



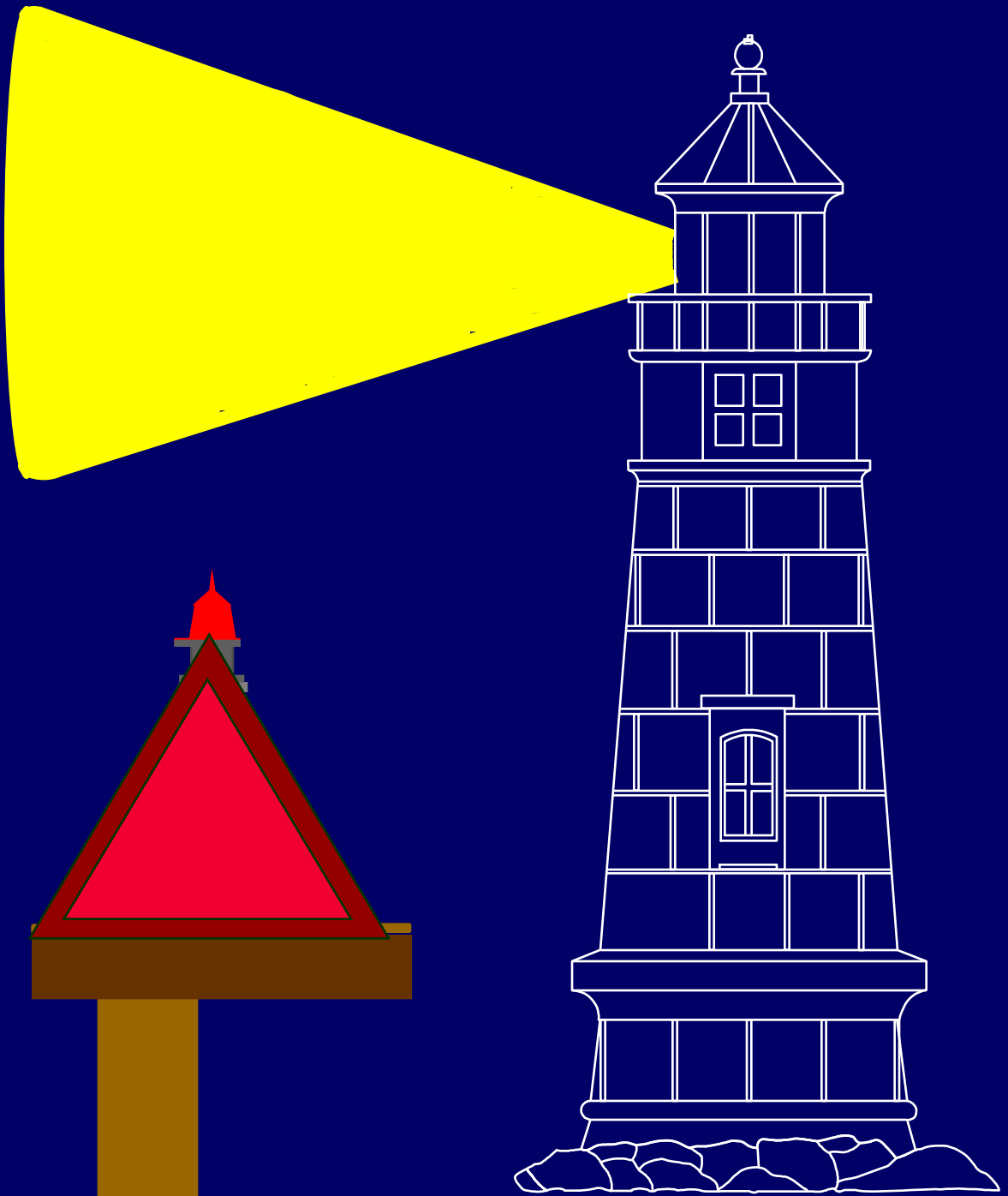
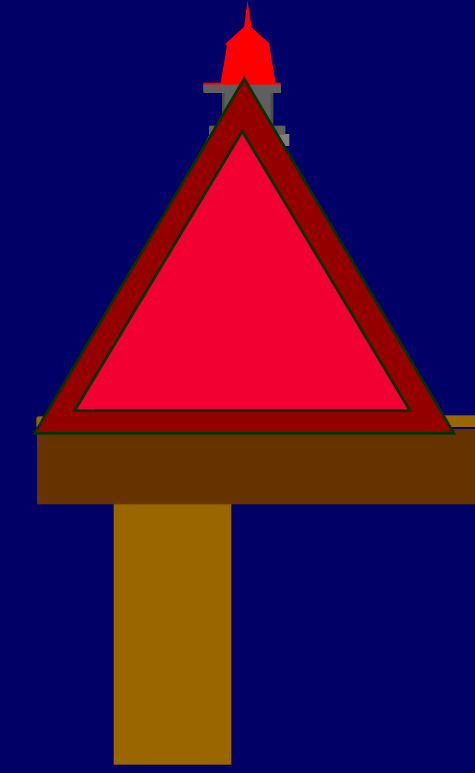
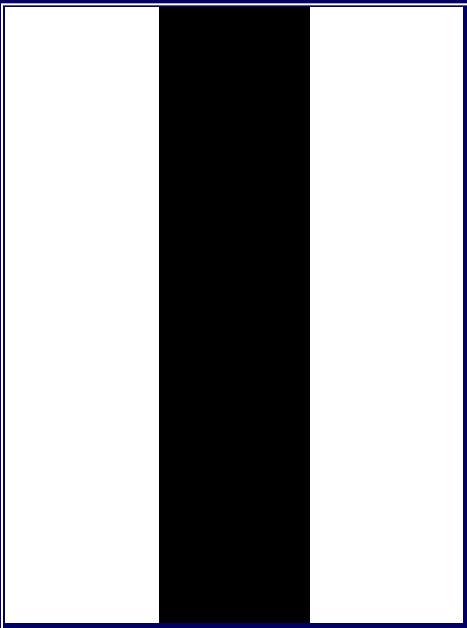
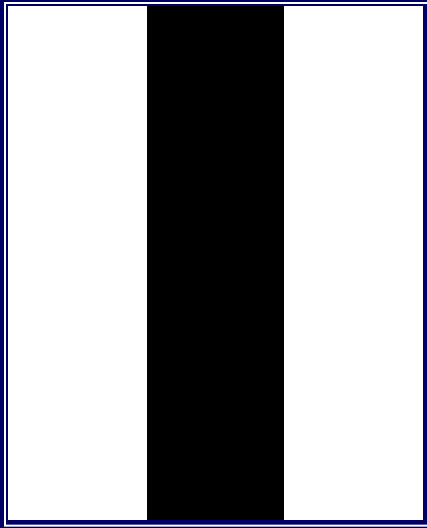
Navigation Systems Division



**Everything you
need to know
about Beacons
and
Daybeacons.**



Beacons



Training Objectives

Identification of various structures.

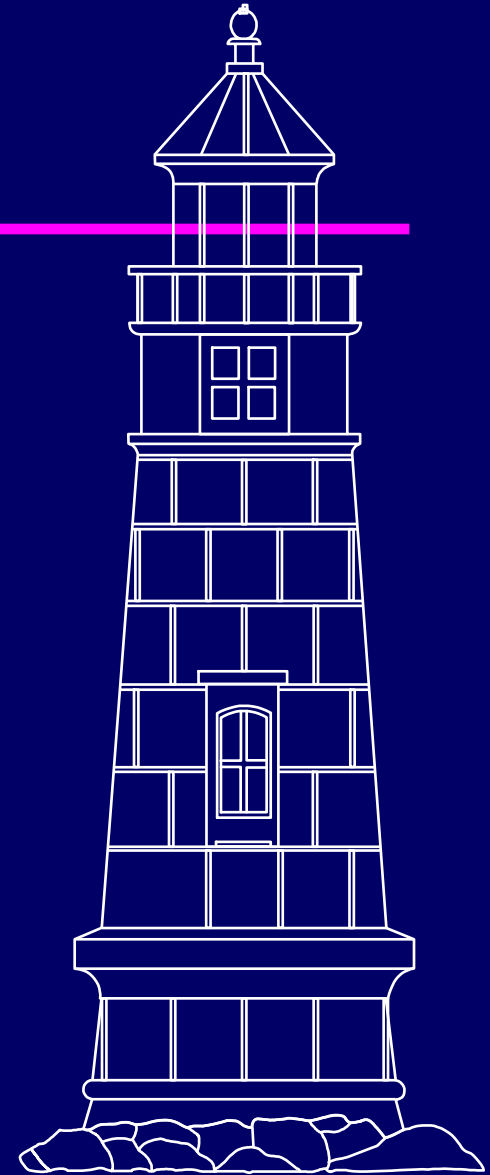
Proper use and maintenance of retro-reflective material.

Structures

- Support visual and audible navigation equipment in a fixed location at a designed elevation that establishes the geographic range of the Aid to Navigation.
- **Two Classifications:**
 - **Lighthouse**
 - **Beacon**

Lighthouse

- Enclosed edifice that houses protects, displays, or supports visual, audible, or radio aids to navigation.
 - Can be manned or unmanned.
 - Located in an offshore, wave swept, exposed environment.
 - Or as a landfall object.



Beacon

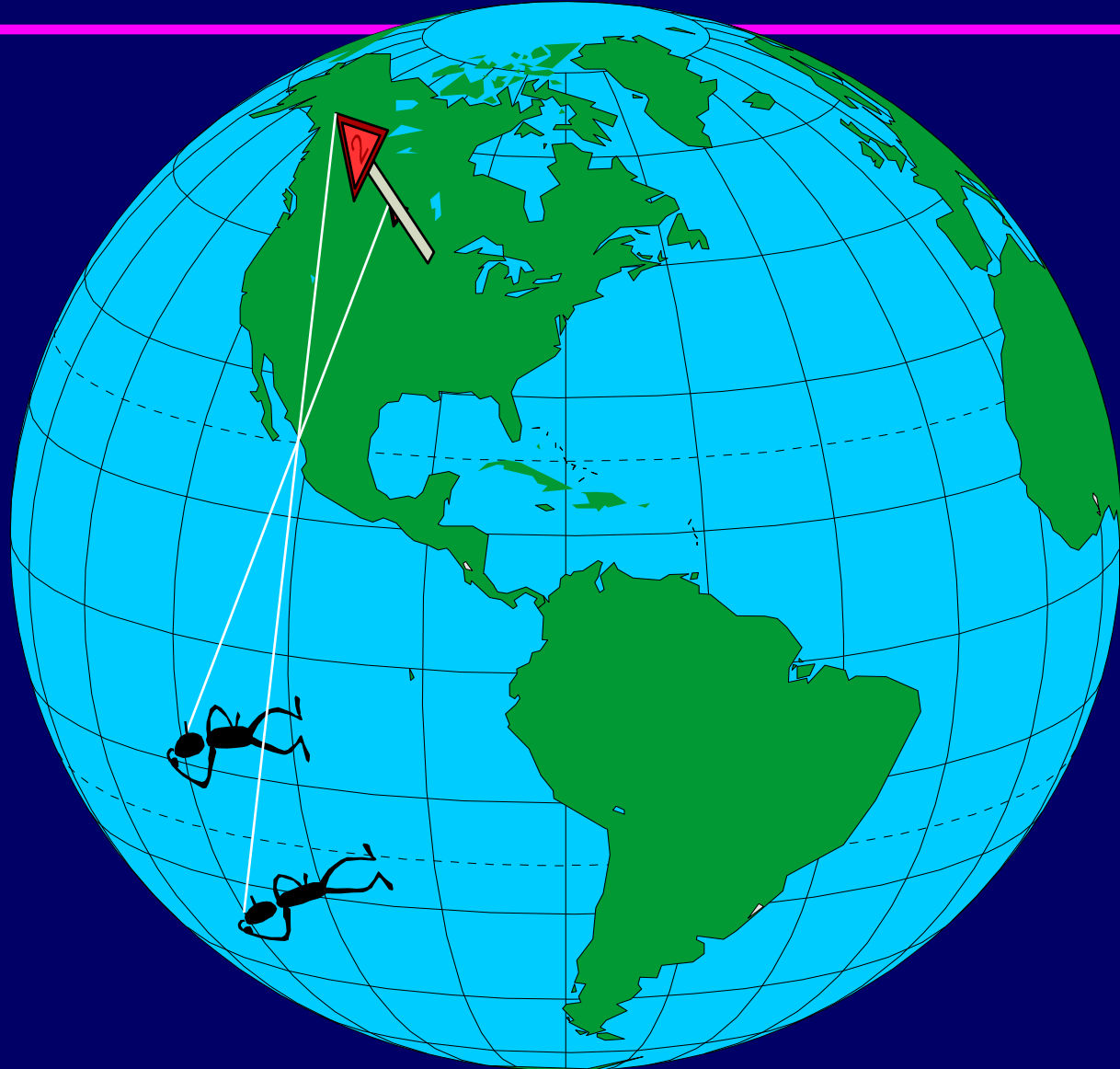
- A support platform for visual and/or audible aids to navigation.
- Simple in design.
- Constructed of wood, concrete or steel.
- May be lighted or unlighted.

Design Considerations

- **Payload requirements:**
 - Dead load (batteries and equipment)
 - Live load (servicing personnel)
- **Environmental factors:**
 - Weather (wind, waves, storms)
 - Site location (water depth, type of bottom)
 - Collision (high destruction areas, ice)

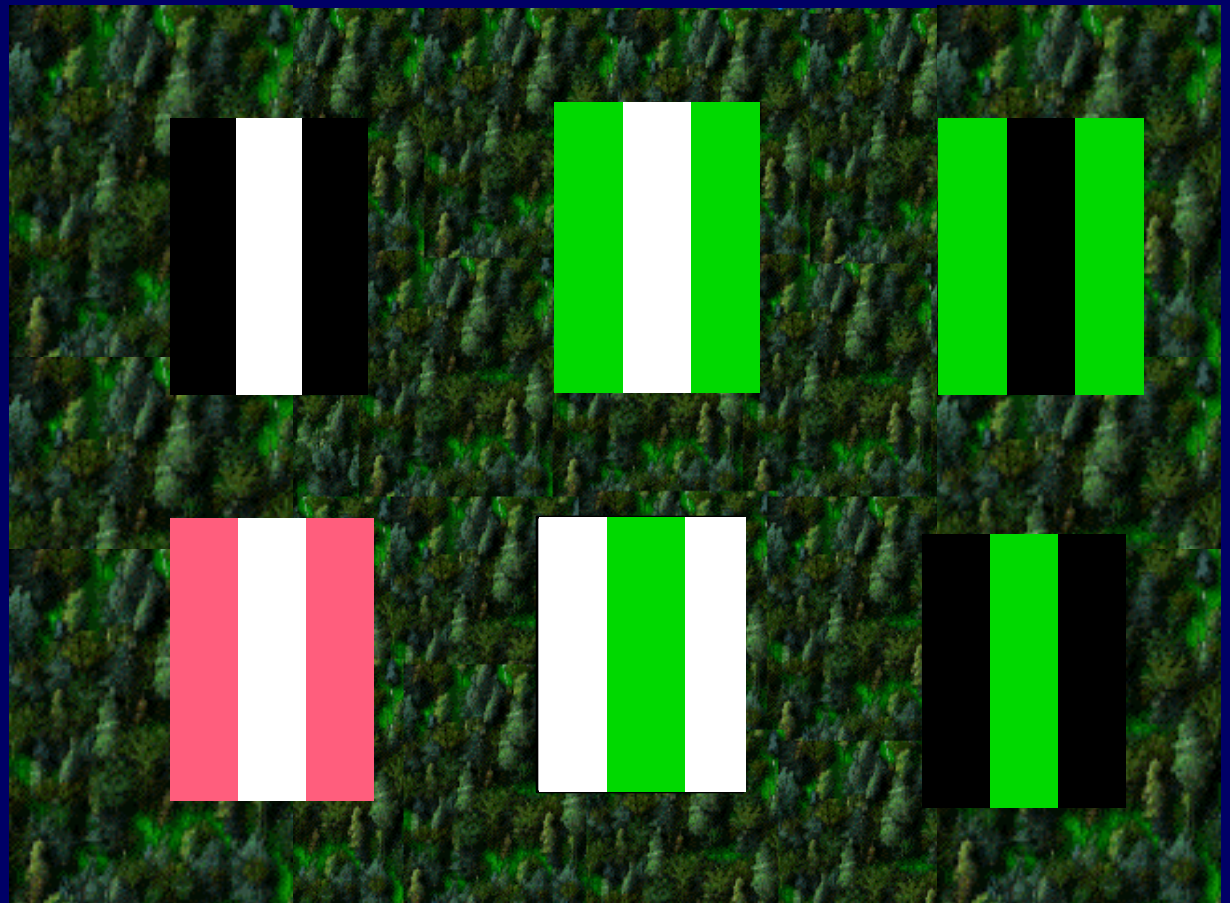
Operational Requirements

- Height
- Size



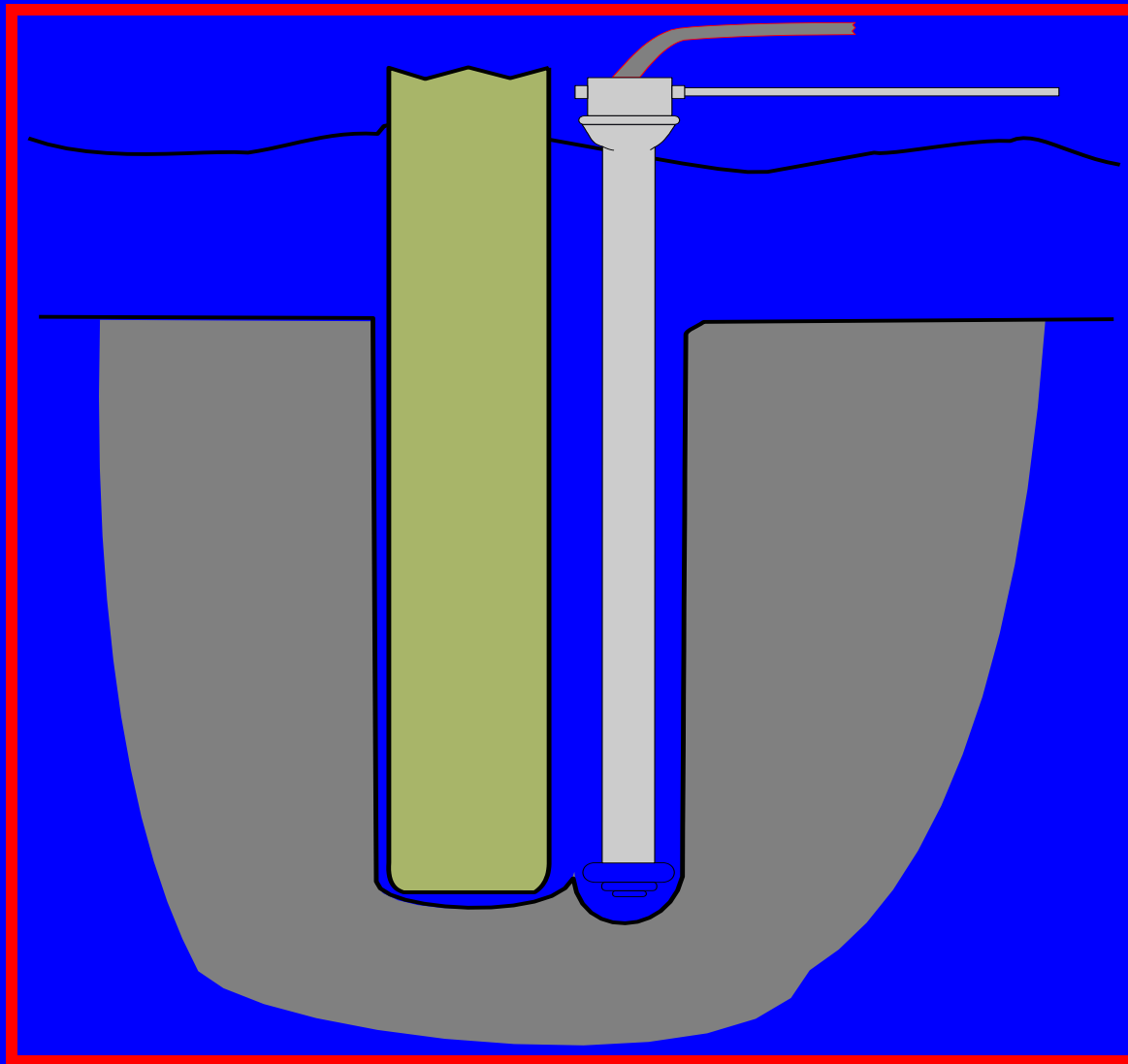
Operational Requirements

- Contrast
 - Vegetation
 - Background lights



Construction Methods

- WLICs
 - Driven with diesel hammer
- ANTs
 - Jetting
- Contract



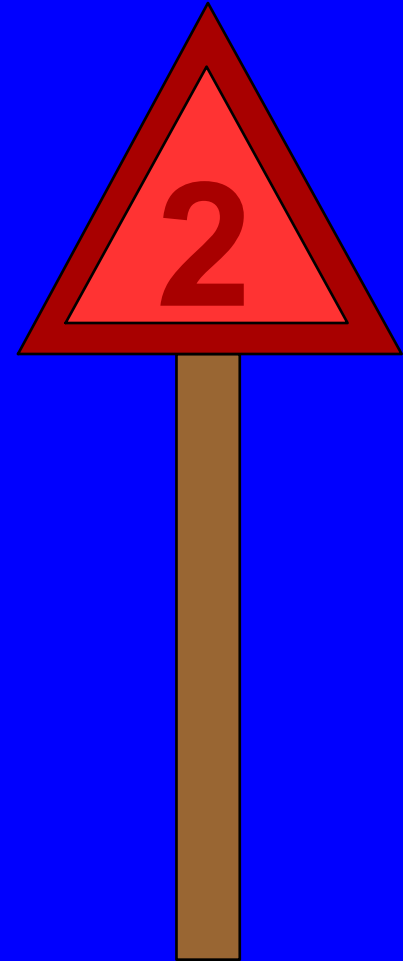
Structure Categories

Single pile

Multiple pile

Single Pile Structure

- Used in protected or semi-exposed locations where *fixity* can be attained.



Multiple Pile Structures

- Used when *fixity* can not be achieved with single pile.
- Two categories:

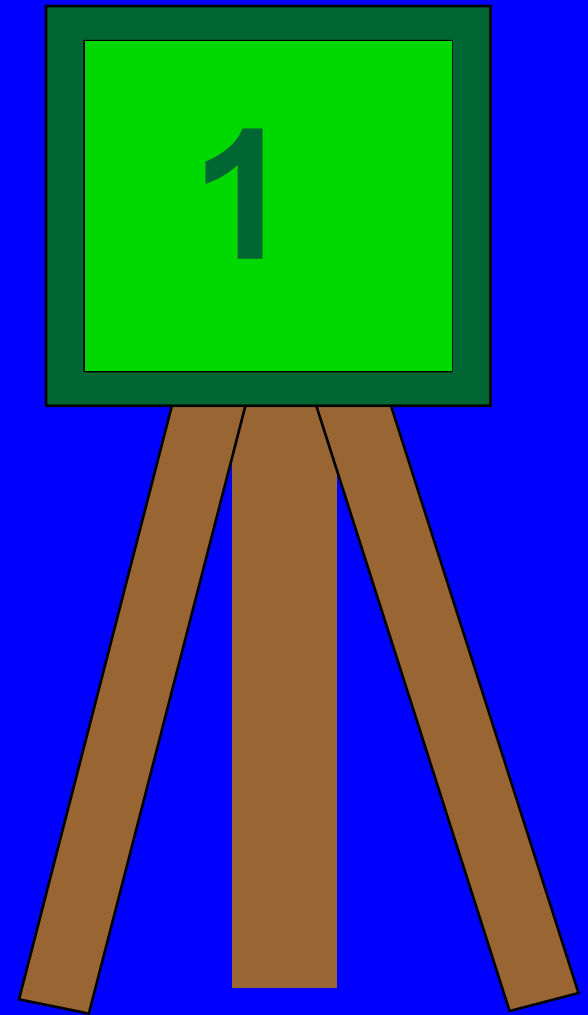
–Dolphin

–Platform Structure

Dolphin

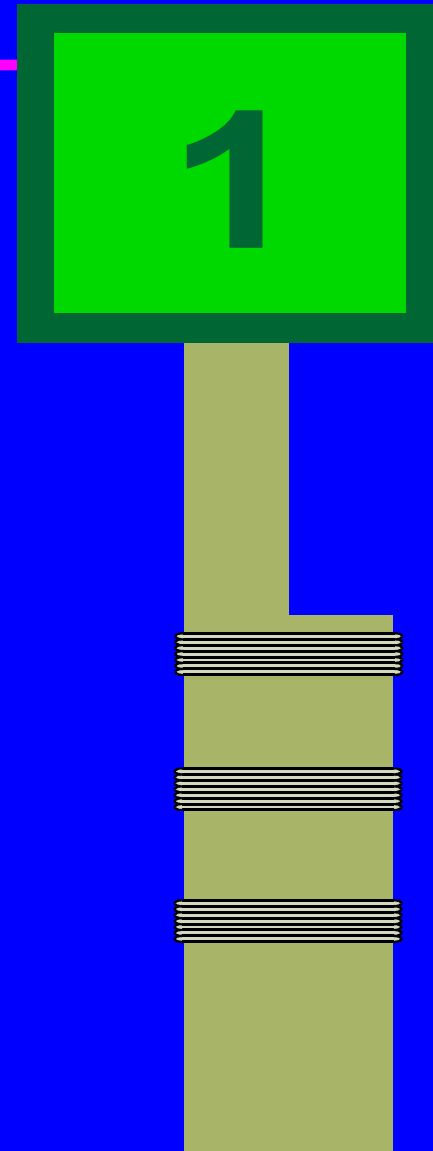
- **Battered pile**

Three to seven piles driven at an angle with the bottoms spread and the tops secured with *wire rope* or bolts and shear connectors.



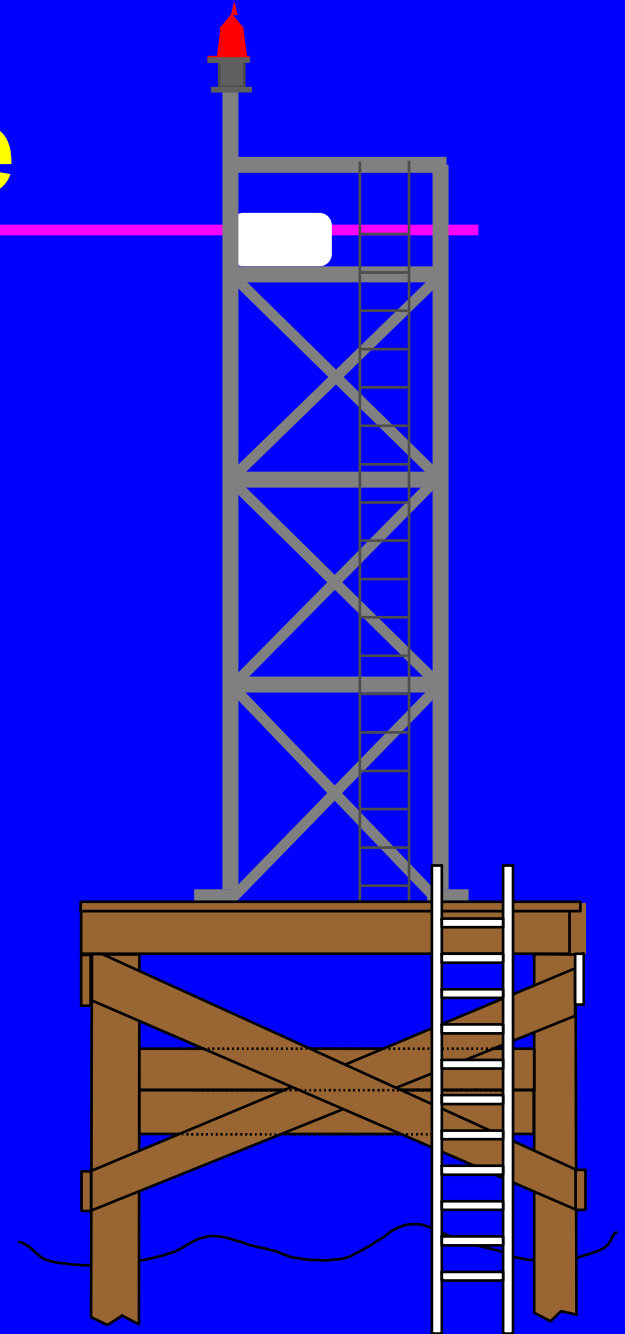
Dolphin

- **Cluster pile**
 - Three or more piles driven vertically with their surfaces in contact with each other and wrapped tightly at various heights.



Platform Structure

- Three or more separate piles driven vertically, connected at the top by a platform that spreads the load over all the piles. Usually is the foundation for skeleton towers.



Materials Used

- **Wood**

- Economical, if life expectancy is greater than 6 months wood must be treated.

- **Steel**

- Expensive, strong, can be driven into hard bottoms, must be driven to required height.

- **Concrete**

- Expensive, fragile, must be driven to required height.

Towers

Two types of towers:

Guyed skeleton

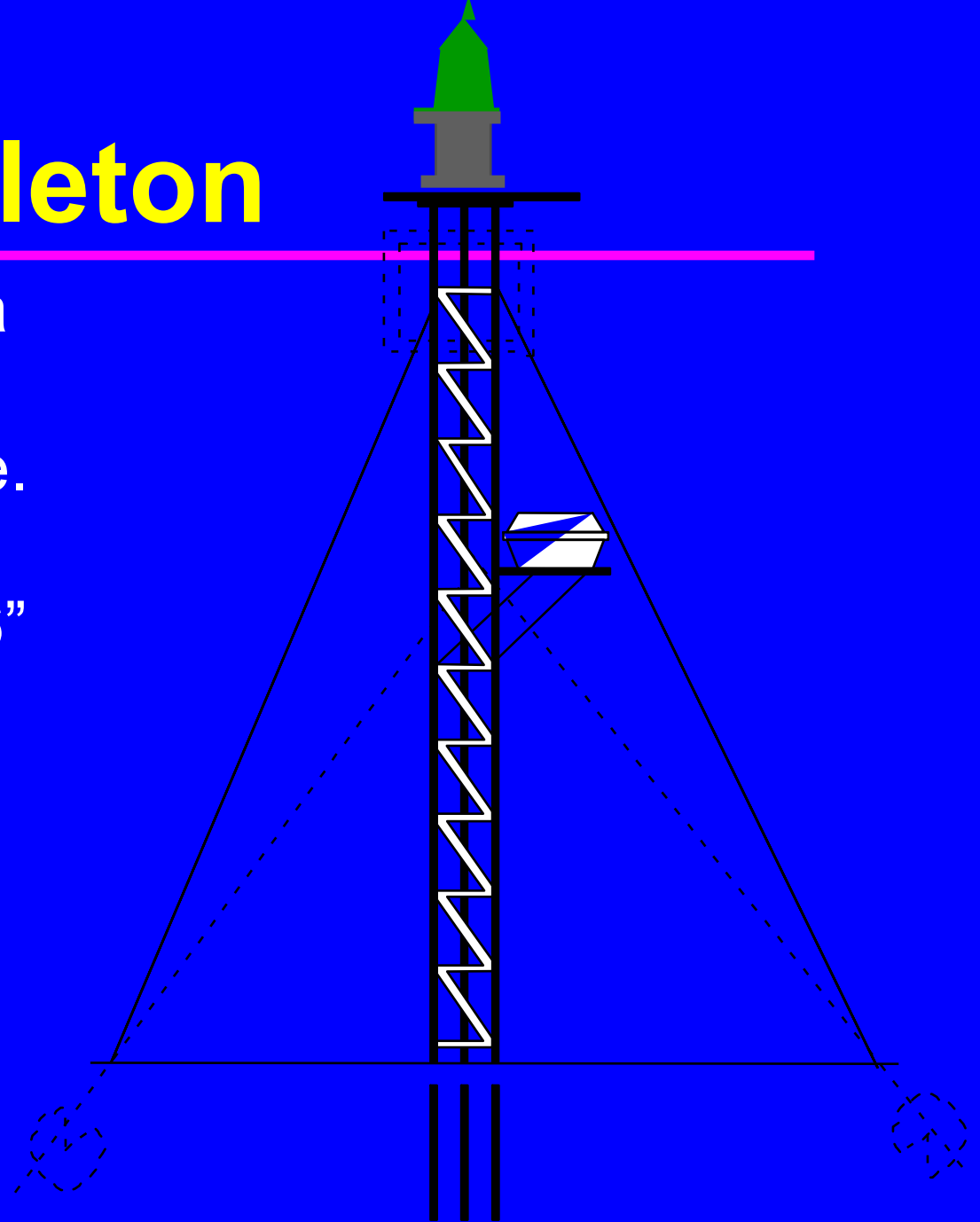
Supports equipment on land less than 30'.

Free standing skeleton

Supports equipment on land or marine sites when over 30'.

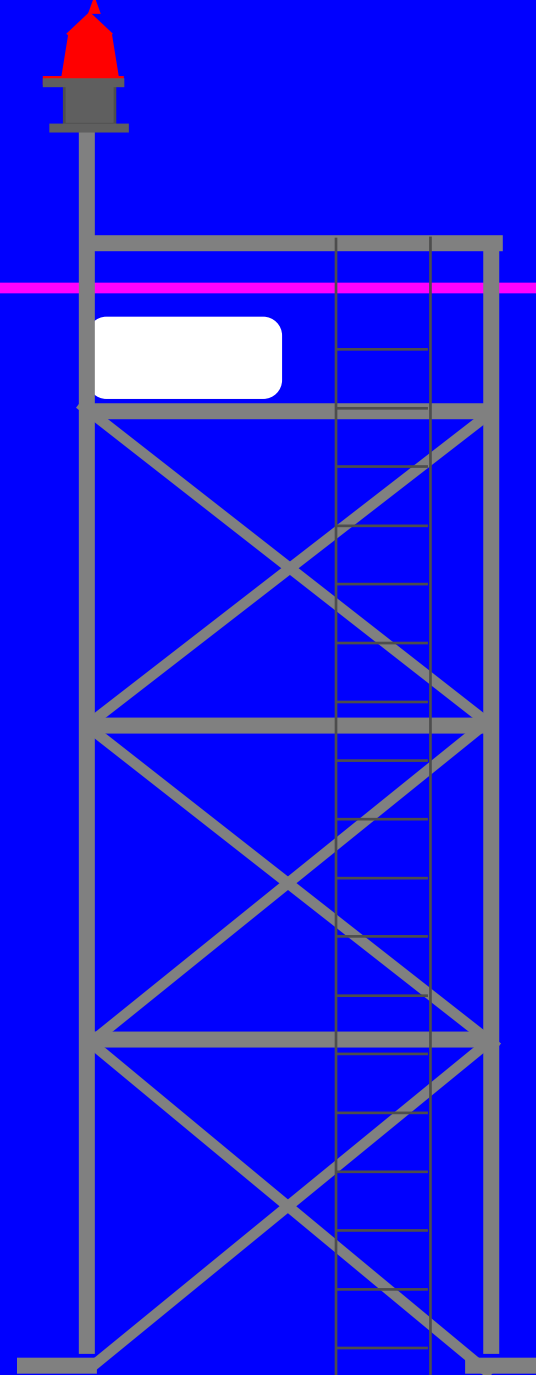
Guyed Skeleton

- Commonly called a “TV tower.”
- Triangular in shape.
- Galvanized 1 1/4” steel pipe and 3/16” guide wires.
- Each section is 10 ft. in height.
- Usually not built over 30 ft.



Free Standing Skeleton Tower

- Commonly called “5 ft pipe towers”.
- Constructed of galvanized metal.
- Can be uniform or tapered.
- Usually, not built over 100 ft. in height.



Related Equipment

Ladders

- Most often metal.
- Wood can only be used only for special circumstances and must meet minimum requirements.
- 2x4s nailed to the pile does not meet the requirements.

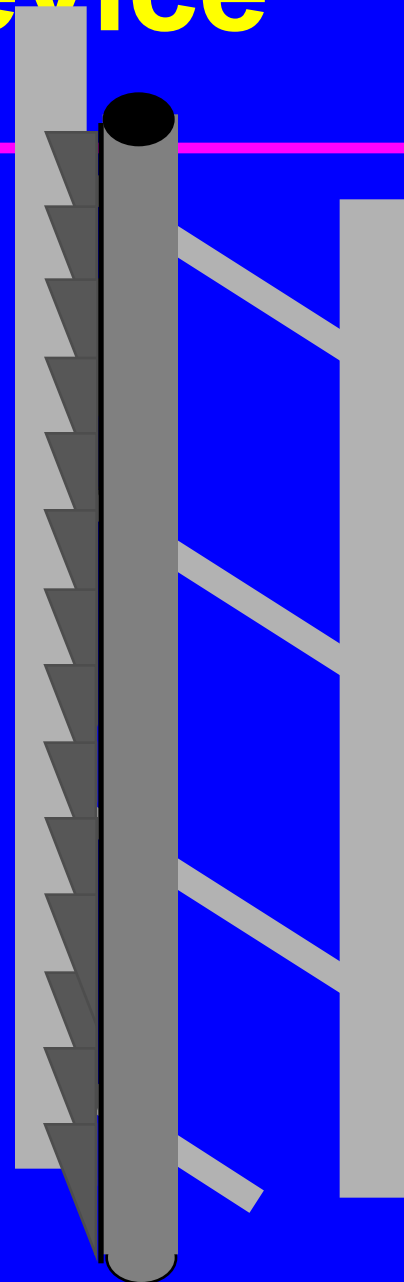
Safety Belt / Harness

- **According to the office of safety:**
 - The use of a safety harness in lieu of a safety belt is recommended, but not mandatory.
 - The requirement to use these devices remains at 20', as currently published.

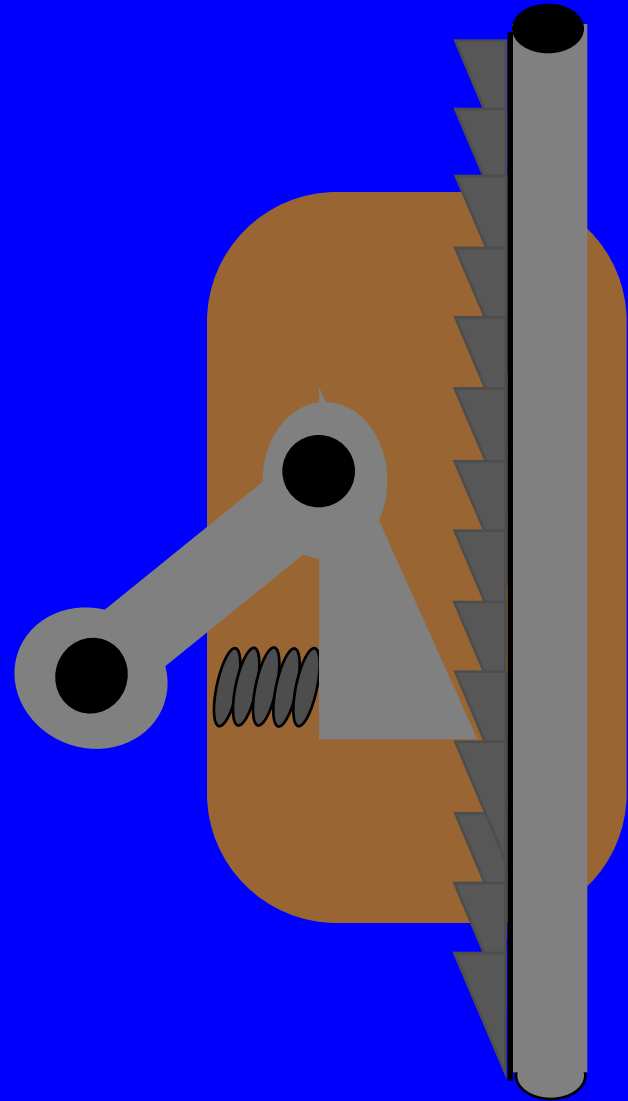
Safety Climbing Device

- Will be installed on all structures over 20 ft.

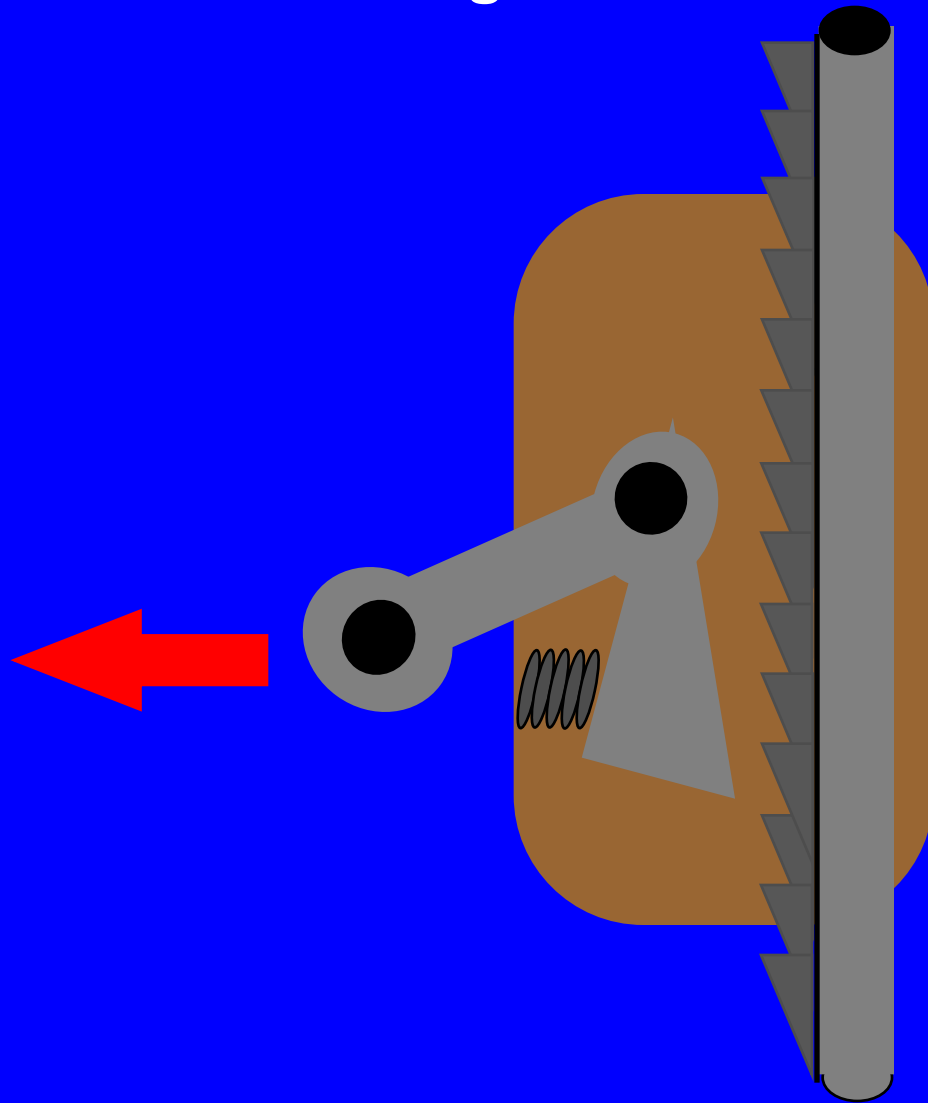
It looks like a pipe with teeth and is installed on the ladder rungs.



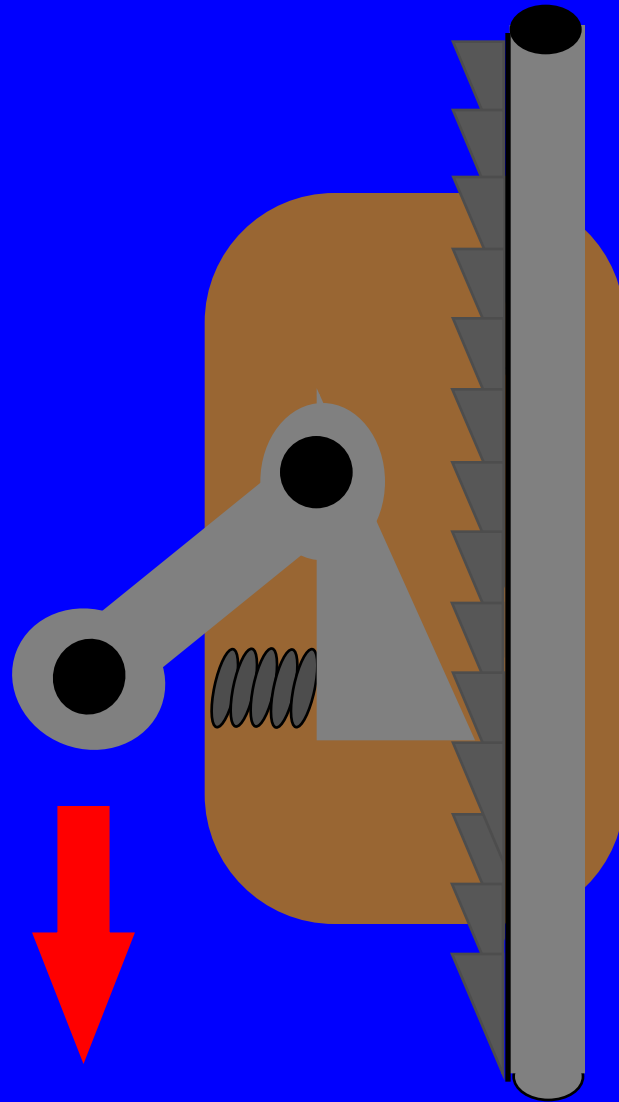
A safety climb car is attached to the climber's safety belt and is slid over the safety climb rail.



As the climber leans back the safety climb releases allowing ascent



If the climber slips the safety climb catches preventing a fall

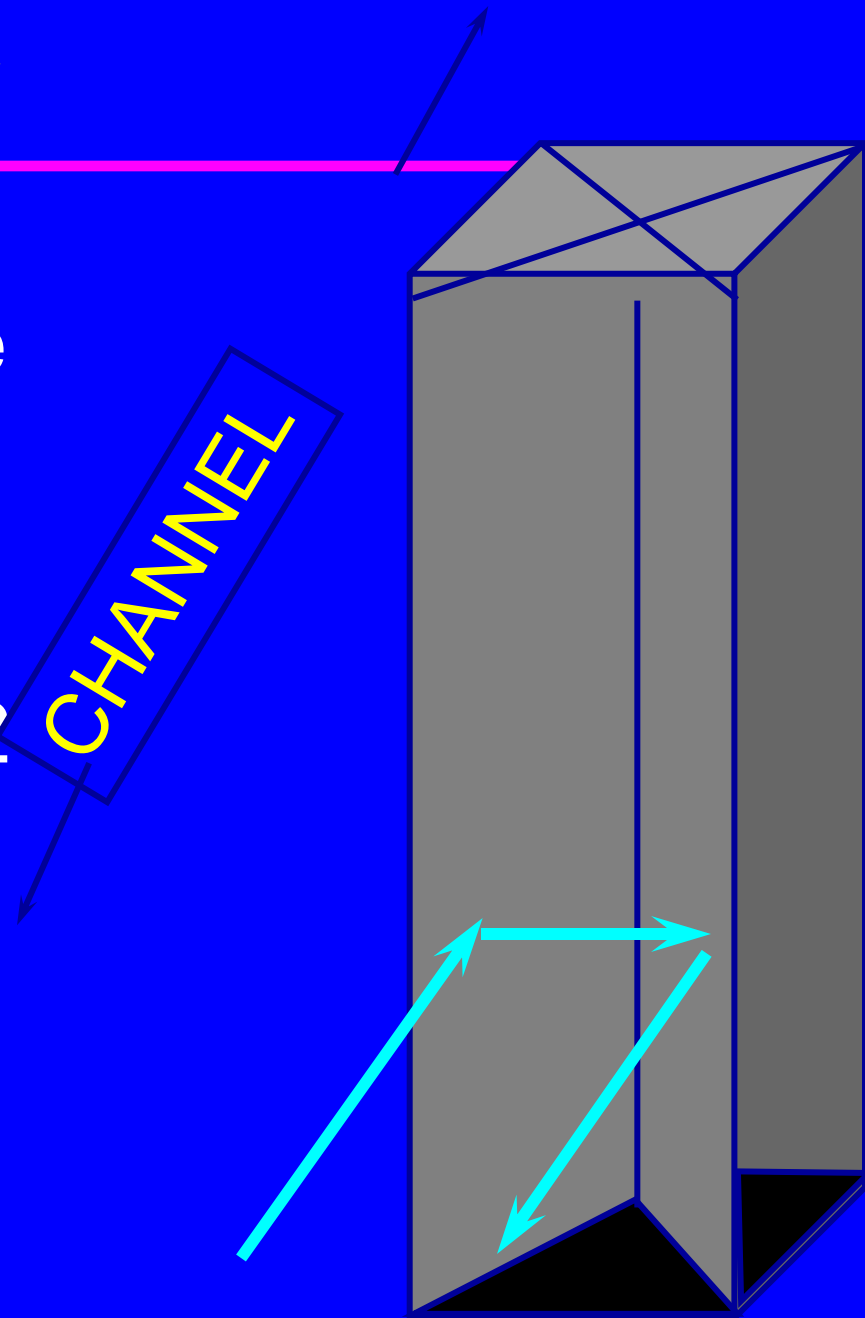


Battery Box

- Large box is designed to hold up to 4 secondary batteries.
- Small box is designed to hold up to 2 secondary batteries.
- Single battery boxes are available commercially and are acceptable as long as they are white in color.

Radar Reflector

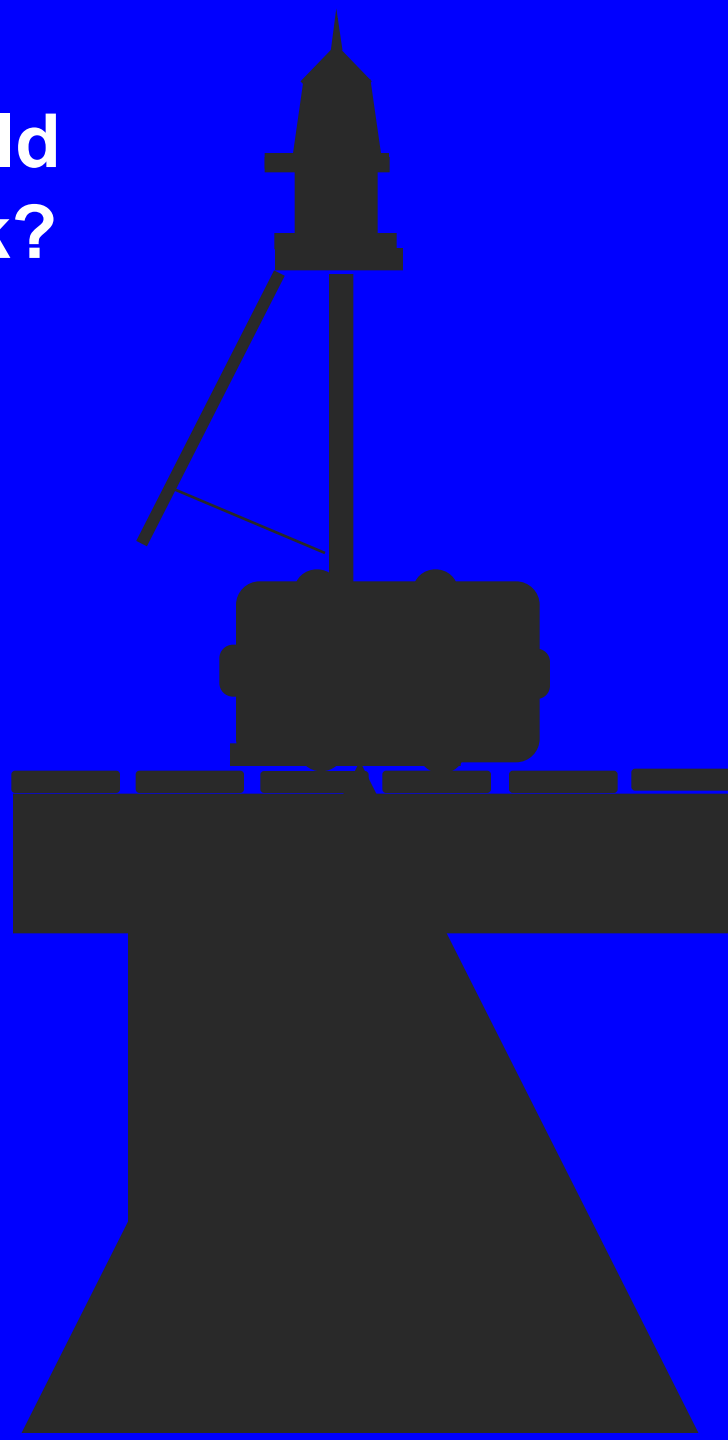
- Installed when the reflectivity of the structure doesn't meet the operational requirements.
- A standard radar set should detect it at 1.5 to 2 NM when mounted 10 ft above the water.
- Must be properly oriented to the channel.



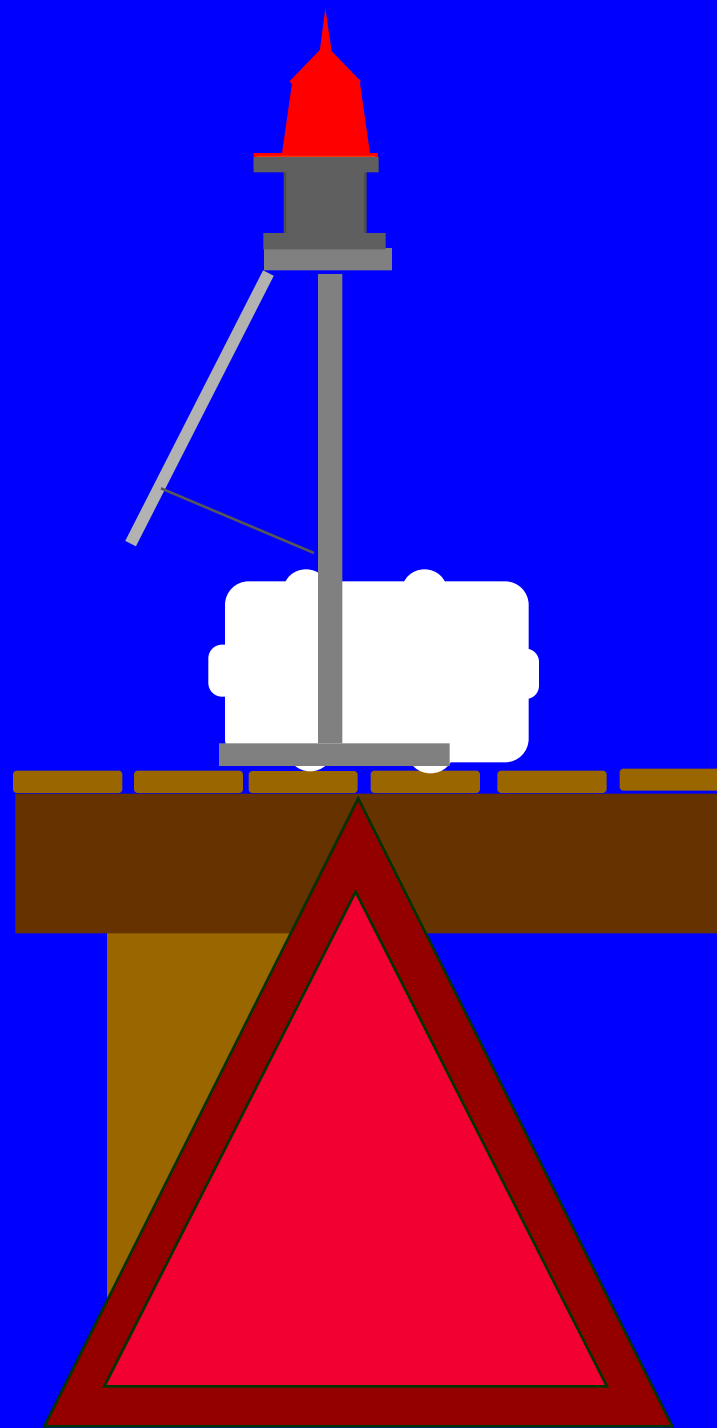
Dayboards

- A dayboard shall always be installed for maximum utility.
- The dayboard should be the dominant component of the silhouette with the battery box hidden behind it.

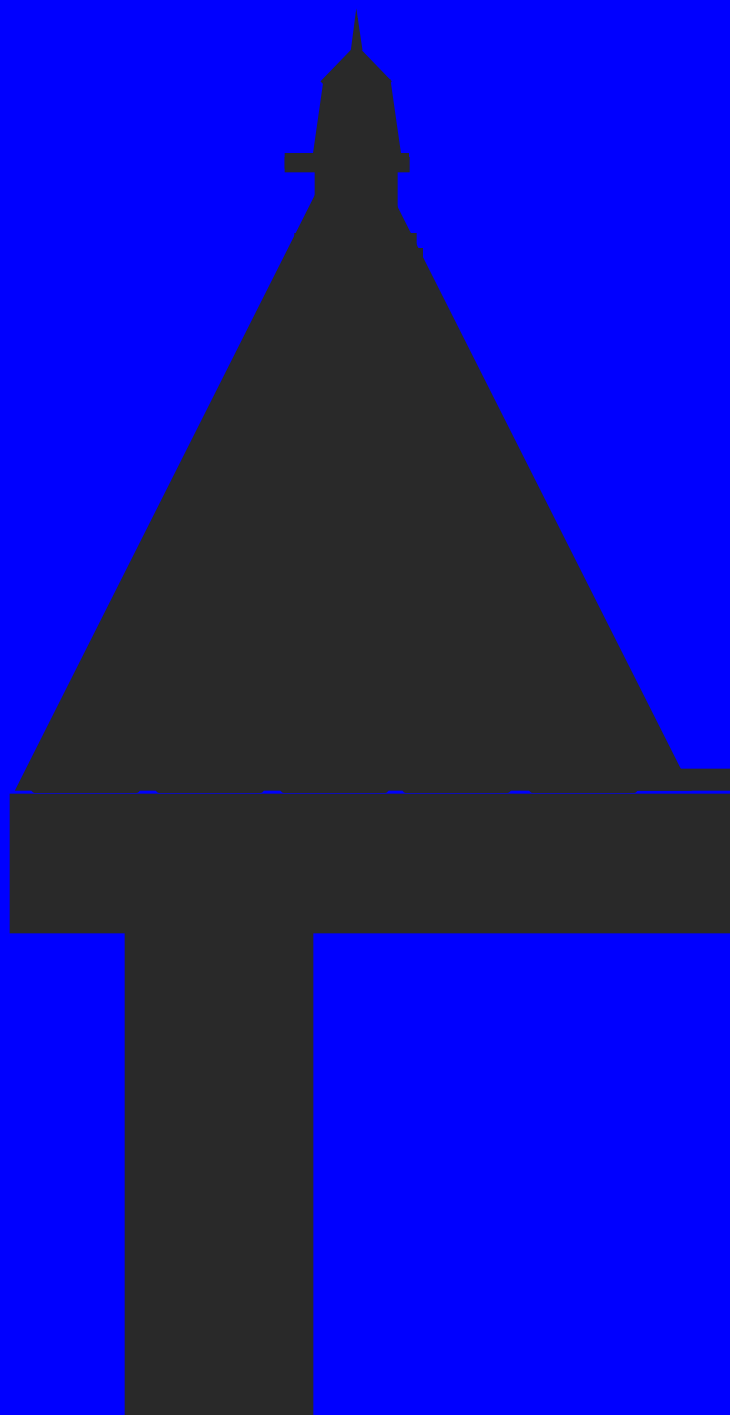
**On what side should
you pass this mark?**

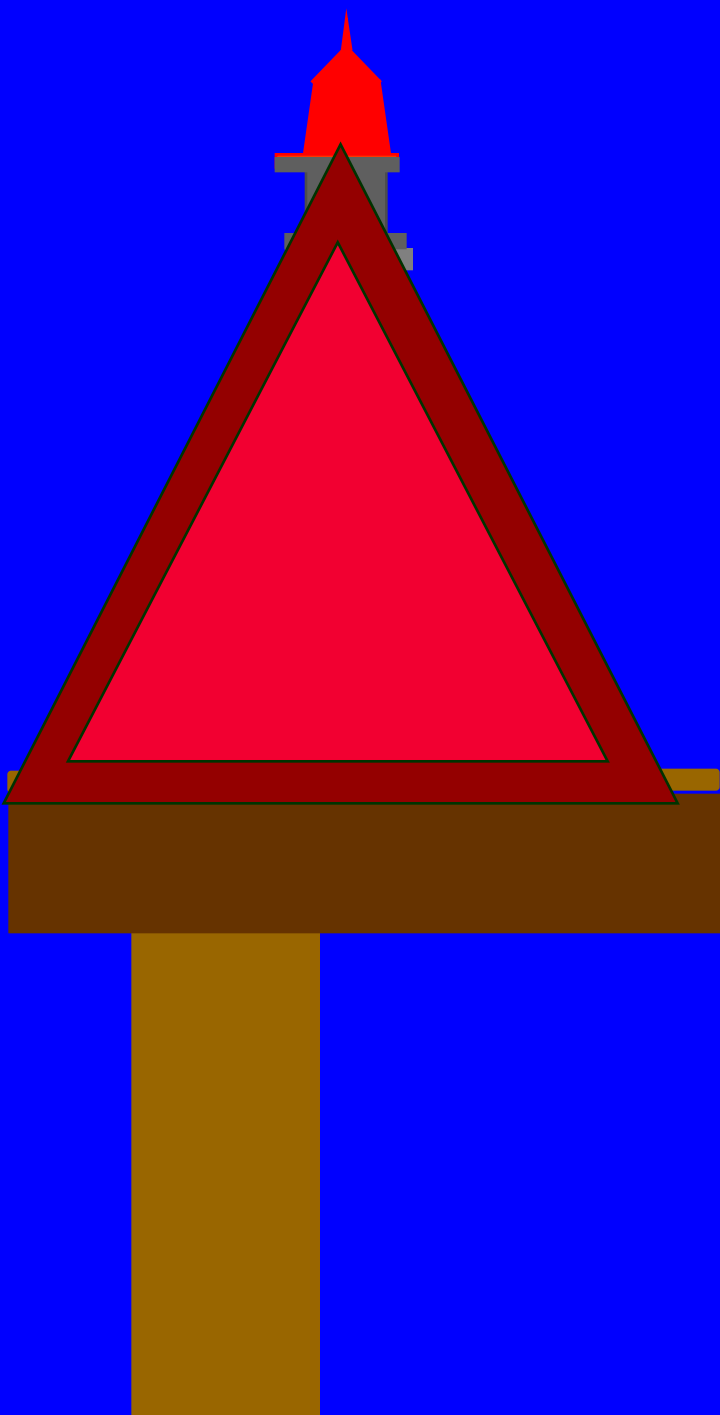


**It is a little
easier to make
the decision in
the daylight!**



**Raising the
board makes it
more obvious.**



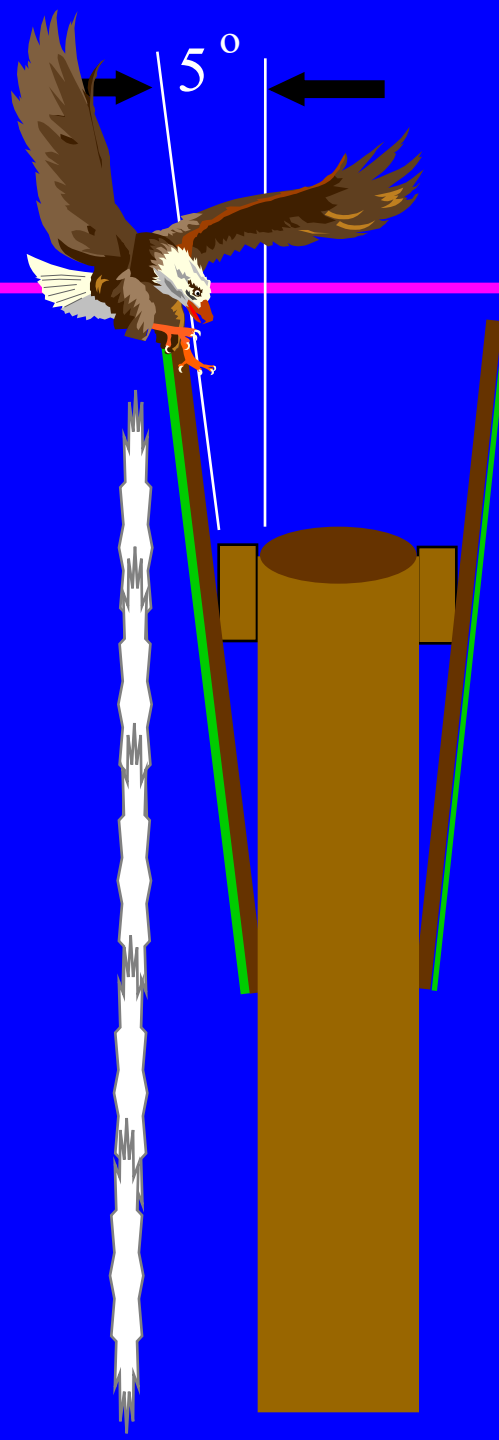


Mounting Dayboards

- Dayboards should be fastened so the dayboard becomes sacrificial in high winds.
- Dayboards shall be fastened to meet or exceed a lifetime of 5 years.
- The fasteners shall not pierce the retro-reflective boarder or characters.

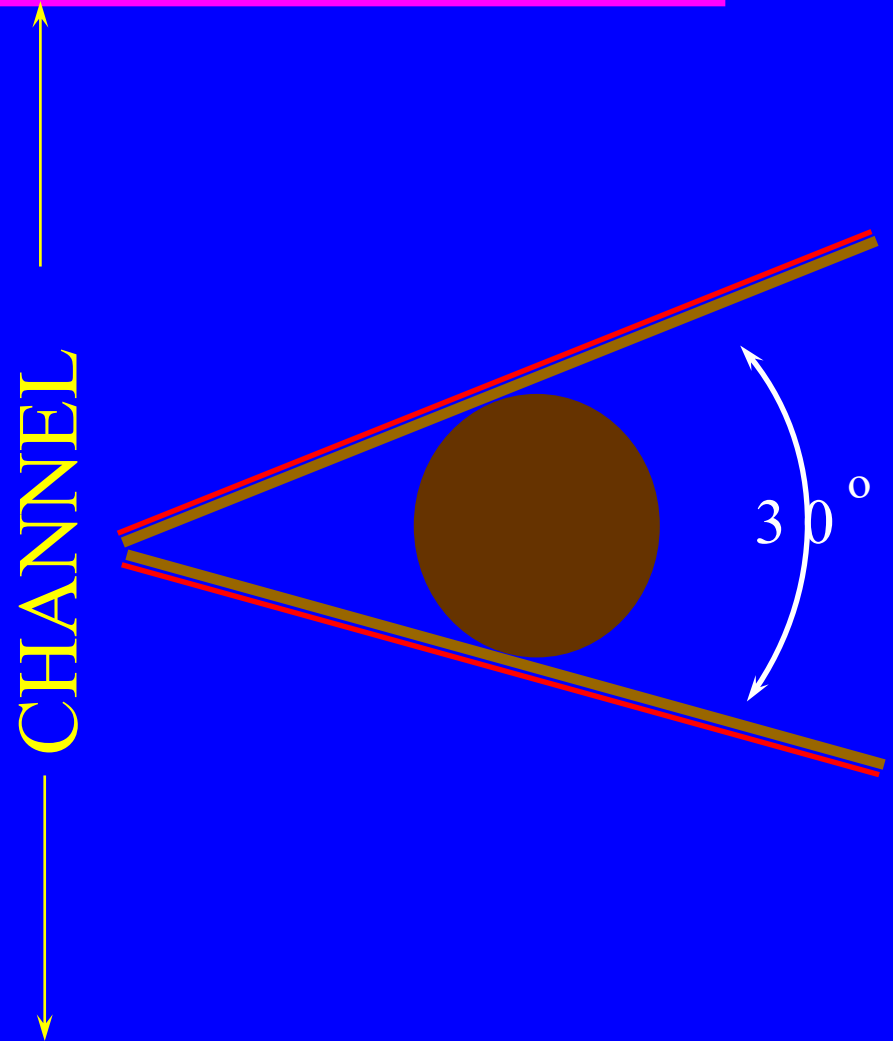
Mounting

Dayboard may be installed approximately 5 degrees from vertical.



Mounting

- Whenever possible, dayboards shall be mounted on an angle to the channel.
- The angle will vary to best suit the channel.
- For a straight channel about 30 degrees.
- **This makes the number easier to read when abeam.**

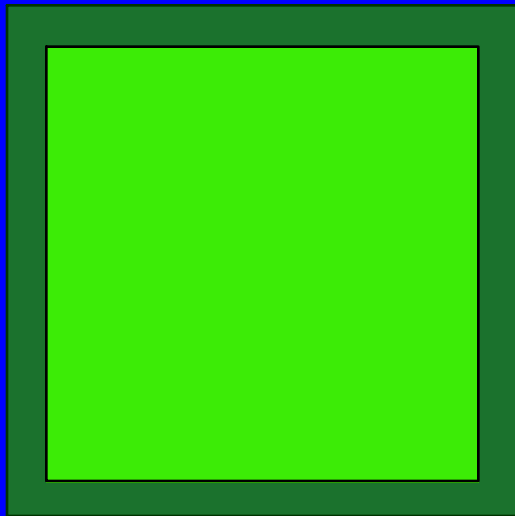


Dayboards

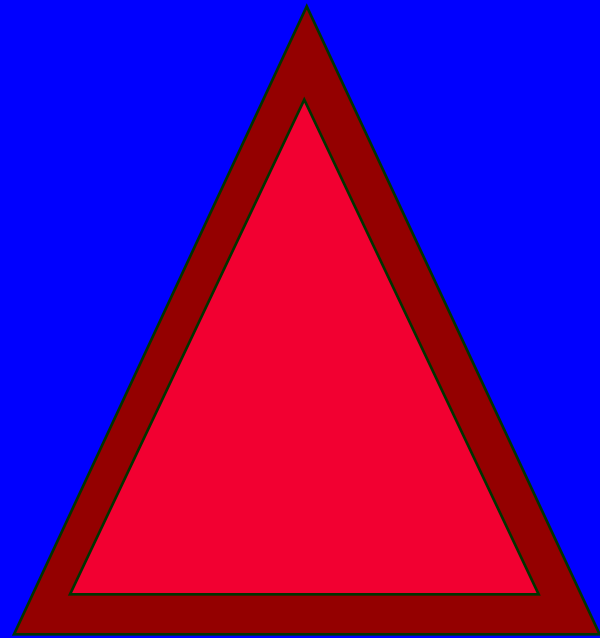
- Dayboards differ in size and shape depending on the marking system and the specific function.
- Each dayboard has a designator composed of a number followed by a group of letters.

Dayboards

- A number gives the width of the dayboard in feet.



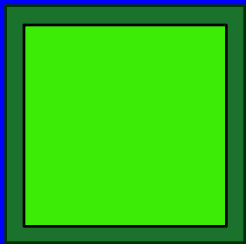
3'



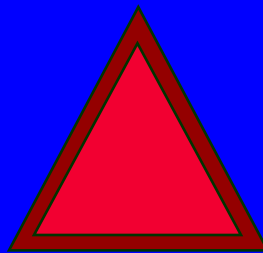
4'

Dayboards

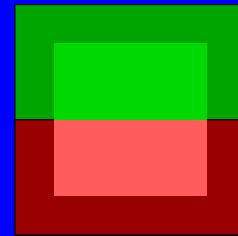
- The first letter refers to the shape or purpose of the dayboard.



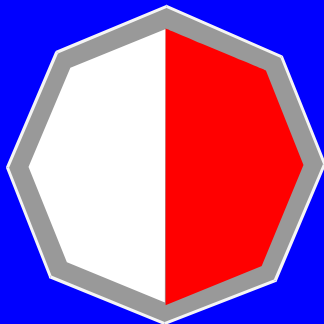
S-Square



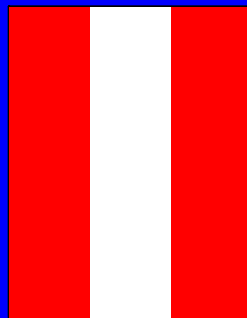
T-Triangle



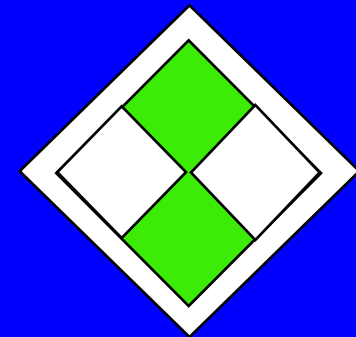
J-Junction



M-Mid-Channel



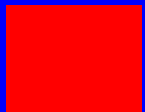
K-Range



N-No Lateral Significance

Dayboards

- The second letter represents the key color.



R- Red



G- Green



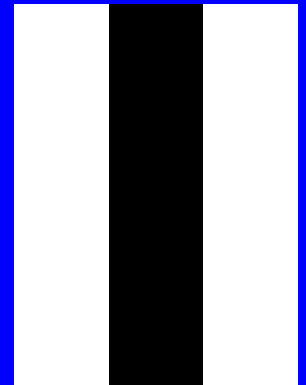
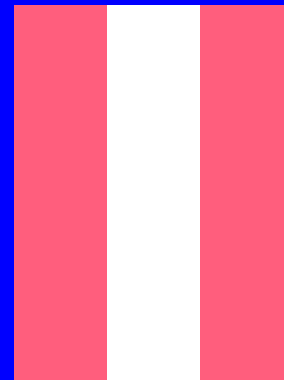
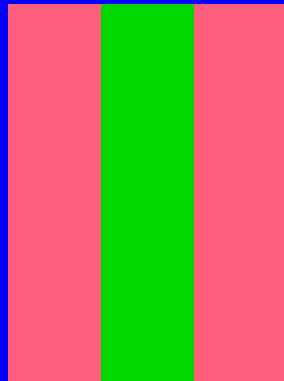
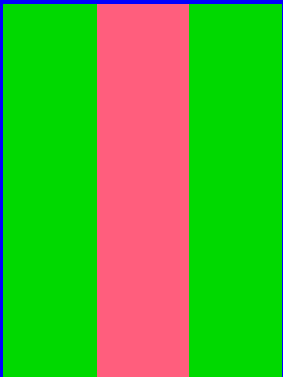
W- White



B- Black

Dayboards

- The third letter indicates the color of stripe (range dayboards only).



R- Fluorescent red G- Fluorescent green

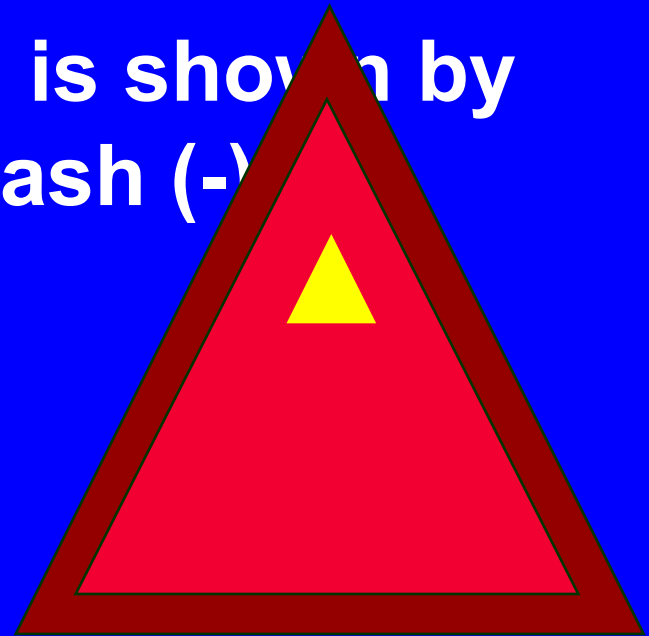
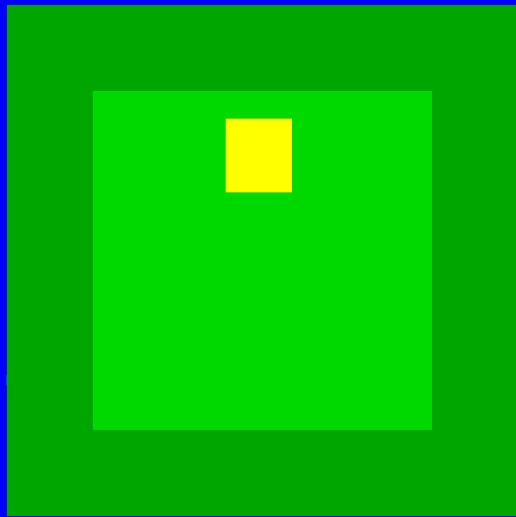
W- White

B- Black

Dayboards

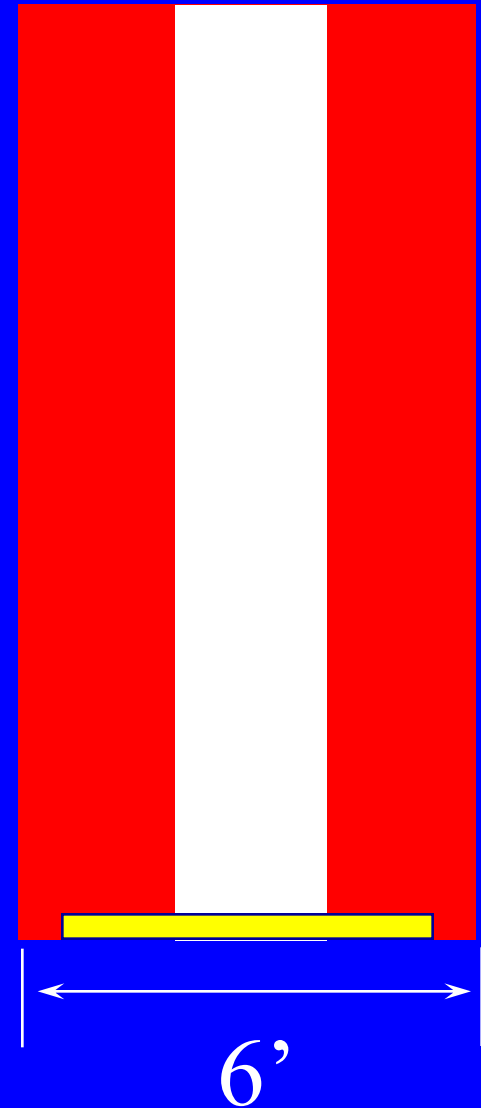
- Additional information is shown by
dash after a dash (-)

- tal
- square
- triangle



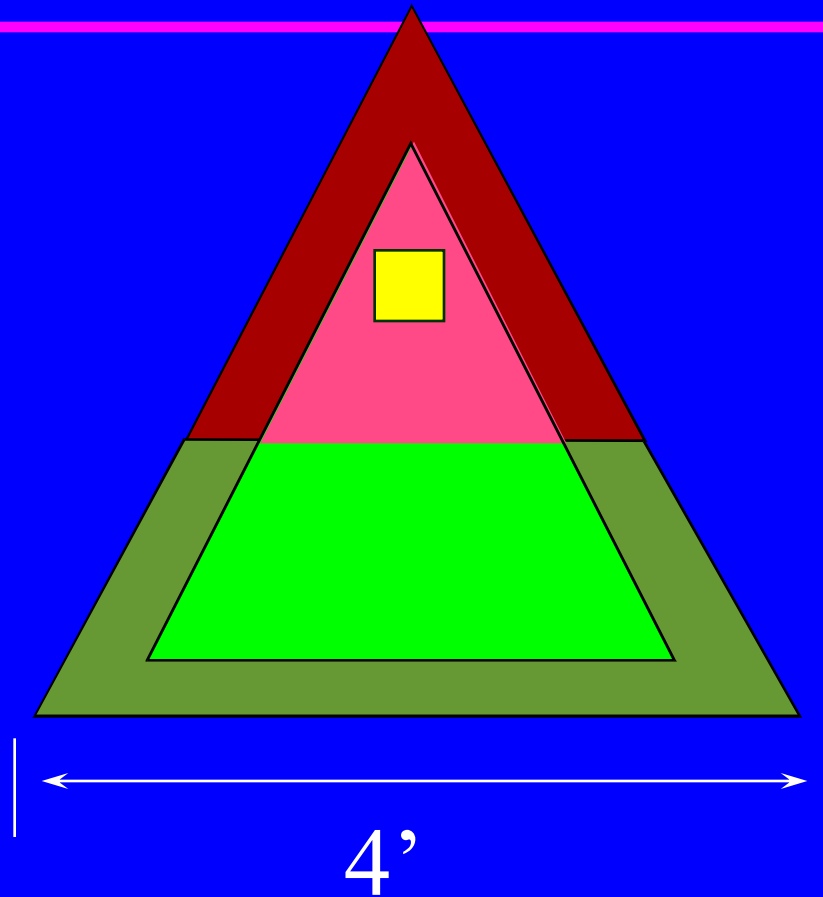
Dayboards

6KRW-I



Dayboards

4JR-SY



Nominal Range

- As a mariner approaches a dayboard from a distance it is first detected as an object apart from its surroundings.

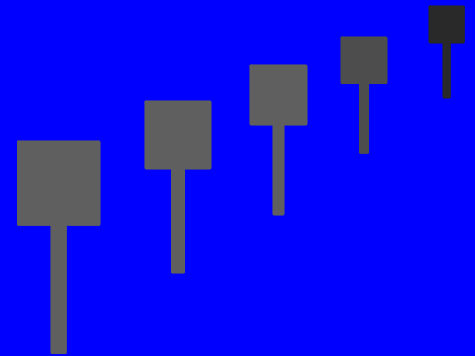


This is the detection range

Nominal Range

- Upon coming closer to the dayboard it can be recognized as an aid to navigation.

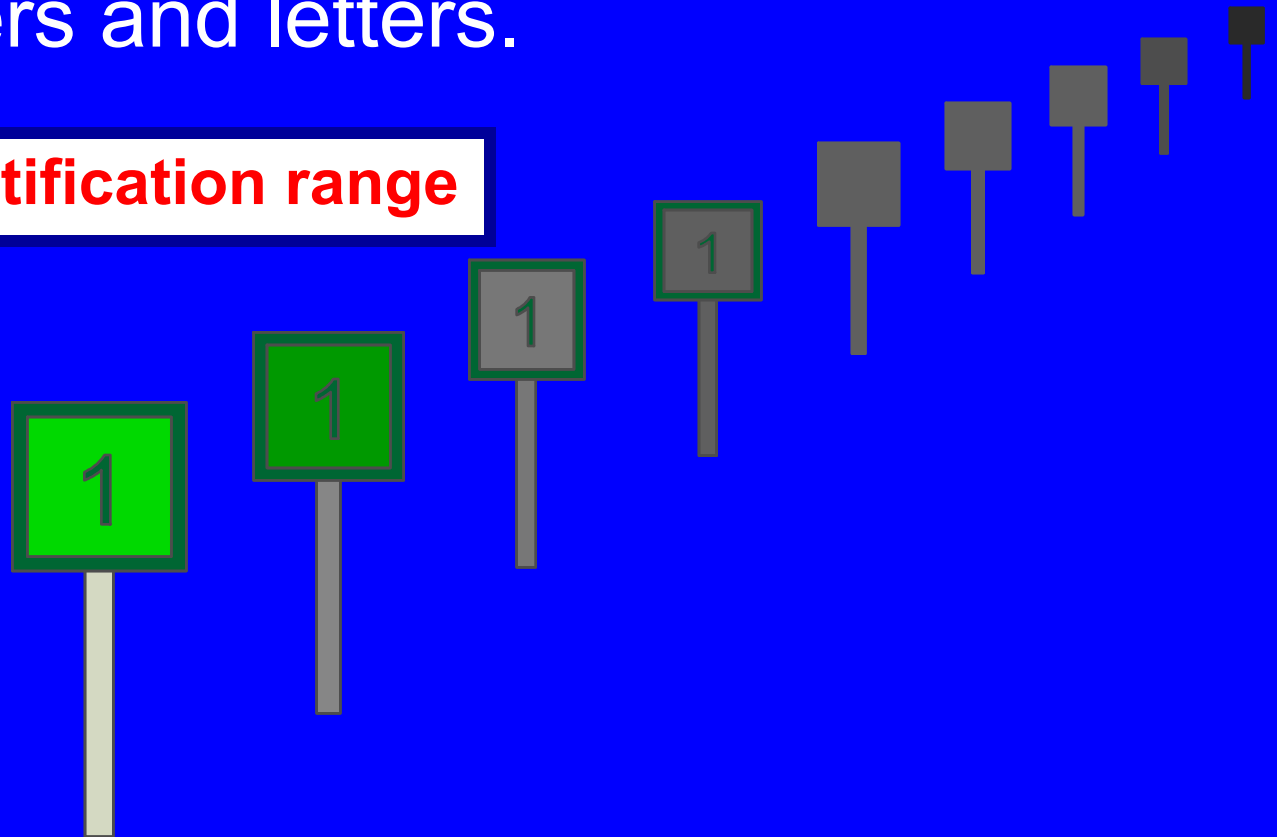
This is the recognition range



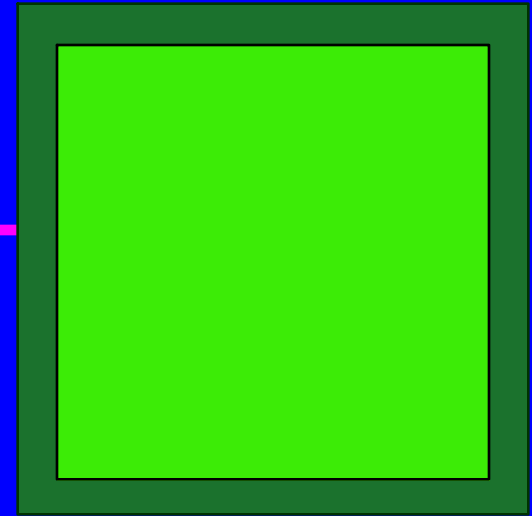
Nominal Range

- Finally the aid can be identified when the mariner is close enough to read the numbers and letters.

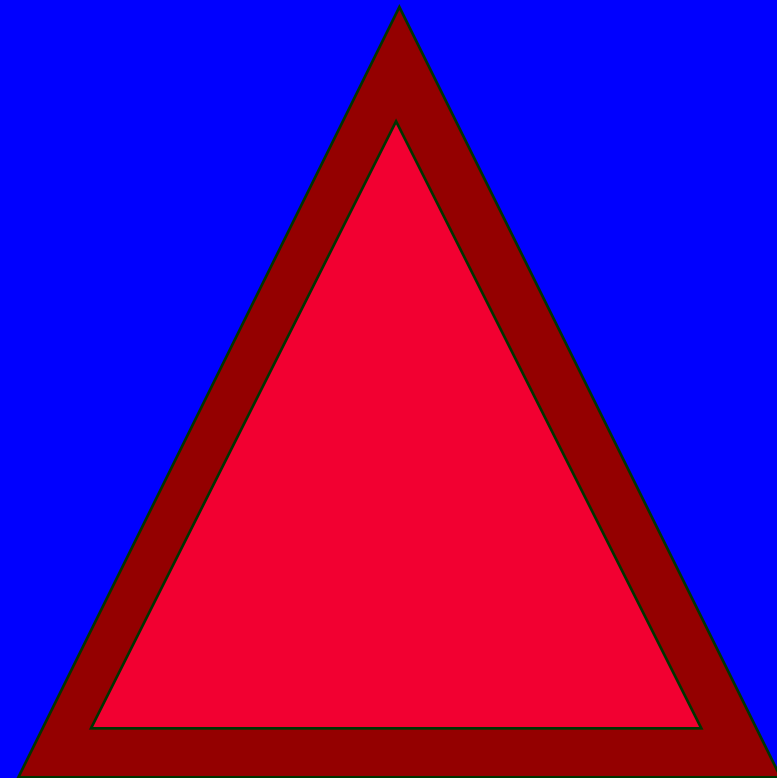
This is the identification range



Nominal Range



- The nominal range rating is used to classify dayboards
 - **3SG and 4TR**
 - nominal range 1NM
 - **4SG and 6TR**
 - nominal range 2NM
 - **6SG and 8TR**
 - nominal range 3NM

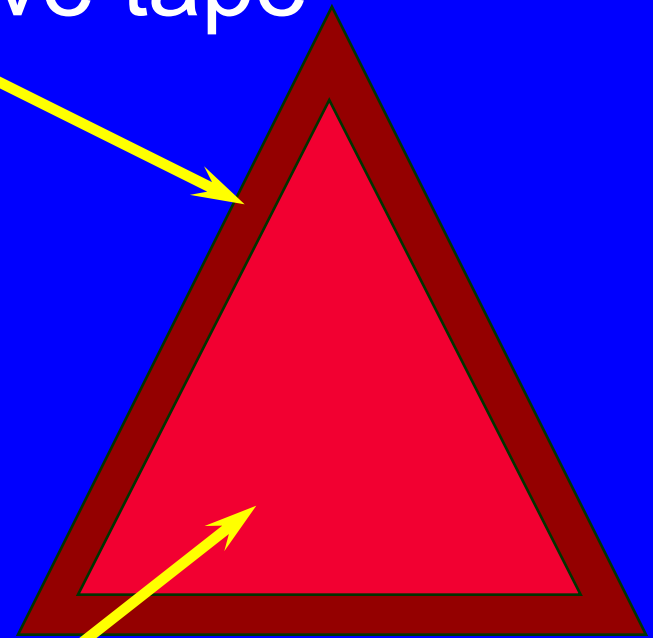
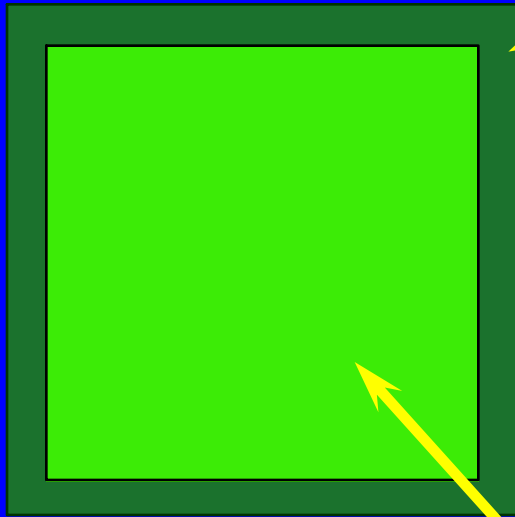


Preparation

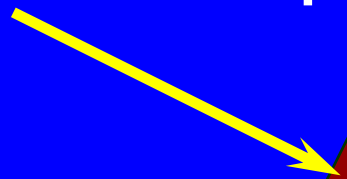
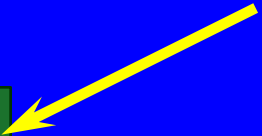
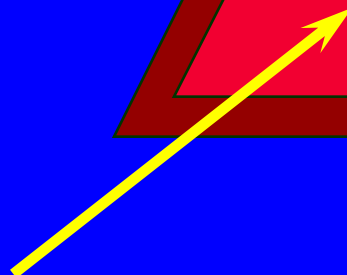
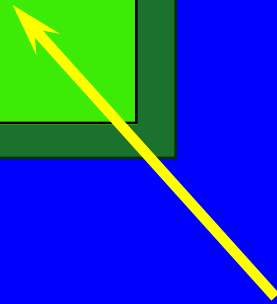
- The technical manual provides cutting patterns for dayboard backings.
- Acceptable materials are 3/8" or 1/2" plywood or 1/8" aluminum sheet.
- The surface of the dayboard is covered with a colored vinyl film and retroreflective tape boarder.

Films

Retroreflective tape

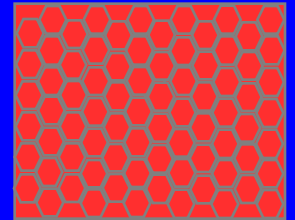
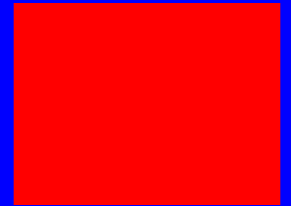


Vinyl Film



Retroreflective material

- Commonly called Retro.
- **Two manufacturers:**
 - Reflexite has a smooth appearance
 - 3M has a honeycomb appearance
- **3M** and **Reflexite** materials may be used together on the same aid.
- Each manufacturer makes two types of retro



Retroreflective materials

- Conformable retro has an aluminum backing and is used only on buoys.
- Non conformable retro has a paper backing and is used only on dayboards.
- Edge sealer is only used on buoys and is not required on dayboards.

Retroreflective materials

- “NEW” retro is conformable.
- This is SUPER STICKY.
- It is used on dayboards and buoys.
- Edge sealer is NOT required with this material.

Manufacturing

- The vinyl film must be heat applied, so most districts manufacture the boards and apply the retroreflective tape.
- Edge sealant should be used on edges & back.
- Preparation by servicing unit should be limited to selection and application of identifying marks.
 - letters, numbers, ICW marks

Inspection and Maintenance

- Dayboard surface and backing materials will deteriorate due to the effects of weathering by:
 - wind,
 - rain,
 - freezing temperatures, and
 - sunlight.

Inspection and Maintenance

- Types of delamination are:
 - **Cracking,**
 - **Peeling.** And
 - **Fading.**

Identifying Marks

- Numbers and letters used on dayboards come in 4 sizes
- 8" on 3SGs and 4TRs with 3 digits
- 12" on 3SGs and 4TRs with 1 or 2 digits
and 4SGs and 6TRs with 3 digits
- 16" on 4SGs and 6TRs with 1 or 2 digits
and 6SGs and 8TRs with 3 digits
- 24" on 6SGs and 8TRs with 1 or 2 digits

Backing Material

- ***Delamination*** should not have progressed over more than 25 percent of the backing material.
- Material should not be sufficiently ***warped*** to visibly detract from the signal.
- ***Mounting points*** should not be ***softened*** or deteriorated to the degree that the board may come loose during a storm.

Films, Numbers, Letters, and Borders

- *Delamination* of the film should not progress over **10%** of the surface area.
- Material should **not** be **cracked**, **checked** or **abraded** so as to provide a dull or roughened top surface.
- Material attached should **not** have **peeled** over more than **10%** of the surface area

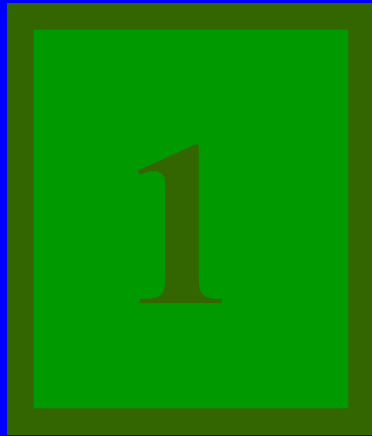
Replacement or Repair

- Dayboards shall be replaced if any deterioration is observed.
- Dayboards shall be replaced if they cannot function as intended.
- Onsite repairs are permitted if they do not detract from the intended signal.
- Painting of dayboards is prohibited.

Fading

- There is no practical way to measure fading.
- Replacement is based on the judgment of servicing personnel.
- It must display the intended signal until the next scheduled service.

... more FADING



NEW



FADED



REPLACE

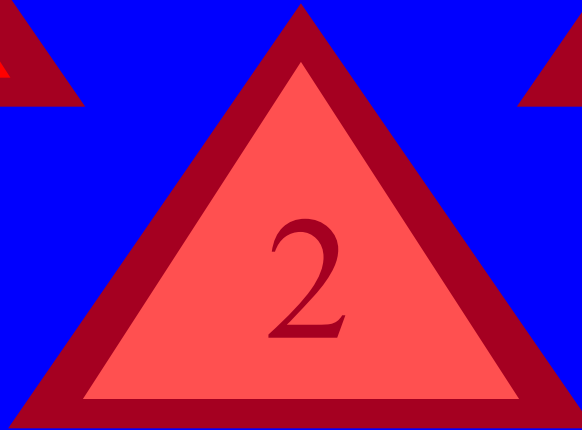
... More FADING



New



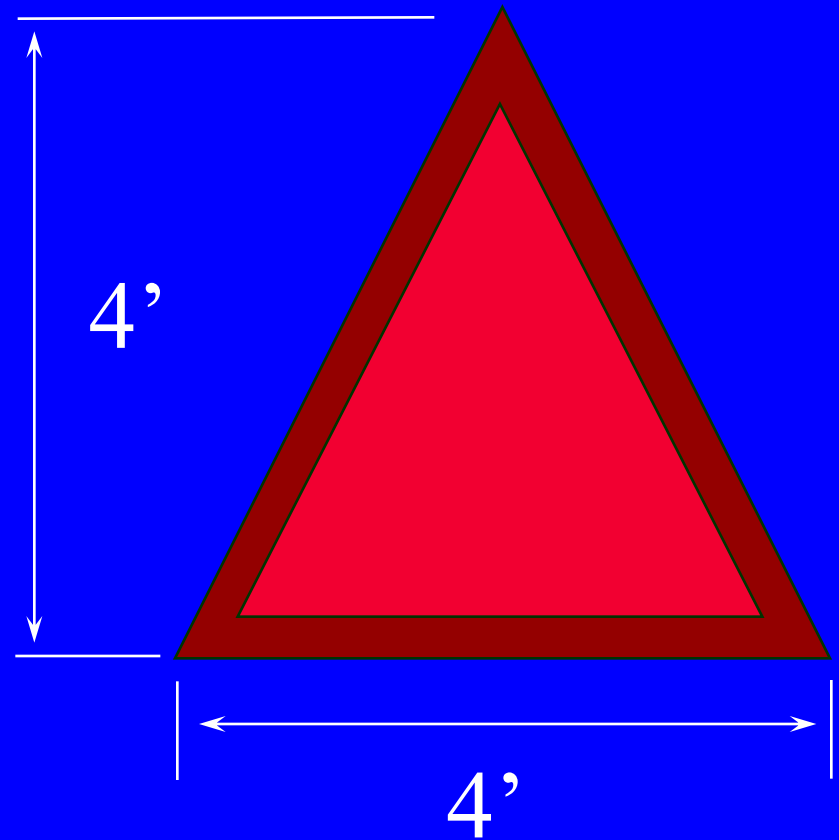
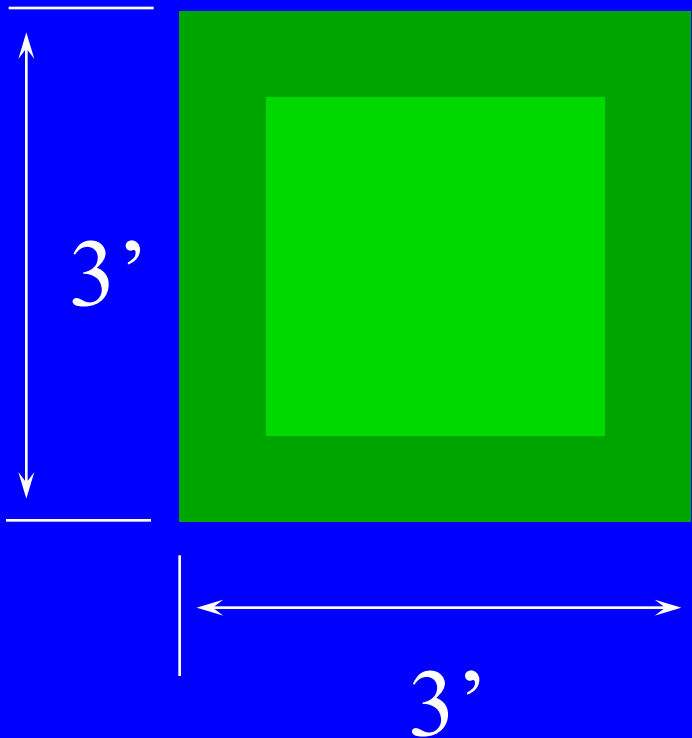
Replace



Faded

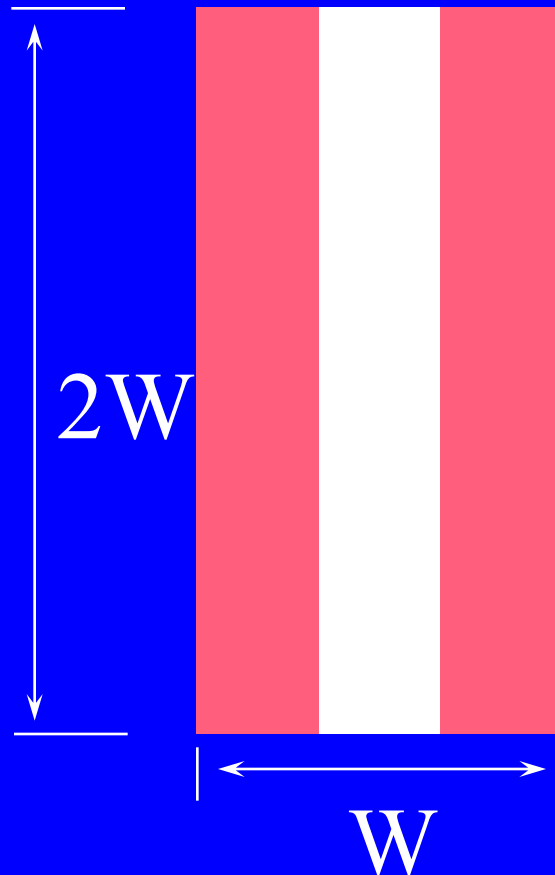
Dayboards

- There is no character for height in the designation.
- All dayboards including TRs and SGs are as tall as they are wide.



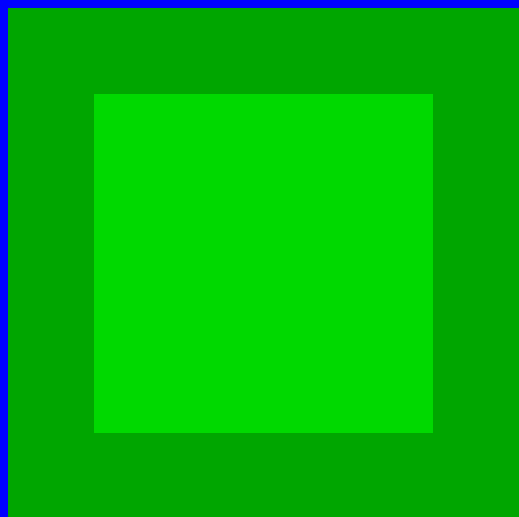
Range dayboards

- Range boards are always twice as tall as they are wide.

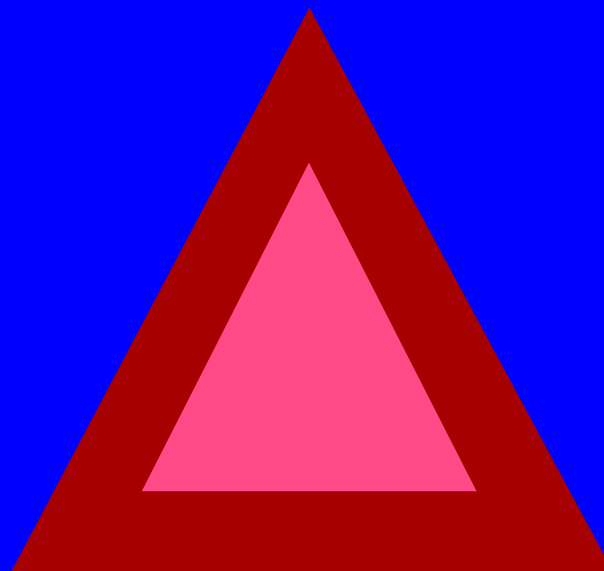


REVIEW

Port and Starboard Markers

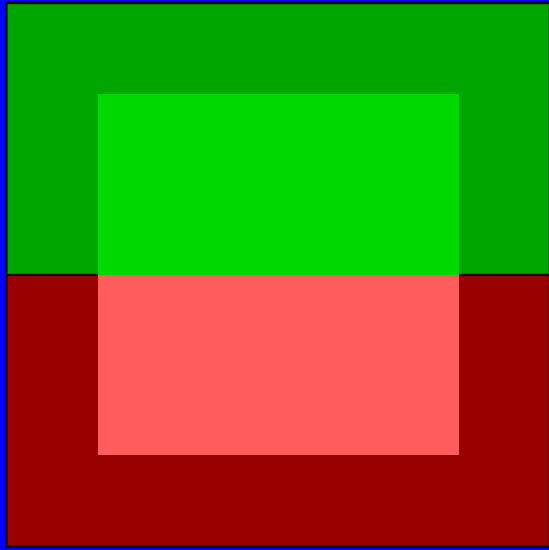


SG

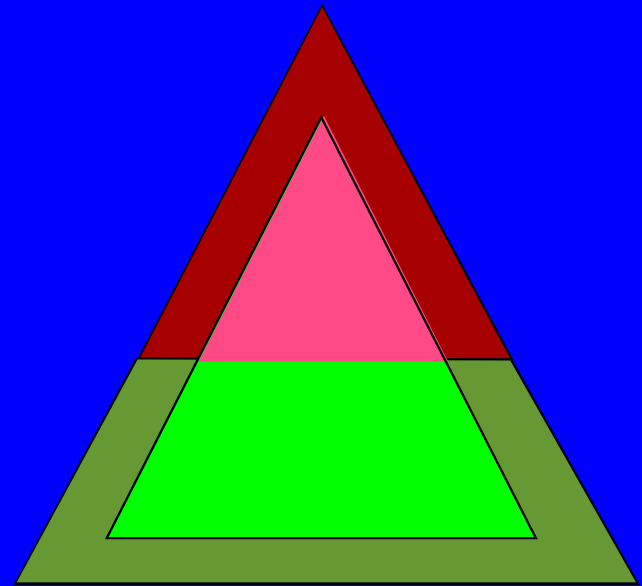


TR

Junction Markers

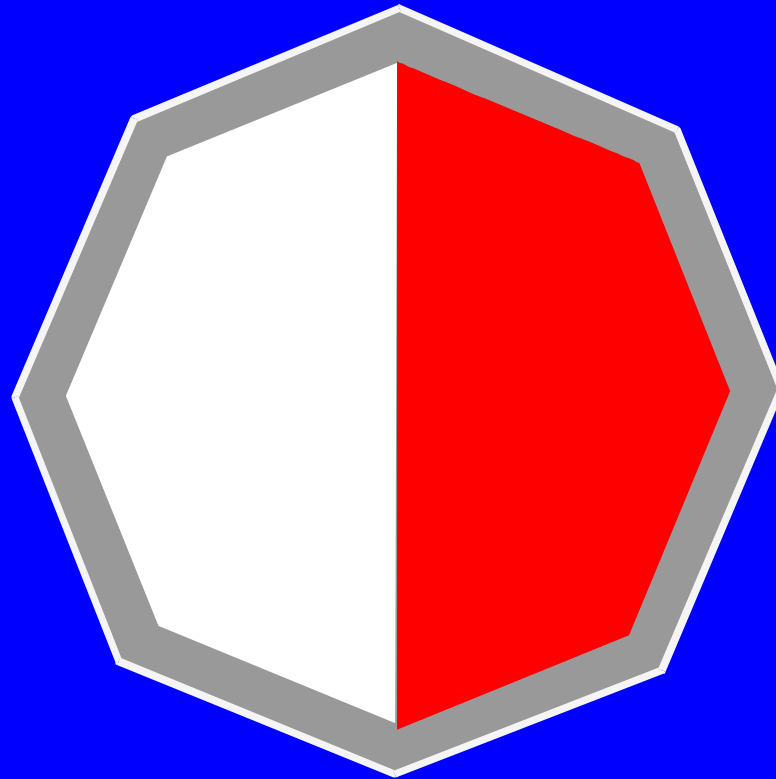


JG



JR

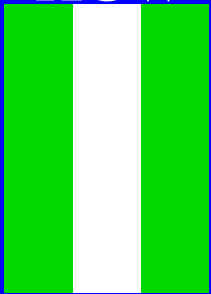
Mid - Channel Markers



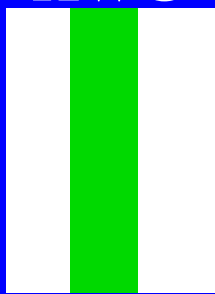
MR

Range Dayboards

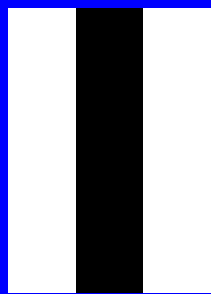
KGW



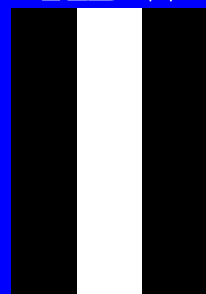
KWG



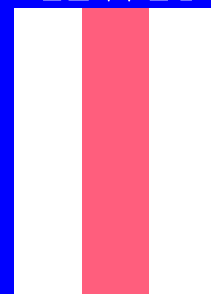
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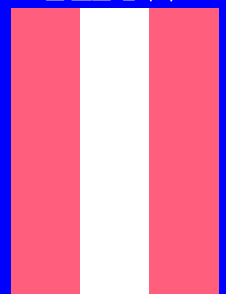
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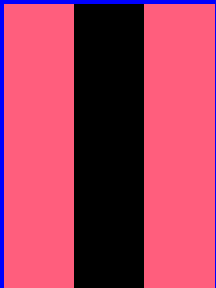
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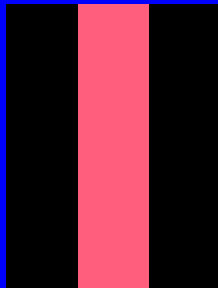
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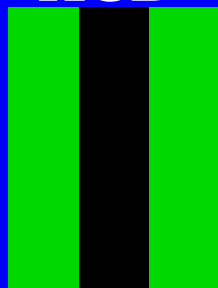
KRB



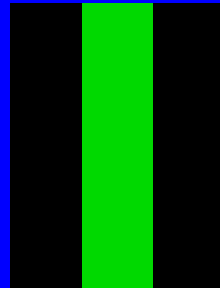
KBR



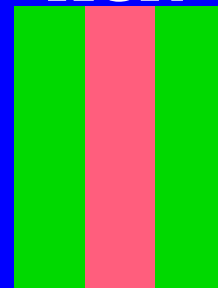
KGB



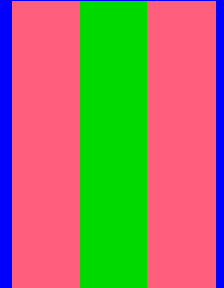
KBG



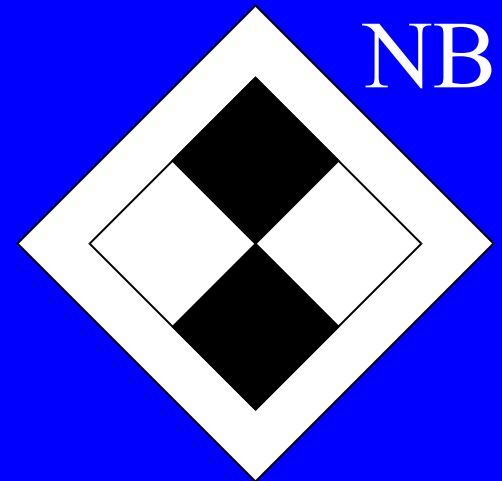
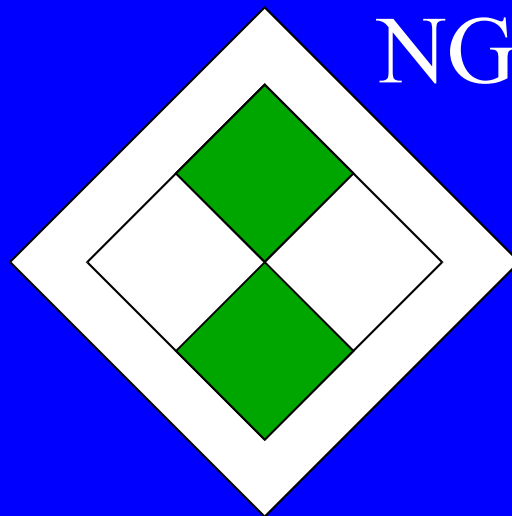
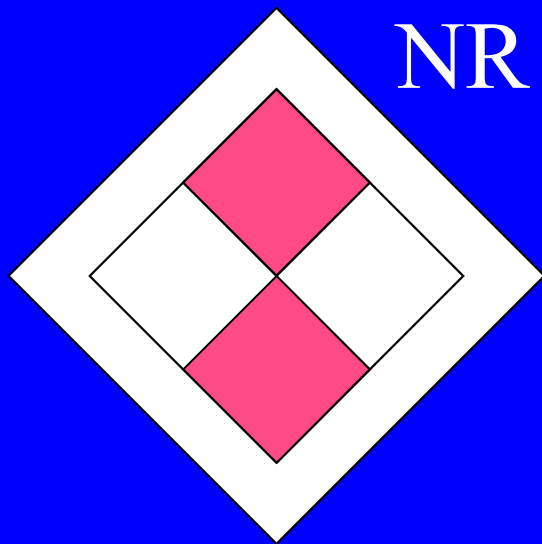
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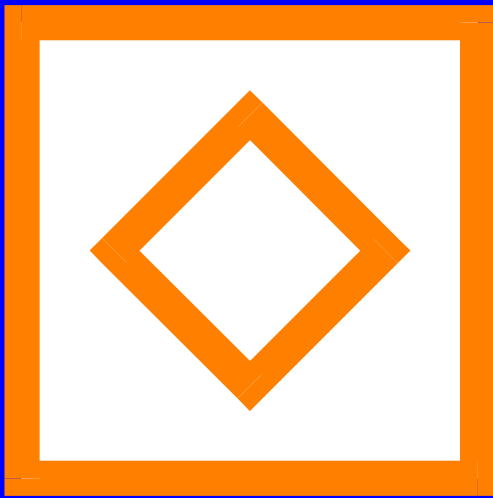
KRG



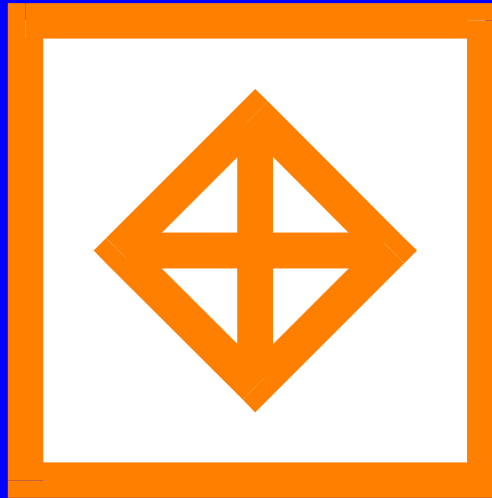
No Lateral Significance markers



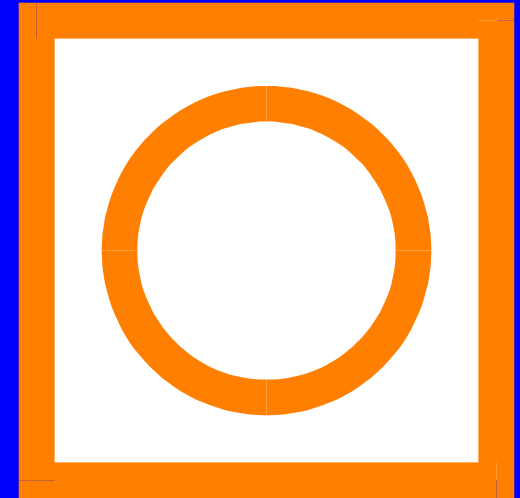
Information and Regulatory Markers



Danger

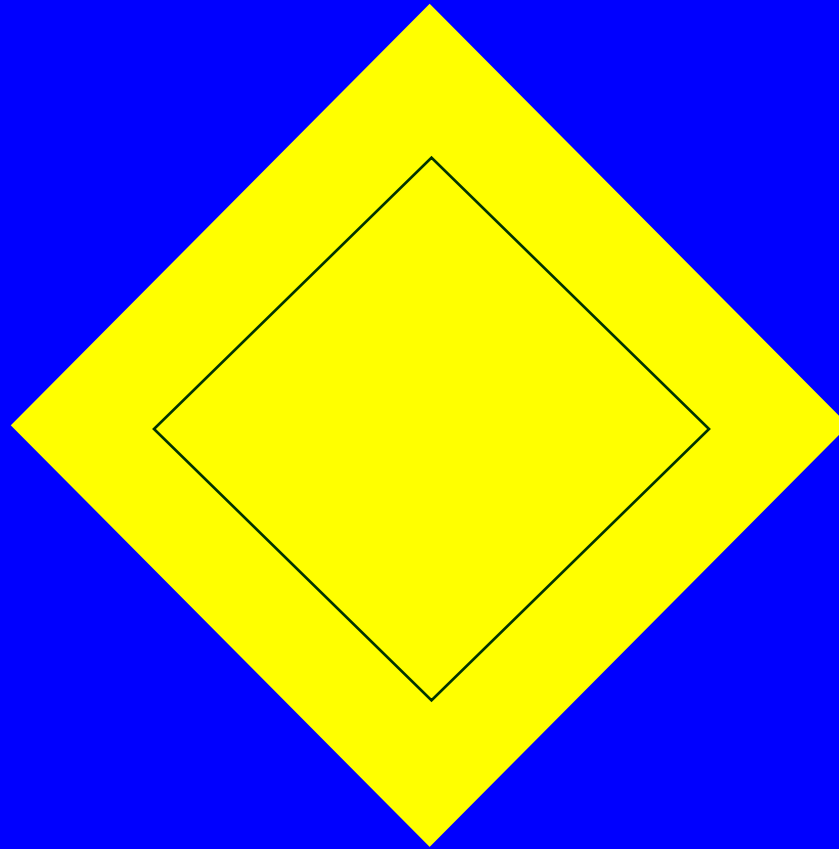


Exclusion
Area



Controlled
Area

Special Purpose Dayboard



NY

LED LANTERN

(Light Emitting Diode)

Introduction

- MFG by Carmanah of Canada.
- Approved as a replacement for the 155 mm.
- Used with a 5NFR/5CFR to replace old style TRLB.
- Cost \$749.00.
- Programmable flash rhythm (TV remote).

Model 701

- Self-powered.
- Omni-directional.
- Single Unit-Solar panels, flasher, battery, DLC and lantern housed together.
- 3 mile range.



Model 701

- Available in **RED**, **GREEN**, **YELLOW**, and **WHITE**.
- Programmable flash characteristic.
- **FIXED** characteristic has 2 mile range.



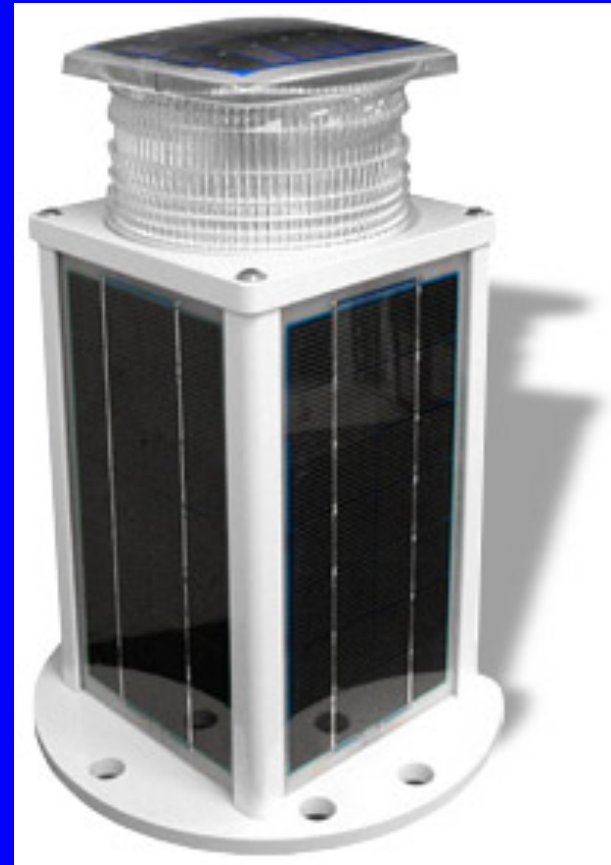
Model 702

- Larger battery.
- More Solar Panels.
- Designed for use in limited sunlight.
- Same features as 701.



Model 702-5

- Same as 702.
- Extra solar panel on top.
- Designed for extremely limited sunlight (less than 1.5 hrs a day).



Model 601

- Not approved for use by USCG.
- 2 NM range.
- Self-contained.
- May be used on private aids.
- Small, lightweight, easy to install, inexpensive.



Charging (700 series)

- Charged prior to shipment.
- MUST be recharged if not installed within 2 months of receipt.
- Charge by placing in direct sunlight for 60 hours.
- 60 hours does not include nighttime.

Charging With External Charger

- Cell Phone type charger available from mfg.
- Open Lantern, disconnect battery and SP.
- Measure battery voltage.
- Plug charger into battery and charge in accordance with battery voltage.
- DO NOT OVERCHARGE.

Charging (con't)

- 701 Lantern
(15 ahs)
- 4.14 volts- 5 hours
- 3.98-4.14 volts- 15 hrs
- 3.86 or less- 20 hrs
- 702 & 702-5
(24 ahs)
- 7 hours
- 18 hours
- 27 hours

Programming

- Lantern color determined by colored dot near serial number.
- Any flash characteristic can be programmed using a Universal TV remote control.
- Security code must be entered to prevent accidentally changing characteristic.
- Follow instructions supplied with lantern.

Installation

- Install with three bolts similar to a 155.
- Use leveling bolts on a structure.
- Bolts can obstruct solar panels, make sure they protrude only as much as necessary.
- Install nylon insulating spacer on buoys to minimize corrosion.

Service Life

- LED lanterns do not burn out.
- Light output degrades over time.
- Replace lanterns according to Duty Cycle.
- 10-29% duty cycle replace every 12 yrs.
- 30-100% replace every 8 years.
- Replace battery every 4 years.

Servicing

- Service according to standard interval cycle established for the aid.
- Clean lens with mild soap and water.
- Cover lantern with shroud and time flash characteristic.
- Observe LEDs through lens.
- Replace optic if Dark Sectors are observed.