3 PLAY EQUIPMENT

3.1 GENERAL REQUIREMENTS

3.1.1 Scope

1 **Inclusive Scope**. Work covered under this Part consists of furnishing all management, labour, equipment, materials, products and accessories and testing necessary for the installation of all play equipment, whether bespoke or proprietary, as specified and contained in the Project Documentation. These shall include age-appropriate equipment for:

(a) Play spaces, for ages 02-06 years and 07-12 years. In addition, a special nested zone for toddlers up to 2 years where indicated in the Project Documentation.

(b) Water Play Areas, for all age groups.

(c) Skate parks

2 **Excluded Scope**. The following are excluded from work under this Part:

(a) Amusement Rides. That are specialized systems and operated as highly supervised rides [e.g., roller coasters, Ferris wheels] as used in commercial theme parks.

(b) Playfields, Kick bouts and Game courts as used for regulation or informal sports and ball games.

(c) Water Features [e.g., interactive fountains]

3.1.2 Related Sections.

1 The Contractor shall ensure full coordination with all other related trades, disciplines and adjacent work onsite as contained in other Parts of this Sec 27, and to the following:

Section 4 Foundation and Retaining Structures
Section 5 Concrete
Section 8 Drainage Works
Section 9 Mechanical and Electrical Equipment
Section 16 Structural Steelworks
Section 17 Metalwork
Section 19 Plumbing Work
Section 28 Landscaping

3.1.3 References

1 The play equipment shall conform with the following international standards for safety and materials, not necessarily limited to the following:

2 General

ASTM F181 .....Standard Safety Specifications for Drawstrings on Children's' Outerwear

ASTM F1487 .....Standard Consumer Safety Performance Specification for Playground Equipment for Public Use

ASTM F1918 .....Standard Safety Performance Specifications for Soft-Contained Play Equipment

ASTM F2373 .....Standard Consumer Safety Performance Specification for Public Use Play Equipment for Children 6 Months through 23 Months

ASTM F3351 .....Standard Test Method for Playground Surface Impact Testing in Laboratory at Specified Test Height

EN 1176 .....Playground equipment and surfacing-

Part 1.....General Safety Requirements and Test Methods

Part 2.....Additional Specific Safety Requirements and Test Methods For Swings

Part 3.....Additional Specific Safety Requirements and Test Methods For Slides

Part 4.....Additional Specific Safety Requirements and Test Methods For Cableways

Part 5.....Additional Specific Safety Requirements and Test Methods For Carousels

Part 6.....Additional Specific Safety Requirements and Test For Rocking Equipment

Part 7.....Guidance for Installation, Inspection, Maintenance And Operation

Part 10.....Additional Specific Safety Requirements and Test Methods for Fully Enclosed Play Equipment

Part 11.....Additional Specific Safety Requirements and Test Methods for Spatial Network

CAN/CSA Z614-98.....Guidelines on Children's Play spaces and Equipment

CPSC .....Guidelines for Designing, Constructing, Operating and Maintaining Public Playgrounds

EN 1176 .....Playground Equipment and Surfacing

TUV .....European Standards for Play Equipment

IPEMA .....International Play Equipment Manufacturer Association Water Play Areas.

3 The following relevant references shall apply for wet-play areas.

ASTM F2376.....Practice of Classification, Design, Manufacture, Construction of Water Slide Systems

ASTM F1487 .....Standard Consumer Safety Performance Specifications for Playground Equipment for Public Use

ASTM 2461 .....Standard Practice for Manufacture, Construction, Operation and Maintenance of Aquatic Play Equipment

ANSI/I AF-9 .....American National Standards for Aquatic Recreation Facilities

EN 649 .....Abrasion Resistance (ISO 10581 Resilient floor coverings — Homogeneous poly(vinyl chloride) floor covering — Specifications)

EN 1069-1 .....Water slides - Part 1: Safety requirements and test methods

EN 1069-2:2017 .....Water slides - Part 2: Instructions

EN 13451 .....Swimming Pool Equipment

EN 13553 .....Water Tightness

EN 15288-1 .....Swimming pools for public use - Part 1: Safety requirements for design

EN 15288-2 .....Swimming pools for public use - Part 2: Safety requirements for operation

ISO 14726 .....Color Coding for Technical Installation

ISO 11731 .....Water Quality, Detection and Enumeration of Legionella

ISO 7010 .....Graphical symbols — Safety colours and safety signs — Registered safety signs

4 Safety Considerations of Surfaces. The following relevant references shall apply for safety considerations for contact surfaces:

ASTM F1292 .....Standard Specification for Impact Attenuation of Surface Systems under and Around Playground Equipment

ASTM F1951 .....Standard Specification for Determination of Accessibility of Surface Systems under and Around Playground Equipment

ASTM F2075 .....Standard Specification for Engineered Wood Fiber for Use as a Playground Safety Surface Under and Around Play-ground Equipment

ASTM F2223 .....Standard Guide for ASTM Standards on Playground Surfacing

ASTM F2479 .....Standard Guide for Specification, Purchase, Installation and Maintenance of Poured-In-Place Playground Surfacing

EN 1177 .....Impact attenuating playground surfacing - Methods of test for determination of impact attenuation

5 Skate parks. The following relevant references shall apply for safety and performance considerations for skate parks:

ASTM F2334 .....Standard Guide for Above-Ground Public-Use Skate park Facilities, 2017 edition or latest

ASTM F2480 .....Standard Guide for In-ground Concrete Skatepark

6 Universal Accessibility. The following shall apply to the design and construction of play areas that are inclusive and meet accessibility guidelines for the handicapped and mobility-challenged:

ADA Guide, Accessibility Guidelines for Play Areas

3.1.4 Technical Product Literature

1 The Contractor shall provide manufacturer-supplied technical literature [e.g. Images, specifications, standard details, installation instructions and diagrams, maintenance instructions, and recommendations for each piece of equipment or system, and its associated key components and materials used.

3.1.5 Quality Assurance

1 **Compliance**. Play equipment and structures shall conform to the relevant requirements of the respective standards.

2 **Experience**. Work under this Part shall be undertaken by an experienced subcontractor specializing in the installation of play equipment and structures. Work shall be performed and supervised at all times by qualified personnel.

3 **Certificates**. All equipment and associated products, materials and accessories shall be shipped with certificates attesting to the safety parameters and quality of the equipment.

4 **Quality**. The Contractor shall ensure that the following quality assurances shall be met at the minimum:

(a) Installers' Qualifications. Required products shall be as in the Project Documentation and shall be installed to the manufacturer's instructions and supervised by its representative.

(b) Testing. Each play equipment shall be assembled and tested at Contractor's or manufacturer's facility, whether offsite or onsite as directed by the Engineer. Each play equipment shall be tested for proper functioning prior to final installation.. Confirm that product meets specifications and quality control standards prior to shipping. The Engineer reserves the right to test any material at the Contractor's cost.

5 Rejected Products, Assemblies and Materials. The Engineer shall reject any such which are non-compliant for any of the following, as a minimum:

(a) Non-Conforming to the requirements in the Play Equipment Schedules of the Project Documentation, or are an unauthorized substitution.

(b) Manufactured Components which exhibit any visible signs of defects and inferior workmanship [e.g. scratches, dents, blisters, tears, fissures and holes, deformities, fading or flaking of paints and finishes, rust and corrosion]

(c) Natural Components such as wood which exhibit any visible signs of defects and inferior workmanship [e.g. cracking, fissures and holes, shrinkage, dents, splinters, insect infestations, stains and discoloration]

(d) Missing Fittings or Parts, which do not allow a complete assembly

(e) Missing Assembly Instructions, which do not allow a complete assembly and testing protocols

(f) Integrity of Delivery which have equipment and products delivered in unlabeled, wet, open, unsealed packaging and not in their original packaging

3.1.6 Submittals

1 Catalogs and Technical Product Literature. Prior to commencing any work, the Contractor shall submit all manufacturers' catalogue data and the relevant technical literature of the specified equipment or assembly. The technical literature shall contain adequate technical information not necessarily limited to :

(a) Safety zones

(b) Dimensions

(c) Fall heights, and corresponding recommended thicknesses of resilient surfacing

(d) Elevation, section and isometric drawings

(e) Materials, finishes and colors specifications as indicated in the Equipment Schedules of the Project Documentation

(f) Installation details, diagrams and instructions

(g) Connection and anchoring details

2 Manufacturers' and/or Suppliers' Certifications. Prior to commencing any work, the Contractor shall submit relevant certifications, including those from independent third-party laboratories that attest to the quality of products and assemblies that are not necessarily limited to safety and sustainability.

3 The Contractor shall provide manufacturer-supplied certification that the materials meet or exceed required specifications.

(a) Toxicity rating of materials and finishes [e.g. VOCs, chromated copper arsenate]

(b) Durability rating, as demonstrated record of durability evident from similar installations in similar climates [e.g. corrosion-resistance, impact-resistance, UV-resistance]

(c) Flammability or combustibility rating

(d) Thermal comfort [e.g. as a measure of coefficient of heat transfer]

(e) Sustainability of wood source [e.g. Forest Stewardship Council]

4 Authority Approvals. Prior to commencing work, the Contractor shall ensure that all landscape materials, products and accessories for work under this Part have met any of the relevant authority approvals affixed.

5 Method Statements. The Contractor shall submit his method statements as required for work or parts of the work in this Part for the approval of the Engineer.

6 Procurement Schedules. The Contractor shall submit Procurement Schedules within fourteen (14) days of the start of the Contract. This schedule shall identify the source of equipment covered by work in this Part.

7 Weekly Work Schedules. The Contractor shall submit a weekly work schedule for approval before work is started. The schedule shall identify tasks to be completed on a weekly basis and the anticipated schedule for completing the tasks. The Contractor will then modify and submit the schedule on a weekly basis identifying tasks completed, tasks to be completed, problems encountered and recommendations additional to a monthly report contains all the above in details.

8 'As-Built' Record containing a true and accurate record of the work installed in drawings which record the types, locations and numbers of equipment installed onsite. The 'as-built' record shall be in both editable electronic formats of CAD and PDF, including a legible hardcopy to the required number of sets in both A2 and A1 formats.

9 Any approved modifications to the original plans and drawings shall be clearly marked and tagged and be made an official part of the 'As-Built' Record.

10 An Operations and Maintenance [O+M] Manual is to be provided by the Contractor, well organized into Sections or Volumes. Instructions shall be furnished for year-round care of installed work under a maintenance contract, and subsequently to be followed by the Owner. The Manual at the minimum shall contain:

(a) Installation Instructions. Explicit installation instructions shall be provided which will include a detailed plan and elevation views with supporting anchoring and footing drawings with written instructions to assure proper installation of the equipment. The provided installation and maintenance instructions shall be project-specific, containing component information of each equipment.

(b) Maintenance Guidelines and Inspection Checklists particular to each equipment.

(c) Spare Parts List, particular to each equipment and its related parts and catalog, Qatari local supplier, plan layouts and foundation or footing design drawings.

(d) Maintenance Schedules, particular to each equipment and covering the entire play areas of the park, specifying the procedures, frequency to be performed within the maintenance period.

3.1.7 Job Conditions

1 Coordinate with All Related Trades and Adjoining Work. The Contractor shall coordinate installation of play equipment with all related works, and shall be aware of the precedence of all such related works in relation to work under this Part.

2 Adverse Conditions. Do not install products under adverse environmental conditions or outside of the manufacturer's absolute limits [e.g. temperature, humidity, ventilation]

3 Protect Units during construction or installation, including all components from damage at all times.

3.1.8 Warranties.

1 All equipment and assemblies supplied and installed shall come with any of a combination of the following warranties as a minimum, unless otherwise indicated in the Project Documentation.

2 Limited Lifetime Warranty on all metal posts, fastening mechanisms, clamps, beams and caps against structural failure due to corrosion or deterioration from exposure to weather, or manufacturing defects. This applies to all metal posts, beams and arches against structural failure due to material or manufacturing defects.

3 Limited Fifteen [15] Year Warranty on all plastic components, coatings, all metal components, main support materials, and assemblies against structural failure due to corrosion, material or manufacturing defects. This applies to all metal components not covered by a Limited Lifetime Warranty.

4 Limited Ten [10] Year Warranty on all concrete works due to natural deterioration, material or manufacturing defects including steel play assembly components and fittings [eg. railings, loops, and rungs] against structural failure caused by defective materials or defective workmanship.

5 Limited Eight [8] Year Warranty for fabrics against failure from significant fading, deterioration, breakdown, mildew, outdoor heat, cold, or discoloration. This warranty is limited to the design loads as stated in the Manufacturer's specifications found in the Project Documentation.

6 Limited Five [5] Warranty shall apply to the following against manufacturing defects, corrosion and natural deterioration ::

(a) Cables, ropes and net climbers

(b) Glass-fiber reinforced concrete [GFRC] components and assemblies

(c) Swing seats and swing ropes, climber handholds or ladders

(d) Rocking equipment [e.g. seesaws, spring riders]

(e) Hydraulic cylinder assemblies

(f) Wood components, against splitting, cracking, and insect infestation

3.2 SHIPPING, DELIVERY, STORAGE AND HANDLING

3.2.1 Shipping and Delivery

1 Record of Deliveries. Logs of all equipment and assemblies shipped and deli-vered onsite shall be kept and accurately logged and maintained in an organized records of deliveries, containing details of items and delivery dates and times, including those which had been rejected for removal off the site.

2 Inspections

(a) **Pre-Shipping Inspections.** Prior to handling and shipping, The Contractor shall be responsible for having inspected and ensuring the correctness of the type of equipment or assembly, its quality, their proper labelling and the manufacturer's product identification. The Engineer shall be notified prior of the delivery schedules in advance so inspections upon arrival at the Site can be arranged.

(b) Store equipment and assemblies in their original unopened packaging until ready for inspection by the Engineer, and their subsequent installation onsite.

(c) **Non-Waiver of Inspections.** Inspections of equipment and assemblies prior to shipping does not constitute a non-waiver of inspections of the same upon delivery onsite.

(d) **Rejected Deliveries Onsite.** All delivered equipment and assemblies that have been deemed non-conforming and unacceptable shall be segregated and removed from the Site immediately. The Engineer reserves the right to reject any that do not meet the quality requirements of the Project Documentation.

3.3 PRODUCTS, ASSEMBLIES AND MATERIALS

3.3.1 General Requirements.

1 All products, assemblies and materials shall be durable, fit-to-purpose, structurally sound and suitable for safe play. Provide equipment as specified in the Play Equipment Schedules and plans and details of the Project Documentation.

3.3.2 General Safety Features.

1 Other than the specific safety features contained in various Clauses of this Part, the following general safety features not necessarily limited to the following, shall apply to avert any injury or entrapment.

2 Welded Joints shall be ground smooth, free of burrs and spatters

3 Surface Textures shall be smooth, free of projections, blisters, flaking, cracks, fissures, gaps, splinters or sharp edges

4 Thermal Comfort. Heat-absorbing metal surfaces shall not be used in slides. Where used as railing, grab rails or rungs, these shall be coated to mitigate against burn injuries.

5 Inclined Surfaces [Ramps] with a Constant Angle shall have walking surfaces slip-resistant

6 Corners, Edges or Projecting Parts over 8mm shall have a 3mm radius edges

7 Segmented Assembles [e.g., slide chutes], shall have no air gaps

8 No Crushing or Shearing points

9 Shock Absorption [e.g. rocking items]. Where equipment comes to a stoop, the points of contact shall be cushioned or dampened

10 Connections and Anchoring shall be tamper-proof and shall not come loose unintentionally or by unauthorized removal

11 Coatings and Finishes shall be non-toxic, free from flaking and blisters

3.3.3 Substitutions

1 shall only be made when an equipment, assembly or product as specified, is not commercially nor practically obtainable and the Engineer authorises a change order providing for use of the nearest equivalent obtainable.

3.3.4 Equipment Capacities

1 [e.g. maximum allowable use in number of persons, weight loading in kg, operating flow rates] for each play equipment shall be stated including safety factor according to the Manufacturer's recommendations. Capacities shall be calculated based on the number of simultaneous activities and the maximum number of persons the equipment can withstand.

2 Allowable Tolerances. Equipment rated for younger and age groups shall also be able to withstand occasional use by adults.

3 Instructional Signage, Bespoke or Manufacturer's Standard. Capacity limits shall be clearly visible in instructional signage, in English and Arabic, either integrated with the equipment or as stand-alone signage element. Design of the signage shall match the overall theme of the equipment

3.3.5 Metal Components.

1 All metal components and fittings used shall be materially compatible in their assembly and installation to avoid galvanic reactions that create corrosion. They shall be structurally sound, of uniform thickness, free of dents, scratches, cracks and fissures, holes, excess welds and spatters.

2 Disallowed Material. Black steel shall not be used in any equipment.

3 Posts, Steel. Components using steel posts shall, at the minimum, be:

(a) Material of steel tubing shall be cold rolled,

(b) Corrosion Treatment. Steel tubing shall be hot-dipped galvanized.

(c) Welds of tubing shall be electric resistance.

(d) End-cuts of tubing shall be uniformly coated with a corrosion-resistant coating

(e) Post-ends shall be end-capped of die-cast construction, to be secured with the correct fittings, with color and finish to match post finish

4 Posts, Aluminum. Components using aluminum posts shall, at the minimum, be

(a) Support Posts and Sleeves. aluminum tubing shall an all-welded assembly fabricated of 6061-T6 extruded seamless aluminum alloy tubing for support post and sleeves

(b) Architectural Parts. Aluminum tubing shall an all-welded assembly fabricated of 6063-T4 extruded seamless aluminum alloy tubing for architectural parts.

(c) Post-ends shall be end-capped of die-cast construction, of cast from 369.1 aluminum alloy and powder coat finished to match the post color

5 Infill Panels, Aluminum Anodized. These shall be anodized aluminum decorative panels to the dimensions, textures, patterns and design according to the Manufacturer's specifications.

6 Decking, Steel. All decking components shall have the following, as a minimum

(a) Material shall be manufactured from a single piece of low-carbon 12 gauge minimum nominal thickness of 2.5mm [.105 in] sheet steel conforming to ASTM A-569.

(b) Construction. Perforated sheet steel shall be flange-formed and edge-reinforced as necessary for structural durability.

(c) Perforations on the standing surface shall not exceed a nominal 8mm 5/16 in] diameter.

(d) Assembly. All decks sides shall be flush with the outside edge of the supporting posts. Protrusions are not acceptable.

(e) All decks shall have minimum four [4] slots along each face to accommodate face-mounting of components.

(f) Coating. All decks shall be supplied and installed as fully polyethylene- coated components to the required colors and finishes

7 Handrails and Guardrails, where associated with inclines and ramps as indicated in the Project Documentation shall be between 600mm-850mm above finish paving level [FPL} and shall meet the following :

(a) Guardrails shall be 600mm high from the first step

(b) Grasp and Grip. Allow better grasp and grip by having rail at a minimum 16mm and maximum 45mm diameter

8 Hardware and Fittings. All play equipment and assemblies shall come supplied complete with the manufacturer's required corrosion-resistant hardware and fittings These shall have smooth surfaces such that these do not pose a risk to injury or hazard [eg. lacerations, cuts, entrapping clothing] .

9 Unless otherwise indicated in details in the Project Documentation, the following requirements apply for fittings and hardware, not necessarily limited to the following.

10 Hardware in moving joints shall be secured against unintentional or unauthorized loosening.

(a) Primary Fasteners shall be of socketed and pinned, tamper-proof in design, either carbon steel plated with zinc/nickel and iridescent chromate finish or stainless steel type 18-8 grade as indicated in the Project Documentation.

(b) Stainless Steel Fasteners shall be type 18-8 grade stainless steel.

(c) Clamps shall die-cast from 369.1 aluminum alloy, and polyester powder-coated to matching colors of the adjoining assembly

(d) Ball Connectors, Aluminum Cast. Shall be versatile ball-and-socket clamping fitting, specially designed for fit-to-purpose use. It shall provide a minimum 28.91kN [6,500 lbs.] of climbing strength to hold each solid steel ball and a 60.32mm [2, 3/8 in] steel supporting arch in place at any angle.

(e) Lock Washers, Self-Locking Nuts and other locking means shall be provided for all bolts and nuts for protection against detachment. All bolts hall be capped with their appropriate nuts.

(f) S and C-Hooks shall all be closed, having no gap greater than 1mm

(g) Bearings and Bushings used in moving joints shall be self-lubricating or easy to lubricate.

(h) Tamper-Resistance for Miscellaneous Items. All bolts, screws and hard parts should be covered with shock absorbing materials. All such shall be tamper- resistant to keep playground safe from unwanted tampering.

(i) Maintenance-Only Access. All bolts, flange nuts and screws shall be operable only by maintenance crews. For this purpose, the needed special tools [e.g. for pinned hex fasteners, assembly and maintenance] shall be provided by the Manufacturer.

11 Metal-Core Cables, Wire Ropes and Links shall be unstressed cable, with no splayed wires outside the ferrule. These shall be polyurethane-clad cables of the following construction, specific to the equipment:

(a) Core shall be aircraft-grade stranded galvanized steel wire rope to the diameters and number of wire strands as specified by the Manufacturer. Each strand shall be sheathed in synthetic or natural yarn.

(b) Dimensions. Outside finish diameters including coating shall be as per Manufacturer's specifications for the particular equipment.

(c) Wire-Connector Clips. Threads of these shall protrude less than 8mm

(d) Turnbuckles shall be enclosed, have a loop at each end and secured

(e) Coating shall be UV-resistant polyurethane coating

12 Chains, as used in swing assemblies, shall be a minimum Grade 8 steel, with corrosion-resistant coating having the minimum performance criteria:

13 Material shall be a minimum Grade 8 steel, with a strength equivalent to a minimum Grade 30 for low-carbon steel

14 Thickness shall be a minimum nominal gauge of 6.4mm [1/4 in]

15 Working Load Limit shall be a minimum 590kg [1,300 lbs.]

16 Opening Dimensions of individual links at 8.6mm in any one direction, connecting links between chains must have openings less than 8.6mm or over 12mm.

17 Other Ropes. These ropes attached to kinetic play equipment [e.g. swings, climbers] shall meet the following minimum performance criteria.

(a) Swinging Suspended Ropes, Fixed at One End. Ropes shall not form loops, and not combined with swings in the same bay shall be:

(i) Less than 2m Long, shall be over 600mm distance from static parts, and over 900mm distance from swinging parts

(ii) 2m-4m Long, shall be 1,000mm from any other part or component

(iii) Diameter shall be a minimum 18mm and maximum 45mm according to the Manufacturer's specifications for the particular equipment

(b) Climbing Ropes. These shall be anchored at both ends and shall meet the following. When part of a net structure, ropes shall allow for safe grip requirements. :

(i) C-Probe shall be capable of insertion through any possible loop.

(ii) Diameter shall be a minimum 18mm and maximum 45mm according to the Manufacturer's specifications for the particular equipment

18 Space or Net Assemblies. These assemblies shall be to the configurations, sizes and dimensions indicated in the Play Equipment Schedules of the Project Documentation. These shall come supplied and installed with complete fittings [e.g. ball connectors, anchoring, links]. Its basic construction shall be, at the minimum, as follows:

(a) Material shall be six [6]-strand galvanized steel cable conforming to Clause 3.3.2 (6) of this Part, wrapped in nylon unless otherwise specified.

(b) Performance shall allow net cable to be flexible yet dimensionally stable, without sagging but flexible for hand gripping, footholds and all climbing activities.

19 Moving Parts. All moving parts that are not ropes or cables shall be self-lubricating self-contained closed-system construction.

20 Drainage Grates and Covers. For metal gratings and covers, refer to Clause 3.3.15-1 (d), (f), (g) and (h) for various metals.

21 Protective Coatings. Refer to Clauses 3.3.9 (1) and (2).

3.3.6 Plastic Components.

1 All plastic components [e.g. slides, tunnels, roof assemblies] shall be of high-impact resistance, durable UV-resistant, anti-static and color-fast construction.

2 Rotationally-Molded [Roto-Molded] Poly Parts. These shall meet the ASTM standards for melt index, material density, tensile strength, heat distortion temperature, flexural modulus, environmental stress and UV and crack resistance.

(a) Material shall be molded using prime compounded linear low-density polyethylene [LDPE]. Dry-blended or molded-in resins are not accepted.

(b) Performance, Tensile Strength. Parts shall be rated for a minimum nominal tensile strength of 17,237 KN per square meter [2500 psi] per ASTM D638.

(c) Thickness. Minimum wall thickness shall be a nominal 4.75 mm [3/16 in] to a maximum nominal 8.00mm [5/16 in]

3 Sheet Plastic Parts. These shall either be standard or custom-cut polyethylene components as used primarily for interactive play panels, tables, handholds and signs. These shall be free of sharp projections, burrs and cracks; and shall conform to the following, as a minimum:

(a) Material shall be molded high-density polyethylene [HDPE].

(b) Performance, Tensile Strength and Density. Parts shall be rated for a minimum tensile strength of 16,545 kN per square meter [2400 psi] per ASTM D638. Compression- molded products shall meet or exceed a density of 0.933g per cubic centimeter per ASTM D1505.

(c) Thickness. Minimum thickness shall be a nominal 2.00mm [3/4 in].

(d) Colors shall be color-fast to the colors and finishes indicated in the Project Documentation and to the Manufacturer's specifications.

(e) Combining two [2] colors shall be provided with laminated items with a nominal 1.75mm [.070" in] thick exterior layer over a nominal 15.5mm [.610 in] interior core of contrasting color.

4 Play Structure Enclosures. These shall either be standard or bespoke construction as indicated in the Project Documentation which shall meet the following minimum safety performance criteria:

(a) Visibility. Perforations and fenestrations on vertical surfaces shall be to the patterns as specified. Openings shall be such that these allow visibility from the outside as achieved by a minimum of 60-70% surface transparency. Openings shall be such that these do not constitute a fall hazard for children.

(b) Entrapments. Enclosures shall have no elements or protrusions that entrap hands, feet or clothing

(c) Heights of vertical panels shall be a minimum nominal height of 975mm [38 in].

5 Slide Chutes, Roof Elements and Infill Vertical Panels, as used in slide assemblies shall be non-metallic construction, except for supporting posts and platforms. Surfaces shall be smooth, free of surface imperfections that can cause injury [e.g. cuts, bruises, lacerations].

6 These shall be to the sizes, dimensions, configurations and colors as indicated in the Project Documentation.

(a) Segmented Chutes. Installation of segmented chutes shall be such that no

(b) Gaps are between segments that can entrap clothing or cause skin injury.

(c) Vertical Infill Panels, as installed in platforms shall conform to Clauses 3.3.4, (3) a, b and c.

7 Drainage Grates and Covers. For plastic and plastic-composite gratings and covers, refer to Clause 3.3.15 (c).

3.3.7 Concrete.

1 For related concrete work for structural elements [e.g. slabs, foundations, footings, beams and columns] and architectural finishes, refer to Section 5, Concrete.

2 Glass-Fiber Reinforced Concrete [GFRC]. These shall be either standard or bespoke components to the specified dimensions, finishes and colors where indicated in the Project Documentation. Components shall be UV-stabilized and fade-resistant.

3 Concrete Footings and Foundations. All play equipment with posts shall be structurally and securely anchored to concrete footings which shall be :

(a) Buried Footings. All footings shall be buried to a nominal 863mm [34 in] below finish paving level [FPL], unless otherwise specified.

(b) No Exposed Concrete Foundations or Footings are allowed. Foundation should be at least a nominal 200 mm [8 in] below finish paving level [FPL]

3.3.8 Wood Components, Natural.

1 All natural wood components shall be free of warps, bends, stains and discoloration, flaking, splits and cracks, splinters, rot, insect and fungi infestation. All wood shall be pressure-treated to preventing splitting, moisture intrusion and attack by insects or termites.

2 Wood Not Allowed. The following shall not be allowed for wood.

(a) Softwoods

(b) No Buried Wood. No wood shall be allowed for post footings nor shall wood Components be allowed to be buried or come into contact with the ground

(c) New Wood or Recycled Salvaged Wood [e.g. railroad ties, telephone poles] That had been treated with coal-tar oils [e.g. creosote] and contain pesticides

3 Suitability of Species. Components shall be to the types and species suited to the climatic conditions of Qatar and shall be to the sizes, dimensions, colors and finishes as indicated in the Project Documentation. Wood shall be wither naturally rot and insect-resistant or shall be treated with approved preservatives and coatings to avoid deterioration.

4 Timber Elements, as logs or planks used in balance beams, with weights of 25kg and over shall be, unless otherwise indicated in the Project Documentation:

(a) Ground Clearance shall be a minimum of 400mm from finish paving level [FPL]

(b) Allowable Movement for elements not rigidly fixed shall have an allowable sway of no more than 100mm in any direction

5 Preservatives and Treatments. Refer to Clause 3.3.10.

3.3.9 Protective Coatings, Metals.

1 Coatings to protect metal components shall be free of toxic substances [e.g. lead additives, PVC] and shall be of the types and color finishes as indicated in the Project Documentation.

2 Finishing, Powder-Coating. Electrostatic ally applied powder-coating shall conform to the following, as a minimum:

(a) Prior to Coating. Ensure that all components are free of burrs, holes and Excess welds and spatters

(b) Pre-Treatment. All parts shall be cleaned in a 6-stage pre-treatment process With hot phosphatizing bath and non-chrome seal for corrosion resistance.

(c) Super-durable Polyester Powder coats shall be applied to withstand the Demands of extreme heat, harsh climates, moisture and UV exposure.

(d) Application. Powder-coating shall be electrostatically applied and oven cured At 400 C0 with a minimum two [2] coats.

(e) Coat Thickness shall be a minimum 2mm, and an average of 4mm

(f) Quality Criteria. Powder-coating shall meet the ASTM quality standards and test requirements for hardness, flexibility, UV, impact and salt spray- resistance

3 Finishing: Polyethylene Coating. Where indicated in the Project Documentation, metal surfaces shall be coated with polyethylene coating to the required colors or transparency as specified. Ensure that all surfaces in contact with play [e.g. steps, decks, swing chains, handholds, pipe barriers, wheels, rings] are adequately coated.

(a) Pre-Treatment. Metal components for coating shall be cleaned in a hot phosphatizing pressure washer.

(b) Pre-Heating. All pinned parts shall be preheated prior to dipping liquid polyethylene.

(c) Priming. Metal components shall be primed prior to coating with a clear thermosetting solution.

(d) Thickness. Coat thickness shall be a minimum 8mm and maximum 10mm for all parts, except chains. Chains shall have a minimum 6mm thickness.

(e) Finish. Coatings shall have a textured finish.

3.3.10 Protective Coatings, Wood. Preservatives and treatments

1 shall conform to EN 351-1 and 351-2. Wood shall not contain the following toxic substances:

2 Preservatives and Treatments. Wood shall not contain the following toxic substances:

(a) Preservatives [e.g. creosote, pentachlorophenol, tri-butyl tin oxide]

(b) Coatings such as film-forming, non-penetrating stains [latex semi-transparent, latex opaque, oil-based opaque stains] shall not be used due to peeling and flaking.

3 Wood Bark, Wood Chip Mulch used as resilient surfacing shall not contain toxic preservatives [e.g., chromated copper arsenate] CCA.

3.3.11 Steps and Ladders shall all be safely accessible.

1 Ladders shall be evenly and uniformly spaced on-centers and shall be, at the minimum:

(a) Non-rotating

(b) Allow Safe Grasping and Grips, such that rungs shall be a maximum 60mm diameter, securely attached to handrails that are between 16-45mm diameters for easy gripping.

(c) Spacing. There should be a clearance behind the rung or step, when measured from the tread centerline, of more than 90mm

(d) Timber rungs shall be securely fixed against removal

(e) Ladder Sides may be higher than the platform or deck they are attached to.

2 Steps and Stairs, whether part of the pavement or integrated with the play assembly shall meet the following at a minimum:

(a) Three [3] Risers as a minimum, no single step is allowed

(b) Tread Depth shall be 110mm depth.

(c) Tread Gaps. A maximum 30mm tread gap between tread front and the back of the next tread

(d) Stairs Over 2.0m Vertical Height shall have intermediate landings at less than 2.0m intervals, the same width and be over 1,0m long. These shall change direction by 900 or be offset. On free-standing slides up to 2.50m height, no offset shall be allowed.

3.3.12 Shading Materials

1 shall be according to the types, materials, dimensions, patterns and colors as indicated in the Project Documentation, and may be any but not necessarily limited to the following:

2 Wood, Natural. Refer to Clause 3.3.8 in this Part.

3 Metal and Metal Composites. Refer to Sec 17, Metalwork

4 Shading Fabrics and Fibers. Refer to Part 7, Protective or Shade Cover Systems of Sec 27, External Works

3.3.13 Resilient Surfacing.

1 Surfacing for both play spaces and water play areas shall be any of the following as indicated to the applied and installed according to the extent, thicknesses [i.e. fall heights], and patterns colors as indicated in the Paving or Surfacing Materials [Hardscape] Schedule of the Project Documentation.

2 Surfacing Not Allowed. The following surfacing shall not be allowed due to either maintenance or safety issues.

(a) Resilient surfacing, in jointed tile or block format

(b) Sand, loose-laid, except in special play conditions or learning environments or as required in the Project Documentation

(c) Pea Gravel

(d) Wood Bark, Wood Chip Mulch used as resilient surfacing containing toxic preservatives [e.g., chromated copper arsenate] CCA.

3 Liquid-Applied Surfacing shall be a site-applied material meeting the following, as a minimum and complying with ASTM F-1292, ASNZ4422:1996 or EN1177. Unless otherwise specified in the Project Documentation, this shall be:

(a) Material shall be a liquid-applied polyolefin plastomer-based pebbles, combined with two [2] part aliphatic binders, using a water based epoxy or aromatic urethane primers for surfacing preparation. The resulting material is a seamless, hygienic paving surface having excellent slip-resistance, high chemical, ultraviolet [UV] and fading resistance, and have non-toxic substances.

(b) Thickness, Play spaces. Material for dry areas shall be porous, laid over an adequately engineered rubber attenuation layer or concrete subbase to a thickness of 8-10mm [approx. 3/8 in].

(c) Thickness, Water Play Areas. Material for wet areas shall be porous, laid over an adequately engineered concrete subbase to a thickness of 8-10mm [approx. 3/8 in]

4 Loose-Laid, Loose-Fill Surfacing shall be any approved material [e.g., wood bark, wood chips, shredded rubber mulch] complying with ASTM F1292 or ASTM F2075.

(a) Depth of Layer, Wood Bark and Wood Chips. Unless otherwise indicated in the Paving or Surfacing Materials [Hardscape] Schedule of the Project Documentation, apply to e build-up layer no less than 240mm deep.

(b) Allow compression of material over time due to use and weathering to approximately twenty-five [25%] percent of the fill volume.

(c) Depth of Layer, Shredded Rubber Mulch shall be applied to a minimum depth of 150mm.

(d) Guide to Maintaining Depth. Where equipment supports are in areas of loose-fill, provide clear, permanent marking guides on supports as an aid in maintaining the required depth of fill material.

(e) Edge Restraints shall be provided throughout the perimeter of areas designated for loose fill to contain the material.

(f) Universal Access. Do not use loose-laid, loose-fill surfacing for portions of the play spaces that are designated in the Project Documentation for universal handicapped access, compliant to ASTM F-1951.

3.3.14 Drainage Grates and Covers.

1 These shall be to the extent, sizes, dimensions materials, patterns and perforations, finishes and colors as indicated in the Project Documentation to be located within or at the edge of play spaces and water play areas. At the minimum, these shall be of modular units conforming to the following, consistent with manufacturer's recommendations.

2 All grates and covers shall come supplied and installed complete with all compatible fittings [e.g., nuts, bolts, grate frames, clamping flanges].

3 Materials shall be as indicated in the plans and details of the Project Documentation and shall include but not be limited to any of the following:

(a) Natural Stone shall be a type of stone with superior water impermeability, hardness, strength, chemical, corrosion and slip-resistance suited for outdoor paving installations in either dry or wet areas. Stone grating units shall be perforated to the pattern indicated in the drawings.

(b) Artificial, Reconstituted or Composite Stone shall be a manufactured pre-cast stone with superior water impermeability, hardness, strength, chemical, corrosion and slip-resistance suited for outdoor paving installations in either dry or wet areas. Grating units shall be perforated to the pattern indicated in the drawings.

(c) Plastics, Plastic Composites shall be manufactured precast units meeting the same requirements as Clause 3.3.13(b), including fading, heat, chemical, corrosion and UV-resistance.

(d) Cast Iron shall be foundry-grade castings of uniform quality, free from blow holes, shrinkage defects, swells, cracks or other defects. These shall be free of fins, burrs, slag and spatters. Cast iron shall be as indicated in the Project Documentation and shall either be:

(i) gray Cast Iron, for pedestrian-rated environments conforming to ASTM A48-83 CLASS 35

(ii) Ductile Cast Iron, where occasionally heavy loading at the perimeters or edges of the play areas may be occasionally subjected to. These shall conform to ASTM A536-80 grade 65-45-12.

(e) Stainless Steel shall be 316 grade, pickle-passivated treated and electro polished to the required colors in the Project Documentation.

(f) Galvanized steel

(g) Cast Aluminum shall be of uniform quality, free from blowholes, shrinkage defects, swells, cracks or other defects. Casting will be free of fins, burrs, slag, and spatters. Cast aluminum shall be alloy 319 and meeting ASTM B-26 in be natural sand-cast finish.

4 Special Units. Where indicated or the design intent requires in the Project Documentation, provide and install the required angle, corner or radius units.

5 Finish Surface Levels shall be flush and level to the surrounding Finish Paving Levels [FPLs], such that these shall not be a trip hazard or cause any entrapment of footwear. No exposed screws, bolts and nuts or protrusions shall be allowed.

6 Secure Installation over their corresponding trench drains or area drains shall allow a full fitted match to drainage fixtures and shall be securely fitted as tamper-proof [eg. locking bars].

7 Perforations and Slots to the required patterns shall allow easy drainage yet shall not be a cause of finger or footwear entrapment. Holes and slots shall be between 8mm-10mm wide or in diameter.

8 Direction of slotted openings shall be perpendicular to the direction of travel.

9 Universal Access. Grates and covers shall allow easy walk-over for universal access [e.g., handicapped, mobility-challenged and the elderly].

3.3.15 Water Play Equipment and Assemblies

1 shall be to the units or types, numbers, dimensions, materials, colors and finishes as indicated in the Play Equipment Schedules of the Project Documentation. These shall be supplied and installed as fully functional, age-appropriate equipment as intended in the manufacturer's technical product information and shall be provided and installed complete with all fittings and accessories.

2 Equipment and Assembly Types. The Play Equipment Schedules, apart from images shall, for each equipment, contain technically adequate material and operational performance information in the Project Documentation, not necessarily limited to the following, for the Engineer's approval.

(a) Age category

(b) Dimensions [e.g., heights, widths, diameters, angles]

(c) Elevation and plan drawings, to scale showing dimensions in (b) above, including any dimensioned detail drawings of special components.

(d) Splash or spray area or coverage, in square meters showing limits.

(e) Splash or spray heights, range of minimum and maximum

(f) Flow rates, in both l/m and g/m [e.g., indicate if dual for low and high-flow rates]

(g) Material types of key components

(h) Material finishes and colors

(i) Interactive features [eg. light, sound, water effects]

(j) Activators or actuators, manual or automated electronic sensing systems

3 Nozzles shall be easy to maintain, of high-grade engineered thermoplastic, corrosion-resistant construction of the required flow-rate ratings and able to deliver the range of spray or splash patterns and heights as intended in the Manufacturer's technical literature.

(a) Material shall be a rust and corrosion-resistant synthetic or composite material able to withstand continuous play and Qatar's climate.

(b) Installation, whether buried on-grade or post-mount, shall be flush clean to surrounding surfaces, without any protrusions.

4 Activators and Actuators shall be as specified for each interactive equipment. in the Project Documentation [e.g., pressure foot-pads, hand triggers, push-buttons, above-grade dials or wheels, electronic proximity sensors].

5 Where not integrated into the equipment or assembly posts, their locations and footprint size as stand-alone elements, whether as above-grade elements or integrated with the surface pavement shall be indicated in the detail drawings of the Project Documentation.

6 Anchoring shall be all flush to Finish Paving Level [FPL] as detailed in the Project Documentation. Flush-mounting of base shall be such the anchor bolts are low-profile, eliminating the need for toe-guards. Anchoring shall come supplied and installed complete with matching fittings and shall either be:

(a) Interim, allowing secure yet future ability to swap and exchange elements.

(b) Permanent, as embedded

7 Water Slides shall be according to the Manufacturer's specifications. The downslope end of the slide shall be fitted with a safety stopper.

8 Interactive Programs for Effects shall be provided containing the Manufacturer's factory preset programs for water and light effects displays, including any additional Owner-preferred effects.

9 Instructions on programming shall clearly be provided as part of the Operations and Maintenance [O+M] Manual.

3.4 EXECUTION

3.4.1 PREPARATORY ACTIVITIES

1 Understanding of Scope of Work.

2 Prior to any operations, the Contractor shall have fully satisfied himself of the correct understanding of the scope of work under this Part, and related works covered by other Sections of the Specifications.

3.4.2 Site Examination.

1 Prior to any operations, the Contractor shall investigate the site to ensure full awareness of existing site conditions affecting the performance of its work in this Section. The Contractor shall not proceed with planting operations until unsatisfactory conditions are discussed and resolved with the Engineer. Familiarity with site conditions include, but are not necessarily limited to:

(a) Site boundaries and extent of work

(b) Conditions of all adjoining developments in surrounding environment

(c) Site topography, in relation to site surface drainage

(d) Existing subsurface conditions [eg. water tables, obstructions such as hardpans, rock formations]

(e) Locations and alignments of all existing above-grade and subsurface utility lines and structures

(f) Locations and alignments of all proposed above-grade and subsurface utility lines and structures by authorities.

3.4.3 Site Enclosures.

1 Unless otherwise instructed by the Engineer, the Contractor shall build temporary fencing to the boundaries of the entire project, and its parts, as indicated on plans as required for the protection of the public, for access control not necessarily limited to:

(a) Site storage yards

(b) Existing stands of vegetation to be protected for retention, as defined from the outer drip line and root zone of trees.

3.4.4 Site Office Faculties.

1 Unless otherwise instructed by the Engineer, the Contractor shall build the required temporary onsite office facilities as indicated on plans and as approved by the Engineer.

3.4.5 Coordinate With Related Trades and Disciplines.

1 The Contractor shall coordinate its work under this Part with all adjoining work under all related trades and disciplines.

3.5 SITE PREPARATION PRIOR TO INSTALLATION

3.5.1 General Requirements

1 Verifying Site Conditions Prior to Commencing Works. The Contractor shall examine areas to receive landscaping for compliance with requirements and conditions. When conditions detrimental to work are encountered, such as rubble, adverse drainage or obstructions, lack of or malfunctioning water supply infra-structure, the Contractor shall notify the Engineer prior to planting.

2 Utility Lines, Alignments and Structures. The Contractor shall determine all locations of above grade and underground utility lines and structures and perform work in a manner which will avoid damage to these. Any damage to underground utilities and structures shall be promptly reported in writing to the Engineer, coordinated with all authorities and repaired at the Contractor's expense.

3 Sub-Grade Conditions. The Engineer shall verify that sub-grade conditions are as indicated in the Project Documentation. Where the Project Documentation does not indicate so, the Contractor shall at his expense verify these.

4 Recording Conditions. Any obstructions are encountered that impact the work under this Part [e.g. subbase and sub-grade conditions] these shall be properly marked onsite and faithfully and correctly recorded in scaled plans and drawings as part of the project records.

5 Grade and Location Stakes shall be maintained until removal of these is mutually agreed upon by all parties concerned.

3.5.2 Setting-Out and Staking of Equipment

1 Setting-Out. Locations of equipment and assembly footings, at-grade nozzles and related structures [e.g., at-grade lighting, signage, actuators, and below-grade pump room with access hatch] shall be staked and marked according to the intent of the layout plans in the Project Documentation. These shall be staked two (2) days before any excavations are made for inspection with the Engineer.

2 Notice for Inspections. The Contractor shall notify the Engineer in writing two (2) days before the start of such inspections.

3 Adjustments and Coordination. Equipment locations may be adjusted by the Engineer and shall be promptly coordinated and resolved with all related trades and disciplines.

END OF PART