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**Marinwood CSD
Park Maintenance Facility
Courtyards, Fences, & Gates
775 Miller Creek Rd
San Rafael, CA 94903**

APPENDIX C

Project Specifications

05/09/2022

03300 – Cast In Place Concrete

06100 – Rough Carpentry

06200 – Finish Carpentry

31000 – Earthwork

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Architectural concrete, complete, as shown and specified.

1.2 REFERENCE STANDARDS

- A. Comply with ASTM C 94; ACI 301, "Specification for Structural Concrete"; ACI 117, "Specifications for Tolerances for Concrete Construction and Materials"; and CRSI's "Manual of Standard Practice."

1.3 SUBMITTALS

- A. Product Data: concrete mix designs and laboratory test reports.
- B. Engage a qualified independent testing agency to design concrete mixes.
- C. Shop drawings:
1. Reinforcement.
 2. Formwork: Show type, design, and materials. Show locations of formwork joints, construction joints, and form ties.
 3. Typical layout including dimensions and floor grinding schedule.
 4. Plan view of floor and joint pattern layout.
 5. Areas to receive colored surface treatment (Confirm with Architect)
 6. Hardener, sealer, densifier identified in notes.
- D. Samples:
1. Concrete: 12-inch by 12-inch by 1-1/2-inch-thick; each type, finish and color for preliminary review.
 2. Form Tie Hole Plugs: Full size, selected color.
- E. Finish Mock-Ups:
1. Finish Mock-Up Size: 5'x5' sample panel at jobsite at location as directed under conditions similar to those which will exist during actual placement (Confirm w/Architect)
 2. Finish Mock-up will be used to judge workmanship, concrete substrate preparation, operation of equipment, material application, color selection and shine.

3. Allow 24 hours for inspection of mock-up before proceeding with work.
 4. When accepted, mock-up will demonstrate minimum standard of quality required for this work.
 - a. Approved mock-up may not remain as part of finished work. Remove mock-up and dispose of materials when no longer required and when directed by Architect.
 - b. Approved mock-up may remain as part of finished work.
 5. Finish Mock-Up will demonstrate required level of cut:
 - a. Level 1 - Cream Finish: Polishing only the Portland Cement paste at the surface without exposing small, medium or large aggregate. Note: If dye will be used, this is not an acceptable level of grinding. Go to Level 2.
 - b. Level 2 - Salt/Pepper Finish: Expose the fine aggregate such as sand and small aggregate with the concrete. The depth of grind will depend greatly on the placement and finishing procedures. Generally, this level of cut can be achieved within 1/16" of the surface.
 - c. Level 3 - Medium Aggregate: Exposing more of the overall girth of the coarse aggregate within the concrete. Generally, this level of cut can be achieved within 1/8" of the surface.
 - d. Level 4 - Large Aggregate: Exposing the overall girth of the coarse aggregate within the concrete. This level of cut generally can be achieved within 1/4" of the surface.
 - e. Sheen Level A: Sheen (glossy) as determined by a gloss reading of 45 - 60.
 - f. Sheen Level B: Sheen (high gloss) as determined by a gloss reading of 60 - 70.
 - g. Sheen Level C: Sheen (very high gloss) as determined by a gloss reading of 70 or higher.
- F. Finish Pre-installation Meetings: Conduct a pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Review the following with Architect:
1. Environmental requirements.
 2. Scheduling and phasing of work.
 3. Coordinating with other work and personnel. Remind all trades that they are working on a surface that is to become a finished surface.
 4. Protection of adjacent surfaces.
 5. Surface preparation.
 6. Repair of defects and defective work prior to installation.
 7. Cleaning.
 8. Installation of polished floor finishes.

9. Application of liquid hardener, densifier.
 10. Protection of finished surfaces after installation.
 11. placing of materials on the concrete surface that may cause staining, etching or scratching
- 1.4 SCHEDULING
- A. General: Coordinate with other trades for installation of items to be embedded in concrete.
- 1.5 QUALITY ASSURANCE
- A. Finish Installer Qualifications:
 1. Installer with a minimum of 5 years' experience in performing work of this section who has specialized in installation of work similar to that required for this project.
 2. Installer trained and holding a current certificate as a FGS PermaShine installer.
 3. Current Certification from the CCAA stating that the technicians are trained craftsmen.
 - B. Finish Manufacturer Qualifications:
 1. Manufacturer capable of providing field service representation during construction and approving application method.
 2. Manufacturer shall have a minimum 5 years of experience in manufacturing components similar to or exceeding requirements of project.
- 1.6 WARRANTY
- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and does not limit, other rights Owner may have under Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Concrete: As specified on Structural drawings.
- B. Cement: As specified on Structural drawings.
- C. Reinforcing Steel: As specified on Structural drawings.
- D. Aggregates: As specified on Structural drawings.

- E. Vapor Retarder: Clear 12-mil thick Reinforced polyethylene sheet, ASTM E 1745, Class C.
- F. Joint-Filler Strips: ASTM D 1751, cellulosic fiber, or ASTM D 1752, cork.

2.2 MIXES

- A. Proportion normal-weight concrete mixes to provide the following properties:
 - 1. Compressive Strength: As shown on Structural drawings.
 - 2. Slump Limit: 4 inches (100 mm) at point of placement.
 - 3. Air Content: 5.5 to 7.0 percent for concrete exposed to freezing and thawing, 2 to 4 percent elsewhere.

PART 3 - EXECUTION

3.1 CONCRETING

- A. Construct formwork and maintain tolerances and surface irregularities within ACI 117 limits of Class A for concrete exposed to view and Class C for other concrete surfaces.
- B. Set water stops where indicated to ensure joint watertightness.
- C. Place vapor retarder on prepared subgrade, with joints lapped 6 inches (150 mm) and sealed.
- D. Accurately position, support, and secure reinforcement.
- E. Install construction, isolation, and contraction joints where indicated. Install full-depth joint-filler strips at isolation joints.
- F. Place concrete in a continuous operation and consolidate using mechanical vibrating equipment.
- G. Protect concrete from physical damage, premature drying, and reduced strength due to hot or cold weather during mixing, placing, and curing.
- H. Formed Surface Finish: Smooth-formed finish for concrete vertical surfaces exposed to view, coated, or covered by waterproofing or other direct-applied material; rough-formed finish elsewhere.
- I. Burnished Finish: On ALL slab surfaces exposed to view. Steel troweled smooth, and then mechanically sand to 400grit to achieve the final burnished finish as follows:
 - 1. Steel trowel burnishing:

- a. Burnishing the concrete by steel troweling shall be achieved by repeatedly working the surface of the concrete using either a hand trowel or mechanical troweling machine until a lustre is produced on the surface of the concrete.
 - b. The troweling shall be undertaken with consistent pressure. Each troweling shall be at 90° to the previous pass to eliminate the development of hollows, ridges and depressions.
 - c. As the surface concrete consolidates with working, the angle of the trowel or troweling blades shall be increased to intensify pressure and further densify the surface layer of the concrete. Avoid over-working any area.
 - d. "Wet-wiping" or addition of water to the surface of the concrete during finishing shall not be permitted.
2. Mechanically sand to 400grit.
 3. Finish color: TBD by architect.
- J. Cure formed surfaces by moist curing for at least seven days.
 - K. Begin curing concrete slabs after finishing. Keep concrete continuously moist for at least seven days.
 - L. Owner will engage a testing agency to perform field tests and to submit test reports.
 - M. Protect concrete from damage. Repair surface defects in formed concrete and slabs.
 - N. Repair slabs not meeting surface tolerances by grinding high areas and by applying a repair underlayment to low areas receiving floor coverings and a repair topping to low areas to remain exposed.
- 3.1 REINFORCEMENT
- A. Coverage: Not less than 2-inch concrete coverage over reinforcing steel.
 - B. Tie Wires: Cut as closely as possible to bars and bend behind bars so concrete placement will not force wire ends to exposed surfaces.

END OF SECTION 03300

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide and install wood framing and finish carpentry as shown on the Drawings and as specified herein. Work includes all connectors, and related hardware and materials.
- B. Where additional instructions are required, work shall be as directed by the Architect.

1.2 SUBMITTALS

- A. Model code evaluation reports for fire-retardant-treated wood.

1.3 QUALITY STANDARDS AND TOLERANCES

- A. Provide a work force that is sufficient in number for the quantity of work and time schedule. Workers shall be skilled, trained, experienced, and competent to do the work as specified.
- B. Unless otherwise directed by the Architect, all work shall be as per building code and the Manual for Wood Frame Construction, American Forest and Paper Association (NFPA), National Design Specifications for Wood Construction of the NFPA, Plywood Specifications and Grade guide of the American Plywood Association.
- C. Tolerances: Vertical framing shall be plumb within 1/4" per 10 linear feet and horizontal framing shall be level within 1/4" per 10 linear feet.
- D. Moisture content of framing lumber shall be 15% or less by weight. Tests will be conducted on all newly shipped lumber to confirm moisture content. Kiln-dried or other lumber requiring lower moisture content shall be as specified.
- E. Follow applicable lumber grading agency standards in accepting or rejecting delivered lumber. Reject special, required lumber that is not marked and certified as preservative-treated or kiln-dried.

1.4 MATERIALS HANDLING AND STORAGE

- A. Reject any delivered framing lumber that is not grade-stamped and certified by a bona fide grading agency. Identify framing lumber by grade, and store each grade separately.
- B. Do not accept or use lumber that deviates from grade standards or has excessive moisture content or other defects. Remove unstamped or defective lumber from the job site.
- C. Handle lumber to avoid damage during transport, unloading, and moving on the job site. Handle chemically treated lumber and panels strictly according to manufacturer's instructions.

- D. Store framing lumber and wood panels to prevent damage and moisture absorption. Store metal connectors that are subject to damage in weathertight wrapping and in safe locations away from traffic or other sources of damage. Store chemically treated lumber and wood panels outdoors until installation. Keep chemically treated lumber and wood panels well ventilated if moved indoors.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Lumber, General: Dressed lumber, S4S, 15 percent maximum moisture content for 2-inch (38-mm) thickness or less, marked with grade stamp of inspection agency.
- B. Preservative-Treated Materials: AWWA C2 lumber and AWWA C9 plywood, labeled by an inspection agency approved by ALSC's Board of Review. After treatment, kiln-dry lumber and plywood to 19 and 15 percent moisture content, respectively. Treat indicated items and the following:
1. Wood members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Concealed members in contact with masonry or concrete.
 3. Wood framing members less than 18 inches (460 mm) above grade.
 4. Wood floor plates installed over concrete slabs directly in contact with earth.
- C. Fire-Retardant-Treated Materials: AWWA C20 lumber and AWWA C27 plywood, interior Type A treatment, labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
1. Use treated lumber and plywood with bending strength, stiffness, and fastener-holding capacities that are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions.
- D. Dimensional Lumber and Miscellaneous Lumber: Provide grades and species as specified on Structural Drawings.
- E. Prefabricated Wood Joists and Engineered Wood Beams: Provide as specified on Structural Drawings.
- F. Wood-Based Structural-Use Panels: DOC PS 2. Provide plywood complying with DOC PS 1, where plywood is indicated.
1. Factory mark panels evidencing compliance with grade requirements.
 2. Provide types, grades, and species as specified on Structural Drawings.
- G. Sheathing and underlayment: Provide as specified on Structural Drawings.
- H. Related construction and materials:

1. Sill gasket atop foundation wall: Glass fiber strip with width equal to plate.
 2. Sill flashing: Galvanized steel or aluminum.
 3. Building paper: No. 15 asphalt felt (or spun-bonded polyethylene).
 4. Vapor barrier: 6 mil polyethylene.
 5. Termite shield: Galvanized sheet steel or aluminum.
 6. Membrane Flashing at Doors and Windows: Self-sealing, self-healing, and fully adhering modified bituminous sheet: “Perm-A-Barrier” or “Bituthene” by W.R. Grace, or approved equal.
- I. Air-Infiltration Barrier: ASTM D 226, Type I, No. 15 asphalt felt, unperforated.
- J. Fasteners: Size and type indicated. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
1. Power-Driven Fasteners: CABO NER-272.
 2. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- K. Metal Framing Anchors: Hot-dip galvanized steel of structural capacity, type, and size indicated.
- L. Sill-Sealer: Glass-fiber insulation, 1-inch (25-mm) thick, compressible to 1/32 inch (0.8 mm).
- M. Adhesives for Field Gluing Panels to Framing: APA AFG-01.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fit rough carpentry to other construction; scribe and cope for accurate fit. Correlate location of furring, blocking, and similar supports to allow attachment of other construction.
- B. Do not install finish panels with defects or deviations from grade standards.
- C. Handle and store wood with care to avoid damage. Store wood as required to prevent damage and moisture absorption.
- D. Properly ventilate wood treated with preservatives; store away from work areas.
- E. Store kiln-dry materials to assure compliance with temperature and humidity restrictions.

- F. Protect newly cut wood with prime coat or preservative treatment. Protect with preservative, wood in contact with masonry or concrete.
- G. Install siding so that joints are square, staggered/patterned exactly as per Drawings and include expansion space at edges as required by manufacturers.
- H. Remove all wood scraps, sawdust, and related debris from the site.
- I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. CABO NER-272 for power-driven staples, P-nails, and allied fasteners.
 - 2. Published requirements of metal framing anchor manufacturer.
 - 3. Table 23-I-Q--Nailing Schedule" of the Uniform Building Code.
- J. Installation of Structural-Use Panels: Comply with applicable recommendations contained in APA Form No. E30 and as follows:
 - 1. Combination Subflooring-Underlayment: Glue and nail to framing.
 - 2. Subflooring: Glue and nail to framing.
 - 3. Sheathing: Nail to framing.
 - 4. Underlayment: Nail or staple to subflooring.

END OF SECTION 06100

SECTION 06200 - FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide and install finish carpentry as shown on the Drawings and as specified herein. Work includes all connectors, and related hardware and materials.
- B. Where additional instructions are required, work shall be as directed by the Architect.

1.2 SUBMITTALS

- A. Shop drawings: Provide complete shop drawings of all millwork items identified in the Contract Documents. Indicate materials and wood species, component profiles, fastening, joining details, finishes, and accessories

1.3 QUALITY STANDARDS AND TOLERANCES

- A. Provide a work force that is sufficient in number for the quantity of work and time schedule. Workers shall be skilled, trained, experienced, and competent to do the work as specified.
- B. Millwork shall be manufactured in accordance with the standards established in the latest Edition of the "Manual of Millwork" of the Woodwork Institute of California (W.I.C.).

1.4 MATERIALS HANDLING AND STORAGE

- A. Provide all materials required to complete the work as shown on Drawings and specified herein.
- B. Deliver, store, and transport materials to avoid damage to the product or to any other work. Return any products or materials delivered in a damaged or unsatisfactory condition. Materials and products delivered will be certified by the manufacturer to be as specified.
- C. Store materials indoors, in a safe, secure, well-ventilated location, protected from dirt, moisture, contaminants, and weather.
- D. Maintain interior installation areas at 70 degrees F, and 50% to 55% relative humidity.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide and install materials as per detail drawings, approved samples, applicable trade standards complying with Architectural Woodwork Standards (AWS), and including accessories as required for complete installation. Provide wood free of significant defects or deviations from grade standards.

- B. Horizontal Boards for Fencing and Gates BASE BID: 1x4 S4S Thermally-cured Ash by Thermory, or equal if approved by Architect.
- C. Horizontal Boards for Fencing and Gates ADD/ALT 03: 1x4 S4S Ipe.
- D. Horizontal Boards for Fencing and Gates ADD/ALT 04: 1x4 S4S Kiln-dried, Clear All-Heart Redwood.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible; do not delay job progress, allow for trimming and fitting.
- B. Verify surfaces are ready to receive work and field measurements are as shown on shop drawings.
- C. Ensure mechanical and electrical items affecting work are properly placed, complete, and have been inspected by applicable authorities prior to commencement of installation.
- D. Inspect each piece of finish carpentry and discard damaged and defective pieces.

3.2 INSTALLATION

- A. Condition finish carpentry in installation areas for 24 hours before installing.
- B. Prime and backprime lumber for painted finish exposed on the exterior.
- C. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Scribe and cut to fit adjoining work. Refinish and seal cuts.
- D. Make wood joints so as to minimize or conceal shrinkage.
- E. Install standing and running trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Stagger joints in adjacent and related trim. Cope at returns and miter at corners.
- F. Fasten all pieces straight, true, and secure. Coordinate backing and blocking with other trades with interfacing work. Nail exterior trim with galvanized nails.
- G. Where sanding is required, sand with grain to totally smooth, unblemished surface. Set finish nails before painting or staining.
- H. Reject as nonconforming any work showing visible damage or defects. Protect finish work from construction damage. Make repairs so they are undetectable.
- I. Select and arrange paneling for best match of adjacent units. Install with uniform tight joints.

- J. Nail siding at each stud. Do not allow nails to penetrate more than one thickness of siding, unless otherwise recommended by siding manufacturer. Seal joints at inside and outside corners and at trim locations.
- K. Preparation for Field Finishing:
 - 1. Sand work smooth and set exposed nails and screws.
 - 2. Apply wood filler in exposed nail and screw indentations and leave ready to receive site-applied finishes.
 - 3. Seal concealed and semi-concealed surfaces; brush apply only, using primer consistent with finish coats specified under Section 09900 – Painting and Coating

END OF SECTION 06200

SECTION 31000 - EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Earthwork, complete, as shown and specified.
- B. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by Architect. Unauthorized excavation and remedial work shall be at Contractor's expense.
- C. Do not interrupt existing utilities serving facilities occupied by Owner. Provide temporary utility services.
- D. Foundation Consultant, if required:
 - 1. General: An acceptable qualified licensed engineer registered in State of Project; selected and paid for by Contractor to perform following:
 - 2. Services: Advise Contractor on construction techniques, design, checking and approval of temporary bracing, sheeting, shoring, underpinning, other terms pertinent to Work, and construction methods for solutions to problems encountered during construction. Consultant primarily concerned with construction methods to prevent movement, settlement, and damage to existing construction, including sidewalks, roads, utilities, embankments, and other items on Owner's property and adjoining properties.

1.2 PROJECT CONDITIONS

- A. Existing Utilities:
 - 1. General: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.
 - 2. Removal: Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.
- B. Protection of Persons and Property:
 - 1. General: Barricade open excavations occurring as part of this work and post with warning lights.
 - 3. Warning Lights: Operate as recommended by authorities having jurisdiction.
 - 4. Protection: Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

5. **Hand Excavation:** Perform excavation by hand within dripline of large trees to remain. Protect root systems from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. **Satisfactory Soil:** ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM; free of rock or gravel larger than 2 inches (50 mm) in any dimension, debris, waste, frozen materials, vegetation, or other deleterious matter.
- B. **Unsatisfactory Soil:** ASTM D 2487 Soil Classification Groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.
- C. **Backfill and Fill:** Satisfactory soil materials.
- D. **Subbase:** Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, ASTM D 2940, with at least 95 percent passing a 1-1/2-inch (38-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- E. **Bedding:** Subbase materials with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- F. **Drainage Fill:** Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (38-mm) sieve and not more than 5 percent passing a No. 8 (2.36-mm) sieve.
- G. **Decomposed Granite (DG) Paths:** Material spec to be approved by Architect.
- F. **Gravel Courtyards:** Submit gravel spec for approved by Architect.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Protect subgrades and foundation soils from softening and damage by water, freezing temperatures, or frost.
- B. **Explosives:** Do not use explosives.
- C. Excavate to subgrade elevations regardless of character of materials and obstructions encountered.
- D. Excavate for structures, building slabs, pavements, and walkways. Trim subgrades to required lines and grades.

- E. Utility Trenches: Excavate trenches to indicated slopes, lines, depths, and invert elevations. Maintain 12 inches (300 mm) of working clearance on each side of pipe or conduit.
1. Place, compact, and shape bedding course to provide continuous support for pipes and conduits over rock and other unyielding bearing surfaces and to fill unauthorized excavations.
 2. Place and compact initial backfill of satisfactory soil material or subbase material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit. Place and compact final backfill of satisfactory soil material to final subgrade.
- F. Plow strip or break up sloped surfaces steeper than 1 vertical to 4 horizontal to receive fill.
- G. When subgrade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface, pulverize, moisture-condition or aerate soil, and recompact.
- H. Place backfill and fill in layers not more than 8 inches (200 mm) in loose depth at optimum moisture content. Compact each layer under structures, building slabs, pavements, and walkways to 98 percent of maximum dry unit weight according to ASTM D 698; elsewhere to 90 percent.
- I. Grade areas to a smooth surface to cross sections, lines, and elevations indicated. Grade lawns, walkways, and unpaved subgrades to tolerances of plus or minus 1-1/4 inch (32 mm) and pavements and areas within building lines to plus or minus 1/2 inch (13 mm).
- J. Under pavements and walkways, place subbase course material on prepared subgrades and compact at optimum moisture content to required grades, lines, cross sections, and thicknesses.
- K. Under slabs-on-grade, place drainage fill on prepared subgrade and compact to required cross section and thickness.
- L. Allow testing agency to inspect and test each subgrade and each fill or backfill layer and verify compliance with requirements.
- M. Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.
- 3.2 DEWATERING
- A. General: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
- B. Removal: Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps,

suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

3.3 STORAGE OF EXCAVATED MATERIALS

- A. General: Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain. Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill.

3.4 EXCAVATION FOR STRUCTURES

- A. General: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.
- B. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.5 EXCAVATION FOR PAVEMENTS

- A. General: Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

3.6 BACKFILL AND FILL

- A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using specified materials.
 - 1. Under walks and pavements, use subbase material, satisfactory excavated or borrow material, or a combination.
 - 2. Under grassed areas, use satisfactory excavated or borrow material.
 - 3. Under steps, use subbase material.
 - 4. Under building slabs, use drainage fill material.
 - 5. Under piping and conduit and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation. Shape excavation bottom to fit bottom 90 degrees of cylinder.
 - 6. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.
- B. Backfill: Backfill excavations as promptly as work permits, but not until completion of following:

1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
3. Removal of concrete formwork.
4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
5. Removal of trash and debris from excavation.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3.7 PLACEMENT AND COMPACTION

- A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
- B. Substrate Density: When existing ground surface has a density less than that specified under Compaction for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.
- C. Placement: Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- D. Before Compaction: Moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- E. Adjacent to Structures: Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.
- F. Compaction: Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Architect if soil density tests indicate inadequate compaction.
 1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D 1557:

- a. Under structures, building slabs and steps, and pavements, compact top 12 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.
- b. Under lawn or unpaved areas, compact top 6 inches of subgrade and each layer of backfill or fill material at 90 percent maximum density.
- c. Under walkways, compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.

3.8 GRADING

- A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.
- B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:
 1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.
 2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
 3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2 inch above or below required subgrade elevation.
- C. Grading Surface of Fill under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2 inch when tested with a 10-foot straightedge.
- D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.9 EROSION CONTROL

- A. General: Provide erosion control methods in accordance with requirements of authorities having jurisdiction.

3.10 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

- B. Repair: Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

END OF SECTION 31000