	Guideline	Transmission
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1. INTRODUCTION

Various types of birds use power line structures for perching and nesting purposes. These structures often are the only substrate. The principle to be followed in perch management is not to prevent birds from roosting on towers, but rather to prevent them from roosting on critical parts of the tower.

The main purpose of the plastic bird perch diverters is to reduce bird related faults (streamer and bird pollution), therefore this guideline provides a fitment strategy/guideline to ensure an optimal and effective installation of bird perch diverters on Eskom Transmission and Sub-transmission line structures.

2. SUPPORTING CLAUSES

2.1 SCOPE

This document provides an installation guideline for plastic bird perch diverters on powerline structures.

2.1.1 Purpose

The purpose of this document is to guide the asset owner and installer to optimally and effectively install plastic bird perch diverters on Eskom Transmission and Sub-transmission line structures.

2.1.2 Applicability

This document is applicable to all Eskom Transmission Grids, Distribution Operating Units as well as installation teams.

2.2 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition (latest revision) of the documents listed in the following paragraphs.

2.2.1 Normative

- [1] ISO 9001 Quality Management Systems.
- [2] 240-60725816TRANSMISSION HIGH-VOLTAGE LIVE WORKING
- [3] 240-132479779 Climbing of Structures on Live Power Lines to gain access for NON Electrical activity
- [4] 240-119669098 Install, Maintain and Replace Line Labels and Bird Anti Perching Devices including the Removal and Relocation of bird nests on OI&E and Live Transmission Lines.
- [5] 240-147885960 Plastic Bird Perch Diverter and Stainless Steel Strap Specification
- [6] 240-114967625 Operating Regulations for High Voltage Systems
- [7] Occupational Health and Safety Act (Act 85 of 1993)

2.2.2 Informative

- [8] Close Proximity Work Authorization – Eskom Transmission Group Requirements

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2.3 DEFINITIONS

Definition	Description
Micro fitting strategy	This term refers to the positioning of bird perch diverters on specific parts of the tower. This decision will be based on the particular design of the tower as well as the bird species that are targeted.
Macro fitting strategy	This term refers to the determination of which towers to fit with bird perch diverters on a particular Transmission line. During the National Bird perch diverter project, both comprehensive as well as partial fitting strategies were followed.
Tower boat	The underside of the lattice beam and cross arms of the power line structure, refer to Appendix A for the drawing.

2.3.1 Disclosure Classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
Dx	Distribution
OU	Operating Unit
Tx	Transmission

2.5 ROLES AND RESPONSIBILITIES

The Line and Servitude Managers for each Grid, as well as the sector managers shall be responsible for the installation of any plastic bird perch diverters in their respective Grids and OUs respectively. Installation teams must also follow the installation guidelines included in this document.

2.6 PROCESS FOR MONITORING

The Grids and OUs must ensure that the installation of plastic bird perch diverters on their assets is recorded and that this information is stored on the latest works management system and update on TxSIS.

Quality of work for the installation of plastic bird perch diverters on power line structures utilising external contractors will be monitored by appointed personnel for the Grids and Operating Units.

2.7 RELATED/SUPPORTING DOCUMENTS

N/A

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3. INSTALLATION

- a) For tower types utilising an I-string or V-string insulator assembly, the plastic bird perch diverters should be installed over the conductor position and should cover at least one meter or more on either side of the conductor (See Figure 3-2: , critical distance). The Grid or OU are allowed to add additional coverage if so required improving performance; however they should take into consideration the cost versus performance benefit of the said additional intervention.

Where it has been established that bird pollution is a factor, the entire V-string can be covered refer to the scope of work report for determination e.g. towers near water or wetlands may need full coverage. The sheet metal cover must be considered for areas with severe bird pollution or bird nesting issues (this will be specified in the investigation reports or scope of work), the prototype is still under development.

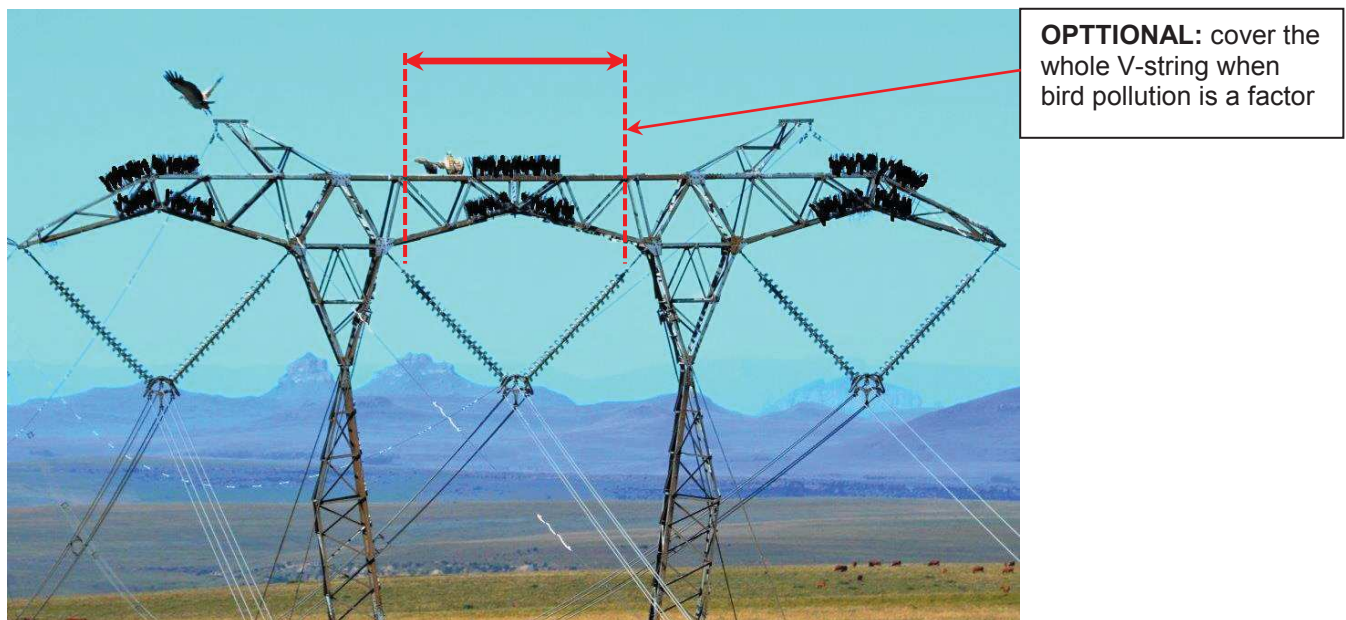


Figure 3-1: Cover the whole V-string for towers with heavy or sever bird pollution.

- b) The entire cross members inside this one meter area or more must be covered with plastic bird perch diverters. This includes the tower top, the boat and everything in-between. On strain structures, one meter on each side of the attachment point as well as one meter either side of the jumper position must be covered. This coverage is based on current practices, but more can be installed based on grid experiences. Allowance must be made for certain sections of the tower to be left free of plastic bird perch diverters, to still provide adequate roosting space for birds (non-critical areas).

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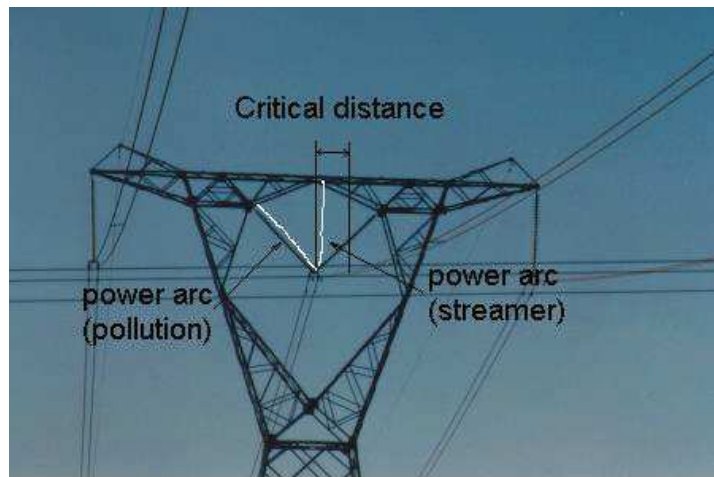


Figure 3-2: A distance of one meter either side of the conductor is regarded as critical in protection against streamer faults.

- c) Two neighbouring units shall be placed at a distance not exceeding 80 mm.
- d) The installations will utilise stainless steel straps to sufficiently fasten the plastic bird perch diverters to the tower members. Three straps will be used on each plastic bird perch diverter.
- e) The recommendation is for 1.5 m to be installed on either side from the centre of V-string; the 1 m can be considered for I-string (the purpose is to prevent perching and insulator pollution due to bird drops).

3.1 MICRO FITTING STRATEGY

The tower configuration and design will determine the placement of plastic bird perch diverters. Care must be taken not to create new perches for birds during the installation process. Plastic bird perch diverters installed on near vertical tower members will result in this situation.

3.1.1 Tower Design

The tower design plays a major role with respect to bird streamer related faults. Vertically configured designs with ample perching space on top of the tower away from the cross-arms, experience fewer faults than horizontally configured designs. The reason for this is that with the latter, the birds roost relatively closer to the conductors, therefore increasing the risk of flashovers. With the former, depending on the design, the birds first utilise the available space on top of the tower, thereby reducing the risk of flashovers. Similarly almost no bird streamer faulting is experienced on the cross-rope suspension type towers, presumably due to the unavailability of convenient perching space for birds above the conductors.

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Transmission uses a variety of tower designs, with each design having as much as ten variations. As a result, broad guidelines will be given in this document. Final fitting strategies will have to be confirmed with subject specialist for final vetting.

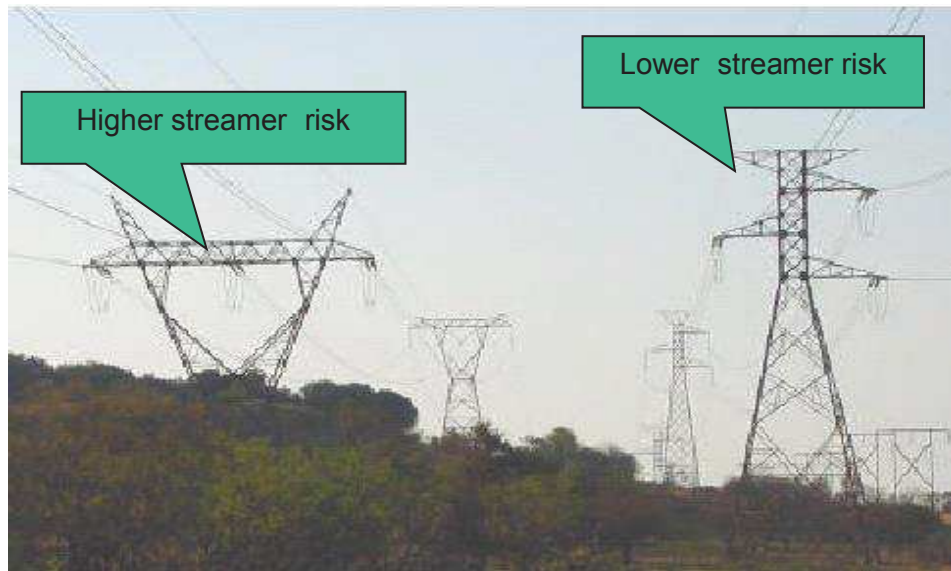


Figure 3-3: A picture showing the tower designs vulnerable to bird streamer faults.

Horizontal strain towers are the most vulnerable to streamer faults, followed by horizontal suspension towers. Delta towers are generally much less vulnerable with suspension towers being the least vulnerable.

3.1.2 Fitting on Outer Phases

Experience revealed that faults occurred on the outer phases where the landing plates were not fully protected, which left roosting space for birds. Care must be taken not to leave any roosting space at the outer phase extremes of towers.

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Figure 3-4: Picture of incorrect fitting leaving the landing plates, and the inside of crossarm, exposed.

3.1.3 V-strings and I-strings

Although V-strings on centre phases were originally thought of as more vulnerable to streamer faults than the I-strings, experience has now shown that the latter are vulnerable and should also be protected with plastic bird perch diverters.

3.1.4 Protecting the inside of the boat

Faults have also occurred where birds had entered and roosted inside the boat of the tower. Hadedda Ibis and Black Eagle in particular have been observed exploiting the inside of the boat or lattice member within the critical area, which was not fitted with bird perch diverters.

3.1.5 Protecting the earth peak

Some lattice structure designs can also have earth peaks that encroaches the critical area (earth peak within the 1m horizontal distance from the phase conductor). This also poses a risk of streamer flashover when a large bird perches on the earth peak. If the earth peak is within, or close to the critical area, a plastic bird perch diverter must also be installed on the earth peak (see risk area indicated on Figure 3-6 below).

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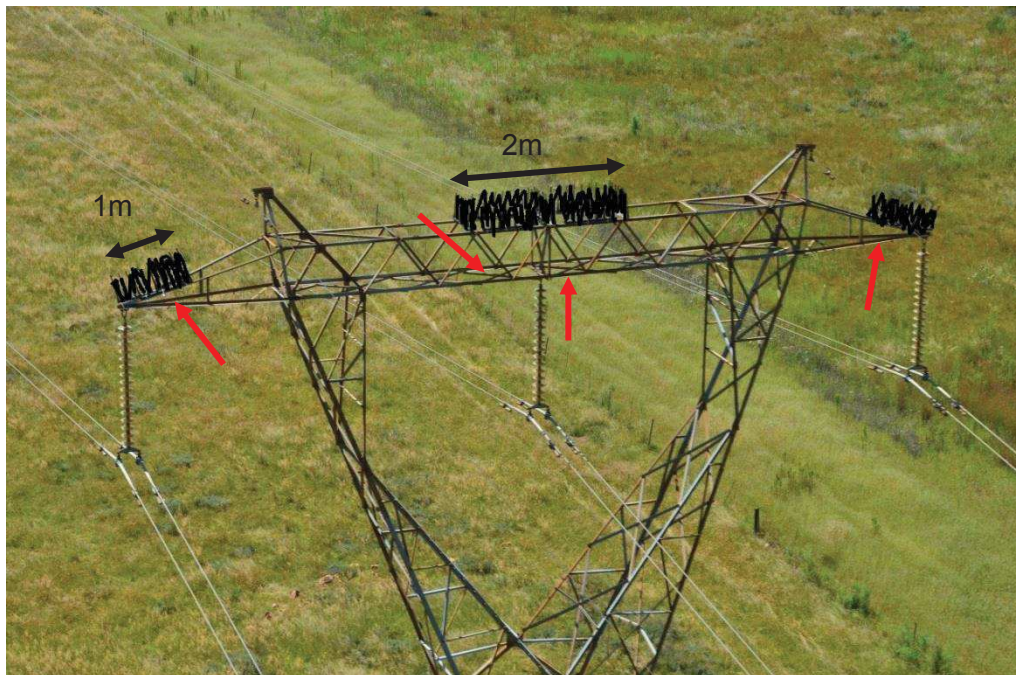


Figure 3-5: A picture showing an example of insufficient fitting on inside of boat indicated by the red arrows.

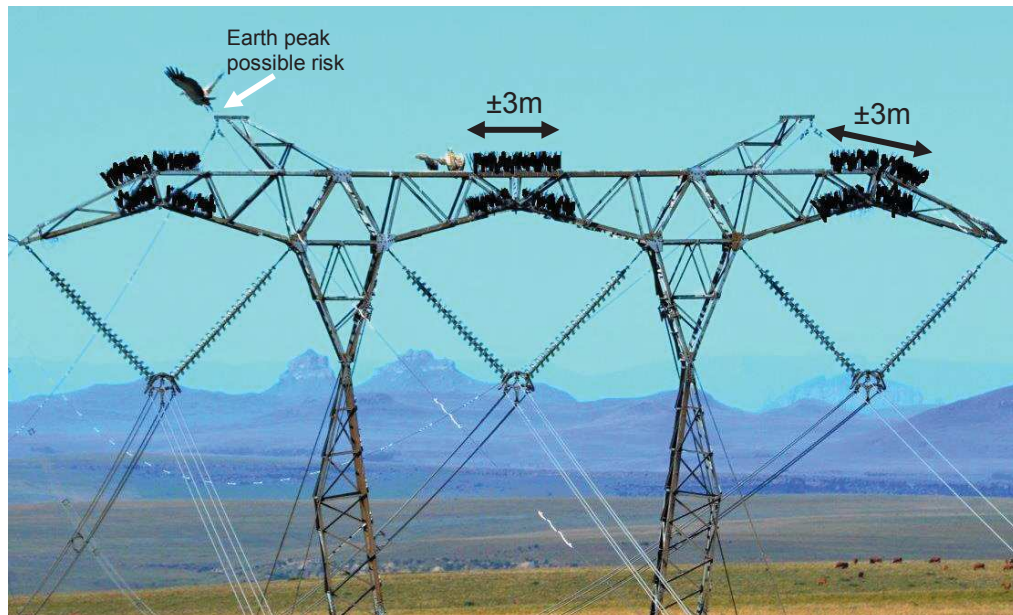


Figure 3-6: Comprehensive fitting strategy above phases, but bird streamer flashover risk if earth peak is close/within the critical area.

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3.2 MACRO FITTING STRATEGY

Whilst a comprehensive fitting strategy is the safest, it also carries a high cost. Results from partial fitting were generally good when comparing risk of streamer fault with cost of installation. It must be pointed out that dependable knowledge of the habitat through which the line runs is critical when partial fitting of a line is contemplated.

The decision to fit plastic bird perch diverters to a line is in the first instance an environmental one then economical one. It is based on:

- the dip sensitive load that the line carries and the effect that these faults are having on the customers and
- the number of bird faults that it experiences (determined from its fault history) ,

Secondly, the habitat through which the line passes and the bird species present in that habitat, and more specifically their behaviour, influences the macro fitting strategy. Bird behaviour refers to aspects such as migration, feeding and roosting habits. This strategy is affected by topography, land use, and type and availability of food sources. The help of subject specialist should be used in this regard.

3.2.1 Consideration of adjacent lines

It has been reported that where bird perch diverters resulted in a decrease of roosting space, birds have moved to adjacent lines and streamer faults have occurred there. The increase in birds (and streamer faults) must however also be seen against the influence of wet weather cycles or other phenomena and the general increase in bird population numbers for an area. It is recommended that these factors be considered where lines without bird perch diverters run adjacent to the targeted line.

3.2.2 Special circumstances

Results to date on lines that have been fitted with bird perch diverters have resulted in a reduction in bird faulting, and some lines have had a 100% reduction in bird related faulting. It is important to note plastic bird perch diverters are not a 100% solution under all circumstances, isolated instances have been recorded where birds have managed to wedge themselves between bird perch diverters (this risk should be reduced with the proposed design modifications). These incidents are always associated with extreme densities of birds on a particular tower or towers, and are often associated with super-abundance of food. To date the following examples have been recorded:

- Cape Vultures roosting in large numbers on towers at a vulture restaurant. The birds are very large and if they repeatedly force themselves between the bird perch diverters, it will eventually result in bird perch diverters collapsing.

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- Large concentrations of Black-headed Herons have been observed on the Nyl River floodplain after the annual flooding. These birds roost in large numbers on the towers during this period, and individuals have managed to wedge themselves between the plastic bird perch diverters when many birds are roosting on one tower.
- One incident has been recorded where a Bald Ibis roosted in a steel bird perch diverter. These birds habitually roost on transmission towers in large numbers and it must be assumed that that could happen, especially as the steel bird perch diverters have bigger gaps between the rods than the plastic bird perch diverters. It is not clear at this stage whether the same will happen with the standard plastic bird perch diverters.

Special circumstances require special solutions, and each incident must be investigated with the help of an ornithologist to arrive at a solution. In doing so it must also be considered whether the level of faulting caused by these "special events" justifies the cost and effort to devise a solution that will result in a 100% elimination of faults, especially if the faulting levels are very low and restricted to a short period of time each year.

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4. AUTHORISATION

This document has been seen and accepted by:

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5. REVISIONS

Date	Rev.	Compiler	Remarks
July 2020	1	T Sibi	First Issue First Revision: The document will be used as a guideline for the installation of plastic bird perch diverters on transmission lines. It will be used in conjunction with other standards, procedures and specifications that are applicable to transmission line maintenance.

6. DEVELOPMENT TEAM

The document has been developed and compiled based on inputs from Transmission Live Line Team, Transmission Grids, Distribution Operating Units and Line Engineering Services.

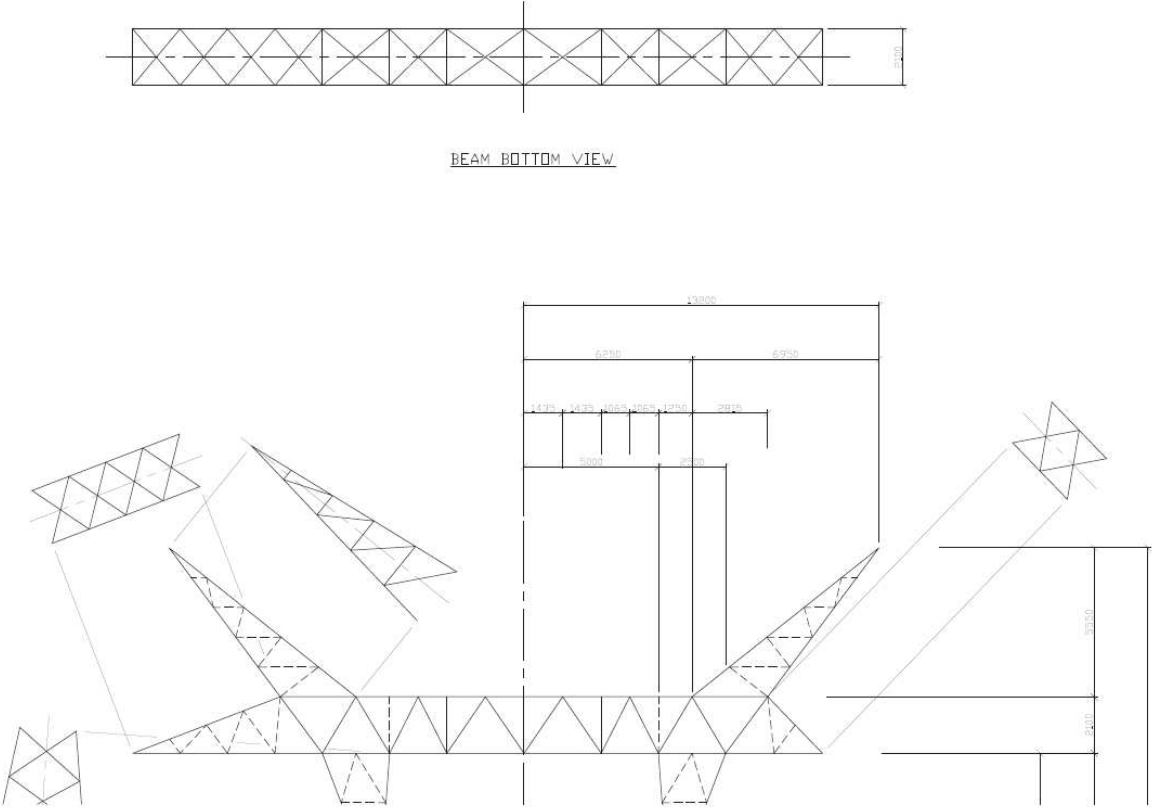
7. ACKNOWLEDGEMENTS

The author acknowledges the input from all the members involved in the development of this guideline.

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APPENDIX A: LATTICE STRUCTURE TOWER BOAT



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