AC/SC/E279 E.T. & D. SECTION

BEAM DIVERGENCE FOR BUOY LIGHTS

A recent letter from J.G. Holmes, lighting consultant, is attached. It has been decided that the recommendations will be followed, with the exception that the field experiments (object 2) will be replaced with visual experiments using a tilting platform at Dungeness.

Hence the following action will be taken:-

(i) The work on a fluted cylinder reported in Test Sheet 177 will be followed up with tests on other spreader (dispersing) materials, including stippolyte or perspex clear stipple.

This should lead to a full understanding of the design requirements of a cylinder which will spread the beam to any desired angle (as may later be recommended by IALA).

(ii) The design of a new lens (which is more efficient than the existing lens plus a spreader) will be established using a prototype model section made, probably, by Talbot Designs.

The above two tasks will require both photometric and visual tests to be carried out at Dungeness. On their successful completion, Trinity House will have the choice of using new lenses, or spreaders with existing lenses, or even spreaders with new lenses in order to meet the various beam divergences which IALA may specify.

Copies of all relevant literature are being supplied to Mr. L.G. Reynolds of Research Group to assist his work on the IALA Technical Committee.

A. Cordell

29.4.82.

YAGAAZ

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19 April 1982

E D Humphrey Esq
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Dear Deryck

Beam divergence for buoy lights

My letters of 19 March have been discussed with Lawry and Colin and also with Alan Cordell. I had said that my calculations based on Test 177 should be followed by some thinking and then by some experiment.

I believe Nick Ward is collecting data on buoys in still water, in steady current and in rough water. I am expecting samples of patterned plastics sheets for experiment as spreaders, and as a check on Test 177.

In the meantime, Alan and I have done some of the thinking and this letter is to record our progress.

It seems, as a first guess, that the beam for a buoy principally in calm water with tidal flow should be as the curve (2B) on sheet B attached, and that for rough water should be as (3B). The nominal beam spreads are 35° and 55° and I think they would be suitable for angular tilts of ±15° and ±25° respectively. The curve (1B) is the present rather peaky beam with a spread of 15° (taken from Test 177 but more exactly calculated than in my letter of 19 March); this is suitable for buoys in still water giving a tilt not more than about ±10°. These three curves all represent the same total amount of coloured light flux in the beams.

Sheets 1E, 2E and 3E show the visual range curves for various angles of tilt, in clear and in misty weather. The solid lines are for the main 'beam' above 10% of the peak intensity and the dashed lines are for the fringe of the beam, seen at shorter distances. The visual range limit for 15° tilt is drawn as a heavy line in each diagram and the rather complicated Sheet F illustrates the conditions for a steady 15° tilt for each distribution.

If you agree, the next steps would be to prepare appropriate optical designs of lenses interchangeable with the standard 200mm, to yield the (2B) and (3B) distributions of intensity as closely as practicable, and then to make a model of a 60° segment of the (2B) design for detailed photometric measurements. At the same time, I would attempt to get the (2B) and the (3B) distributions from experimental assemblies using standard lenses and internal spreaders so that trials could be made in suitable waters.

The optical design would be on the principles discussed with Alan on 6 April and would I think be 200mm moulded glass drum lenses (not ground and polished), having a central belt and two zones of three prisms each, substantially similar in appearance to our present lenses. However, the alternative of a moulded plastics lens would need to be considered as a policy decision; such a lens might be self-coloured (red or green acrylic) giving say 15% more light but costing more for the moulding tool than glass.

It may prove practicable to make a lens for the (2B) distribution

ETvD

and to use a white or coloured spreader cylinder inside it to give the (3B) distribution when required. I should be reluctant to use a white lens, a spreader cylinder and a colour filter all in one buoy lantern, because of the loss of light.

The object of this is threefold:

1. to clear our thinking before any IALA decision is taken,
2. to get experimental information and perhaps field experience before that decision is taken, and
3. to establish a method of design in readiness for that decison.

I think you may wish to examine this with your colleagues before proceeding with experimental assemblies for trial.

I should add that a model lens could be made by Talbot Designs (who did the prisms for the beam-depression technique) and that production moulded glass drum lenses would be easy to make (better by Genthe than by Nazeing) but the thought of finding and using an existing die for a plastics drum lens is attractive.

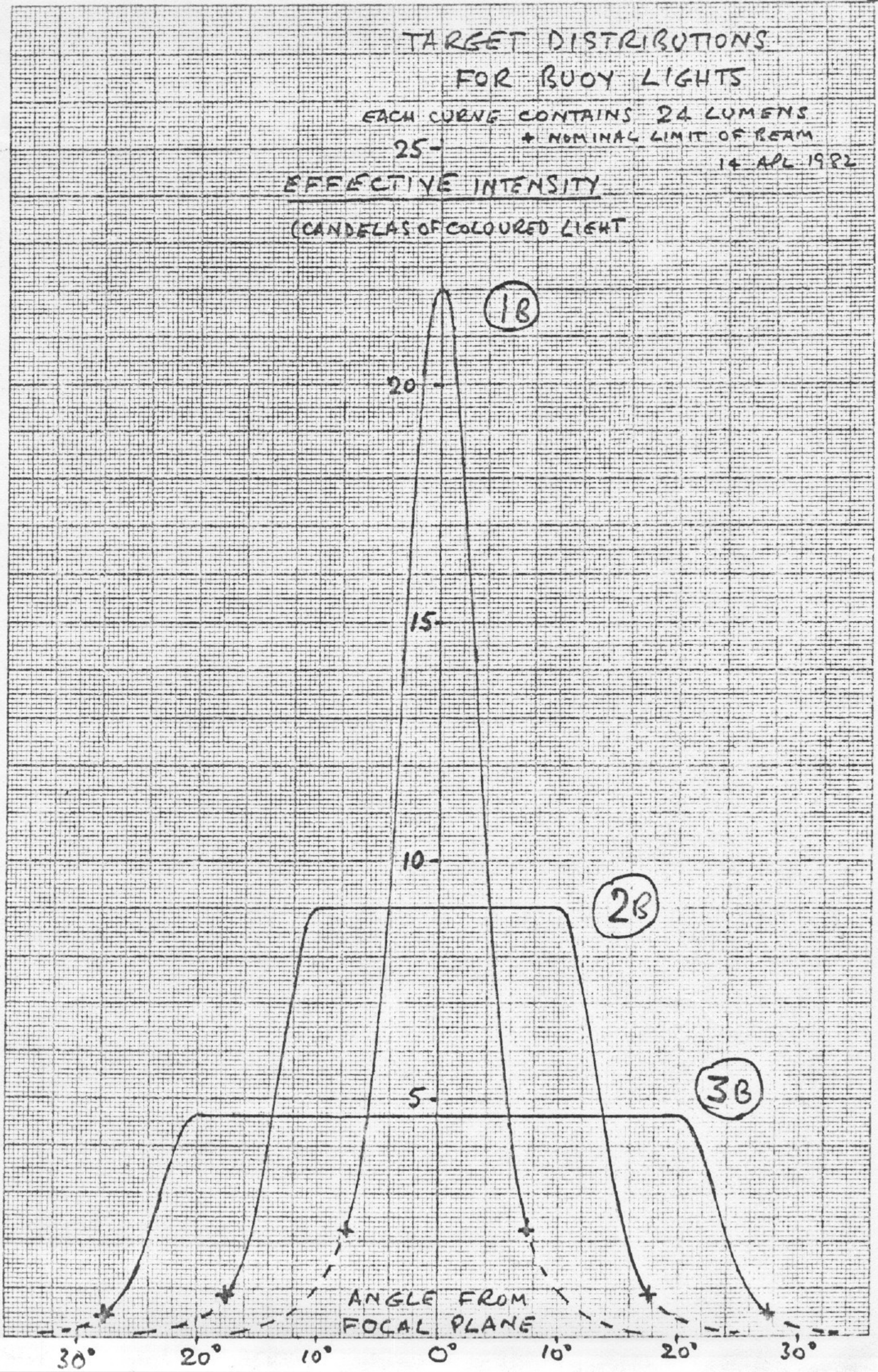
Can you or Lawry find what buoy lenses are available in other Services, such as American or French or German or whatever, and what the practical experience has been? This may come out of the discussions in IALA if the right questions are asked, but it may be more productive to ask direct.

Yours sincerely

John

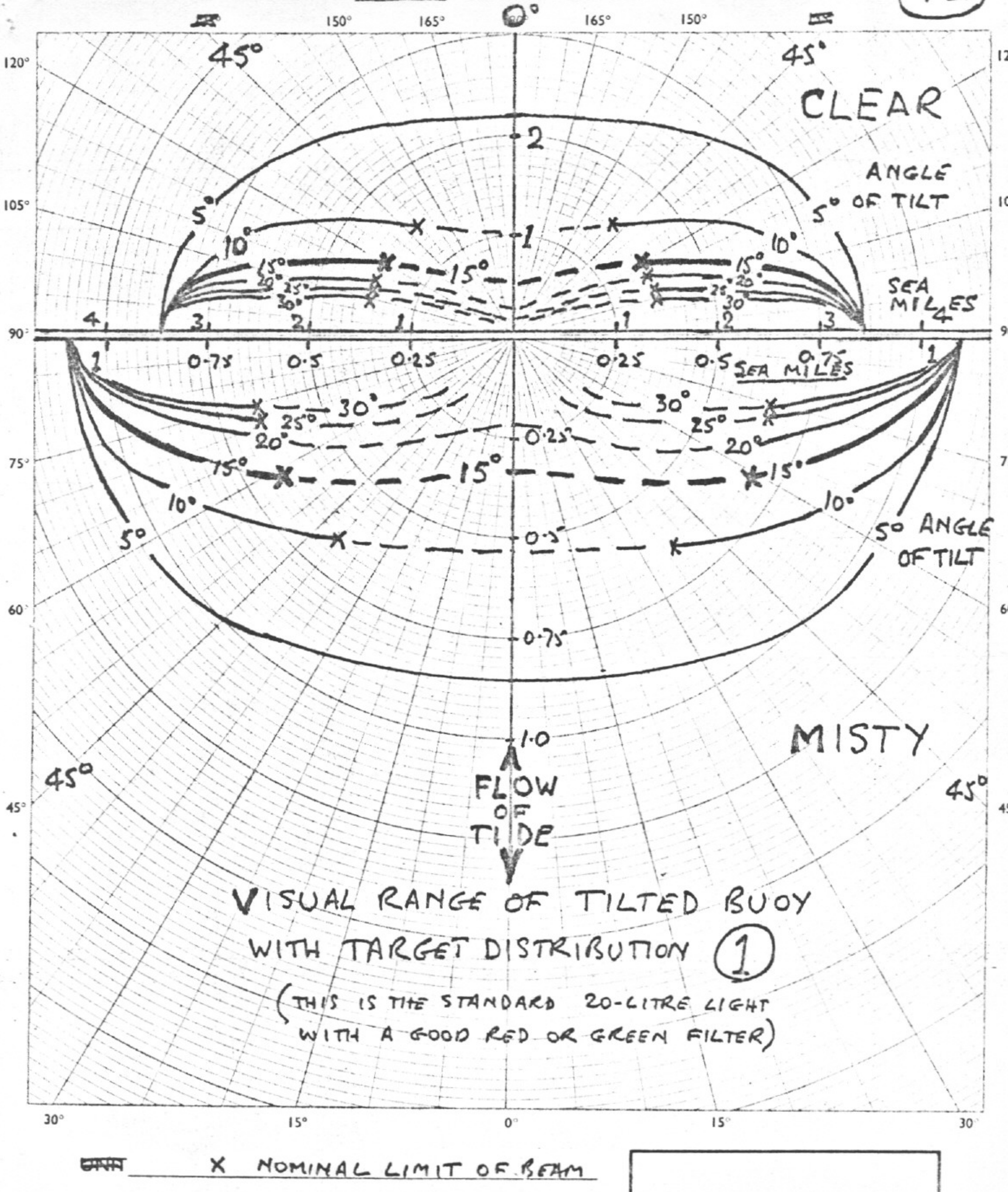
cc LGR, AC

B


TARGET DISTRIBUTIONS
FOR BUOY LIGHTS
EACH CURVE CONTAINS 24 LUMENS
+ NOMINAL LIMIT OF BEAM
14 APL 1982
EFFECTIVE INTENSITY
(CANDELAS OF COLOURED LIGHT
25
20
15
10
5
1B
2B
3B
ANGLE FROM
FOCAL PLANE
30°
20°
10°
0°
10°
20°
30°

RANGE
~~INTENSITY~~ DISTRIBUTION CURVE

1E



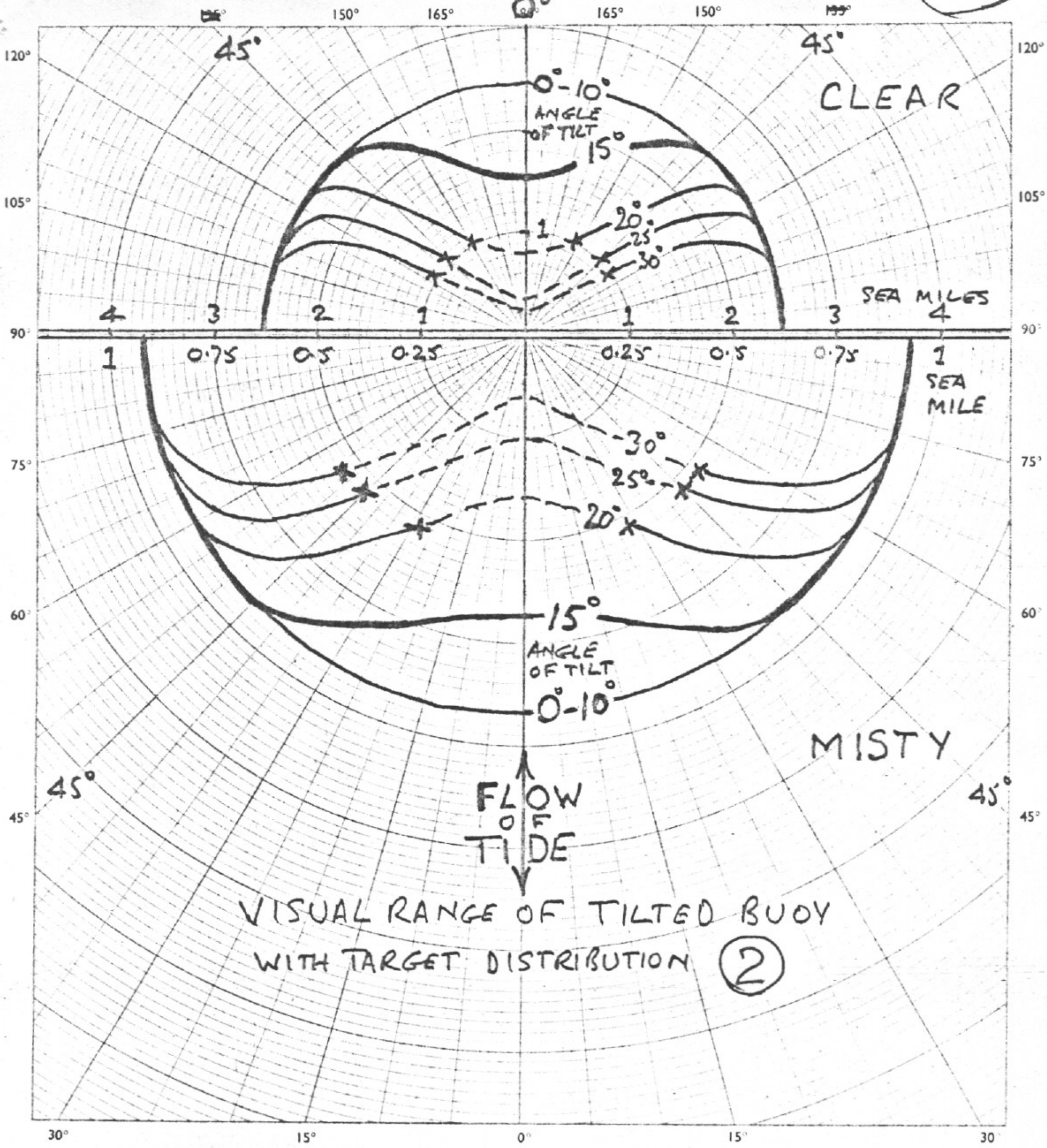
~~UNIT~~ X NOMINAL LIMIT OF BEAM

~~CAT. NO.~~ EACH CURVE CONTAINS 24 LUMENS
~~LAMP~~ OF COLOURED LIGHT
~~L.C.R.~~
~~GLASS~~ NOTE DIFFERENT RANGE SCALES
~~NOTES~~ FOR CLEAR AND FOR MISTY WEATHER

19 APL 1982

2E

[redacted] DISTRIBUTION CURVE



[redacted] X NOMINAL LIMIT OF BEAM

[redacted] EACH CURVE CONTAINS 24 LUMENS

[redacted] OF COLOURED LIGHT

[redacted]

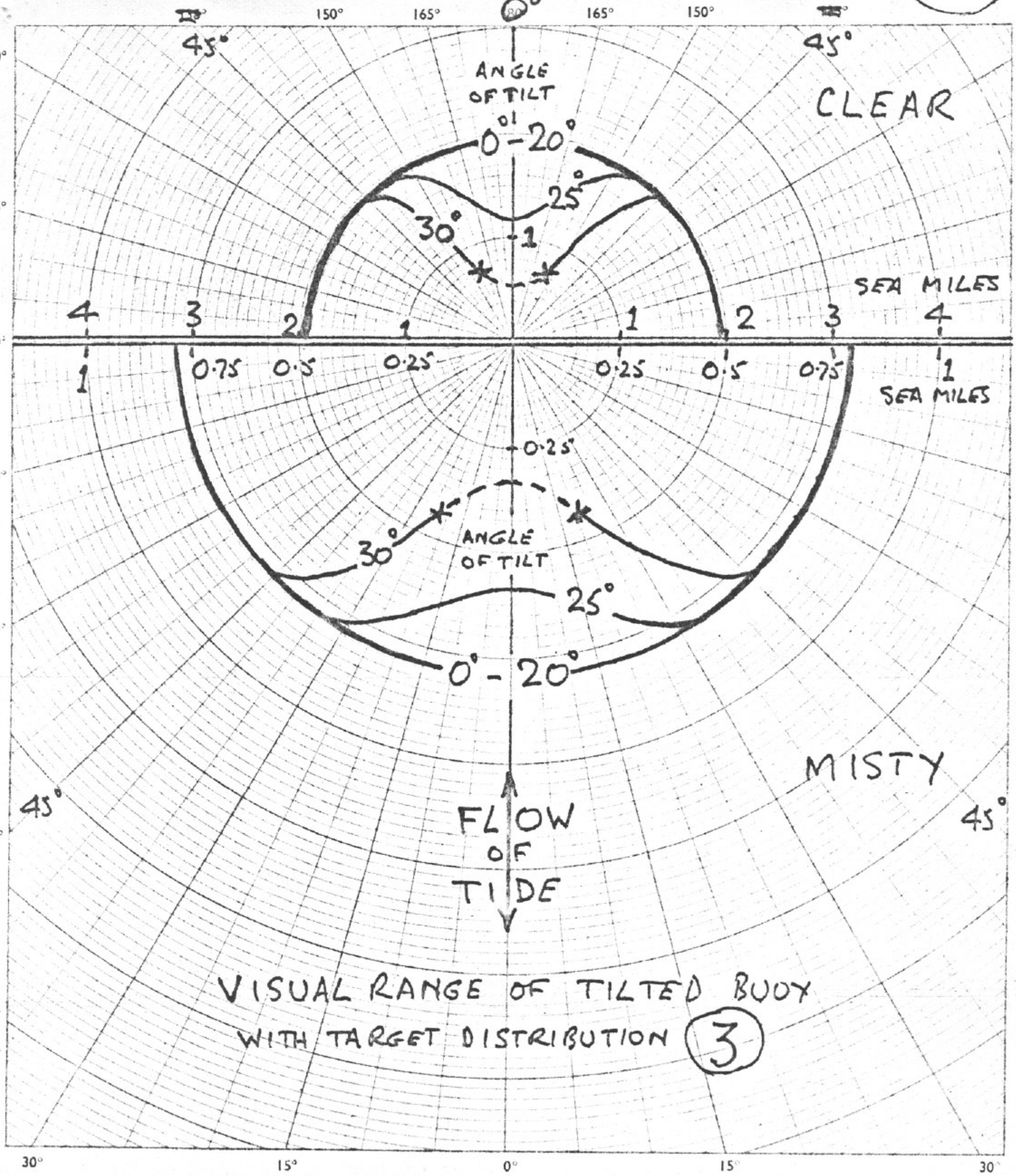
[redacted] NOTE DIFFERENT RANGE SCALES FOR

~~NOTES~~ CLEAR AND FOR MISTY WEATHER

19 APR 82

(3E)

~~INTENSITY~~ RANGE DISTRIBUTION CURVE



~~UNIT~~ X NOMINAL LIMIT OF BEAM

~~CAT. NO.~~ EACH CURVE CONTAINS 24 LUMENS

~~LAMP~~ OF COLOURED LIGHT

~~GLASS~~ NOTE DIFFERENT RANGE SCALES FOR

~~NOTES~~ CLEAR AND FOR MISTY WEATHER

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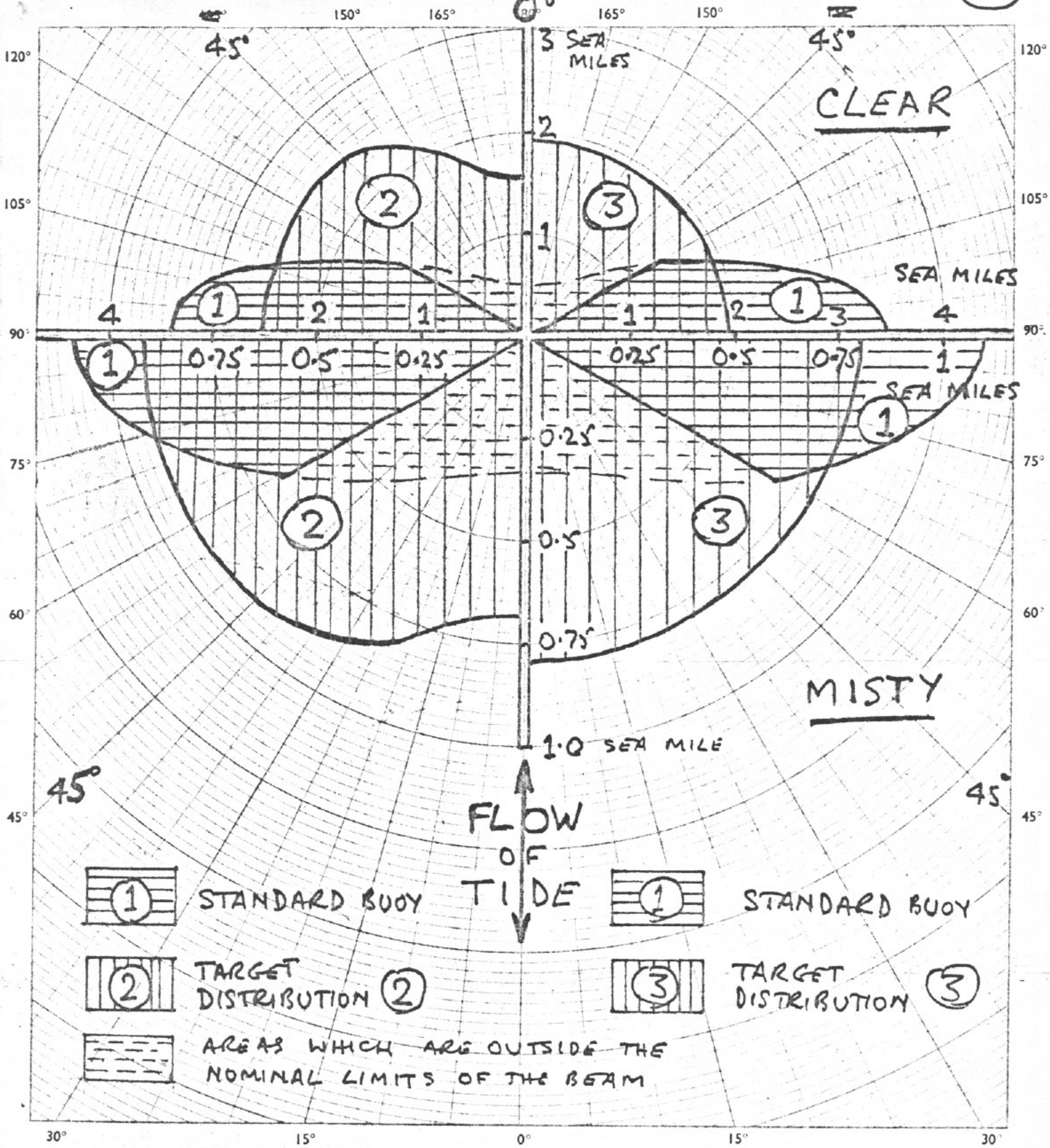
F

INTENSITY DISTRIBUTION CURVE



[redacted] AREA OF SEA SURFACE

WITHIN VISUAL RANGE

[redacted] OF BUOY WITH 15° TILT

[redacted]

[redacted] EACH CURVE CONTAINS 24 LUMENS

[redacted] OF COLOURED LIGHT

[redacted] THE CURVE FOR THE STANDARD 20 LITRE

BUOY LANTERN IS LIMITED BY ITS 15° SPREAD

19 APL 1982