Installation & Maintenance Manual for Sail Shade World Fixed Size Shade Sails

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1. Planning & Design Considerations

Before anything is dug or bought, careful planning maximises safety, effectiveness, lifespan, and user satisfaction.

- **Understanding Purpose & Use**
  What is the primary function? UV protection from sun? Partial shelter from rain? Shade for play areas, seating, walkways? The intended use will drive decisions about sail shape, orientation, slope, and the required durability of materials.
- **Sun Path & Desired Shade**
  - Map the path of the sun at relevant times of year (especially midday, early morning, late afternoon) to understand how shadow moves.

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  - Determine what parts of the ground / area need shade at what times. For example, in schools you might want shade at recess in late morning or midday, perhaps less need in early morning.
  - Also check whether adjacent trees, buildings, fences etc. cast shadows already; obstructed sky can reduce wind load but may also reduce shade.

- **Wind Loads, Local Weather & Environmental Factors**
  - What are prevailing winds? What are maximum gusts in storms? Is snow likely?
  - Are there code requirements for wind / snow load in your jurisdiction? You may need engineering for large sails or poles.
  - Soil type: rocky, sandy, clay, highly frost-prone etc. will affect footing design.
- **Existing Anchor Points**
  - Are there existing strong structures (walls, buildings, large stable trees) that can serve as anchors? If yes, they may reduce the need for extra poles. But check structural strength.
  - If no, plan for purpose-built poles.
- **Regulatory/Permitting Issues**
  - Local building codes may dictate maximum sail size, height of structures, setbacks from property lines, etc.
  - Utility lines: check above-ground and below-ground (electrical, water, sewer, gas). Before digging, get utility location surveys.
  - Where it is a school or public property, there may be safety codes (falling objects, structural failure) to address.

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- **Material Specification**
    - Sail fabric: Seek supplies from Sail Shade World to be sure of high quality, Maximum UV protection, strength, longevity and safety
    - Hardware: only use Marines grade 316 stainless steel for all fixings, turnbuckles, shackles, eye bolts.
    - Poles: steel is your standard; check galvanizing or coating to resist rust.

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2. Mounting Hardware & Turnbuckle Offset / Spacing

Because your sails are pre-sized and you use turnbuckles with a fixed extended length, this is very important.

- **Turnbuckle Offset**
  If your turnbuckles can extend **320 mm**, then each mounting point (from the sail's corner/ring) must allow **at least 320 mm** of space beyond the sail corner to the anchor point (eye bolt, pad eye, or welded ring on pole). This means:

Distance from sail corner (fabric ring or tab) to anchor point ≥ 320 mm.

If you have a ring in the sail corner, and then a shackle or snap hook, plus the turnbuckle, that all contributes. Better to allow extra slack beyond minimum so tensioning is easier, and hardware doesn't collide with sail edge.

- **Slack / Allowance for Fabric Stretch & Hardware**
  In general, anchor-to-anchor distances need to be somewhat larger than the "relaxed" or nominal sail size, to allow for hardware offset and fabric stretch under load (sun, wind). Many shade sail manufacturers recommend adding about **10%** extra in each edge to accommodate hardware and stretch.
- **Shape & Corners**

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- Triangles: 3 corners; often two at one height and one at a different height to form slope.
- Rectangles / Squares: ideally diagonally opposed heights so water can run off; avoid having all four corners identical height (flat = water pooling, poor drainage).

- **Hardware Types**

Item	Function / Where used
Eye Bolts / Pad Eyes / Wall Brackets	Anchor points to attach sail rings or turnbuckles. Must be structurally embedded.
Shackles, Snap Hooks, Closed Links	To connect sail ring to turnbuckle or anchor. Closed types are safer (won't accidentally detach in high winds).
Turnbuckles	Adjustable connectors to tension. At least 2 corners should have turnbuckles (adjacent corners preferred). Over-tension at one corner only causes distortion.
Extension Chain / Wire Rope or Cable	If anchor point is further away than sail corner or adjusting corners to required height. Ensure minimal stretch, rated strength.

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3. Pole & Footing Design & Installation

Since you stipulate poles are always steel, here are full details for what steel poles, footings etc. need to be like.

Pole Material, Diameter & Wall Thickness

- Steel poles should be **galvanised** or otherwise treated / powder coated to resist corrosion.

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- Diameter depends on sail size, expected wind load, height. Some guidance:
    - Smaller sails (say up to ~3–4 m span) might use 4" steel pipe (≈100 mm OD) with sufficient wall thickness (e.g. ≥ 4 mm).
    - Larger sails, or those exposed to higher winds or at greater height, require larger diameter or thicker wall.
- It may be useful in your offerings to have standard pole sizes like 100 mm, 127 mm (5"), 150 mm etc, depending on sail span.

Pole Height & Placement

- Height above ground must coordinate with slope/water runoff: at least one corner lower & one higher (for hypar or twist effect).
- The exposed height of the pole plus the buried depth (footing) determines total pole length.

Footings / Foundations

Critical for stability. Should prevent tilting, settlement, uplift.

- **Hole Depth & Diameter**
    - Rule of thumb for depth: at least **1/3 to 1/2** of the exposed height of pole. Some sources say if pole exposed 3 m, bury 1.0–1.5 m.
    - Minimum depth might also have to be below frost line in areas with freezing conditions. Local standards will dictate that.
    - Diameter of hole depends on pole diameter and expected loads. Common guidance:

Hole diameter ≈ 3× the pole's diameter (or more) for steel poles. For example, for a 100 mm pole, hole diameter perhaps 300 mm or more. Some sources use 400 mm (approx. 16") for 4" OD poles.

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- **Gravel Bed / Drainage Layer**
    - Lay base (say 100 mm or so) of crushed stone / gravel at bottom to allow drainage and reduce water accumulation. Best if gravel is compacted.
- **Concrete Plug / Full Backfill**
    - Many installations fill entire hole around pole with concrete (anchored). Use structural concrete of appropriate strength.
- For large footing (plinth) around poles, standard might be to build a concrete pad or plinth base before anchoring poles. Some designs have a concrete plinth of e.g. 25"×25"×25" (≈ ~63 cm cube) in imperial sources.
- **Sleeved Removable Posts (if needed)**
    - If you want to remove poles seasonally, some designs embed a sleeve in concrete; pole fits into sleeve. The sleeve is anchored, and pole can be removed. Sleeve should have a bolt through to prevent pole from rotating.
- **Sloping / Finishing Top of Concrete**
    - Finish the top of the concrete around the post/pad slightly sloped away from the post so that water runs off and does not pool around pole base. This helps reduce rot (if wood), corrosion (if metal), freeze-thaw damage.

Concrete / Curing

- Use good quality concrete mix; follow specifications.
- Allow concrete to cure / set **at least 48 hours** (or more, depending on mix) before applying load (i.e. tensioning or attaching sail). Some sources ask for up to 24–48 hrs for small jobs; larger footings or low temperature may slow curing.
- During curing, brace the pole (i.e. temporary supports) to ensure it remains plumb.

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4. Sail Shape, Slope, and Water Runoff

To avoid water-pooling, ensure the sail is shaped / mounted to encourage water to run off. Also to reduce snow or debris load.

- **Slope / Pitch Recommendations**
  - Many guides suggest a slope of approximately **1 foot drop per 10 feet span** (≈ 5–6°).
  - Others suggest steeper, especially in climates with heavy rainfall—sometimes up to ~15° or more. For example, Carefree suggests slope of approx. 15° (rise/run ≈ 1/3.75).
  - In some European guides, minimum slope may be 30° depending on rainfall intensity. But steeper slopes affect aesthetics; may need taller poles or varying heights.
- **Hypar / Twist Designs**
  - By setting diagonal corners at different heights, you can create a twist that lets water run to lower corners. Typical for rectangular or square sails: two opposite (diagonal) corners high, two opposite corners low. For triangles: two equal, one different.
- **Orientation**
  - Placing sail so that wind blows slightly under sail (not directly onto sail flat) helps reduce uplift.
  - Consider direction of rainfall, prevailing wind.
- **Avoiding Flat or Nearly Flat Surfaces**
  - Flat or minimal slope will encourage pooling; water weight stretches fabric, increases loads on hardware, may cause sagging or damage.

5. Mounting the Sail & Tensioning

Putting everything together: hardware, poles, sail, tension.

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Hardware Attachment & Anchors

- Install pad eyes, eye bolts, or welded rings to anchor points on poles or walls. Use nuts/washers etc. All hardware must have a strength rating higher than expected loads (wind etc.). Stainless steel recommended.
- All anchor points should face toward the **centre of the sail**. This ensures when sail is tensioned, forces pull inwards uniformly. If an anchor is sideways or facing away, it can cause twisting or lever action on bolt.
- For walls: use chemical anchors / anchor bolts sized appropriately, ensure substrate (brick, concrete, structural timber) is capable.

Cantering & Lay-Out

- Lay sail out on ground (inside the area to be shaded) in the intended orientation. Mark where each corner will be attached. This helps visualise layout, slope, and ensures no interference.
- From each sail corner, using string or tape, measure to proposed anchor point. Verify that the distance from sail corner to anchor includes the turnbuckle extension (in your case ≥320 mm), plus any extra (shackles, rings).

Tensioning the Sail

- **Corner Sequence & Use of Adjustable Links**
    - At least **two adjacent corners** should have adjustable hardware (turnbuckles). Using turnbuckles on all corners is possible but more complex. What matters is that tensioning can be balanced across corners. Some authorities warn against putting turnbuckles on diagonally opposite corners only.
    - Fixed links (shackles, etc.) for other corners.

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- **Tightening Stepwise**
    - Begin by fastening all corners loosely.
    - Gradually tension via turnbuckles, going corner by corner. After small tightening, walk around, check for wrinkles or sag. Adjust.
- **Avoid Over-Tensioning**
    - Over tensioning can damage sail edges, fabric, hardware or even poles. Only tension to remove sag and wrinkles. Fabric should be taut, minimal wrinkles. Some “give” in wind loads expected.
- **Final Checks**
    - Check that anchor bolts, eye bolts etc. are well seated, nuts tight.
    - Ensure bolts are accessible for later tensioning.
    - Ensure no abrasion points: edges of sail should not rub on rough surfaces (pole edges, metal edges etc.).

6. Safety, Codes, and Regulation Issues

- Comply with local building, electrical, safety codes. Sometimes large shade sails are “structures” and need permits.
- Wind / Snow loads: design hardware and poles for maximum loads expected.
- Height clearances: ensure safe head height, especially over walkways.
- Fire safety: keep sails away from open flames (barbecues etc).
- Use of safe access for children: ensure children cannot climb the poles or climb onto sail surfaces.
- Inspection of anchors, pole welding etc for corrosion or fatigue.

7. Cleaning, Maintenance & Seasonal Care

Even well-installed sails need routine care to have long service life.

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- **Regular Inspections** (at least annually, ideally twice a year; after storms)
    - Fabric: check for tears, fraying at edges, any UV degradation.
    - Hardware: check turnbuckles, shackles, eye bolts, welds, rust, corrosion.
    - Poles: check base for corrosion (if steel), especially at or near ground/concrete interface.
- **Tension Maintenance**
    - Fabric will “settle in” over time: exposure to sun, wind, rain can cause fibres or stitching to stretch slightly. Retighten turnbuckles as needed. Many manufacturers note needing to tension again in a few weeks after initial installation.
- **Cleaning**
    - Rinse off debris, leaves, droppings frequently. Pull off any sticks or objects that can damage fabric.
    - For more thorough cleaning: mild detergent + soft brush (not stiff) + warm water. Allow detergent to soak, rinse thoroughly. Avoid bleach, harsh chemicals. Do not machine wash or tumble dry. Power washers are risky unless low pressure.
- **Drying & Storage (if seasonal removal)**
    - Ensure sail is dry before folding/storage to avoid mildew.
    - Store in a cool, dry location away from pests.
- **Dealing with Snow / Heavy Rain**
    - If snowfall is expected, either design slope steep enough so snow slides off or take down sails temporarily. Heavy snow load can damage fabric or poles.
    - If heavy rain (or after storms), inspect for water pooling; if pooling, adjust slope / tension.

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8. Common Problems & Troubleshooting

Problem	Possible Causes	Remedies
Sagging in middle or sides	Not enough slope, fabric stretch, distance too short, too weak or too flexible hardware	Tension more, increase slope, ensure using required offset, ensure anchor points are rigid
Pooling of water (ponding)	Flat sail, insufficient slope, fabric slack, too small drop between corners	Increase height of some corners, use hypar twist, adjust tension, rebalance heights
Whipping or wind noise	Loose edges, poor tension, fabric flapping	Tension more, ensure corners tight, use wind vents if available, perhaps remove in high winds
Rust / corrosion of hardware or pole base	Inadequate protective coating, water trapped at base, poor concrete slope drainage	Use stainless / galvanised materials, ensure concrete top slopes away, seal pole base, inspect and paint / repair corrosion
Fabric damage from abrasion or UV overload	Edges rubbing on hard surfaces; extended exposure; over tension; poor quality fabric	Add protective buffers, ensure edges clear surfaces, use quality fabric with UV rating, do not over tension, tension rather than leave slack
Storm damage	Extreme wind, debris, improper anchoring	Remove sail in extreme weather, ensure strongest anchors, use design that handles expected loads, maintain slack / release tension temporarily in storm warning if feasible

Putting It All Together: Sample Installation Steps with Your Specs

To make it concrete, here's a sample walkthrough using your products (pre-sized sails; turnbuckles with 320 mm extension; steel poles).

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1. **Select Sail & Orientation**
   Decide which of your 24 sizes (triangles / square / rectangles) is appropriate. Decide desired orientation and slope e.g. for a rectangular sail of 6×8 m, perhaps two high corners at one end at 3 m height, two low corners at opposite diagonal at ~2.5 m.

2. **Map Anchor / Pole Locations**
   For each corner, mark where anchor will be. If using dedicated steel poles, decide their spacing. At each anchor point ensure that the anchor will be ≥ 320 mm from the sail corner to allow turnbuckle extension.

Example: Sail corner ring is at point A; anchor point on pole or wall must be placed so that the turnbuckle in its fully extended state will reach from anchor point to the corner ring (or ring + shackles etc). In other words, anchor to anchor (if sail rings are rigid) distance must be ≤ sail edge length + hardware allowances (turnbuckle, shackles etc). If sail edge is exactly 6 m, and hardware adds ~0.3 m each side maybe, anchor spacing might be ~6.6 m.

3. **Set Poles / Footings**
   - For steel poles of say 100 mm diameter, determine exposed height (say 3 m). Then bury depth of ~1 m (≈1/3) to 1.5 m (≈1/2) depending on soil and wind.
   - Dig hole diameter about 300-400 mm around pole (≈ 3× pole diameter). If soil is weak, make larger or deeper.
   - At bottom, lay ~100 mm gravel or stone. Then either build a concrete pad or pour concrete fully around pole. Concrete should be strong (e.g. f’ c ≥ 20–25 MPa or local standard).
   - Ensure top of concrete is slightly crowned / sloped away from pole (so water drains away).
   - Brace the pole vertical during curing; allow minimum 48 hours before loading.

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4. **Install Anchor Hardware**
    - On poles: fit eye bolts, pad eyes, or welded rings securely. Anchor should be oriented toward the sail corner.
    - On walls: fit strong plate, eye bolts using chemical anchors or through-bolts etc.
5. **Attach Sail & Initial Tension**
    - Lay sail on ground, align corners. Use fixed links (e.g. shackles) on two corners, turnbuckles on adjacent corners. Attach fixed corners first loosely.
    - Then attach turnbuckle corners; gradually tension, working corner by corner to achieve even tension. Make sure sail is taut, no sagging or large wrinkles.
6. **Check and Adjust**
    - Walk around; inspect sail shape; check for sharp creases; adjust turnbuckles.
    - Inspect poles: are they vertical and not being pulled?
7. **Final Inspection & Safety Check**
    - Check all hardware, nuts, bolts. Ensure none are loose.
    - Ensure clearance beneath sail is adequate (for people, machinery etc).
8. **Ongoing Maintenance**
    - After a few weeks: retighten if needed.
    - Regular inspection seasonally.
    - Cleaning as described.

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9. Table of Details for installing each of the 24 sizes

The next two pages are tables to provide you with all the details to make a perfect installation for each of our 24 sizes.

Table one covers Sail Sizes & Anchor Spacing:

Shape – Size - Span – Class - Anchor Notes

Table Two is for Pole & Footing Recommendations-

Shape – Size – Pole diameter – Wall – Heights – Hole Depth & Diameter

Table 1: Sail Sizes & Anchor Spacing

Shape	Size	Span	Class	Anchor	Notes
Triangle	3.0×3.0×3.0	3.00	Small	3.70/3.70/3.70	Two corners high, one low
Triangle	3.6×3.6×3.6	3.60	Small	4.31/4.31/4.31	Two corners high, one low
Triangle	4.0×4.0×4.0	4.00	Small	4.72/4.72/4.72	Two corners high, one low
Triangle	4.5×4.5×4.5	4.50	Medium	5.23/5.23/5.23	Two corners high, one low
Triangle	5.0×5.0×5.0	5.00	Medium	5.74/5.74/5.74	Two corners high, one low
Triangle	4.0×6.0×6.0	6.00	Large	4.72/6.76/6.76	Two corners high, one low
Square	3.0×3.0	4.24	Medium	L:3.70/W:3.70	Hypar twist
Square	3.6×3.6	5.09	Medium	L:4.31/W:4.31	Hypar twist
Square	4.0×4.0	5.66	Large	L:4.72/W:4.72	Hypar twist
Square	5.0×5.0	7.07	Large	L:5.74/W:5.74	Hypar twist
Rectangle	2.5×3.0	3.91	Small	L:3.19/W:3.70	Diagonal drop
Rectangle	2.5×4.0	4.72	Medium	L:3.19/W:4.72	Diagonal drop
Rectangle	2.0×3.0	3.61	Small	L:2.68/W:3.70	Diagonal drop
Rectangle	2.0×4.0	4.47	Medium	L:2.68/W:4.72	Diagonal drop
Rectangle	3.0×4.0	5.00	Medium	L:3.70/W:4.72	Diagonal drop
Rectangle	3.5×5.0	6.10	Large	L:4.21/W:5.74	Diagonal drop
Rectangle	3.0×5.0	5.83	Large	L:3.70/W:5.74	Diagonal drop
Rectangle	3.0×6.0	6.71	Large	L:3.70/W:6.76	Diagonal drop
Rectangle	4.0×5.0	6.40	Large	L:4.72/W:5.74	Diagonal drop
Rectangle	4.0×6.0	7.21	Large	L:4.72/W:6.76	Diagonal drop
Rectangle	5.0×6.0	7.81	Large	L:5.74/W:6.76	Diagonal drop
Rectangle	5.0×7.0	8.60	Large	L:5.74/W:7.78	Diagonal drop

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Table 2: Pole & Footing Recommendations

Shape	Size	Pole	Wall	Heights	Depth	Dia
Triangle	3.0×3.0×3.0	100 mm	3.6 mm	2.8/2.3 m	1.0 m	Ø300–350 mm
Triangle	3.6×3.6×3.6	100 mm	3.6 mm	2.8/2.3 m	1.0 m	Ø300–350 mm
Triangle	4.0×4.0×4.0	100 mm	3.6 mm	2.8/2.3 m	1.0 m	Ø300–350 mm
Triangle	4.5×4.5×4.5	127 mm	4.5 mm	3.2/2.6 m	1.2–1.4 m	Ø350–400 mm
Triangle	5.0×5.0×5.0	127 mm	4.5 mm	3.2/2.6 m	1.2–1.4 m	Ø350–400 mm
Triangle	4.0×6.0×6.0	150 mm	5–6 mm	3.5/2.8 m	1.5 m	Ø450–500 mm
Square	3.0×3.0	127 mm	4.5 mm	3.2/2.6 m	1.2–1.4 m	Ø350–400 mm
Square	3.6×3.6	127 mm	4.5 mm	3.2/2.6 m	1.2–1.4 m	Ø350–400 mm
Square	4.0×4.0	150 mm	5–6 mm	3.5/2.8 m	1.5 m	Ø450–500 mm
Square	5.0×5.0	150 mm	5–6 mm	3.5/2.8 m	1.5 m	Ø450–500 mm
Rectangle	2.5×3.0	100 mm	3.6 mm	2.8/2.3 m	1.0 m	Ø300–350 mm
Rectangle	2.5×4.0	127 mm	4.5 mm	3.2/2.6 m	1.2–1.4 m	Ø350–400 mm
Rectangle	2.0×3.0	100 mm	3.6 mm	2.8/2.3 m	1.0 m	Ø300–350 mm
Rectangle	2.0×4.0	127 mm	4.5 mm	3.2/2.6 m	1.2–1.4 m	Ø350–400 mm
Rectangle	3.0×4.0	127 mm	4.5 mm	3.2/2.6 m	1.2–1.4 m	Ø350–400 mm
Rectangle	3.5×5.0	150 mm	5–6 mm	3.5/2.8 m	1.5 m	Ø450–500 mm
Rectangle	3.0×5.0	150 mm	5–6 mm	3.5/2.8 m	1.5 m	Ø450–500 mm
Rectangle	3.0×6.0	150 mm	5–6 mm	3.5/2.8 m	1.5 m	Ø450–500 mm
Rectangle	4.0×5.0	150 mm	5–6 mm	3.5/2.8 m	1.5 m	Ø450–500 mm
Rectangle	4.0×6.0	150 mm	5–6 mm	3.5/2.8 m	1.5 m	Ø450–500 mm
Rectangle	5.0×6.0	150 mm	5–6 mm	3.5/2.8 m	1.5 m	Ø450–500 mm
Rectangle	5.0×7.0	150 mm	5–6 mm	3.5/2.8 m	1.5 m	Ø450–500 mm

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