1. Objective

To advise of the available Overhead Aerial Markers, and their different applications.

In addition to the current overhead aerial markers, after trials, Energy Queensland is introducing the Rotamarka, supplied by Balmoral Engineering, as an alternate to the warning flags for aerial based, and some ground based, applications.

2. Introduction

2.1. Aerial based identification

This standards alert is only applicable for Low Level Aviation operations (Crop dusting and similar operations) based on Australian Standard AS 3891.2 Air navigation—Cables and their supporting structures—Marking and Safety requirements Part 2: Low level aviation operations. This standard advises that a white marker is preferred to be used on conductors for aerial based identification. An orange marker should not be used for conductor identification for low level aviation unless specifically requested by an aviation operator.

Marking of lines in the vicinity of Licensed or Government Aerodromes, authorised landing and alighting areas, cables in excess of 90m above ground or span lengths of >1500m are covered by Australian Standard AS3891.1. Marking of lines in these areas should be referred to Transmission Design teams for specialist design and consideration.
AS 3891.2 Clause 2.2.2

2.2.2 Colour

The colour of aircraft warning markers shall be chosen for visibility and contrast with the surrounding background.

Markers referred to in this Standard shall be coloured with one, or a combination of, the colours listed in Table 1 in order of preference, commencing with white:

<table>
<thead>
<tr>
<th>Colour</th>
<th>Common name</th>
<th>AS 2700 Reference colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>White (preferred)</td>
<td>Off White</td>
<td>Y38</td>
</tr>
<tr>
<td>Yellow</td>
<td>Canary</td>
<td>Y11</td>
</tr>
<tr>
<td>Red*</td>
<td>Signal Red</td>
<td>R13</td>
</tr>
<tr>
<td>Orange*</td>
<td>International Orange</td>
<td>R11</td>
</tr>
</tbody>
</table>

* Orange shall not be used except in circumstances requiring unusual contrast.

NOTE 1. Orange is included above for the sake of continuity, to provide for aircraft warning markers installed prior to the issue of this Standard.

2.2. Ground based identification

An orange marker flag is to be used on conductors for ground based identification of a relatively temporary nature (6 months up to a few years depending on location). This includes for building and roadwork sites and the like.

Where a longer term solution is required, a different marker can be considered. This includes marking for agricultural applications or where existing marker flags have not provided the desired longevity.

3. Markers

3.1. Orange Flag Markers

For use in grounds based operations to provide a visual identification aid for overhead powerlines.
3.2. White Flag Markers

For use in aerial based operations to provide a visual identification aid for overhead powerlines for low flying aircraft.

3.3. Warning Markers for Large Birds

For use in areas where there are issues with bird strikes on the overhead conductors by large birds (e.g. Pelicans). These light weight Markers emit ultra violet light from the disc at centre to assist in deterring birds.

3.4. Large Marker Balls

For use in aerial based operations to provide a visual identification aid for overhead powerlines for low flying aircraft. Can also be used where ground-based marking is required. (E.g. for Birds or boats over waterways)
3.5. Red/White Spinning Large Markers (Large Rotamarka)

For use in aerial based operations to provide a visual identification aid for overhead powerlines for low flying aircraft. Can also be used where ground-based marking is required.

The large spinning marker is only to be used where site specific requirements deem that the mini-marker is not the preferred option.

Note: It is possible that the Rotamarka will stop spinning after a period of time, in which case it will become a static marker. It is still considered suitable for powerline marking and there is no intention to replace these markers if they stop spinning, unless there are site specific exceptional circumstances that warrant replacement.

3.6. Red/White Spinning Mini-Markers (Mini Rotamarka)

For use in ground or aerial based operations to provide a visual identification aid for overhead powerlines for aircraft or ground based machinery.

Where spinning markers are deemed to be required, the mini-marker is the preferred marker to use unless there is a site-specific requirement identified where a large marker would be more suitable.

Note: It is possible that the Mini-Rotamarka will stop spinning after a period of time, in which case it will become a static marker. It is still considered suitable for powerline marking and there is no intention to replace these markers if they stop spinning, unless there are site specific exceptional circumstances that warrant replacement.
4. Installation of the Aerial Markers

4.1. Safe Design – Use of Aerial Markers

The installation of aerial markers should be considered during the design stage to improve community and wildlife visibility of the overhead network. This is important over agricultural cropping land or in areas where post construction marker installation may be difficult.

4.2. Instructions and Limitations on Use of Aerial Markers

Install markers according to the relevant work practice. Prior to installation conduct a visual inspection on the span of the conductor, pole top and hardware. Consideration should also be given to holding slack span conductors during installation.

No aerial marking devices are to be applied to any conductors that are significantly corroded/deteriorated.

| WARNING | Aerial Marking devices are not to be installed on any conductor showing signs of significant corrosion or other deterioration. |

4.3. Use of Aerial Markers on 7/.064 Copper Conductor

To reduce the risk of conductor failure on this small conductor, only the bird diverter type markers (refer section 3.3) can be used to mark 7/.064 Cu. These markers have a lighter weight and smaller wind surface area compared to traditional markers so should reduce the risk of causing a failure. These markers can only be used on 7/.064 Cu subject to the following conditions being met:

- Crews are to perform an on-site assessment of the conductor to ensure there is no damage or deterioration of the conductor & attachments prior to installing the marker.
- The installation of the marker is to be performed with the conductor de-energised (HV under access and any LV proven de-energised).

If the installation of the markers is required for CTG/CTS defect purposes, but is deemed to be unsafe due to potential conductor failure by the crew on site, other mitigating options are to be considered as per section 7.3 of the “Standard for Conductor Clearance Prioritisation and Remediation” (document numbers - Ergon STNW3399, Energex RED 01970).

| WARNING | Only bird diverters are to be used when marking 7/.064 Cu conductor. An on-site assessment of the hazards shall be undertaken, and attachment of markers shall be carried out with conductors de-energised. |

4.4. Small Markers (Flags and Bird Diverters)

- The number of marker flags and spacing’s are to be as requested by the property owner or aerial operator. The drawing below details the technical limitations for a typical installation.
- Maximum of 4 flags per conductor per span
- Formation and spacing may vary but scoper must ensure conductor clashing is avoided
- Check that the conductor(s) still meet required clearance after markers have been applied
4.5. Large Markers (all spinning markers and marker balls)

- The number of markers, locations and spacing’s are to be as requested by the property owner or aerial operator. The drawing below details the technical limitations for a typical installation.
- The number of markers per conductor is limited to two, so as not to exceed tension of 70% of the conductor Nominal Working Load at 15°C, 900 pa wind. For higher wind pressures refer to Lines Standards.
- The reduction in ground clearance at 50°C will be typically less than 150mm. Refer to the Overhead Construction/Design Manuals for regulation ground clearances. Check that the conductor(s) still meet required clearance after markers have been applied.
- If marker balls are used, they must be Dulmison Australia or equivalent 300mm diameter spheres. Part numbers for the Dulmison type are as detailed in table below.
- Marker balls are to have a maximum diameter of 300mm and maximum weight of 3 kg.
- Preferred Marker ball colours are White for aerial operations or Orange for ground operations. Other colours can be used if requested by the owner/aerial operator.
This Standards Alert will remain in force until either the expiry date is exceeded, or update of the relevant sections of the specified manuals has occurred.

Uncontrolled Document When Printed
5. Application of the Rotamarka

| WARNING | As per section 4.2 & 4.3, Rotamarker Aerial Marking devices are not to be installed on 7/.064 Cu conductor, or any conductor showing signs of significant corrosion. |

The Rotamarka can be attached to the overhead conductors from either the ground or from a EWP using the appropriate attachment with either a link stick or shot-gun stick.

5.1. Ground based
5.2. EWP based

6. Stockcodes

<table>
<thead>
<tr>
<th>Item</th>
<th>Southeast (Energex) SC</th>
<th>North/South (Ergon) SC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange Marker Flag, for use in ground based operations</td>
<td>21702</td>
<td>2461523</td>
</tr>
<tr>
<td>White Marker Flag, for use in aerial based operations</td>
<td>21703</td>
<td>2422368</td>
</tr>
<tr>
<td>Warning Marker for Large Birds</td>
<td>16813</td>
<td>*</td>
</tr>
<tr>
<td>Marker Balls</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Red/White Spinning Large Marker, for use in aerial based operations</td>
<td>2466464</td>
<td>2466464</td>
</tr>
<tr>
<td>Red/White Spinning Mini-Marker, for use in ground and aerial based operations</td>
<td>2473478</td>
<td>2473478</td>
</tr>
</tbody>
</table>

*Stockcodes are not available; these items are to be ordered directly from the supplier.
7. Obsolete Line Markers

7.1. Ronstan Aerial Line Marker

The Ronstan Aerial Line Marker (SC 2461416) has been made obsolete. It has been replaced by the marker balls and the Balmoral Rotamarka.

8. Quick Reference Matrix

<table>
<thead>
<tr>
<th>Marker Type</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ground</td>
</tr>
<tr>
<td>Orange Flag Markers</td>
<td>Preferred</td>
</tr>
<tr>
<td>White Flag Markers</td>
<td></td>
</tr>
<tr>
<td>Warning Markers for Large Birds*</td>
<td>*</td>
</tr>
<tr>
<td>Red/White Spinning Markers (Mini)</td>
<td>Approved</td>
</tr>
<tr>
<td>Red/White Spinning Markers (Large)</td>
<td>Approved</td>
</tr>
<tr>
<td>Large Marker Balls</td>
<td>Approved</td>
</tr>
</tbody>
</table>

*Bird Marker can be used for 7/.064 Cu if suitable, refer section 4.3.

Preferred: First choice for a particular warning marker application.
Approved: Marker can be used when the preferred option is deemed not suitable for that application.

9. Further Information

For further information, please contact

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