Introducing Best Practice for Shipbuilding

The increased ordering activity in the shipbuilding industry has led to more pressure on shipyards. As a worldwide supplier of support systems for cable management and fasteners we have seen the potential to improve and simplify installation practices.

We have worked together with several shipyards to invent smarter and more lean installation practices that comply with the latest requirements.

The result of this work is presented in our brand-new Best Practice for Shipbuilding. This 100-page long document contains smart installation practices that ensure flexibility throughout the vessel’s entire lifecycle.

This document is a teaser of the original document, to provide an overview of the topics covered.

To gain access to the full version, please contact your local Øglænd System or Hilti sales organisation.
BEST PRACTICE
SHIPBUILDING
As a partner, we have always strived to make our customers more competitive.

The shipbuilding industry are experiencing challenging projects with short timelines and man-hour demanding construction. Support systems for EIT, HVAC and piping are among the greatest “time thieves” in a project.

Today’s installation methodology consists of late stage changes, endless welding, touch-up paint, and supporting each technical system separately. This way of working has remained essentially unchanged over the last 40 years.

As a leading and worldwide supplier of fasteners and support systems we have seen the potential for improvement. Several years ago, our engineers started working together with shipyards, to learn more about the challenges they are facing. Together with the industry we continuously invent smarter and more lean installation methods. The result of this work will be presented in this document.
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S-BT Threaded Studs for Fastening on Steel (FoS)
A quick overview of standard products to get you started on cold work modification. Use S-BT threaded studs for fastening on steel. S-BT can also be used for electrical connections.

Ceiling: Use 2 x S-BT to fasten a Mekano® CH50-2T channel to the ceiling. Use 2 x twisted brackets to fix the RZE-R cable ladder.

Wall: Use S-BT to fasten Mekano® CH50-2T channels on the wall. Fix RZE-R cable ladders and equipment.

Equipment: Use S-BT to fasten Z-profiles for multiple applications. Cable Tie bars are also available for small cable routing.
# Product Overview

## Starter Brackets
- **Welded Bracket 50/100**
- **Welded Bracket 50**
- **Wall Grid**
- **Clamp**
- **S-BT Threaded Studs, for Direct Fastening on Steel (FoS)**
- **Magnets**

## Support Channels
- **Mekano® CH100-2T**
- **Mekano® CH50-2T**
- **Mekano® CH100-1**
- **Mekano® CH50-2**
- **Mekano® CH50-1**

## Cable Ladder and Cable Trays
- **OE100 and OE150 Cable Ladder (Covered in O&G Best Practice)**
- **RZE-R and RZE-P Cable Ladder**
- **SPBE20 and SPBE40 Cable Tray**
- **SPB-RF40 Cable Tray**
- **Cable Tie Bars**

## Accessories
- **Tubing Clamps**
- **Pipe Shoes**
- **Multi Cable Transit (MCT)**
- **Light Fitting Support**
- **Cable Cleats**
- **Z-profiles**
- **Electrical Connections**
Application Areas

Navy Vessels

- Mekano® CH50-2
- Welded Bracket 50
- S-BT Threaded Studs
- Z-profiles
- FoS Grid Bracket 50
- Light Fitting Support

- Mekano® CH50-2T
- Mekano® CH100-2T
- Welded Bracket 100
- RZE-R Cable Ladder
- RZE-P Cable Ladder
- SPB-RF40 Cable Tray

Commercial Ships

- Mekano® CH50-1
- Mekano® CH50-2
- S-BT Threaded Studs
- FoS Grid Bracket 50
- Z-profiles
- Light Fitting Support

- Stringer Clamp 50
- SPBE Cable Tray
- Cable Tie Bars
- Tubing Clamps
- Perforated Profiles
- Electrical Connections

FPSO

(Covered in O&G Best Practice)

- Welded Bracket 50
- Mekano® CH50-2T
- SPB-RF40 Cable Tray
- Cable Cleats
- Z-profiles
- S-BT Threaded Studs

- Welded Bracket 100
- Mekano® CH100-2T
- OE Cable Ladder
- Pipe Shoes
- ETIN™ Tubing Clamps
- FoS Grid Bracket 50
**Typical Support Configurations**

When designing a multidiscipline support system on board a ship, certain key-factors must be taken into consideration:

- **Low weight**
- **Easy installation**
- **Space efficient**
- **Configurable**

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**Recommended products for support:**

- **LIGHT LOAD**
  - Sensors
  - Signal cables
  - Electronic equipment

- **LIGHT/MEDIUM LOAD**
  - Light weight cables
  - Luminaires
  - Sprinkler heads
  - HVAC

- **MEDIUM LOAD**
  - Medium weight cables
  - Piping/Tubing
  - HVAC
  - Cabinets
  - Panels

- **HEAVY LOAD**
  - Pumps/machines
  - Piping
  - Heavy weight cables
  - False floor systems

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**NB!** For more heavy duty support channels refer to Oil & Gas best practice.
Choose Level of Flexibility

**Minimum Flexibility**

Starter Brackets and Support Channels are chosen based on the defined requirements. There is minimum flexibility and the supports have to be redesigned in case any changes are required.

**Application areas:**
Deck and bulkhead with low grade of technical installations.

**Medium Flexibility**

Medium Flexibility Grid System enables sideways movement without having to add Starter Brackets. Hot Work is therefore avoided at a late stage in the installation process.

**Application areas:**
Deck and bulkheads with multiple disciplines of technical installations mainly going in one direction.

**Full Flexibility**

A full Grid System offers an integrated system where the support often is shared between the disciplines. This results in stable, weight saving and cost efficient design.

**Application areas:**
Deck and bulkheads of big vessels with complex routings. All vessels where modification can occur.
MultiGrid® Example - Bulkhead Welded

Step #1 - Pre Paint
Starter brackets are welded to the wall in a grid formation. C-C distance between brackets should be a multiple of 25 mm, to obtain full flexibility by use of Mekano® profiles.

The longer distance between the starter brackets, the higher demand for horizontal support channels. A good tip is to increase the amount of starter brackets to avoid the heaviest support profiles.

CC = 1200 mm is recommended.

The grid system can also be spaced from the wall by the use a cantilever starter.

Max spacing distance = 300 mm

Step #2 - Post Paint
Fix horizontal channels to the starter brackets. This is done quickly and easily with Oglaend Anti-Vibration fasteners.

No thread locking compound required!
Bolts can easily be re-used.

Add vertical channels and supply with extra horizontal channels where needed. The support system can now be moved in horizontal and vertical direction without re-positioning of the starter brackets.

Traditional method:
MultiGrid® Example - Bulkhead Welded

Step #3
Fix Cable Ladders, Equipment Plates and other accessories to the Support System.

The Junction box plate is compatible with Mekano® Support System and can easily be integrated without additional fixing to the hull structure.

We have a variety of equipment plates compatible with the Mekano® Support System that can easily be integrated without additional fixing to the hull structure.

Step #4
Outfitting of electrical equipment can start.

Exit plates can be used to avoid sharp edges for the cables when they go over the edge of the ladder.

The triangular support profiles can also be used to cable support. Custom cable protectors are available for routing in this way.
**MultiGrid® Example - Bulkhead Bolted**

The MultiGrid® installation method

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**S-BT Threaded Studs**

The MultiGrid® installation concept can also be applied as a 100% cold work solution. For instance, fasten Mekano® channels directly to the bulkhead using S-BT threaded studs. Fasten to every second stiffener. Then apply horizontal channels, and you have a full flexibility MultiGrid® System.

Ideal for heavy technical installations.

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**Bolted Grid Bracket**

Fasten the bracket to the bulkhead using S-BT threaded studs. Mekano® Channel can be fastened to the bracket on the underside or topside. It can also be installed both vertical and horizontal.

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Support Configurations Concept

**Primary Routings**
Primary routings are usually detail designed before the building process is started, and welded starters can easily be integrated in the hull mainframe, without any significant extra cost or time aspect.

A good rule of thumb is to use welded starters for all Primary routings. For instance, a multidiscipline system in a MultiGrid® formation. And cold work solutions for secondary routings.

**Secondary Routings**
Secondary routings are often ‘as built’, and more lightweight in application than primary routings. For secondary routings beam clamps and S-BT is a good alternative. Then they can easily be moved in case of clash.
**Support Configurations: Ceiling**

**Welded Solution**
Recommended max load: see load data in end of chapter.

**Bolted S-BT Solution**
Supports configured with S-BT threaded studs. The cable ladder is fixed under the support using two twisted brackets (directional adjuster).
Recommended max load: 180kg

**Clamped Solution**
Ideal solution for secondary (as built) routings. When two bolted stringer brackets are connected with a horizontal channel, stability and load capacity is increased. Loads must be checked.
Recommended max load: 150kg

**Elevated Ladder**
The ladder can also be positioned above the support using two twisted brackets (directional adjuster).

**ALTERNATIVE**
When space is limited cable ladder can be placed between stiffeners. Only builds 75 mm below stringer.
- 2 x Stringer Clamp S-M BC-ST-HD
- 1 x Mekano® CH50-2T
- 2 x M10 Hex Bolts
- 2 x Ladder Fixing Clamp
Support Configurations: Wall

Welded Solution: Cantilever
Cantilever welded to bulkhead with welded MultiGrid Light Starter Bracket and Mekano® CH50-2T. The RZE cable ladder is fixed to the channel with RZE Fixing Clamp.

Recommended max load:
L=400 170kg
L=500 100kg
L=600 65kg
for SS & HDG

Bolted S-BT Solution: Cantilever
Mekano® CH50-2T bolted to bulkhead using two S-BT threaded studs. Use gusset plate to connect the Mekano® channels to make a cantilever.

Load example: Cantilever L=300.
C-C S-BT studs (2 ea) = 300 mm.
Max load = 180kg
CC_sbt * 180 = L * W
L=300, CC = 300, W=180kg

Bolted S-BT Solution: Bulkhead
Bolted with S-BT to bulkhead horizontal. Fix RZE ladder to channel with angle bracket.

Recommended max load: 200kg

ALTERNATIVE

Vertical Ladder
Bolted with S-BT to bulkhead vertical.

Recommended max load: 75kg
RZE Cable Ladder System

We offer two distinctive types of cable ladders specially designed for ships; the RZE-R and the RZE-P Cable Ladder System. RZE-R is a cable ladder with a smart design which reduces the need for fittings to change direction of the cable run. RZE-P is the preferred system for heavy loads. Both systems are complemented by a comprehensive range of accessories, and have designs allowing for the direct installation of our ETIN™ tubing clamps.

RZE LADDER DESIGN

Sideways Adjustment
Place the ladder upright on a pallet, then line up the hole to the edge of the pallet. Simply step and press down on the side rail to adjust sideways. This technique is useful for avoiding obstacles like pipes.

Z-rungs
Symetric rung allows for installations on both sides of the Cable Ladder. Slot pattern is ideal for cable ties, cable cleats and tubing clamps without compromise. The Z profile of the rungs allow for easy access for cable ties. The design also allows for equipment to be installed above as well as below the rungs.

Available widths
*Only available for RZE-P. 2 x 450 are recommended for 900 mm widths.

RZE Cable Ladder System

<table>
<thead>
<tr>
<th>RZE Cable Ladder</th>
<th>Rail Height (mm)</th>
<th>SWL 1.5 m HDG/SS/AL (kg/m)</th>
<th>SWL 2 m HDG/SS/AL (kg/m)</th>
<th>SWL 2.5 m HDG/SS/AL (kg/m)</th>
<th>Available lengths (m)</th>
<th>Material thickness HDG/SS/AL (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RZE-P</td>
<td>40</td>
<td>260 / 337 / -</td>
<td>134 / 159 / -</td>
<td>75 / - / -</td>
<td>3</td>
<td>5 / 5 / -</td>
</tr>
</tbody>
</table>

Available widths (mm): 100, 150, 200, 300, 400, 450, 500, 600, 650*, 750* & 900*

SWL = Safe Working Load. Loading data according to IEC61537. The length of the end span must be reduced to 3/4 of the support spacing and with no splices on the end span.

*Only available for RZE-P. 2 x 450 are recommended for 900 mm widths.

Rail Pattern

RZE-R
The RZE-R side rails feature a hole pattern, which allows the ladder to be partially cut, then bent to create vertical risers. The cuts can then be welded in place if necessary.

RZE-P
The RZE-P ladder has a traditional slotted side rail design allowing for bolting support and a multitude of accessories to the side rails using M10 bolts.
RZE System Parts

**Splice Connector**
Two splice connectors required for each connection.

**Fixing Clamp**
Fixing clamp for clamping on the sidereal of the RZE-R Cable Ladder.

**Flat Elbows**
90° Flat Elbow for the RZE-R Cable Ladder System. Radius = 200mm

**Tee- and Cross-Piece Bracket**
Bracket for forming Tee- and Cross-Pieces.

**Rail Pattern**
The RZE-R side rails feature a hole pattern, which allows the ladder to be partially cut, then bent to create vertical risers. The cuts can then be welded in place if necessary. The pattern also allows the ladder to manually be bent sideways. No need for extra fittings.

**COMPATIBLE SYSTEMS**

- Smart Cleat®
- Equipment Plates
- Light Fitting Support
- Tubing
Z-profiles

Versatile profiles for many different applications in shipbuilding. Supplied in ZM and SS. Length = 3000 mm. Custom lengths available on request. Cut in 50 mm increments for optimal application.

Material thickness = 2.0 mm
Height = 30 mm

Material thickness = 2.5 mm
Height = 70 mm

Recommended placement of S-BT threaded studs.

Cable Tray SPBE20 used as EQ Plate. SPBE-20 is widely used as equipment plate. Combine it with Z-bracket for a weld free solution.

Tubing installation

Piping installation.

Installed to wall for electrical outfitting.