

SECTION 11 6811

COMPOSITE PLAY STRUCTURES

EDIT NOTE: REFER TO THE STANDARD TECHNICAL DRAWINGS FOR TYPICAL PLAY STRUCTURE LAYOUTS FOR AGE GROUPS 2 TO 5 AND 5 TO 12.

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes composite play structures with integral shade structures as indicated on the drawings.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 03 2000: Concrete Reinforcing.
 - 3. Section 03 3000: Cast-in-Place Concrete.
 - 4. Section 05 0513: Hot-Dip Galvanizing.
 - 5. Section 31 2200 - Grading.
 - 6. Section 31 2313 - Excavation and Fill for Structures.
 - 7. Section 32 1319 – Site Concrete Work.
 - 8. Section 32 1816 - Playground Protective Surfacing.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM A36 – Standard Specification for Carbon Structural Steel.
 - 2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 3. ASTM A135 – Standard Specification for Electric-Resistance-Welded Steel Pipe.
 - 4. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

5. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
7. ASTM A513 – Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
8. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
9. ASTM A1023 – Standard Specification for Stranded Carbon Steel Wire Ropes for General Purposes.
10. ASTM B26 - Standard Specification for Aluminum-Alloy Sand Castings.
11. ASTM B108 - Standard Specification for Aluminum-Alloy Permanent Mold Castings.
12. ASTM B179 – Standard Specifications for Aluminum Alloys in Ingot and Molten Forms for Castings from All Castings Processes.
13. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
14. ASTM C109 – Standard Test Method for Hydraulic Cement Mortars (Using 2-in Cube Specimens).
15. ASTM C939 – Standard Test Method for Flow of Grout for Pre-Placed Aggregate Concrete (Flow Cone Method).
16. ASTM C1090 – Standard Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic-Cement Grout.
17. ASTM D2261 – Standard Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine).
18. ASTM D5034 - Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
19. ASTM D6112 - Standard Test Methods for Compressive and Flexural Creep and Creep-Rupture of Plastic Lumber and Shapes.
20. ASTM D6386 - Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.

21. ASTM D7803 – Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating.
 22. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 23. ASTM F594 - Standard Specification for Stainless Steel Nuts.
 24. ASTM F879 – Standard Specification for Stainless Steel Socket Button and Flat Countersunk Head Cap Screws.
 25. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.
 26. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
 27. ASTM F3125 - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
- B. The Society for Protective Coatings (SSPC):
1. Surface Preparation Standards.
- C. National Fire Protection Association (NFPA):
1. NFPA 701: Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- D. U.S. Consumer Products Safety Commission (CPSC):
1. Public Playground Safety Handbook.
- E. 2010 ADA Standard for Accessible Design.

1.03 SECTION DEFINITIONS

- A. Composite Play Structures: ASTM F1487 defines composite play structures as “two or more play structures attached of functionally linked, to create one integral unit that provides more than one play activity.
- B. Critical Height: CPSC Public Playground Safety Handbook defines critical height as “the fall height below which a life-threatening head injury would not be expected to occur.” Is the Standard measure of shock attenuation.

- C. Fall Height: ASTM F1487 defines fall height as “the vertical distance between a designated play surface and the protective surfacing beneath it.” The fall height of playground equipment should not exceed the critical height of the protective surfacing beneath it.
- D. Play Structure: ASTM F1487 defines play structure as “a free-standing structure with one or more components and their supporting members.”
- E. Transfer Point: ASTM F1487 defines transfer point as “platform along an accessible route of travel or an accessible platform provided to allow a child in a wheelchair to transfer from the chair onto the equipment.”
- F. Use Zone: ASTM F1487 defines use zone as “the area beneath and immediately adjacent to a play structure or equipment that is designated for unrestricted circulation around the equipment and on whose surface, it is predicted that a user would land when falling from or exiting the equipment.”

1.04 SUBMITTALS

- A. Shop Drawings: Layout plans and elevations indicating extent of playground equipment with playground surface systems. Indicate playground equipment locations, use zones, fall heights, extent of protective surfacing, and critical heights. Include two 3D renderings. Show footing layout, sizes, reinforcement, and concrete strength.
- B. Engineering Calculations: Submit structural calculations for the Division of the State Architect (DSA) approval. Engineer shall structure using the loads and procedures in accordance with:
 - 1. ASCE 7 – Minimum Design Loads for Buildings and other Structures.
 - 2. California Code of Regulations Title 24.
 - 3. AWS D1.1 - Structural Welding Code - Steel.
 - 4. AISC 360 – Specification for Structural Steel Buildings.
 - 5. ACI 318 – Building Code Requirements for Structural Concrete.
- C. Product Data: For each type of product specified. Include construction details, material descriptions, dimensions of individual components, profiles, and finishes. Submit a list of each component of the play structure.
- D. Maintenance Manuals: Containing the maintenance instructions and describing the recommended preventive maintenance, inspection frequency and techniques, periodic adjustments, lubricants, and cleaning requirements.

- E. OWNER's Office of Environmental Health and Safety (OEHS) Approval: Installation of composite play structures and horizontal bars shall not be started until detailed plans and product data are approved by the OEHS. OAR will submit drawings and product data to the OEHS for approval.
- F. Certificate or Testing Report demonstrating shade fabric conforms with NFPA 701.
- G. Samples: Submit complete sets of colors representing manufacturer's full range of available shade fabric colors for ARCHITECT's selection.

1.05 QUALITY ASSURANCE

- A. Provide playground equipment complying with or exceeding the requirements in CPSC, "Handbook for Public Playground Safety." Label play structures with warning label and manufacturer's identification in accordance with ASTM F1487.
- B. CPSI (Certified Playground Safety Inspector) inspection of composite structures prior to installation of surfacing materials to ensure that applicable requirements are met.
- C. Composite play structures shall be designed to provide challenging play activities by age group. Design playground equipment to be age appropriate for the age group designated to use it.
- D. Equipment Identification: Identify playground equipment with attached and durable labels stating the age-group that the equipment is designed to accommodate. Provide permanent WARNING labels and manufacturer's identification labels, ASTM F1487. Submit a list to include part numbers of furnished play event and equipment materials and components.
- E. Manufacturer Qualifications: Play structures similar to those furnished must have been installed in a minimum ten sites and been in successful service for a minimum five year calendar period. Submit name of the owner or user; service or preventive maintenance provider; date of the installation; point of contact and telephone number; and address for ten sites.
- F. Installer Qualifications: Installer shall be certified by the manufacturer for training and experience installing the play structure. Submit the installer's company name and address, and training and experience certification.
- G. Manufacturer's Representative: The manufacturer's certified playground safety inspector or the manufacturer's designated certified playground safety representative shall supervise the installation and adjustment of the play events and equipment to verify the installation meets the requirements of the manufacturer, this specification, and the referenced standards. Submit the individual's name, company name and address, and playground safety training certificate.

1.06 WARRANTY

- A. Manufacturer shall provide OWNER a Certificate of Insurance AA rated for a minimum one million dollars covering both product and general liability.
- B. Five years on the structural integrity of the play structure from date of substantial completion, failures include but are not limited to:
 - 1. Deterioration of metals, finishes, and other materials beyond normal weathering.
 - 2. Deterioration of shade fabric including seam failure.

1.07 COORDINATION

- A. Coordinate construction of equipment use zones and fall heights during installation of playground equipment with installation of protective surfacing specified in Section 32 1816.

PART 2 – PRODUCTS

2.01 PLAY STRUCTURE

- A. Manufacturer:
 - 1. BCI Burke Company, LLC.
 - 2. Playcraft Systems.
 - 3. Landscape Structures Inc.
 - 4. Miracle Recreation.
 - 5. Playworld Systems Inc.
 - 6. Equal.

EDIT NOTE: SELECT AGE GROUP APPLICABLE TO PROJECT; DELETE UNUSED OPTION.

- B. Age Group:
 - 1. 2 to 5 years.
 - 2. 5 to 12 years.

2.02 MATERIALS

- A. Metal components shall have factory-drilled holes and be corrosion resistant. Components shall be free of excess weld and spatter.
- B. Steel:
 - 1. Tubular components shall comply with ASTM A53 grade C, ASTM A135, ASTM A500 grades B or C, or ASTM A513.
 - 2. Plates and other non-tubular components shall comply with ASTM A36, or ASTM A572.
 - 3. Bolts, nuts and washers shall comply with ASTM F3125, ASTM F593 or ASTM F594. Anchor Bolts set in concrete shall comply with ASTM F1554.
 - 4. Welding: Shall conform to AWS D1.1 Structural Welding Code - Steel.
- C. Extruded aluminum components shall be type 6061-T6, 6062-T6, or 6063-T6, and shall conform to ASTM B221. Cast aluminum alloy shall conform to ASTM B179, ASTM B26, and ASTM B108.
- D. Hardware:
 - 1. Fasteners shall be corrosion resistant.
 - 2. Fasteners, connectors, and covering devices shall not loosen or be removable without the use of tools.
 - 3. Fasteners, connectors, and covering devices that are exposed to the user shall be smooth and shall not be likely to cause laceration, penetration, or present a clothing entanglement hazard.
 - 4. Lock washers, self-locking nuts, or other locking means shall be provided for nuts and bolts to protect them from detachment.
 - 5. Hardware in moving joints shall be secured against unintentional or unauthorized loosening.
- E. Rails, Loops, and Hand bars shall consist of corrosion resistant aluminum, hot-dip galvanized steel or powder-coating over hot-dip galvanized steel.
- F. Plastic:
 - 1. Plastic panels shall be molded of ultraviolet (UV) and color stabilized polyethylene or nylon with a minimum 3/16 inch thickness, ASTM F1487. Edges shall be a minimum 3/16 inch radius.
 - 2. Plastic windows shall be flat or molded into a bubble shape, consisting of clear polycarbonate plastic a minimum 3/16 inch thick before forming in accordance

with ASTM D1248. Material shall be shatterproof and resistant to crazing, cracking, or fogging.

3. Fabricate plastic components with a maximum 1/4 inch deflection or creep in any member, ASTM D6112. Submit results of individual component and assembled unit structural integrity test; creep tolerance; deflection tolerance; and vertical load test results.

G. High Density Polyethylene:

1. Mold components of ultraviolet (UV) and color stabilized polyethylene consisting of a minimum 75 percent plastic profile of high-density polyethylene, low-density polyethylene, and polypropylene raw material. The material shall be non-toxic, have no discernible contaminants such as paper, foil, or wood, and contain a maximum 3 percent air voids. The material must be free of splinters, chips, peels, buckling, and cracks and be resistant to deformation from solar heat gain. Material shall have factory-drilled holes. Components with extra holes not filled by hardware or covered by other components will be rejected. The material shall not be painted.
2. Panels shall be a minimum 1/4 inch thick; exposed edges shall be smoothed, rounded, and free of burrs and points; and the material shall be shatterproof and resistant to fading, cracking, or fogging.
3. Structural Component Recycled plastic materials shall not be used as load bearing structural members: framing, beams, columns or posts.

H. Steel Finish:

1. Structural and miscellaneous steel components, except items embedded in concrete, shall be hot-dipped galvanized after fabrication per ASTM A123 and Section 05 0513 Hot-Dip Galvanizing. Hardware fabrications shall be galvanized in accordance with ASTM A153. Remove tailings and sharp protrusions formed as a result of the hot-dip process; edges shall be burnished.
2. Hot-dipped galvanized components to be painted shall not be water or chromate quenched. Surfaces of hot-dipped galvanized steel components shall be prepared in accordance with ASTM D7803 or ASTM D6386 and referenced SSPC surface preparation standards. Powder-coated surfaces shall receive electrostatic zinc primer prior to painting. Powder coating shall be electrostatically applied and shall be oven cured.

I. Shade: Post pyramid structure with shade membrane attached by cable along the perimeter.

1. Shade fabric:

- a. Fabric shall be made of a UV stabilized high-density polyethylene. Mesh shall be knitted with monofilament and tape yarn filler to ensure that material will not unravel if cut.
 - b. Fabric shall be flame retardant in accordance with NFPA 701.
 - c. Fabric shall achieve an ultimate tensile capacity when tested in accordance with ASTM D5034:
 - 1) Warp direction of 100 lbs. per inch at 66% maximum elongation.
 - 2) Fill direction of 50 lbs. per inch at 33% maximum elongation.
 - 3) Across seam of stitching of 80 lbs. per inch at 80% maximum elongation.
 - d. Fabric shall achieve an average tearing strength when tested in accordance with ASTM D2261.
 - 1) Warp direction: 14 lbs.
 - 2) Fill direction: 11.5 lbs.
2. Stitching & Threading:
- a. Corners shall be reinforced and edges hemmed. Sewing threads shall be double stitched.
 - b. Thread shall be GORE Tenara Sewing Thread manufactured from 100% expanded PTFE (Teflon); mildew resistant exterior approved thread. Thread shall meet or exceed the following:
 - 1) Flexible temperature range.
 - 2) Very low shrinkage factor.
 - 3) Extremely high strength, durable in outdoor climates.
 - 4) Shall resist flex and abrasion of fabric.
 - 5) Unaffected by cleaning agents; acid rain, mildew, salt water and rot resistant, unaffected by most industrial pollutants.
 - 6) Treated for prolonged exposure to the sun.
3. Cable: For fabric attachment use galvanized cable per ASTM A1023. Cable shall be tensioned to 250 lbs. minimum. Cables shall be fed through the fabric

sleeves and tensioned until the fabric panels reach a taught appearance. Provide hot-dip galvanized fittings for securing cable.

- J. Concrete: Normal-weight concrete with a minimum 28-day compressive strength of 3,000 psi and 3 to 5 inch slump. Concrete shall be in conformance with ACI 318 and the following Sections:
 - 1. 03 2000 Concrete Reinforcing.
 - 2. 03 3000 Cast-in-Place Concrete.
 - 3. 32 1313 Site Concrete Work.
- K. Non-shrink Grout: Shall have a minimum compressive strength of 5,000 psi and shall comply with the requirements of ASTM C109, ASTM C939, ASTM C1090, as applicable.
- L. Field applied primers, paints, adhesives, and sealants shall be OEHS approved.

2.03 PLAY STRUCTURE FABRICATION

- A. Provide standard sizes and weights as indicated or required to comply with ASTM F1487. Factory drill components for field assembly. Provide complete play structure, including supporting members and connections, means of access and egress, designated play surfaces, barriers, guardrails, handrails, handholds, and other components.
- B. Play event configuration, platform height, fall height, and maximum equipment height:
 - 1. Age Group 2 through 5 years of age: maximum 48 inches above the finished elevation of the protective surfacing.
 - 2. Age Group 5 through 12 years of age: maximum 72 inches above the finished elevation of the protective surfacing.
- C. Steel and Iron Components: Galvanized and color coated. Bare metal steel or iron components are not permitted, unless stainless steel.
 - 1. Color-Coated Pipe and Tubing for Main Frame: Powder coat baked enamel finish.
 - 2. Color-Coated Pipe and Tubing for Component Frames: PVC-coat or baked-enamel powder-coat applied to steel.
- D. Provide hardware as required for a complete installation of play structure. Fasteners shall be socketed and pinned tamperproof in design, stainless steel and conforming to ASTM F879.

- E. Provide signage indicating age group.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for Project site clearing, earthwork, surface and sub-grade drainage, and other conditions affecting installation.
- B. Do not begin installation before final grading for placing protective surfacing is completed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Verify that playground layout and equipment locations comply with the requirements for each type and component specified.

3.03 INSTALLATION, GENERAL

- A. Post and Footings:
 1. Excavation: Hand-excavate holes for posts and footings to dimensions, profile, spacing, and in locations indicated on Drawings, in firm, undisturbed or compacted subgrade soil. Level bearing surfaces with drainage fill, to required elevation.
 2. Install footing reinforcement per Section 03 2000.
 3. Post Setting: Install posts in concrete footing. Protect portion of posts above footing from concrete splatter. Install concrete per Section 03 3000 around posts and vibrate or tamp for consolidation. Verify that posts are set plumb or at the correct angle and are aligned and at the correct height and spacing. Brace posts in position during placement and finishing operations until concrete is sufficiently hydrated. Smooth tops of concrete footings and slope top surface for positive shedding of water.
- B. Anchor playground equipment securely, installed at locations and elevations indicated. Coordinate installed heights of equipment and components with installation of protective surfacing, Section 32 1816. Install equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Installation must be inspected and approved by certified playground safety inspector (CPSI) prior to installation of protective surfacing.

- C. Follow manufacturer's installation instructions when assembling and installing the equipment.

3.04 ADJUSTING AND PROTECTION

- A. Adjust movable playground equipment components to operate smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range.
- B. Protect the Work of this section until Substantial Completion.

3.05 CLEANING AND CLEANUP

- C. After completing playground equipment installation, inspect components. Remove spots and dirt. Repair damaged finishes to match original finish or replace component.
- D. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION