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Installation & Maintenance Manual
FLI Piled Base Grillages

Prepared for: General Guidance

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1.0 INTRODUCTION

FLI Structures (FLI) design and supply a range of products, including towers, steel grillages and frames, monopoles & screw piles. These products provide a safe foundation and support for signals, antennas and other services.

This document contains general information required for the safe Installation and maintenance of FLI Piled Base Grillages. This document includes a summary of the designer's residual hazards, a maintenance statement and general installation guidance.

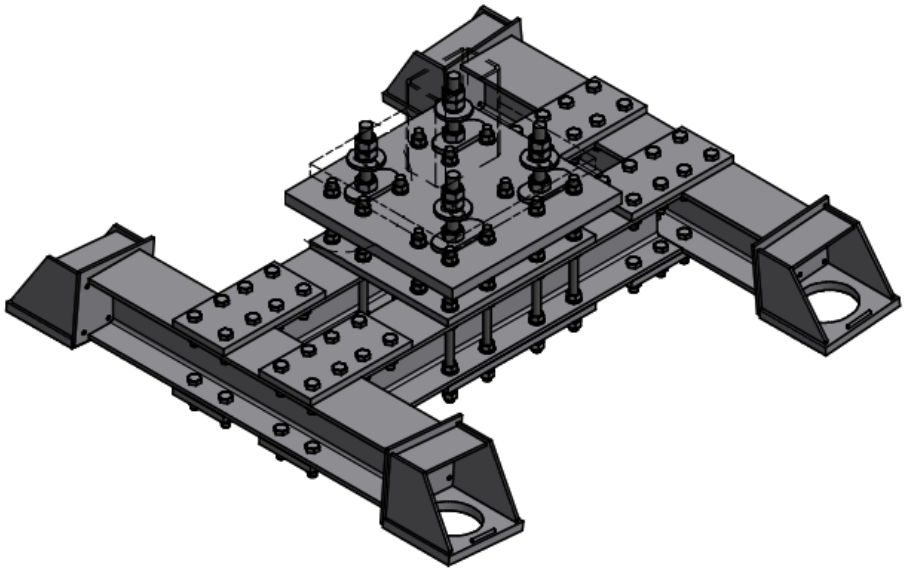
Furthermore, this document is intended only to provide general guidance and is not a method statement. It is essential that FLI's products are installed using proven techniques by competent Contractors. The installers should provide a method statement outlining the proposed method prior to commencing any works. The statement of Designers Residual Hazards addresses general issues regarding the installation, maintenance and dismantling of structures, however all projects will require task specific risk assessments.

1.1 DESCRIPTION

FLI Piled Base Grillages provide an interface between piled foundations and the supported structure.

The Frames are made up from bolted-together steel sections that generally connect to an interface plate – to which the structure base connects. In some cases, access steps may be provided.

Refer to the General Arrangement drawing (GA) for information and instructions concerning the setting out and installation of a specific grillage.



2.0 DESIGNERS STATEMENT OF RESIDUAL HAZARDS

Design Residual Hazard	Description	Activity
Tripping	It is likely there will be trip hazards in the form of uneven ground, and other encumbrances protruding from the surface. (In some cases piles and grillages).	Installation Maintenance Dismantling
Use of inappropriate lifting techniques or equipment	Injury or product damage can result from employing inappropriate lifting techniques or equipment. The weights of individual elements and assemblies are shown on the relevant general assembly drawings.	Installation Dismantling
Handling heavy individual pieces	Injury could result from manual lifting of heavy items. Individual elements have been limited in weight as much as is possible. The weights of the items are listed on the relevant General Arrangement Drawing (GA)	Installation Dismantling
Injury from Vehicle and Plant Movements	Vehicles and Plant is likely to be operating around the site, and serious injury can result from inappropriate man-machine interfaces.	Installation Maintenance Dismantling
Use of under strength bolts	The structural bolts used on all FLI general products are generally grade 8.8. Substitute bolts from other sources shall not be used or structure failure could result.	Installation Maintenance
Use of hazardous material: touch-up paint and zinc rich paint	Damage to the galvanised coating can be repaired using zinc rich paint. Painted products are similarly repaired using touch-up paint. Inappropriate use of these materials can cause harm to operatives or the environment.	Installation Maintenance
Falls from height	Many structures require working at height, or pose a potential path for the general public to access unsafe areas. The use of unsuitable fall arrest systems or climbing techniques can result in falls. Inadequate security (lack of anti-climb measures) can give the public access to unsafe locations.	Installation Maintenance Dismantling
Falling objects from height	Items can be dropped by operatives working at height. This can include tools, bolts, structural items or equipment. Falling items can seriously injure persons in the fall zone.	Installation Maintenance Dismantling
Use of incomplete steps	Climbing steps or access equipment before the structure is fully installed can result in serious injury or death.	Installation Dismantling
Lightning strikes	Serious injury can result if structures are climbed during electrical storms or if the earth lugs provided at the base of the structure are not connected to the earthing system.	Installation Maintenance Dismantling
Use of inappropriate foundation designs	It is the responsibility of the foundation designer to ensure that appropriate base sizes have been designed for above-ground structures. Refer to the relevant drawings for more information on the unfactored base forces and foundation connections.	Installation
Collapse during dismantling	Structures can collapse unexpectedly if dismantled in an inappropriate manner. A competent person must always prepare a suitable method for dismantling.	Dismantling

A full risk assessment or each of the relevant identified hazards above and any other hazards that present themselves needs to be completed by the inspector and/or maintainer.

This list is not exhaustive and site specific risks should always be considered.

3.0 INSTALLATION GUIDANCE

Refer to the relevant General Arrangement drawings for details of the structure layout, elements and fixings used on the structure.

It is essential that the structure is installed using proven techniques by competent Contractors. Refer to Residual Risks prior to determining the preferred installation method for each site.

3.1 Assembly and Erection

The assembly and lifting method and sequence will vary between structure types, equipment availability and site constraints.

When planning the structure assembly and erection the installer must consider the health and safety of the workforce as his first priority. Good practice in this regard is to follow the Working at Height Hierarchy of control:

a. Avoid working at height, e.g. pre-assemble as much as possible at ground level.
b. Prevent falls using appropriate access equipment such as Mobile Elevated Work Platforms (Cherry pickers) or rope access techniques.
c. Reduce the distance and consequences of a fall should one occur, e.g. use fall arrest systems or catch nets.

Practicality and efficiency should also be considered. Where structurally possible, lifting structures in one piece is preferable to multiple lifts or as a last resort, derrick build. However the cranes available and the site constraints will also influence the assembly and erection methods.

Prior to lifting structures onto the foundation or grillage, the position of the Hold Down Bolts or base stubs should be checked against the layout of the structure base plates or legs. Any discrepancy shall be noted and clarity sought.

3.2 Bolt Configuration

Bolt assemblies supplied by FLI Structures are typically Grade 8.8 spun galvanised to BS EN ISO 10684:2004 and usually comprise a Bolt, Nut and flat washer for use under the nut. Spring washers are not supplied, nor desired.

U-Bolts and N-Bolts are typically Grade 4.6. and comprise the shaft, and one washer and 2 nuts per threaded end, the second nut being used as a lock nut.

Special bolts, fixings and configurations are utilised form time to time, as detailed on the structure specific General Arrangement Drawing. Where special fixings are supplied, appropriate tightening methods must be used.

3.3 Bolt Tightening – Ordinary Bolts (non-preloaded)

Refer to ‘Guidance Notes for Tightening Non-Preloaded (Ordinary) Bolts’ Document No. FLI-GN-0007.

3.4 Bolt Tightening – Pre-loaded Bolts

Pre-loaded bolts shall be tightened in accordance with a specific method appropriate to the bolt assembly type.

4.0 MAINTENANCE STATEMENT

As a minimum, the following items are to be examined intervals no greater than 2 years:

Item	Description
Earthing	The earthing system must be checked for electrical resistance in accordance with the original customer specification.
Structure and steps	An ascent of the structure shall be made to inspect all members and connections for corrosion and any form of distress, e.g. bent or fractured members.
Corrosion, Distress and Bolt Tightness	Members and connections shall be inspected for corrosion and any form of distress, e.g. bent or fractured members. A 5% representative sample of all structural bolts shall be tested for tightness, and if there are any problems, check another 5% of remaining sample. If further problems are encountered all bolts in similar locations must be checked and tightened. A 5% representative sample of all ancillary bolts (i.e. hand railing etc.) shall be tested for tightness, and if there are any problems, check another 5% of remaining sample. If further problems are encountered all bolts in similar locations must be checked and tightened. Preloaded bolts shall be visually inspected to ensure that the bolt has been fitted correctly.
Galvanising and Painting	Members shall also be checked for signs of any damage to the galvanised surface. Any damaged surface shall be identified and remedial measures proposed. Refer to the following section 5.1 for guidance.
Cables and cable-trays	Equipment and power or other feed cable mountings should be checked for any loose fittings. Any obvious damage to equipment should be reported.

4.1 Galvanising Coating Repair

These notes are an example only and the Relevant manufacturer's product details and BS EN ISO 1461 should be referenced.

Repair Materials:

- Zinc rich paint (Manor Coating Systems or equivalent).
- Zinc sheen aerosol spray.
- Paint brushes.
- Protective gloves.
- Wire brushes.
- Sheets of emery paper.
- PPE as identified by task Risk Assessments shall also be used.

Repair Procedure:

1. Visually inspect all galvanising components to identify areas of coating damage.
2. Wire brush any damaged areas to remove loose coating material, signs of staining and corrosion products.
3. Exposed steel and the edges of any mechanically damaged areas are to be abraded with emery paper and the edges 'feathered' to provide a keying surface.
4. Clean area of damage with a clean cloth removing all dust/dirt from damaged area.
5. Observe good painting practice and do not apply paint in wet or damp conditions, or when the air temperature is below 5°C.
6. Apply 2 coats of zinc rich paint to the repair area (Touch dry approximately 1 hour). The total Dry Film Thickness (DFT) shall be no less than 100µm. (as per Clause 6.3 of BS EN ISO 1461:2009)
7. When dry, the painted area should be over sprayed with a zinc sheen spray to give a similar appearance to the galvanise coating. Note that when first applied, zinc sheen spray may appear bright but will fade quite quickly to match the galvanised surface.

Notes:

a) Superficial marks such as band staining and footmarks should be wiped clean and sprayed with zinc sheen.
b) White rusting rarely progresses past the superficial stage and will generally wear off in normal weather. No remedial treatment is required for light white rusting.
c) White rusting which has progressed past the superficial stage is characterised by a noticeable darkening and apparent etching of the galvanised coating. In such cases less than 5% of the galvanised coating has been removed and repair may be limited to removal of the white rust by wire brushing and over spray of the affected area with zinc sheen.
d) Severe white rust is characterised by heavy oxide deposits, with the area underneath almost black and showing signs of red rust.

4.2 Removal/Decommissioning

To remove the structure and decommission the site, typically, the reverse of erection procedures should be followed. A new Method Statement must be produced (by an appropriate authority) that takes into consideration any changes to the site and to the structure since the original design and construction (as this may impact on plant that can be used, space within which the decommissioning team can operate and the types of risk present on site).

Care should be taken to identify primary, secondary, tertiary (etc.) structural members so as to ensure that the dismantling process is safe and does not lead to instability, partial or total collapse of the structure. If in doubt, professional advice must be sought.

ANNEX A: COSHH DATA SHEETS

The Following Data sheet has been included as an example. Other touch-up products are available and other hazardous products may be required on-site. All hazardous materials used on site will require a COSHH data sheet.

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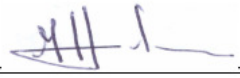
Substance Identification Record (COSHH) and Assessment Record

Substance: Paint-Zinc Rich Primer (Manor Product)	**Record No:** 54	
Manufacture: Shipley Paint Limited	**Manufactures Health & Safety Identification Number:** UN 1263	
Process: Repair/ touch-up of damaged hot dip galvanised steel.	**Process Location:** Workshop and Site.	
Ingredients	**Occupation Exposure Limit**	**Date**
Xylene (mixed isomers) Ethylbenzene	100ppm 8hr TWA 100ppm 8hr TWA	02/02/04 02/02/04
Physical Properties	**Suppliers**	
Liquid Aromatic Odour Boiling Point 138-185ºC Vapour heavier than air Auto-flammability 490ºC	Shipley Paint Ltd Otley Road Shipley West Yorkshire BD17 7DP Tel No: 01274 587351	
Frequency & Duration of Exposure	**Hazard Identification**	
Intermittent, (as required for repairs), Maximum duration 3 hours.	- Highly Flammable - Harmful by inhalation - Harmful in contact with skin - Irritating to skin	
Assessment of Exposure: The level of exposure is considered acceptable providing this Product is applied in a well-ventilated area.		
Exposure Controls: -Use only in well-ventilated areas. -Keep container sealed when not in use. -Store in cool dry place	**Personal Protection:** -Wear eye protection, gloves and overalls. -Do not smoke when using this product. -If insufficient ventilation wear suitable respiratory protection.	
Approved for Use: Providing controls and personal protection requirements are followed. **Safety Officers Signature :**____  _____ **Date :**_____18/01/06		

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