

1st October 2019, Bristol

Foundation Ex 2019

Explore innovation. Exchange ideas. Expand minds.

Protecting Offshore Wind

Toro Corporation Limited

Tensile Membrane Structures-Transition Piece TP Design

by

Dimitrios Evangelopoulos

Business Development & Research Manager



Contents

Introduction
to Toro

Tension Fabric
Structures

Tensile
Membrane
Structures

Structural
System

Structural
Analysis

Health &
Safety

Economy

Fabrication

Transportation
Installation

Operations

Commercial



TORO
SHELTERS

Introduction to Toro Shelters

- ❑ Number one supplier of Salt Barns and Aircraft Hangars in the UK
- ❑ Operates since 2011
- ❑ Founded in Bristol, staff of 12
- ❑ Has sister Company in Cairns, Australia



Toro Shelters

Unit A, Berkeley Court Business Park
Earl Russell Way, Lawrence Hill
Bristol, BS5 0BX
United Kingdom
+44 (0) 117 259 1259



Tension Fabric Structures



Tension Fabric Structures



TORO
SHELTERS

torocorp.co.uk



Tensile Membrane Structures

- Thin-shell structures
- They take tension only and no compression or bending
- Compression or bending stresses are taken from the support structure such as , such as masts, rings or beams.
- They are ideal for roofs, as they can economically and attractively span large distances.
- Good for sports facilities, warehousing and storage buildings, and exhibition venues



Millennium Dome



TORO
SHELTERS

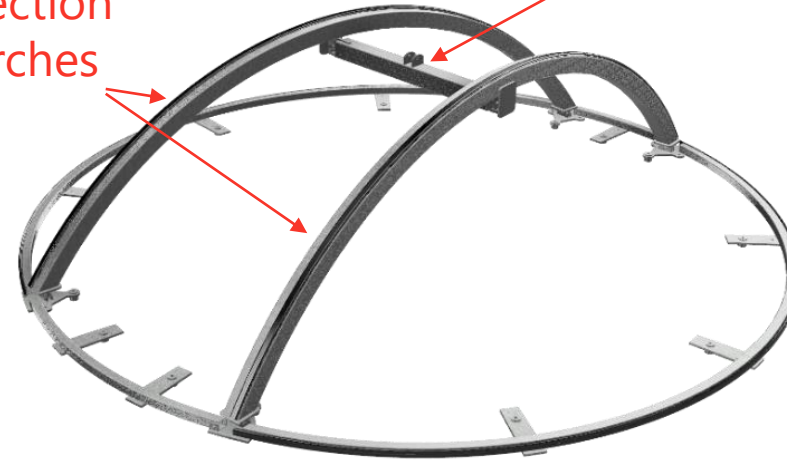
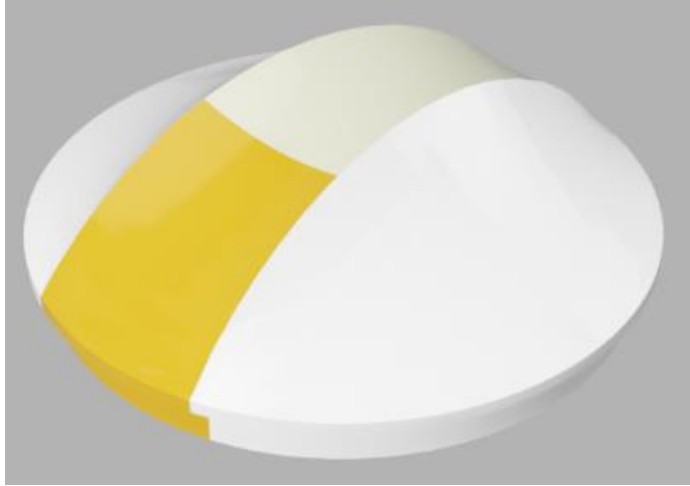


Structural System

Hollow
Section
Arches

Bridge

Interface Ring

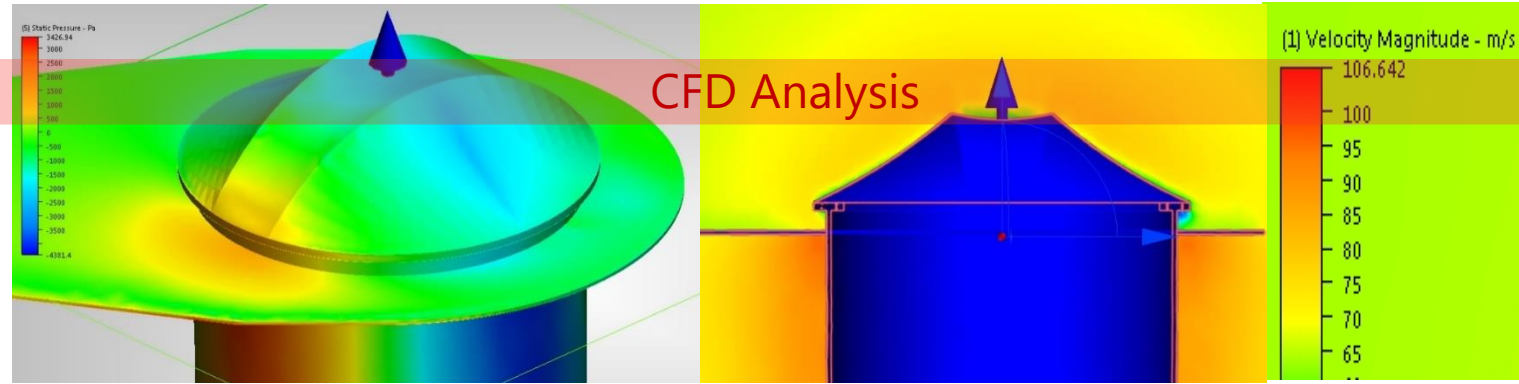


- ✓ Robust & lightweight
- ✓ Designed for wind speeds greater than 190km/h
- ✓ Hot dip galvanized
- ✓ Waterproof
- ✓ Geodesic dome, low wind drag coefficient
- ✓ Marine grade fixings
- ✓ Ventilation can be provided

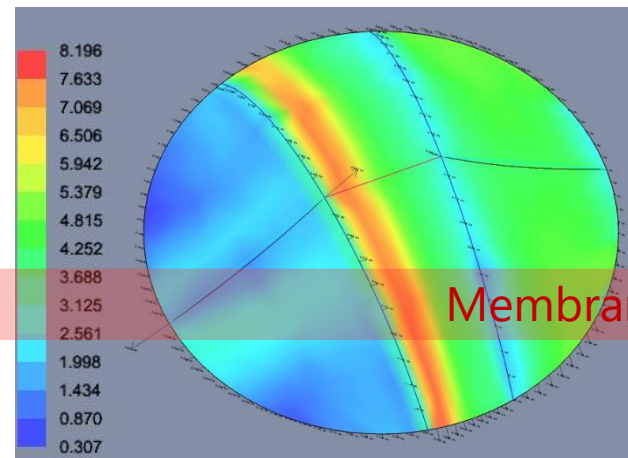
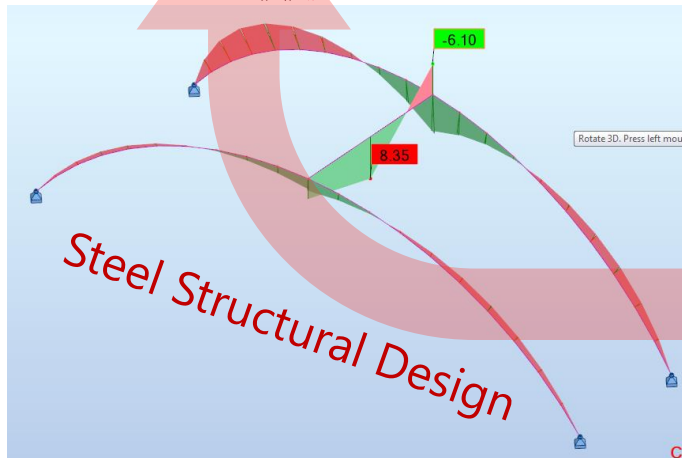
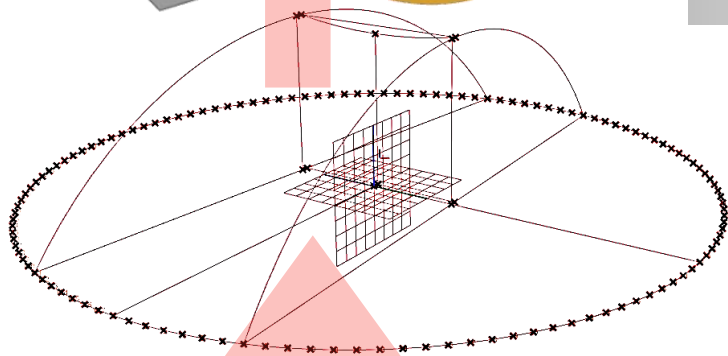


Structural Analysis

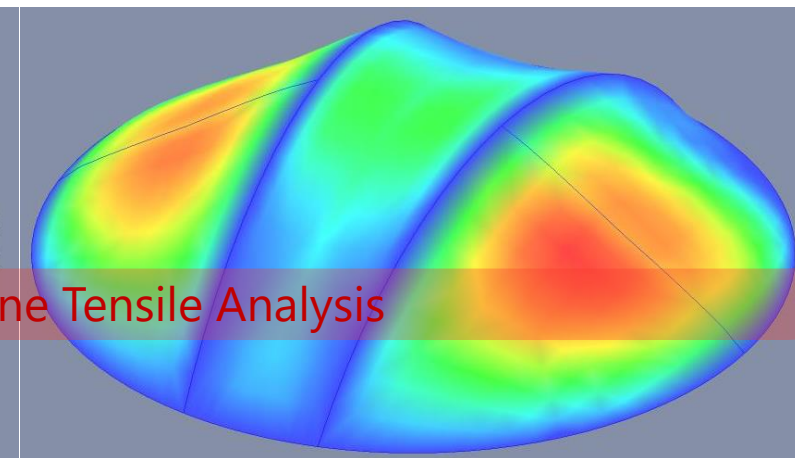
Parametric Geometry



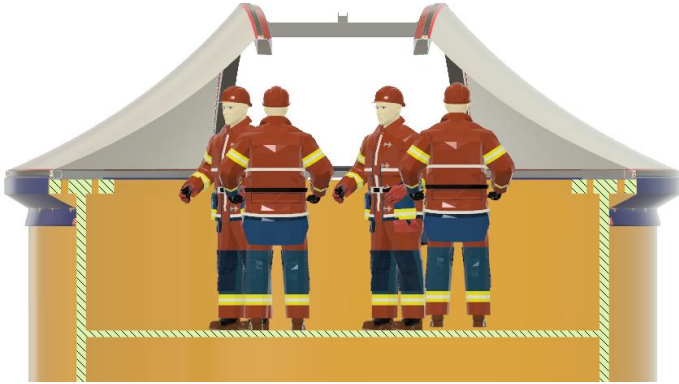
TORO
SHELTERS



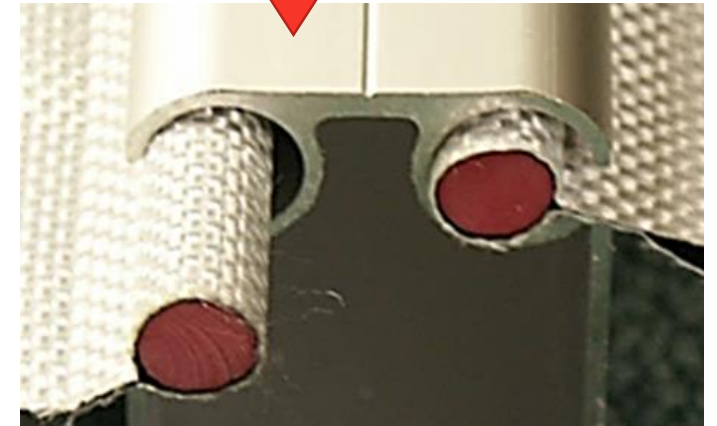
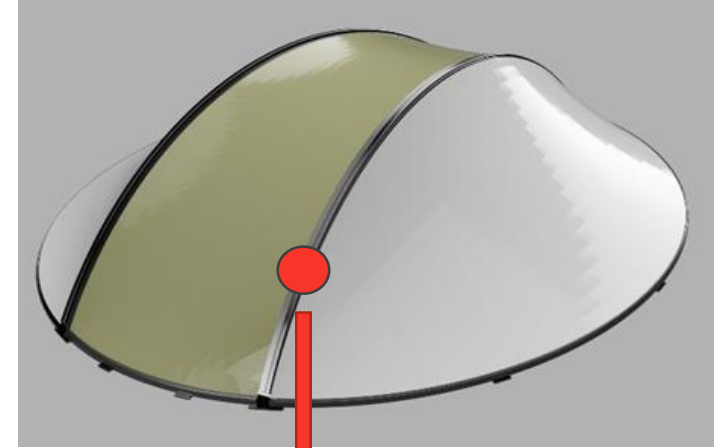
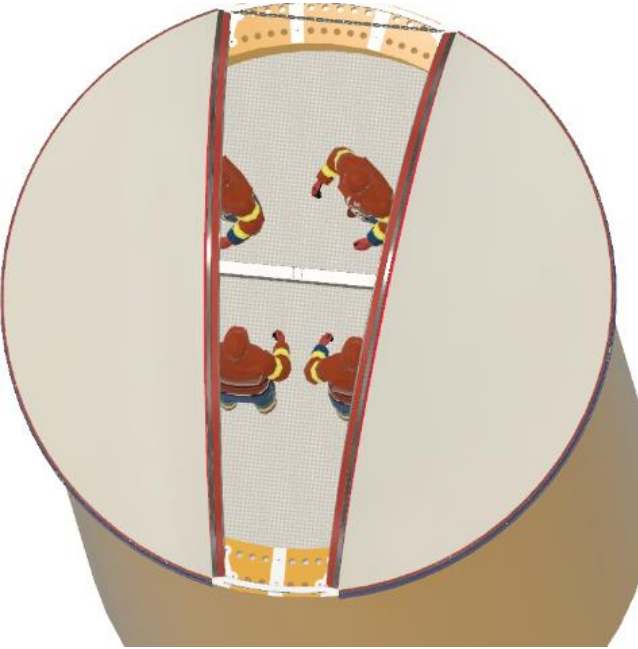
Membrane Tensile Analysis



Health and Safety



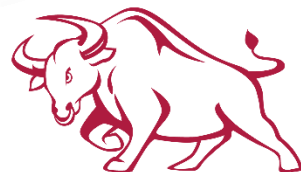
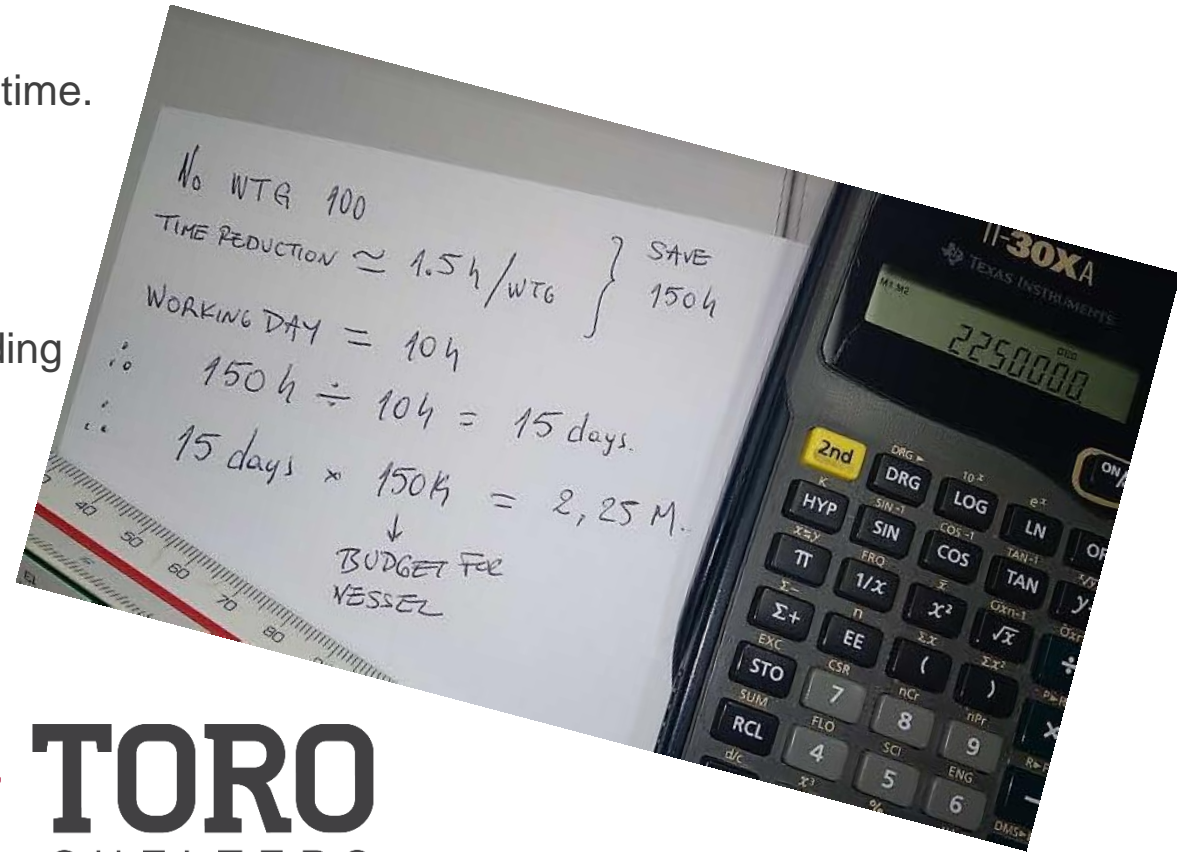
- ✓ Flame retardant fabric
- ✓ Side crew protection panels
- ✓ Lightweight handling
- ✓ Rapid large access
- ✓ No zips
- ✓ No tripod for pulling the cables is needed
- ✓ Low crane lifting risk
- ✓ Comfortable working environment
- ✓ The crew can operate safe under stronger winds
- ✓ 5000 LUX of light transmittance so no need for artificial light



Economy



- ✓ Lower cost comparing with heavy steel cans or other lightweight aluminium or fiberglass covers.
- ✓ Provides appropriate environmental conditions when switchgear is placed in the transition piece
- ✓ Requires less operational time.
- ✓ Less delays on deck
- ✓ Wider weather windows
- ✓ Finish the job earlier avoiding adverse weather windows



TORO
SHELTERS

Fabrication



- ✓ Fast
- ✓ Simple construction
- ✓ Lightweight
- ✓ Steel or Aluminium frame
- ✓ Heavy duty PVC fabric
- ✓ Hot deep galvanised



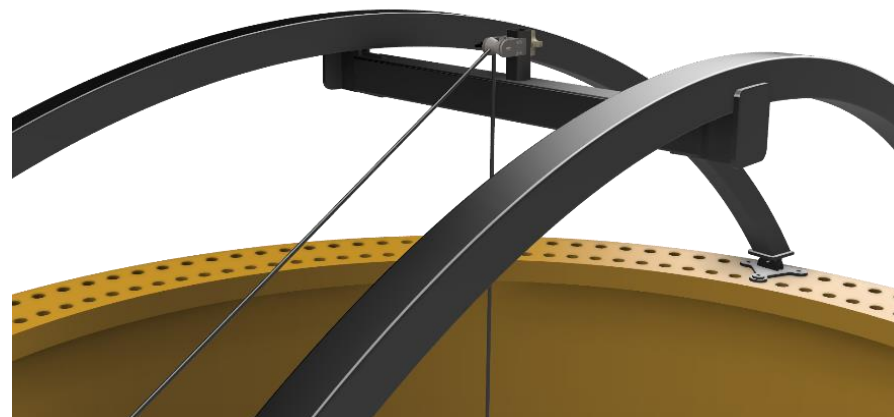
Transportation & Installation

- ✓ Stackable
- ✓ Transport by trucks
- ✓ Shipped by 20ft or 40ft ISO globally
- ✓ Rapid
- ✓ Easy assembly on the ground
- ✓ Crane liftable
- ✓ Easy connection onto the TP flange
- ✓ Bolted connections
- ✓ Bespoke connection to much any TP flange geometry



Operations

- ✓ The frame can be used to pull the array cables [40kN]
- ✓ The retractable access panel in the middle reveals hooking points for lifting the entire TP
- ✓ The TP fabric cover and the frame does not need to be removed for pulling the array cables
- ✓ There is no zip, a fabric panel is retractable allowing wide access even in very strong winds

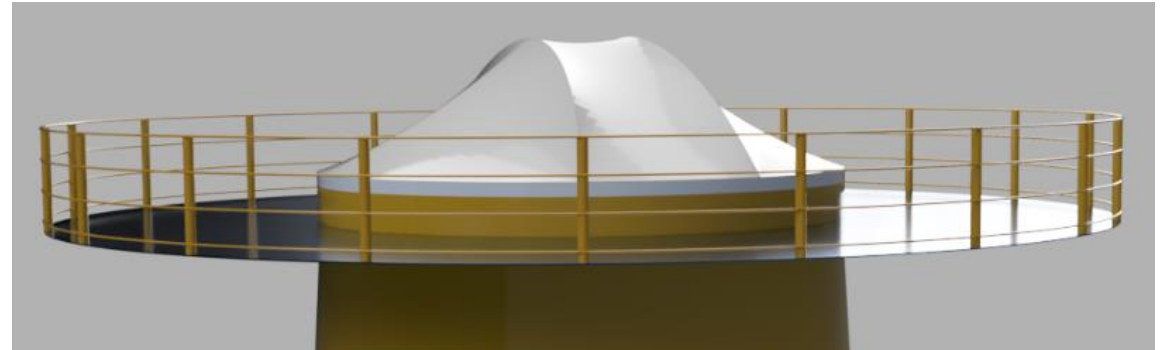


TORO
SHELTERS

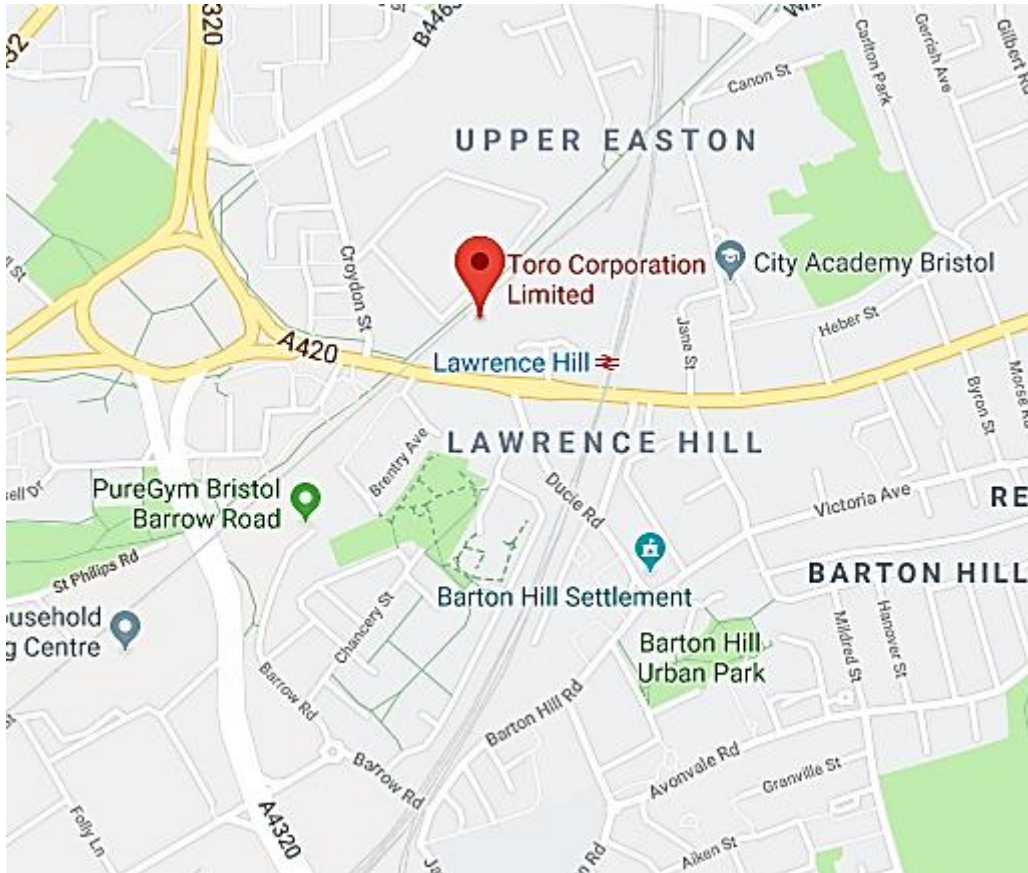
Commercial



- ✓ Large corporate branding can be printed onto the fabric cover
- ✓ Smart engineered look
- ✓ Many colour options
- ✓ The TP cover can be integrated with Toro's Hybrid Temporary Power Supply System using wind, solar, diesel generator and battery.



Contact Details



Contact:

Dimitrios Evangelopoulos

Office Tel:

+44 (0)117 259 1259

Web:

<https://torocorp.co.uk/>

Email:

de@torocorp.co.uk

Address:

Unit A, Berkeley Court Business Park
Earl Russell Way, Lawrence Hill
Bristol, BS5 0BX
United Kingdom

