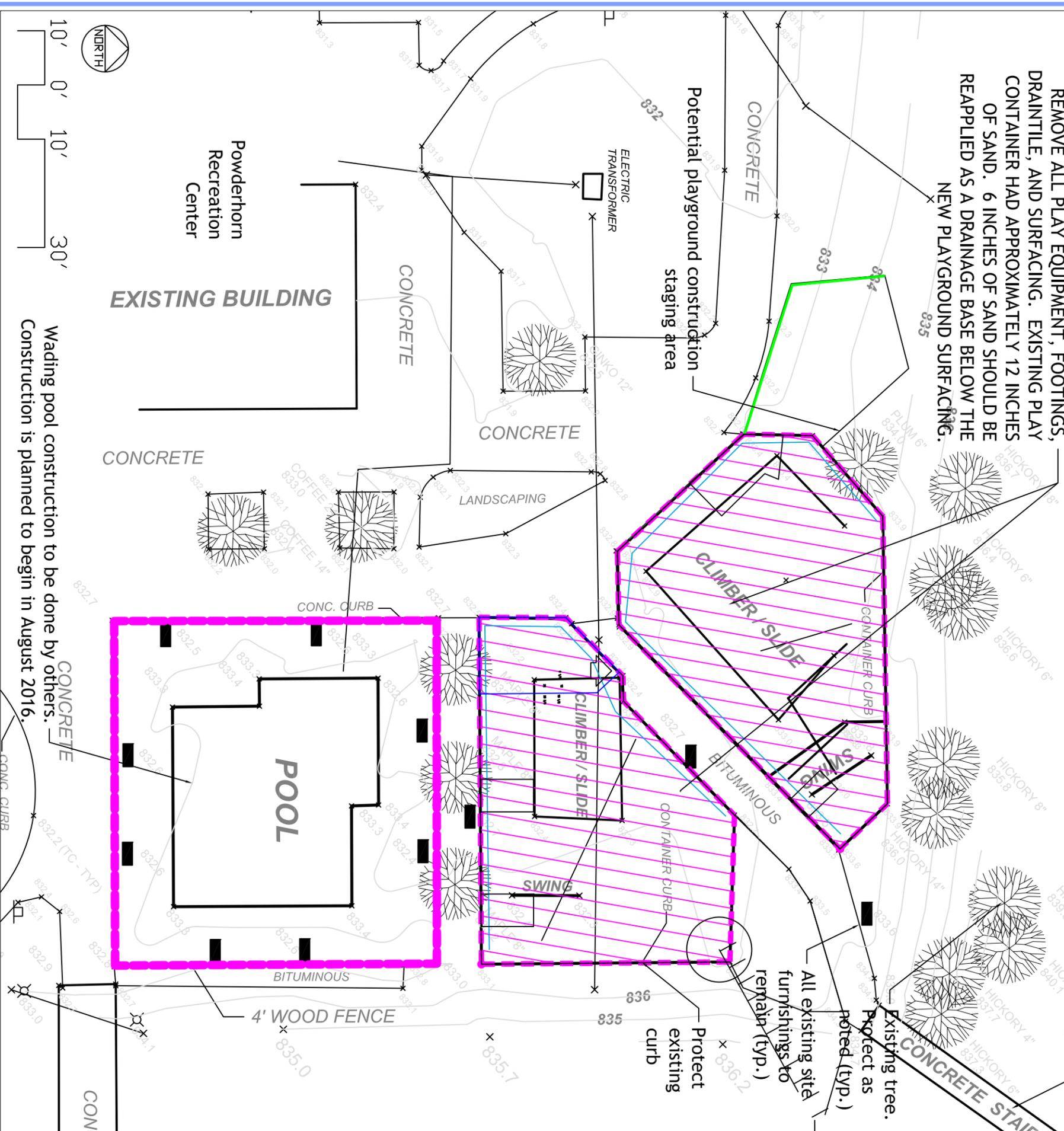
| Table 9 | |
|---|---|
| Deductions for Concrete Pavement Thickness Deficiencies | |
| Thickness Deficiency Exceeding Permissible Deviations, in. | Adjusted Unit Bid Price Per sq. yd. of Payment |
| 0.00 – ≤ 0.10 | None (tolerance) |
| 0.10 – ≤ 0.20 | \$0.20 |
| 0.20 – ≤ 0.30 | \$0.40 |
| 0.30 – ≤ 0.40 | \$0.70 |
| 0.40 – ≤ 0.50 | \$1.00 |
| 0.50 – ≤ 1.00 * | \$20.00 |

END OF SECTION

POOL

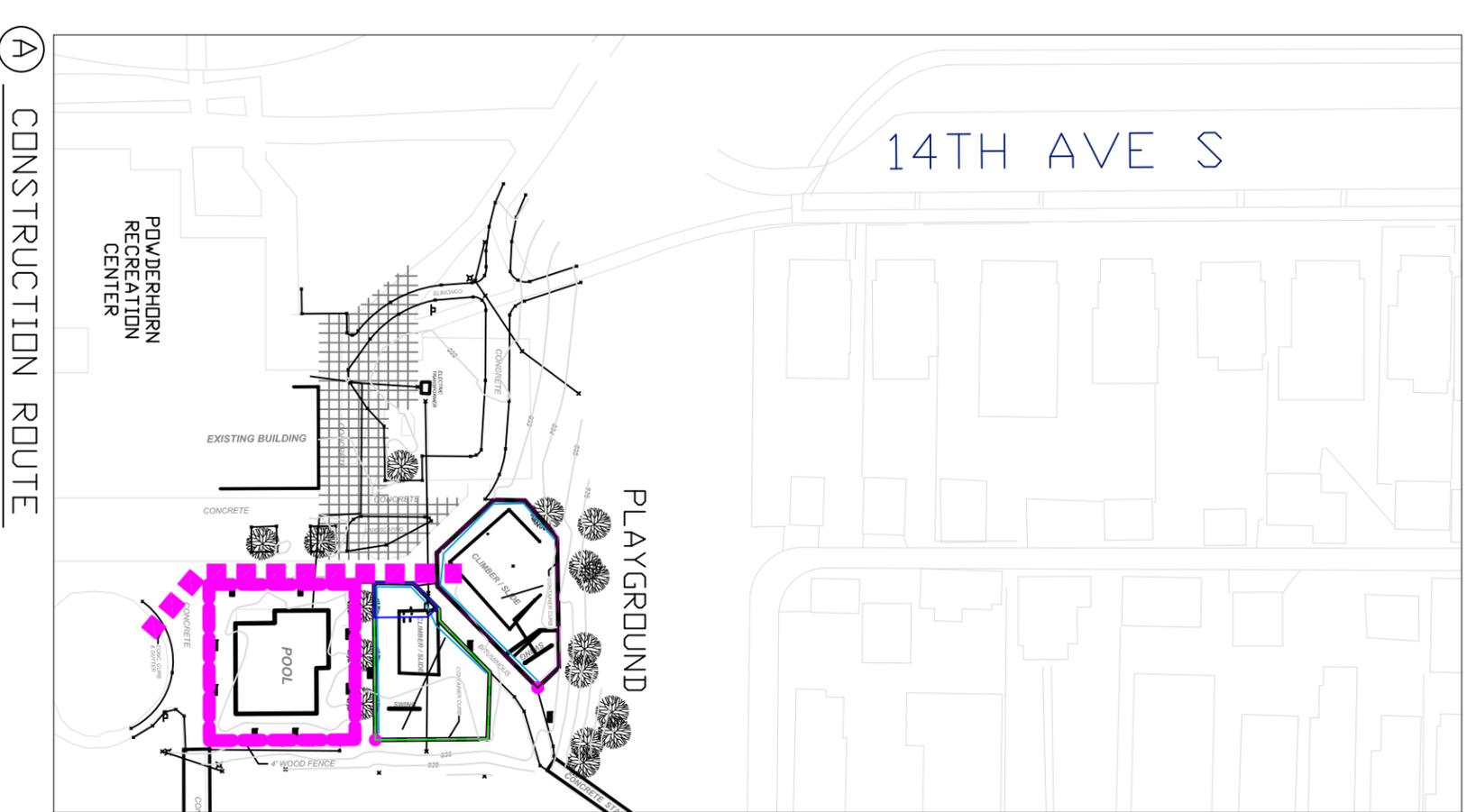
REMOVE ALL PLAY EQUIPMENT, FOOTINGS, DRAINTILE, AND SURFACING. EXISTING PLAY CONTAINER HAD APPROXIMATELY 12 INCHES OF SAND. 6 INCHES OF SAND SHOULD BE REAPPLIED AS A DRAINAGE BASE BELOW THE NEW PLAYGROUND SURFACING.

Do not block pathways with construction fencing.



DEMOLITION AND EROSION CONTROL NOTES:

1. EXISTING PIPE CONNECTIONS TO BE REUSED. SEE GRADING PLAN FOR APPROXIMATE LOCATIONS. DO NOT DAMAGE EXISTING DRAINAGE CONNECTIONS DURING REMOVALS.
2. SUBMIT RECOMMENDED CONSTRUCTION STAGING AREA DRAWINGS TO THE OWNER FOR APPROVAL. PROTECT STAGING AREA WITH 6' CHAIN LINK FENCE AS WELL AS PLAYGROUND AREAS.



(A) CONSTRUCTION ROUTE

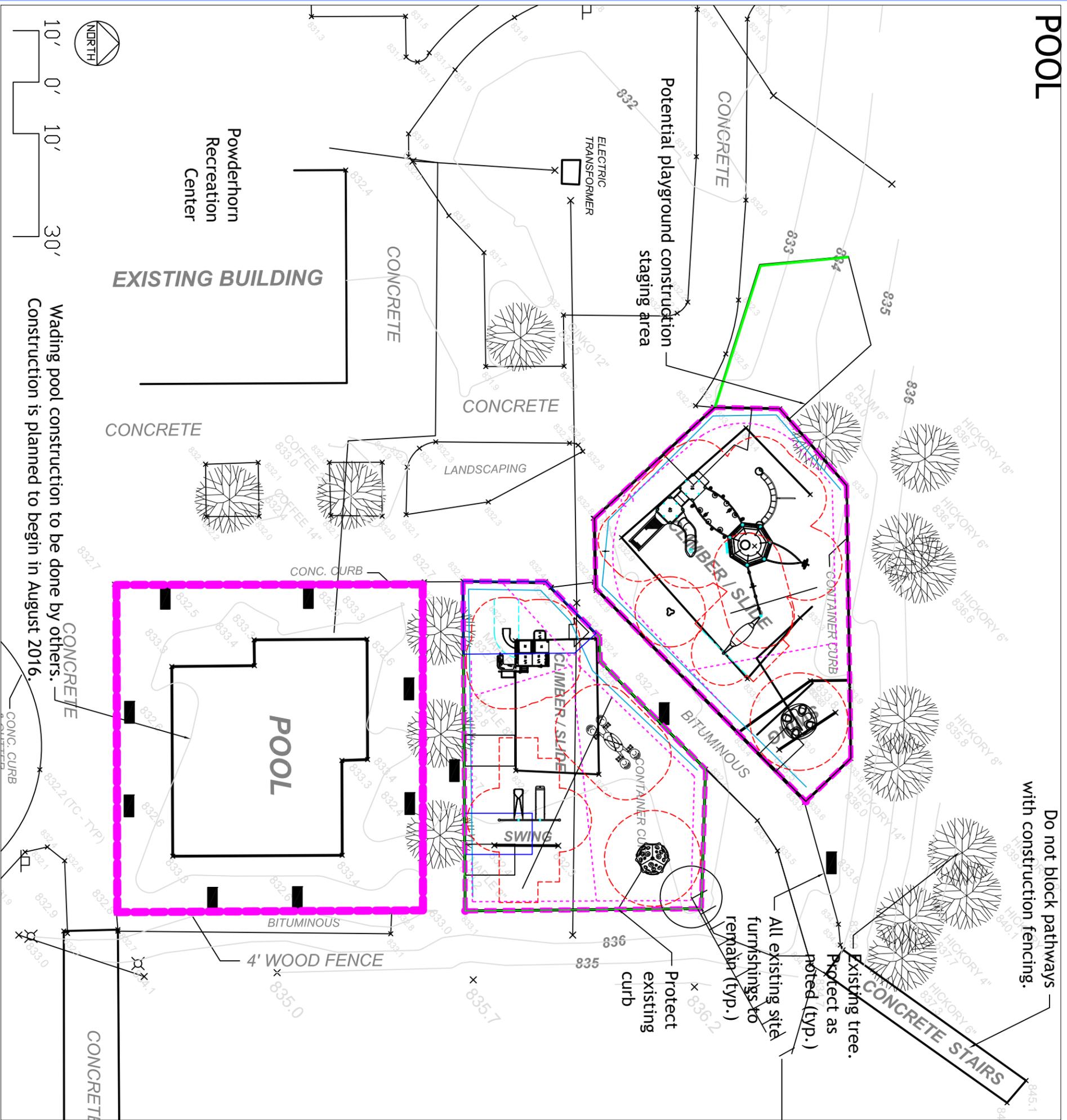


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POWDERHORN PARK
PLAYGROUND IMPROVEMENTS
MINNEAPOLIS, MINNESOTA

DEMOLITION AND EROSION CONTROL PLAN
Construction Year: 2016

SHEET
L1.2



Do not block pathways with construction fencing.

Existing tree. Protect as noted (typ.)

All existing site furnishings to remain (typ.)

Protect existing curb

GRADING AND DRAINAGE NOTES:

1. ALL DRAIN TILE TO BE SET INTO WATER PERMEABLE, GEOTEXTILE LINED, TRENCHES A MINIMUM OF 12 INCHES BELOW THE SURFACE OF THE SUBGRADE BELOW THE ENGINEERED WOOD FIBER MULCH. DRAIN TILE TO HAVE A MINIMUM OF 6 INCHES OF SOIL COVER. THE DRAINAGE TRENCH TO BE FILLED WITH OPEN GRADED AGGREGATE.
2. SLOPE CONTAINER TO DRAIN TO DRAIN TILE TRENCHES
3. ALL DRAIN TILE TO BE ENCLOSED IN A WATER PERMEABLE SODK.
4. PROVIDE CAPPED DRAIN TILE CLEANOUTS AT ENDS OF DRAIN TILE PIPING.
5. DRAIN TILE TO BE 6" PERFORATED PIPE OR APPROVED ALTERNATIVE.
6. PLAYGROUND SHALL BE GRADED SO THAT THE TOP OF 12 INCHES OF ENGINEERED WOOD FIBER MULCH IS 2-4 INCHES BELOW THE ADJACENT CURBS. EXCAVATE AS NECESSARY AND BELIEVE INCHES OF FORMER SAND SURFACING AS A DRAINAGE MEDIUM BELOW ENGINEERED WOOD FIBER.
7. NOTIFY OWNER IF EXISTING PIPE CONNECTIONS TO STORM SEWER ARE NOT FOUND DURING EXCAVATION, OR IF CONNECTIONS ARE DAMAGED AND UNSALVAGEABLE.
8. 4 INCH CONCRETE TO BE PROVIDED BELOW PROPOSED POURED IN PLACE LOCATIONS. SEE SITE PLAN FOR LOCATION. 12 INCH BEVEL UNDER TOP OF CONCRETE. GRAB BARS TO BE APPROXIMATELY FLUSH WITH THE TOP OF ENGINEERED WOOD FIBER (2 INCH DEPTH). SPOT ELEVATIONS WILL BE PROVIDED BY OWNER.
9. ALL POURED IN PLACE PATHWAYS TO PROVIDE AN ACCESSIBLE ROUTE INTO THE PLAY CONTAINER. MAXIMUM SLOPE TO BE 4.5% AND MAXIMUM CROSS SLOPE TO BE 18%.
10. VERIFY THICKNESS OF PIP TO BE INSTALLED WITH OWNER PRIOR TO CONCRETE INSTALLATION.

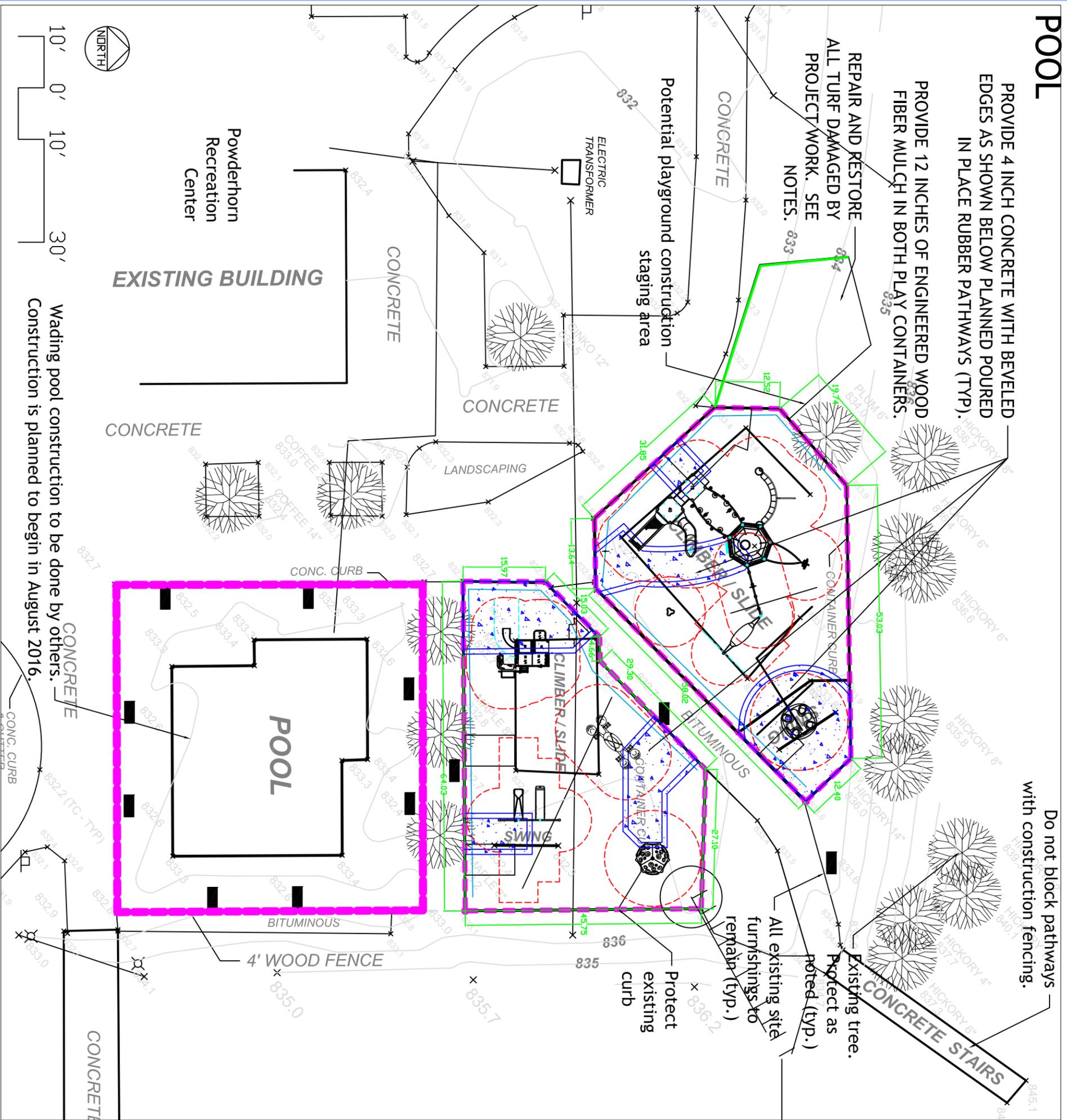
POOL

PROVIDE 4 INCH CONCRETE WITH BEVELED EDGES AS SHOWN BELOW PLANNED POURED IN PLACE RUBBER PATHWAYS (TYP).

PROVIDE 12 INCHES OF ENGINEERED WOOD FIBER MULCH IN BOTH PLAY CONTAINERS.

REPAIR AND RESTORE ALL TURF DAMAGED BY PROJECT WORK. SEE NOTES. 833

Do not block pathways with construction fencing.



SITE INSTALLATION NOTES:

1. TOP OF CONCRETE GRADES TO BE APPROXIMATELY FLUSH WITH THE TOP OF ENGINEERED WOOD FIBER (12 INCH DEPTH). SPOT ELEVATIONS WILL BE PROVIDED BY OWNER.
2. ALL CONCRETE TO BE 4" CONCRETE WALKS WITH 12 INCH BEVELS. BEVELS TO EXTEND TO THE SUBGRADE OF THE CONTAINER.
3. PLAY CONTAINERS TO BE FILLED WITH A MINIMUM OF 12 INCHES OF ENGINEERED WOOD FIBER MULCH MANUFACTURED AND CERTIFIED TO BE USED AS PLAYGROUND SAFETY SURFACING SHOULD MEET IPEMA CRSD, AND OTHER APPLICABLE STANDARDS. 12 INCH DEPTH SHOULD REFLECT THE INSTALLED AND COMPACTED DEPTH.
4. INSTALL ENGINEERED WOOD FIBER MULCH OVER WATER PERMEABLE GEOTEXTILE FABRIC.
5. COORDINATE SITE INSTALLATION WORK WITH THE INSTALLATION OF THE PLAYGROUND FOOTINGS, EQUIPMENT, AND FURNISHINGS IN PLACE. RUBBER WITH THE PLAYGROUND CONTRACTOR. PLAYGROUND EQUIPMENT FOOTINGS AND INSTALLATION AND IS NOT INCLUDED IN THIS QUOTE SET.
6. PROVIDE A PROJECT SCHEDULE TO OWNER. PROJECT SHOULD BE COMPLETE IN THE FALL OF 2016. CONCRETE INSTALLATION SHOULD ALLOW TIME FOR THE PLAYGROUND CONTRACTOR TO INSTALL THE MULCH IN PLACE. RUBBER BY THE OWNER. ENDORSEMENT OF THE WEATHER, CONCRETE AND FIBER MULCH INSTALLATION MAY BE DELAYED UNTIL THE SPRING OF 2017. SEE APPENDUM NO. 1 FOR ADD ALTERNATE PRICING FOR FALL CONCRETE INSTALLATION AND SPRING CONCRETE INSTALLATION.



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