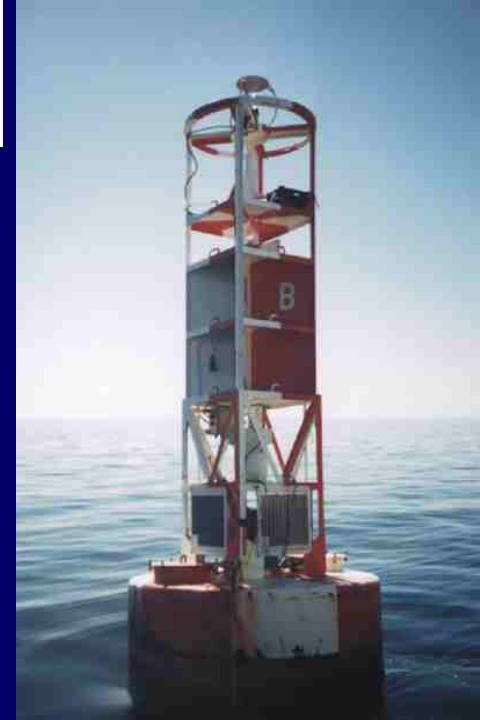




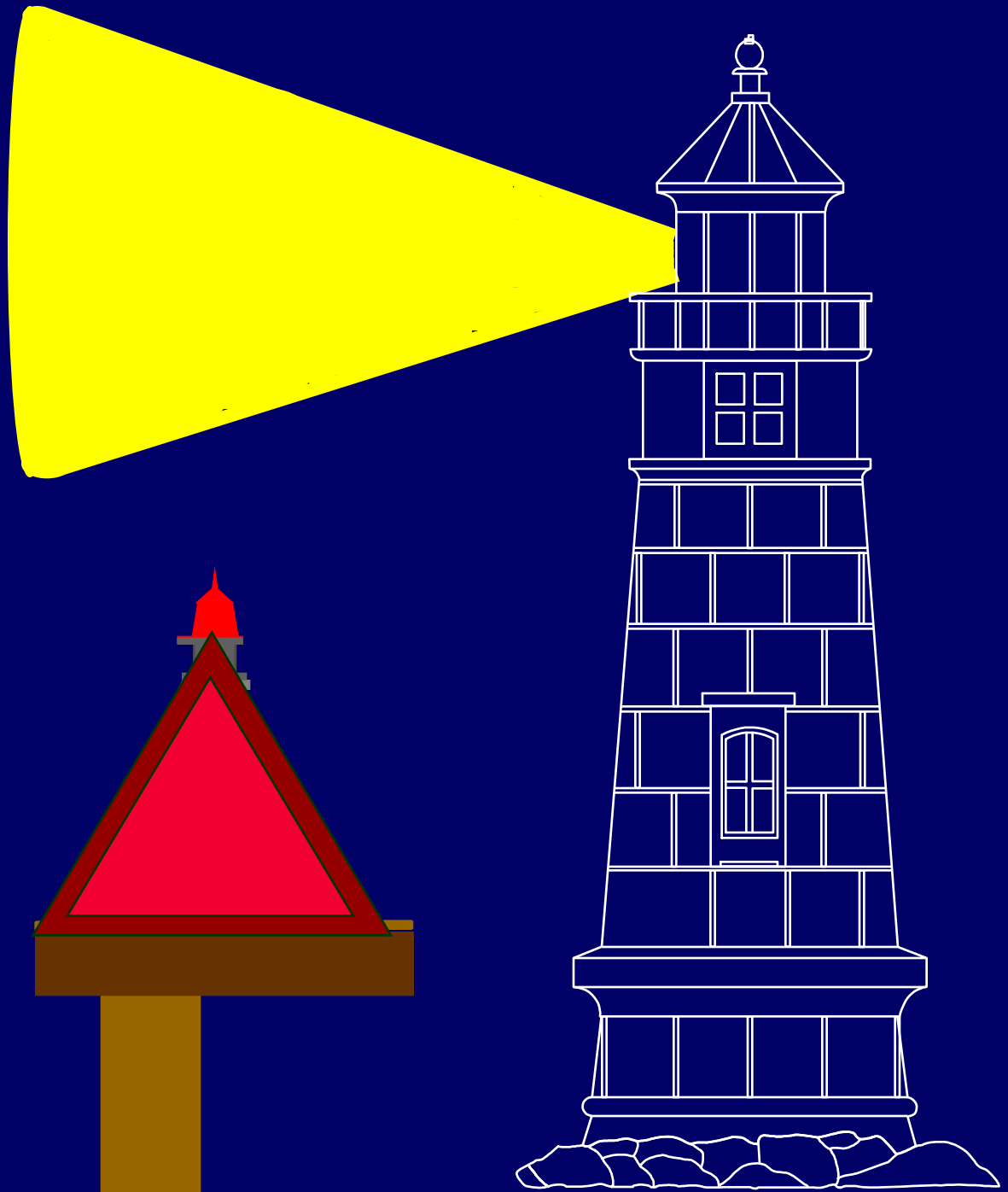
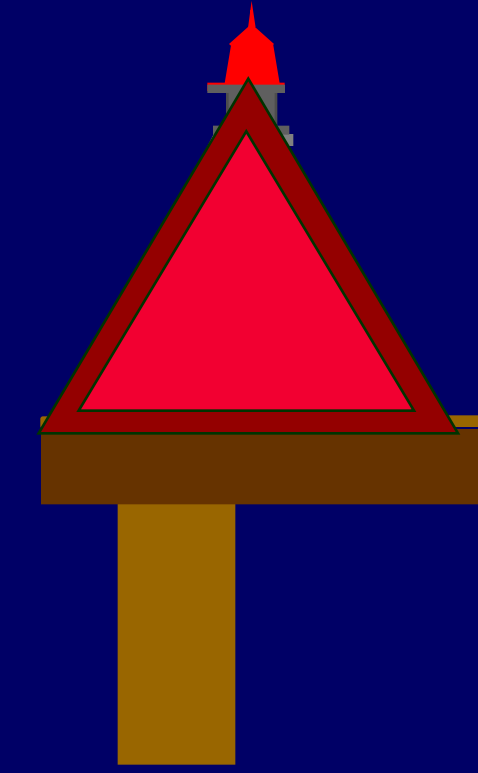
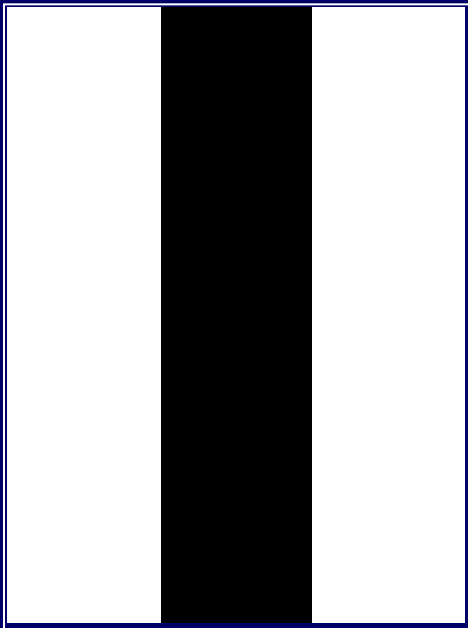
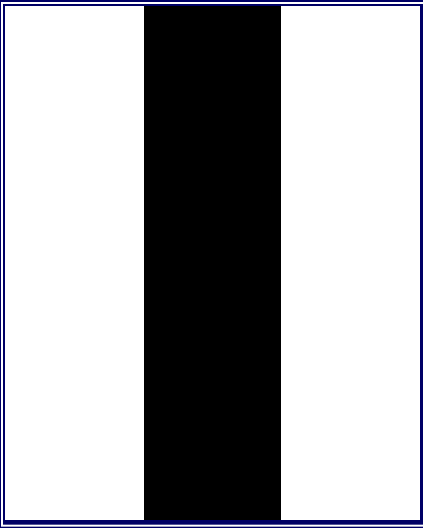
**Prevention
(Marine Safety)
Department
Navigation
Systems
Division**



**EVERYTHING
YOU NEED TO
KNOW ABOUT
BEACONS**



Beacons



Training Objectives

Identification of various structures.

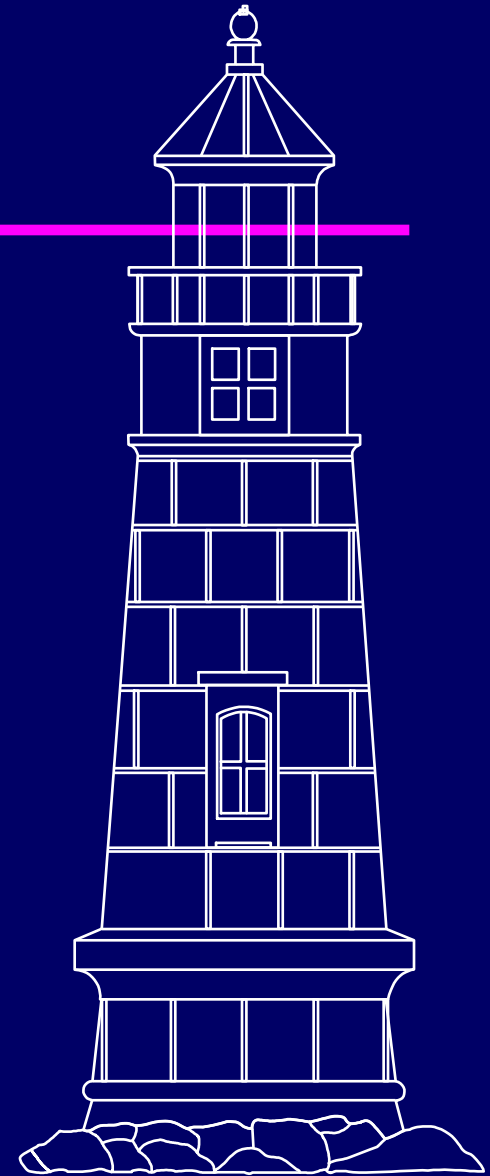
Proper use and maintenance of retro-reflective material.

Structures

- 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

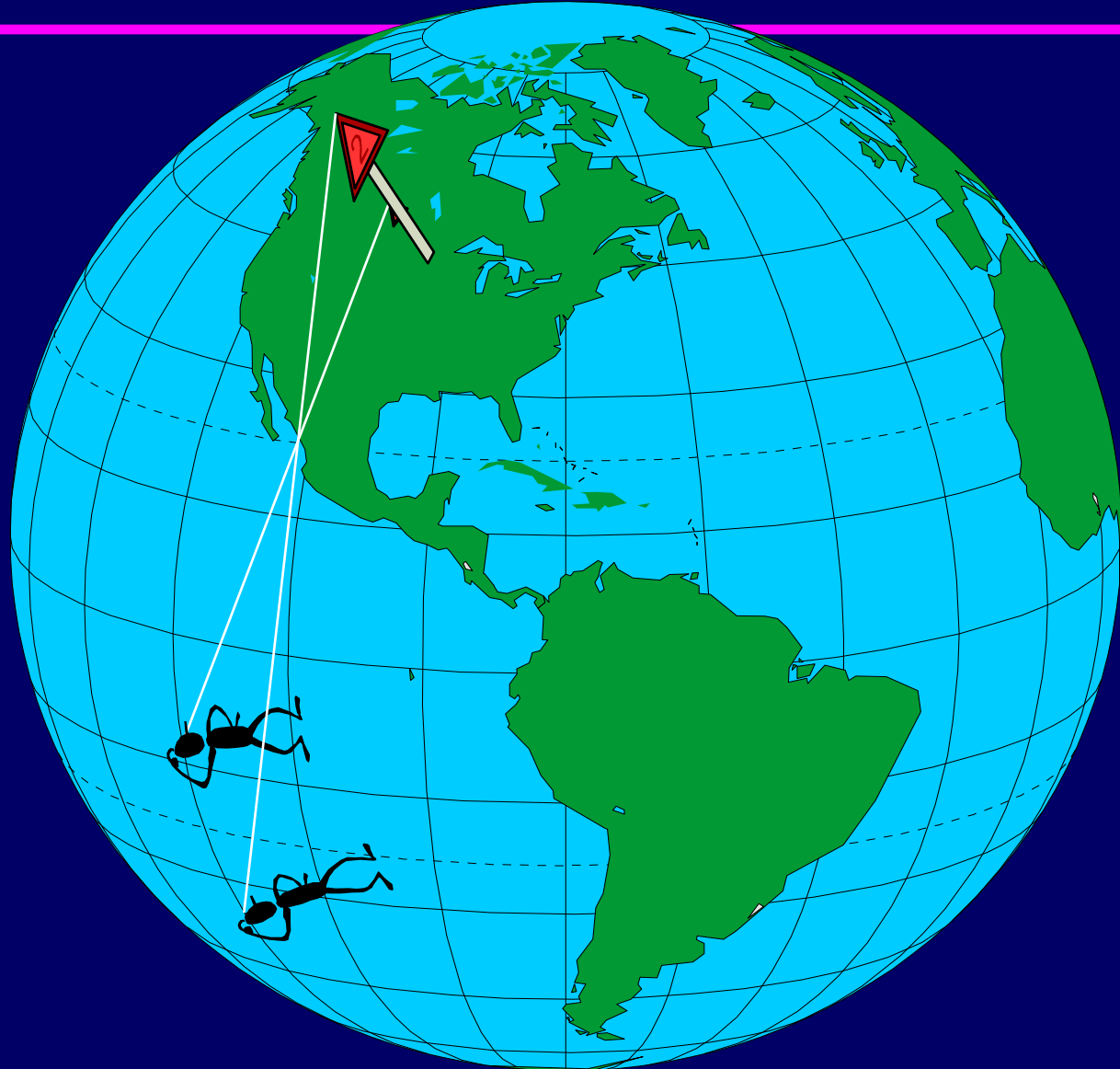
- A support platform for visual and/or audible aids to navigation.
- Simple in design.
- Constructed of wood, concrete or steel.
- May be lighted or unlighted.

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)

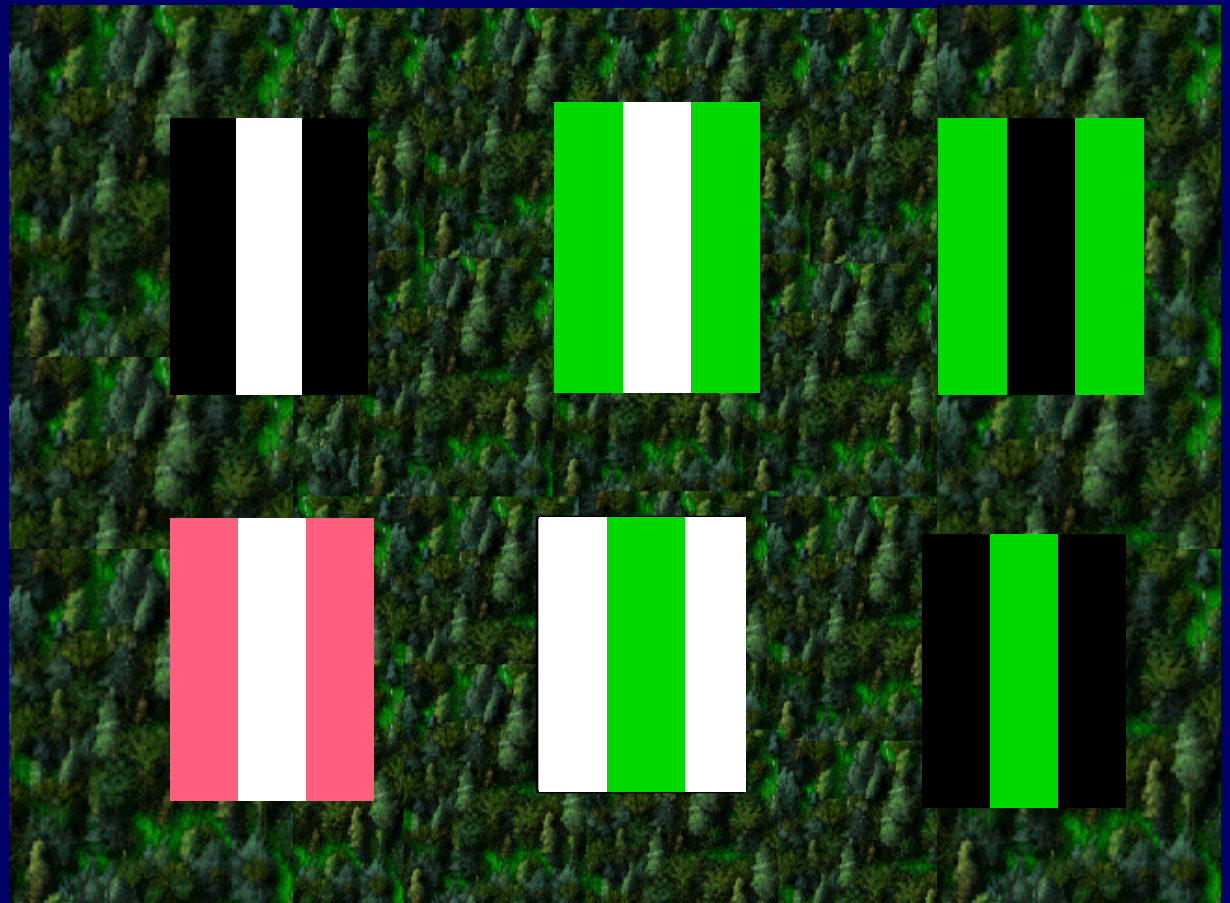
Operational Requirements

- Height
- Size



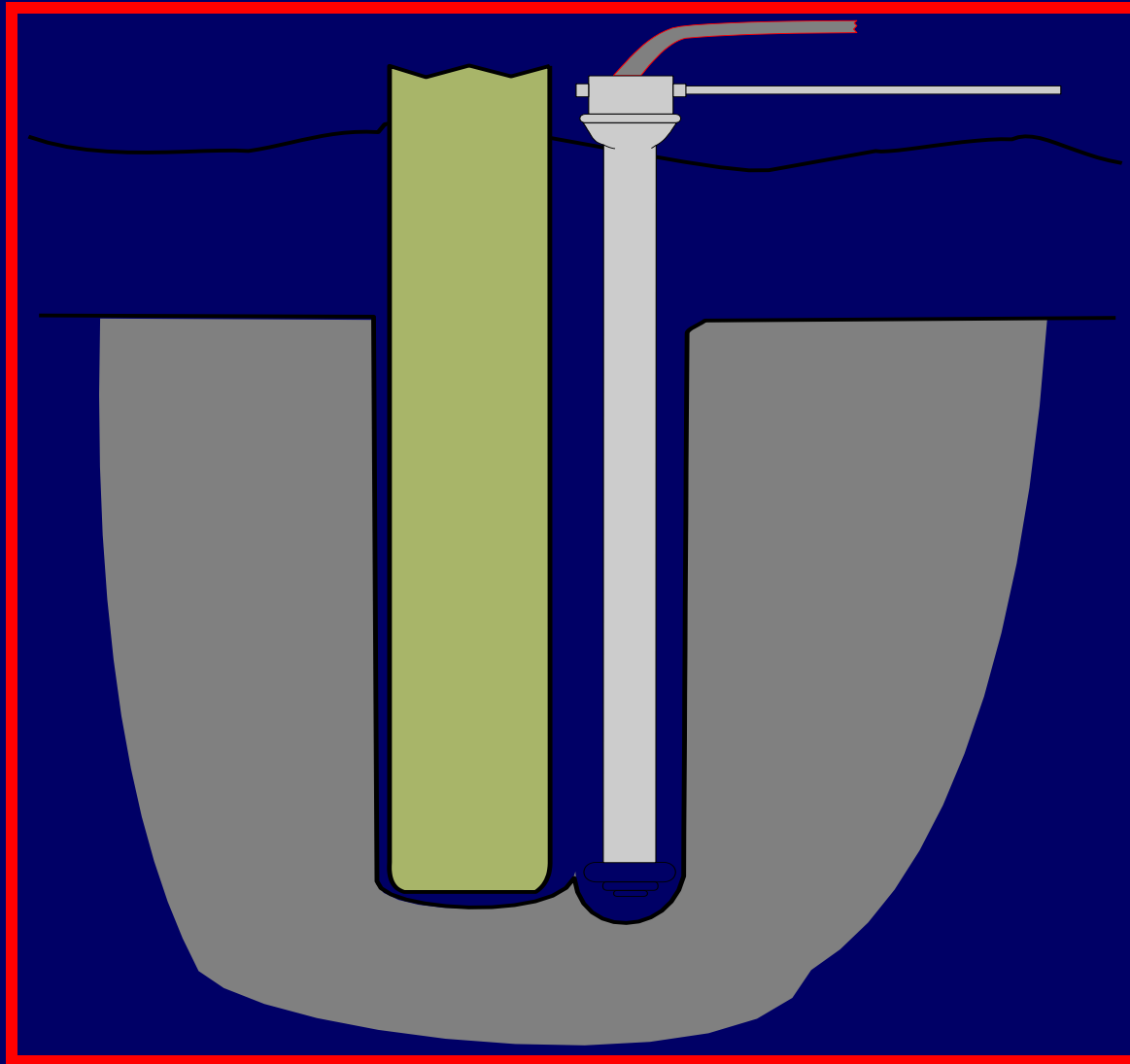
Operational Requirements

- Contrast
 - Vegetation
 - Background lights



Construction Methods

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



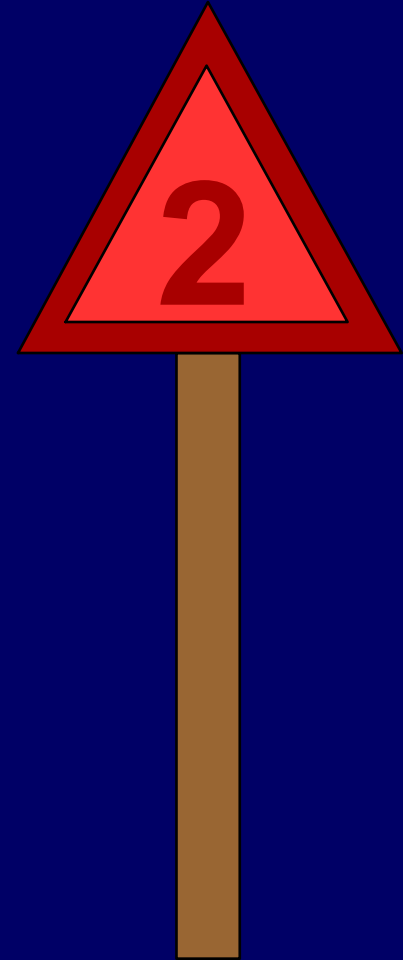
Structure Categories

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:**

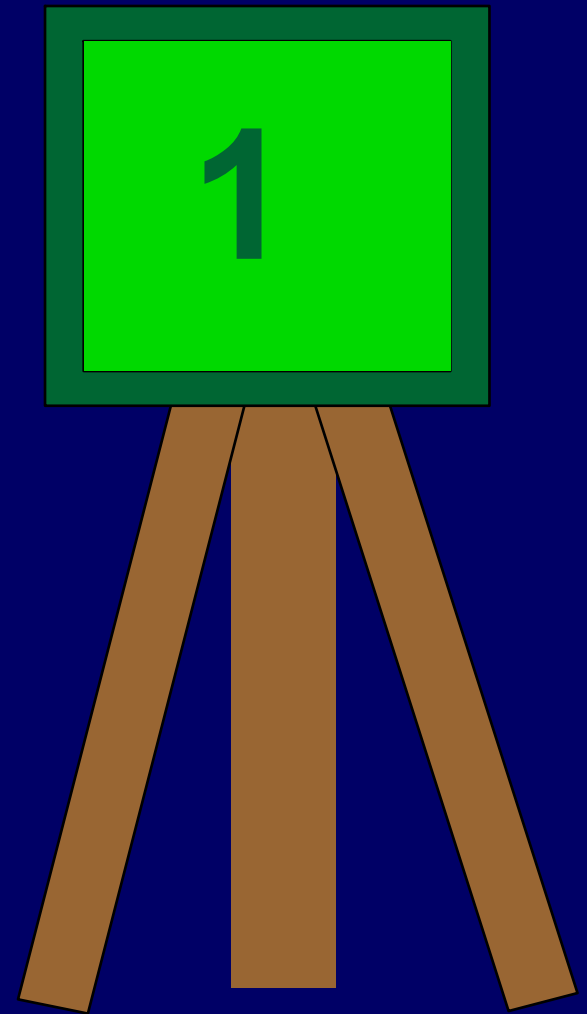
– **Dolphin**

– **Platform Structure**

Dolphin

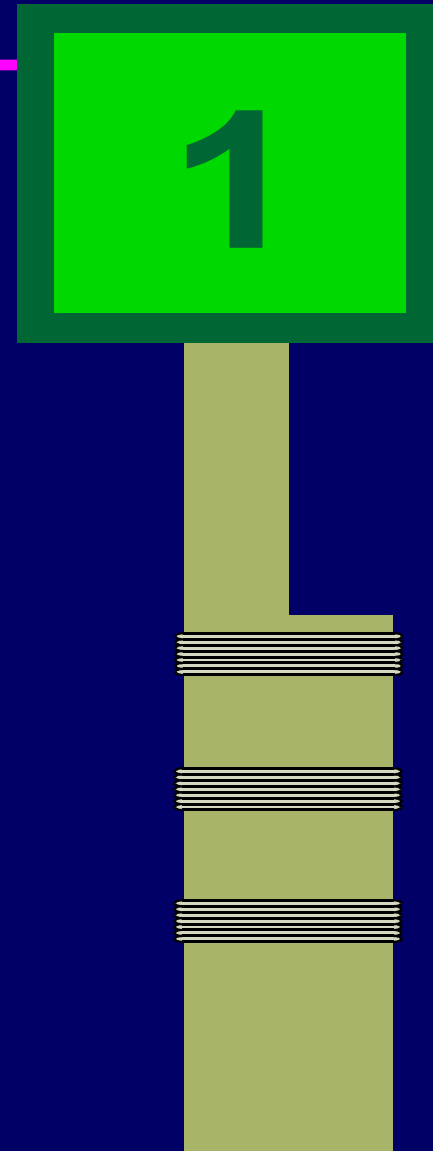
- **Battered pile**

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



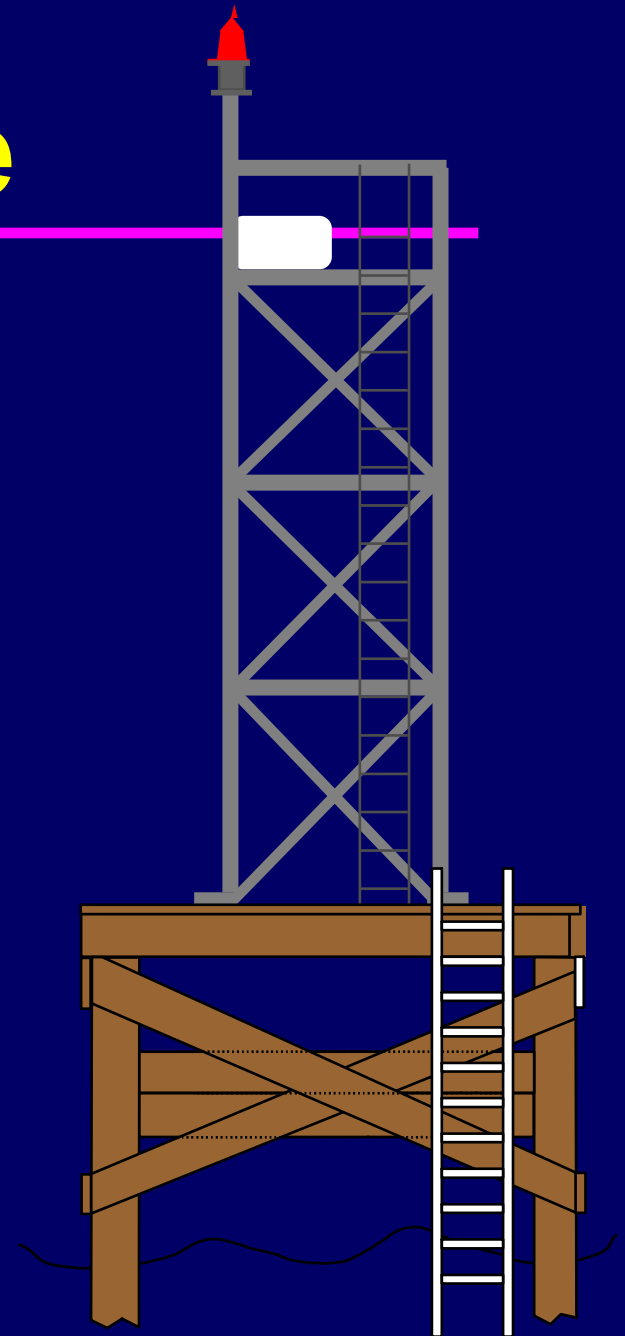
Dolphin

- **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

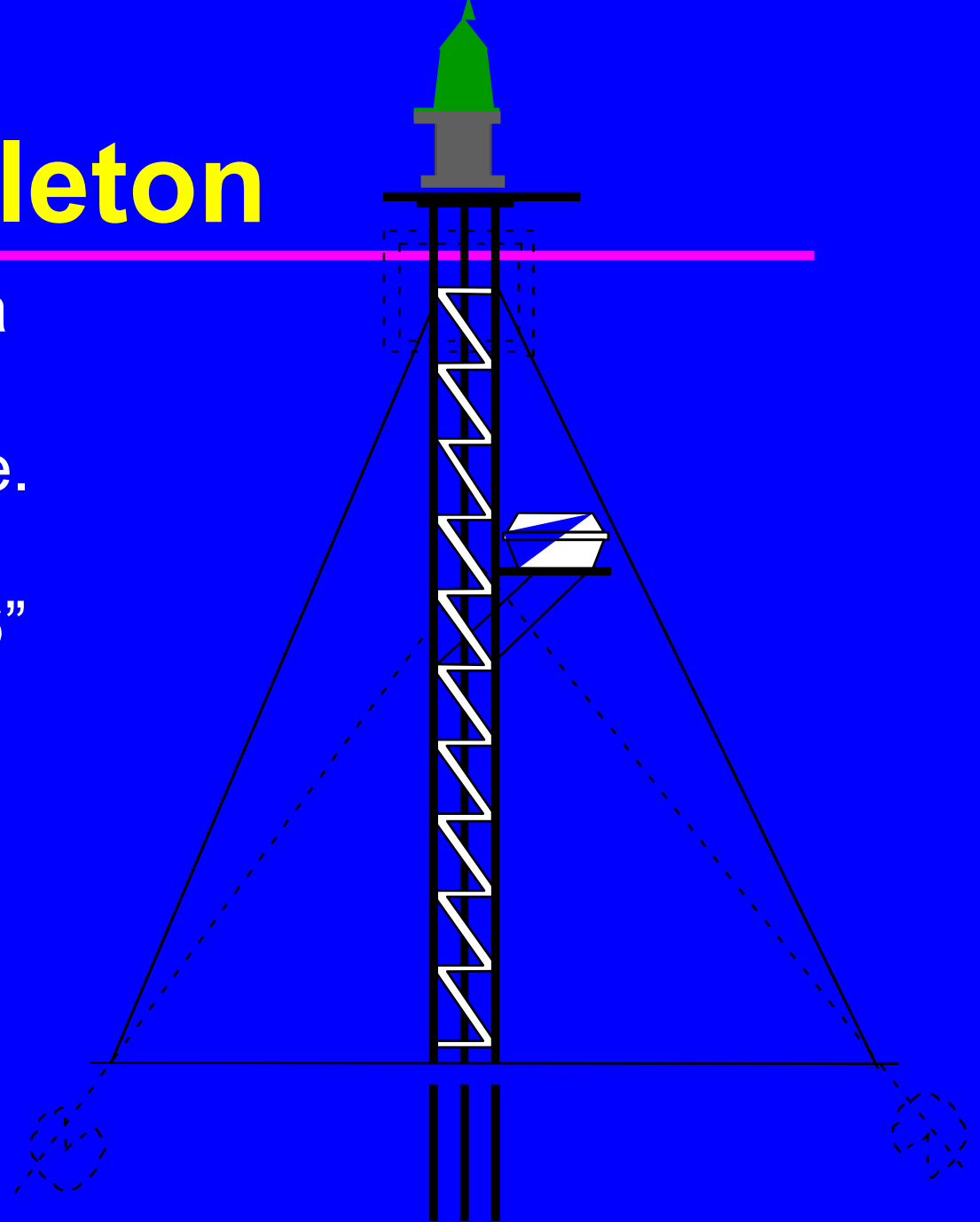
Supports equipment on land less than 30'.

Free standing skeleton

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

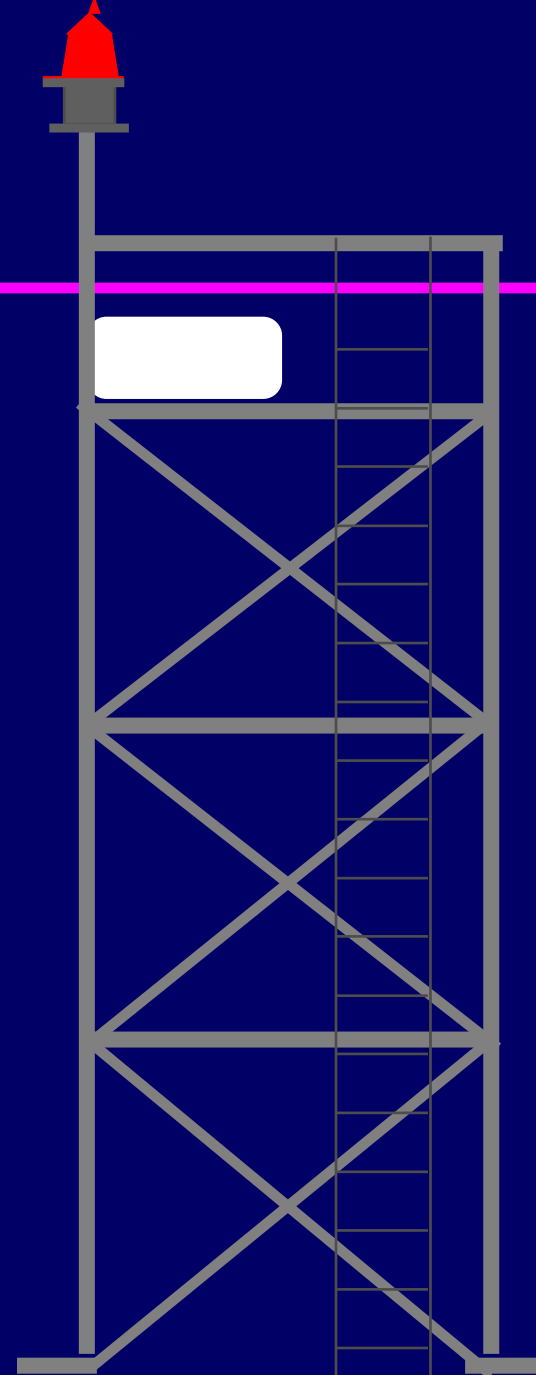
Guyed Skeleton

- 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.

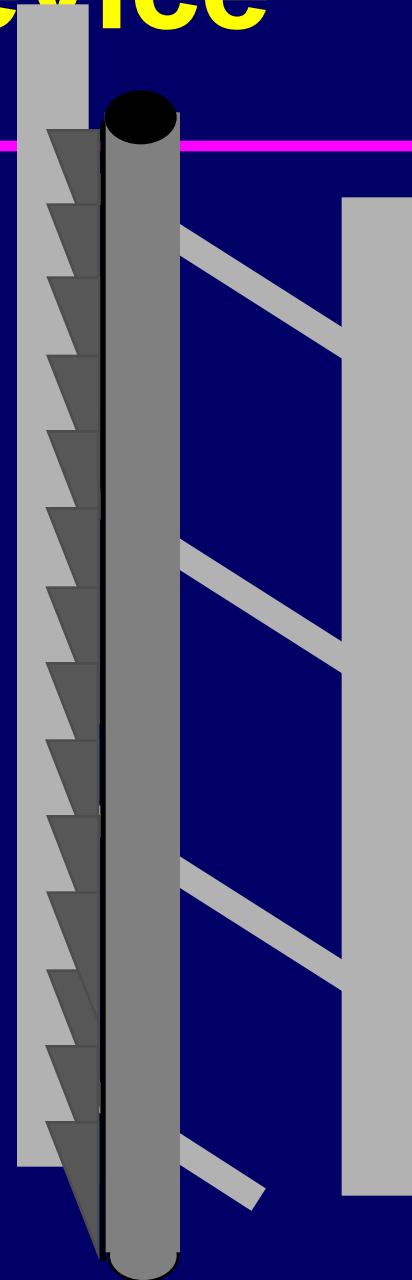
Safety Belt / Harness

- **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.

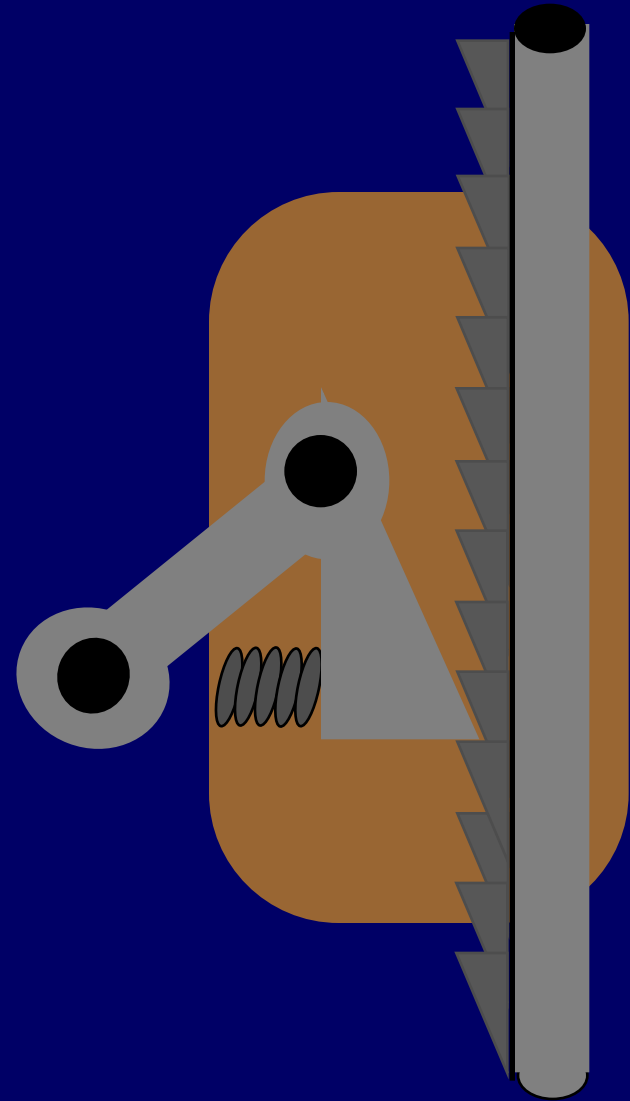
Safety Climbing Device

- Will be installed on all structures over 20 ft.

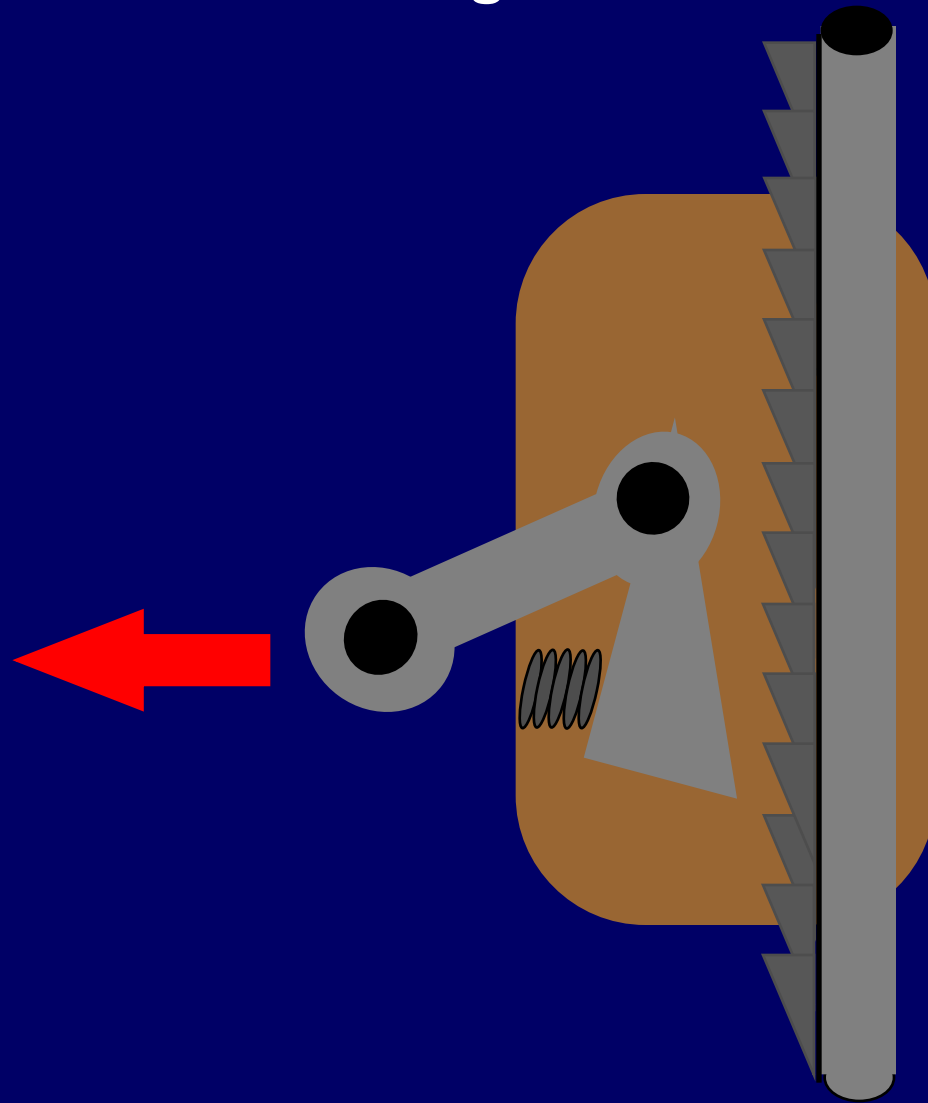
It looks like a pipe with teeth and is installed on the ladder rungs.



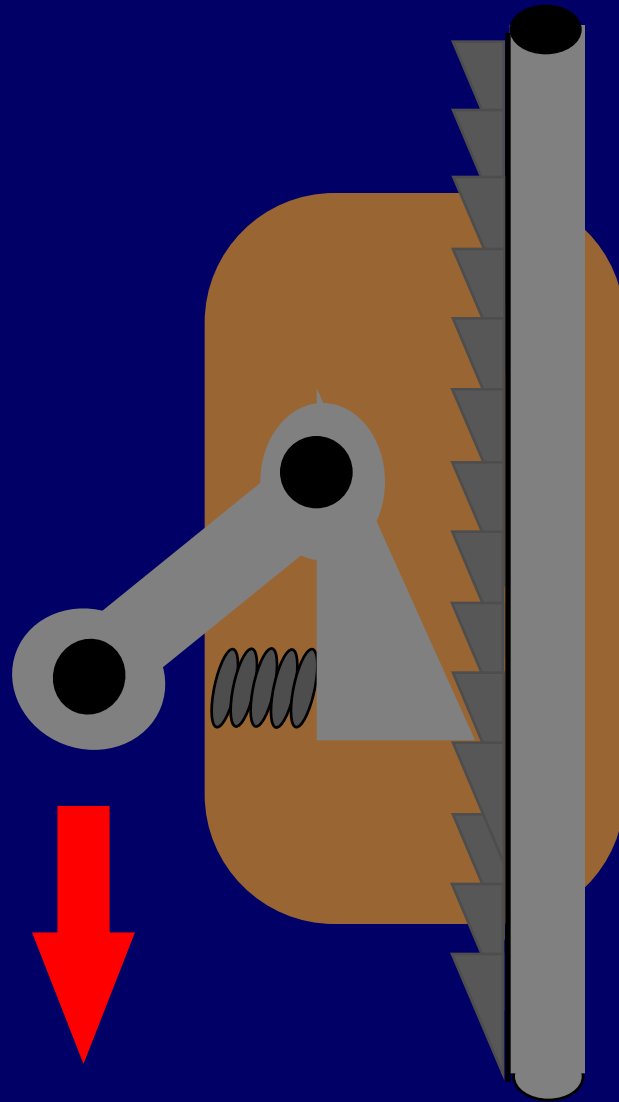
A safety climb car is attached to the climber's safety belt and is slid over the safety climb rail.



**As the climber leans back the
safety climb releases allowing
ascent**



If the climber slips the safety climb catches preventing a fall



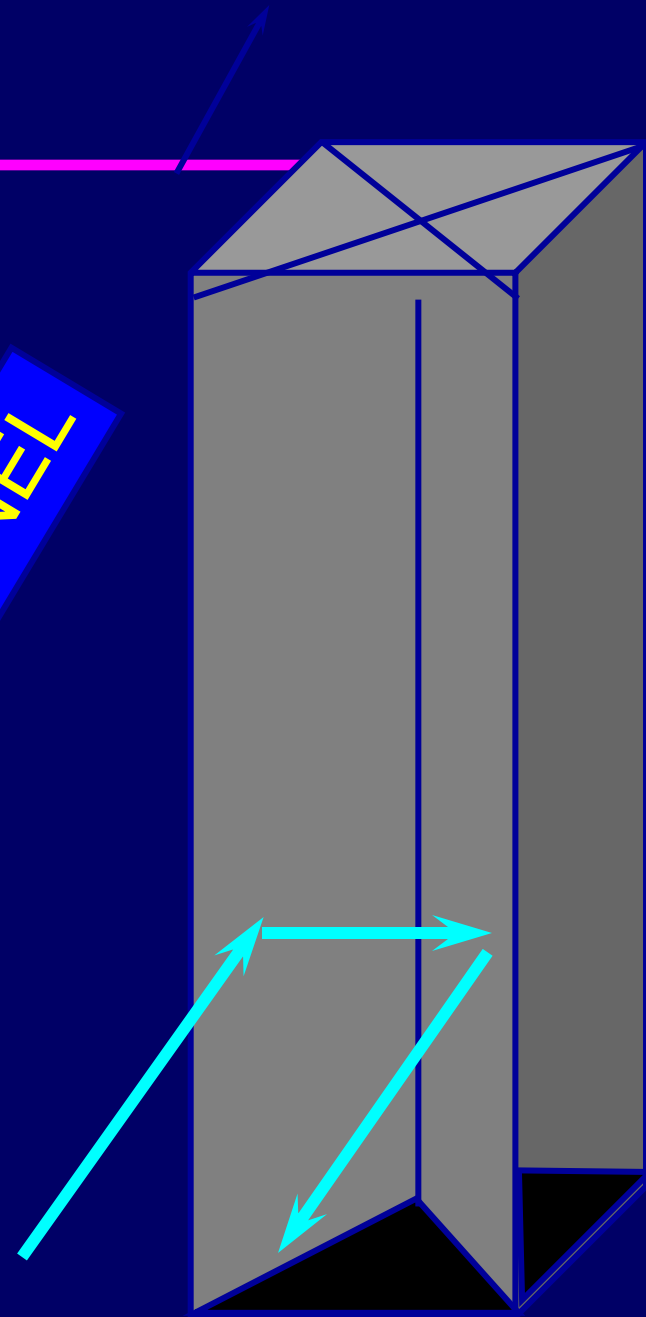
Battery Box

- 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.

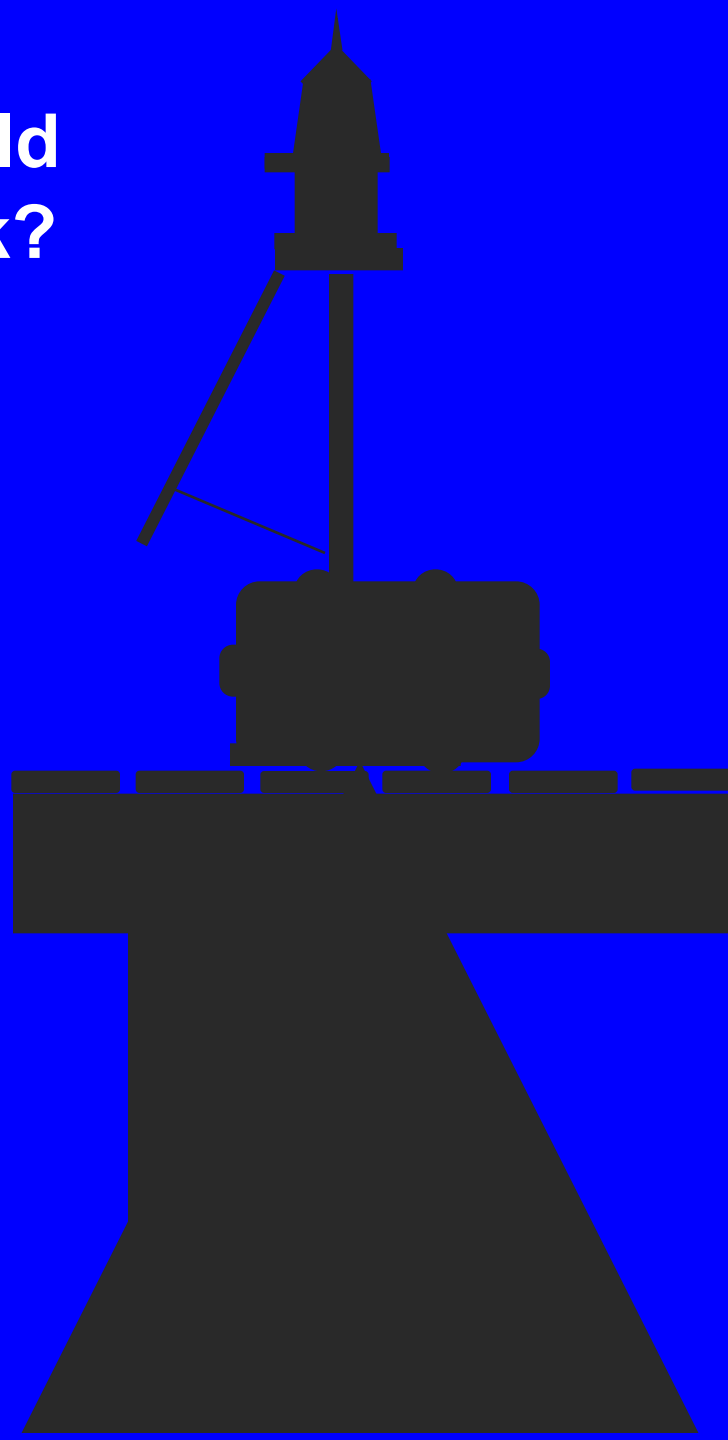
CHANNEL



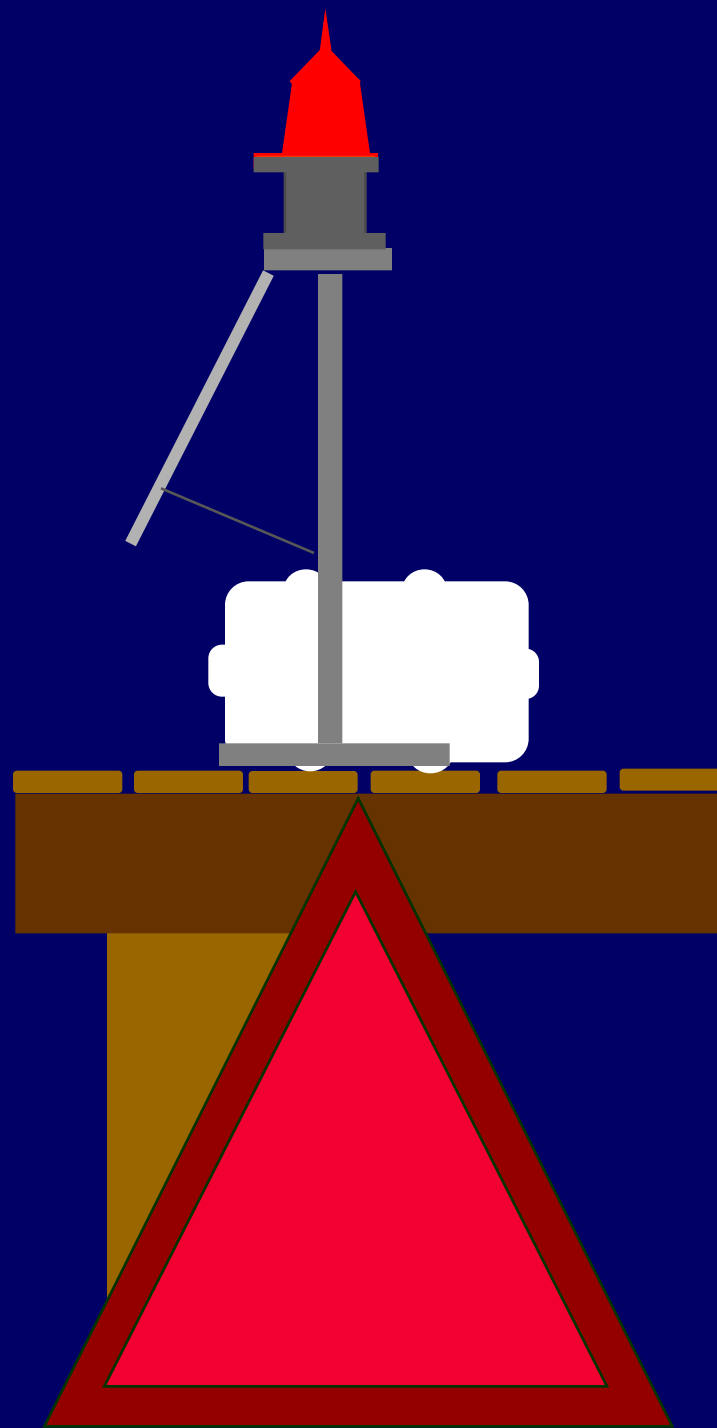
Dayboards

- 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?**

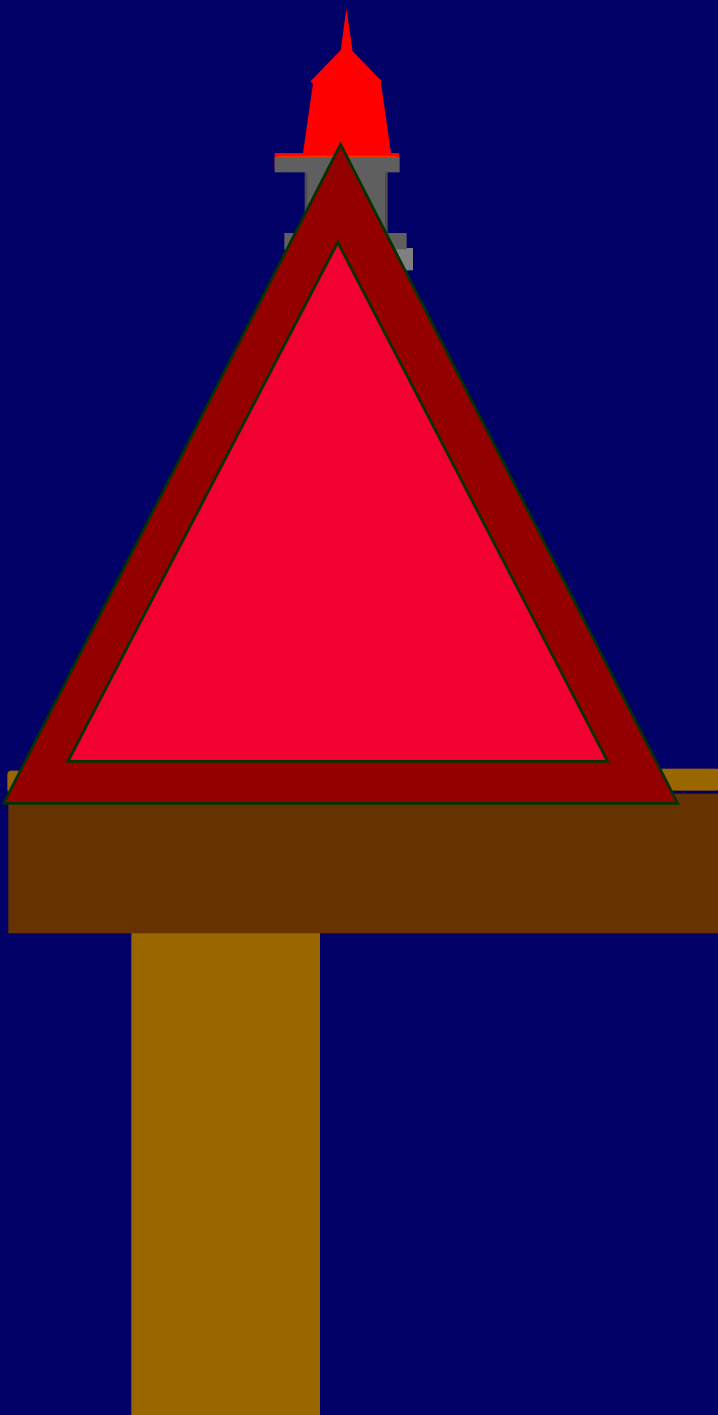


**It is a little
easier to make
the decision in
the daylight!**



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



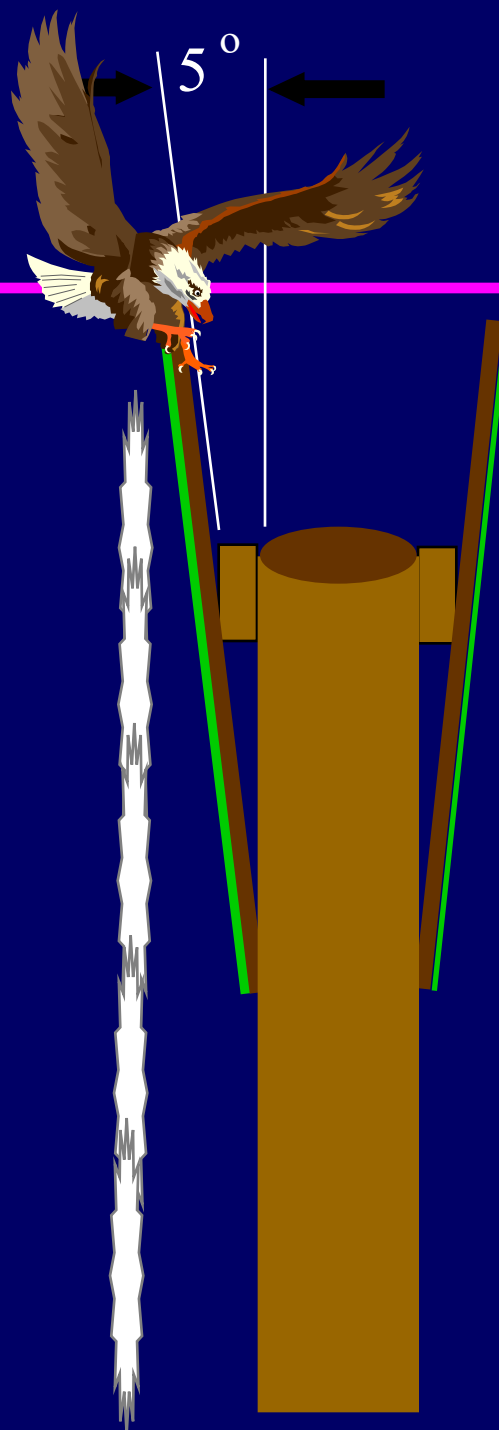


Mounting Dayboards

- 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.

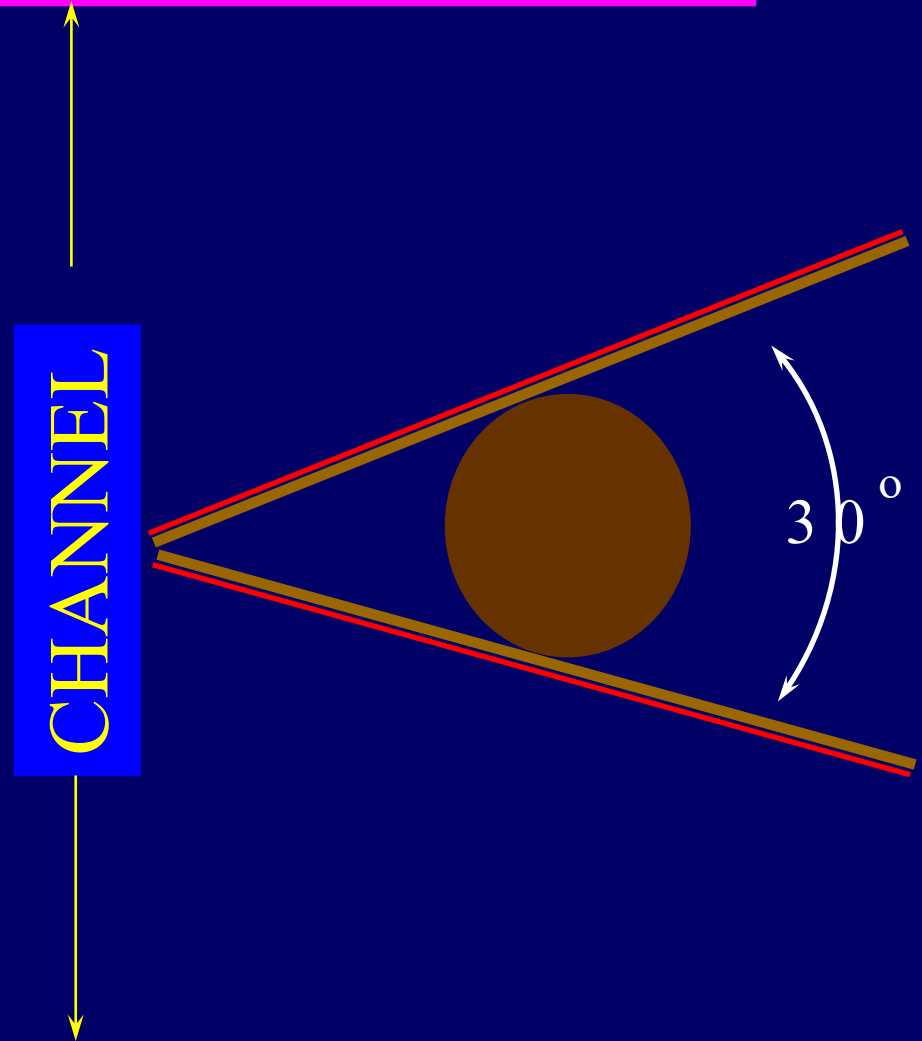
Mounting

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.**

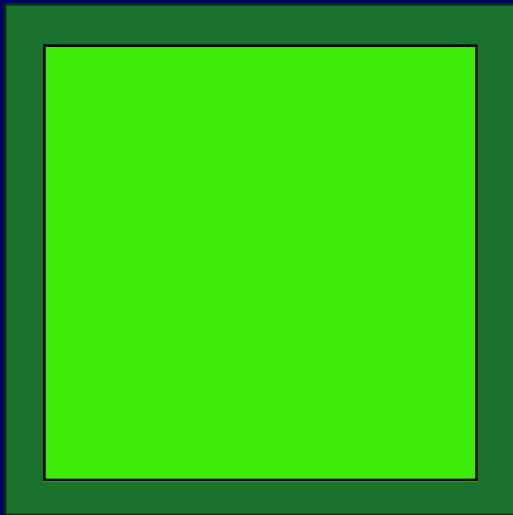


Dayboards

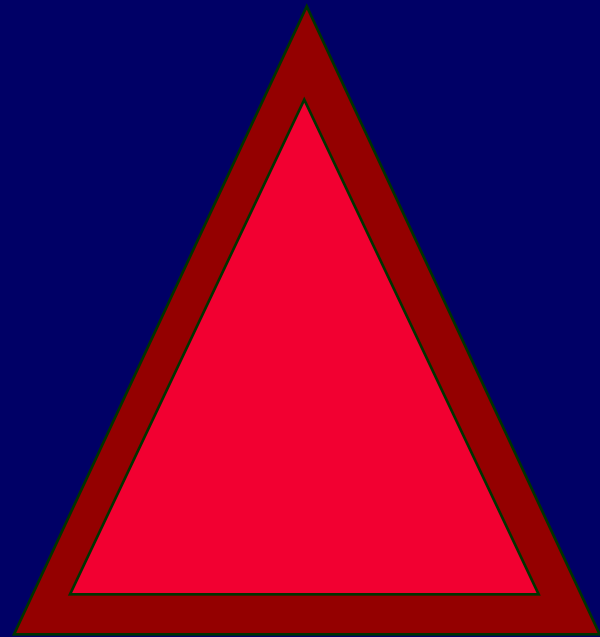
- Dayboards differ in size and shape depending on the marking system and the specific function.
- Each dayboard has a designator composed of a number followed by a group of letters.

Dayboards

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



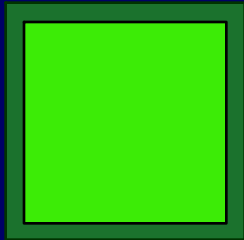
3'



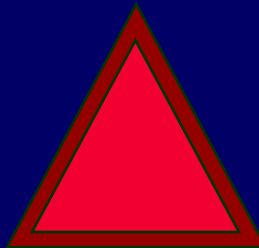
4'

Dayboards

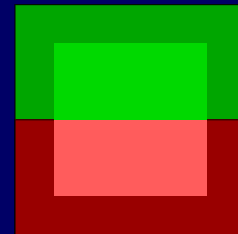
- The first letter refers to the shape or purpose of the dayboard.



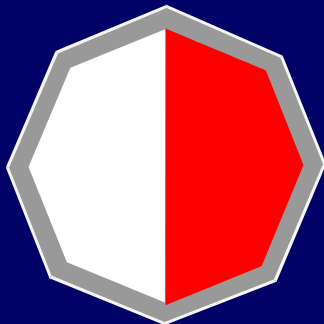
S-Square



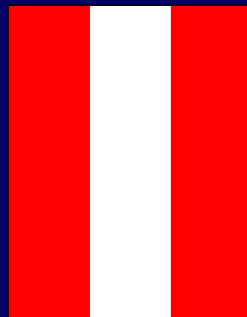
T-Triangle



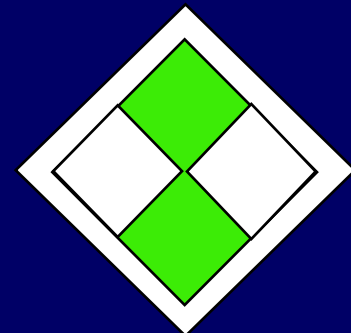
J-Junction



M-Mid-Channel



K-Range



N-No Lateral Significance

Dayboards

- The second letter represents the key color.



R- Red



G- Green



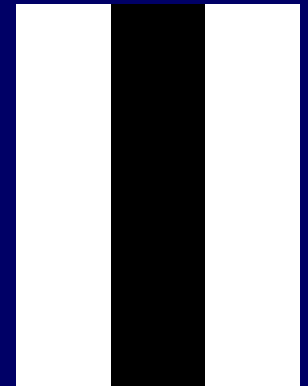
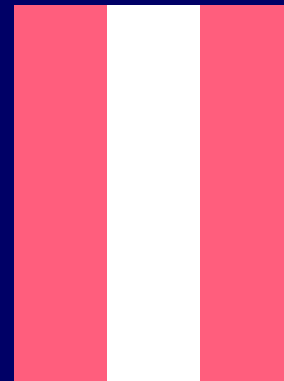
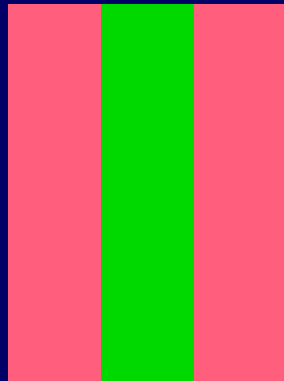
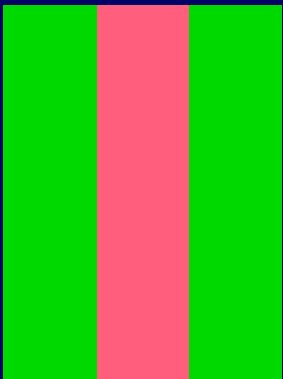
W- White



B- Black

Dayboards

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



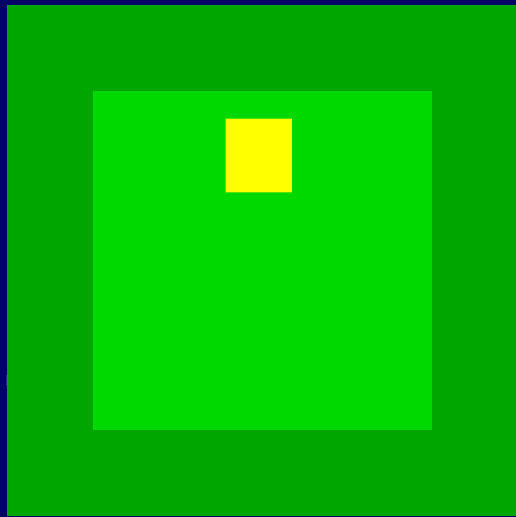
R- Fluorescent red G- Fluorescent green

W- White

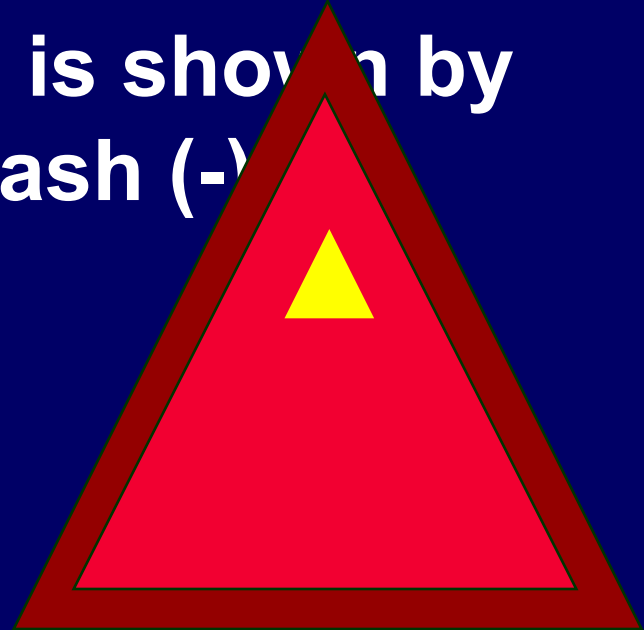
B- Black

Dayboards

- Additional information is shown by a dash (-)

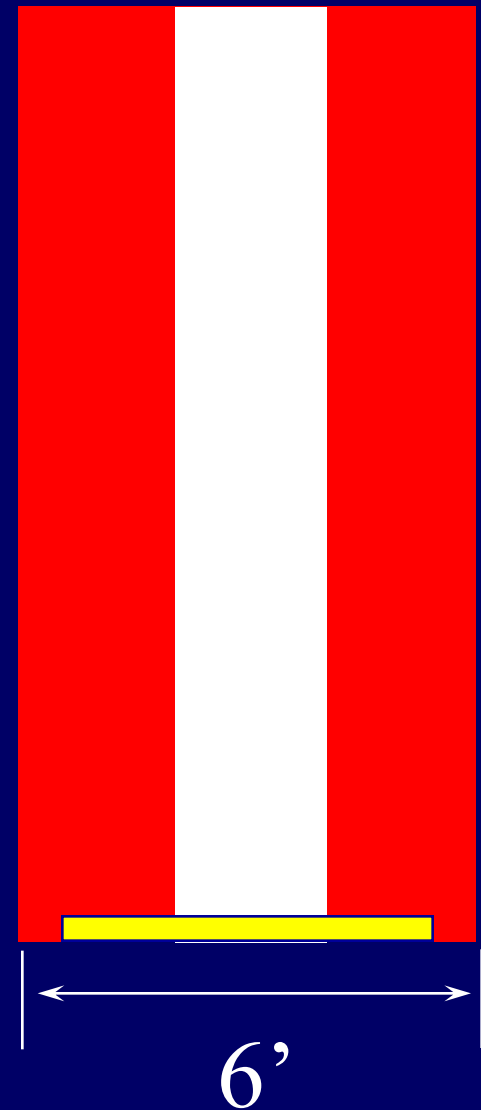


- Total
- square
- triangle



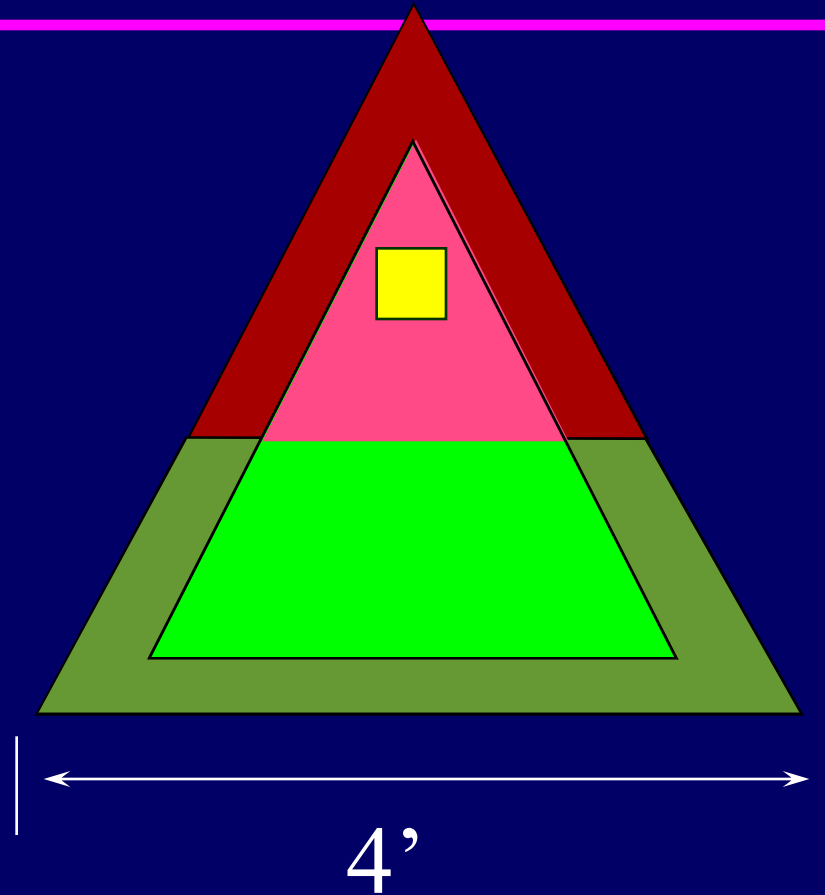
Dayboards

6KRW-1



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.

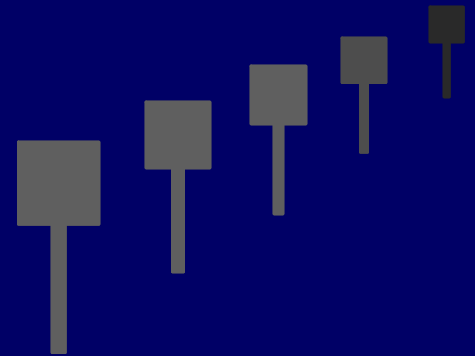


This is the detection range

Nominal Range

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

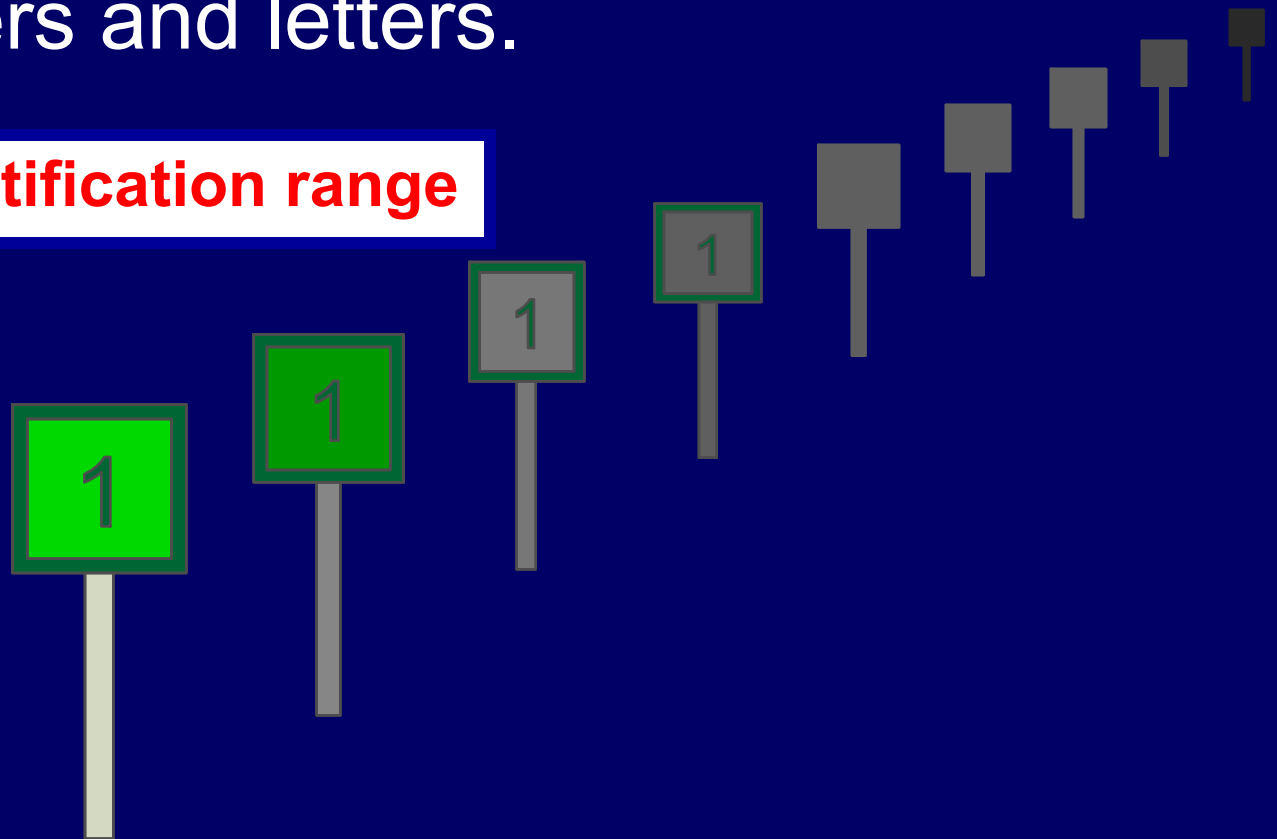
This is the recognition range



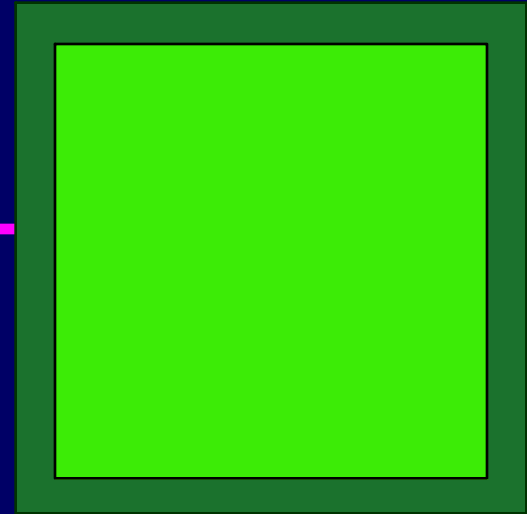
Nominal Range

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

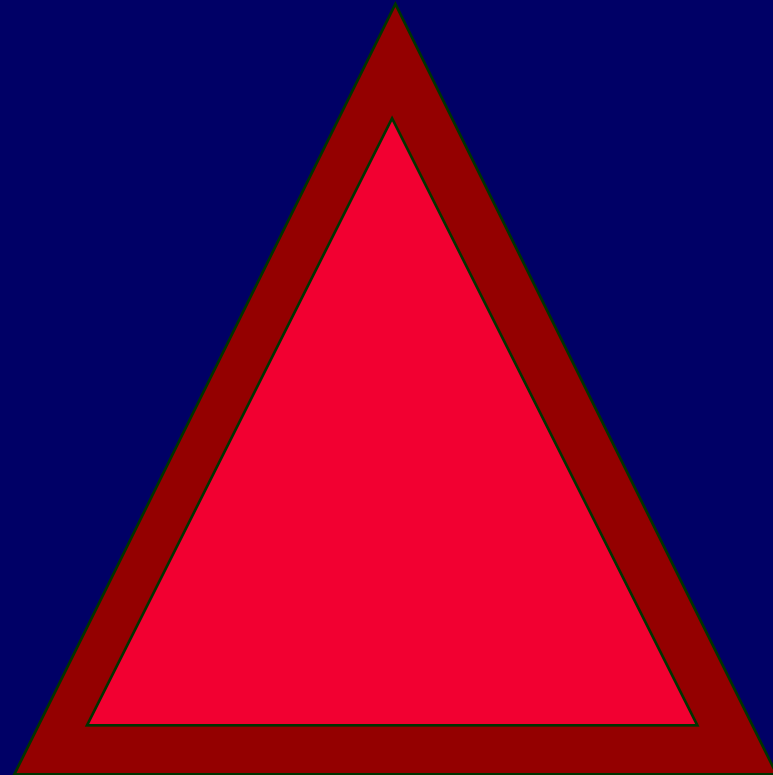
This is the identification range



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

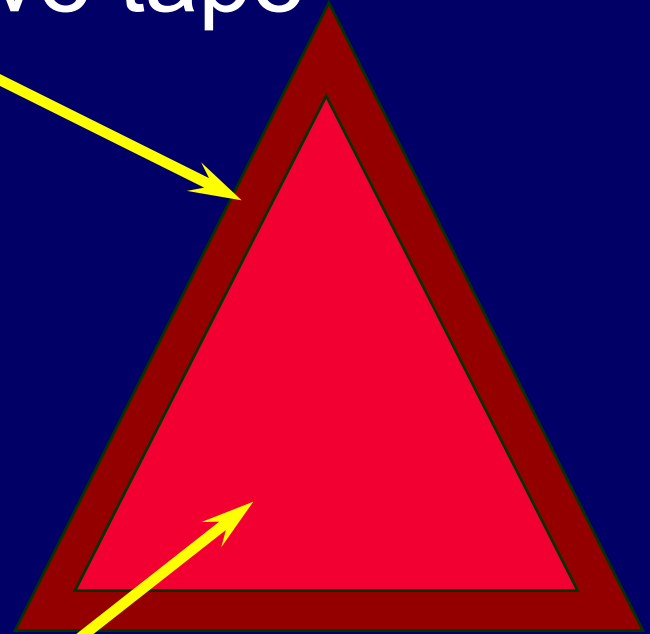
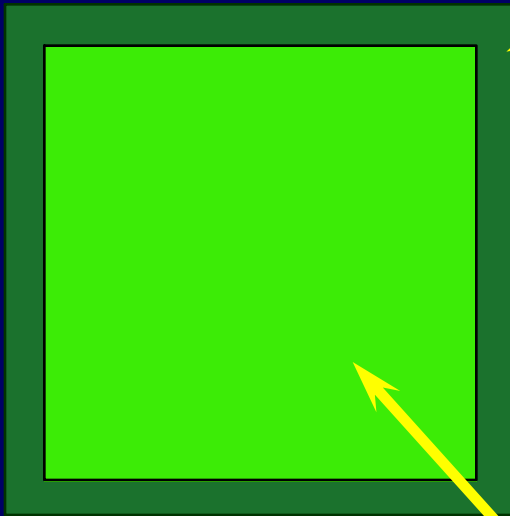


Preparation

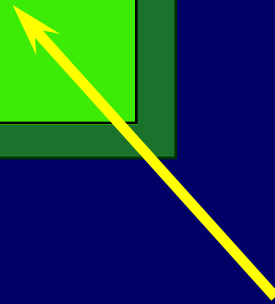
- The technical manual provides cutting patterns for dayboard backings.
- Acceptable materials are 3/8" or 1/2" plywood or 1/8" aluminum sheet.
- The surface of the dayboard is covered with a colored vinyl film and retroreflective tape boarder.

Films

Retroreflective tape

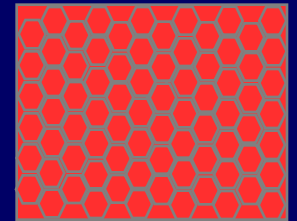
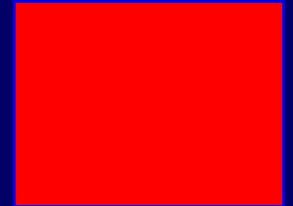


Vinyl Film



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

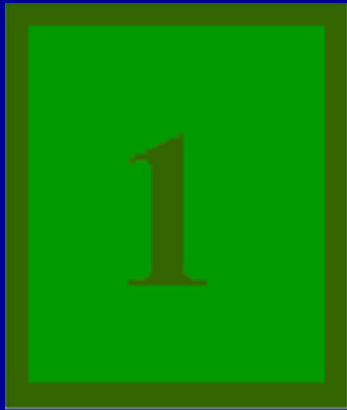
Replacement or Repair

- 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



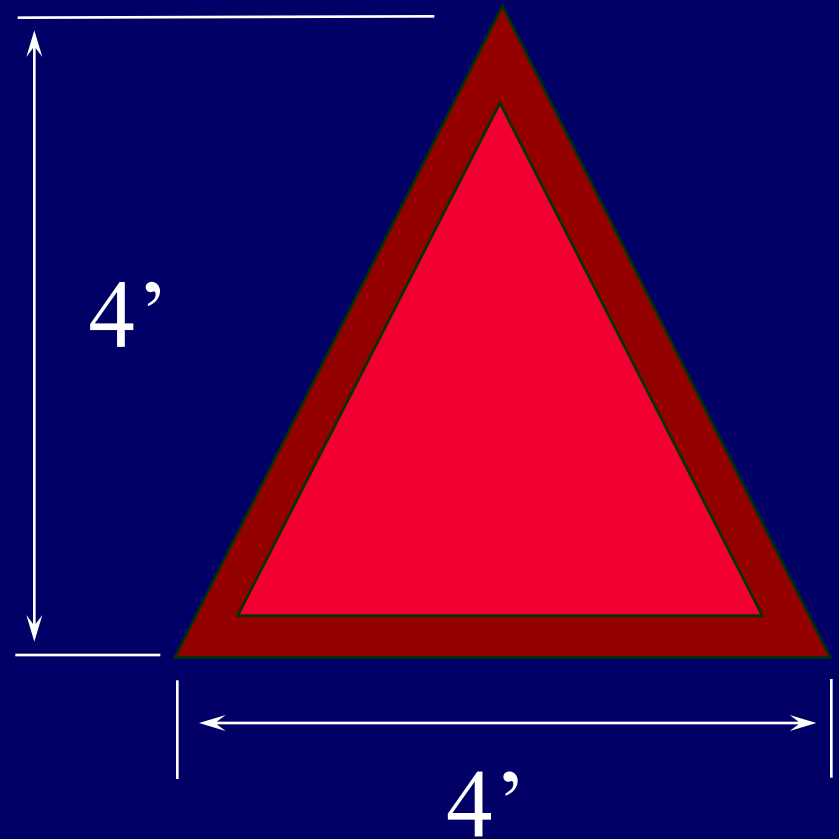
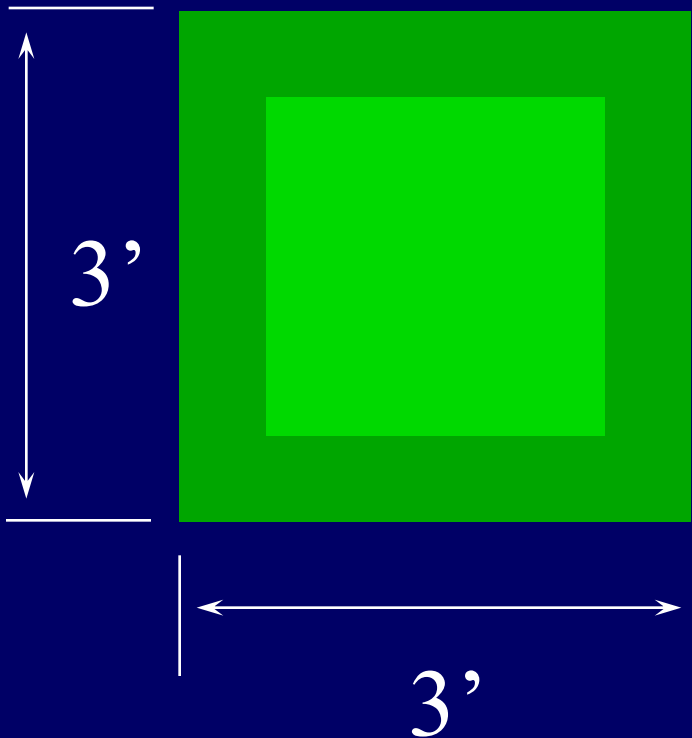
Replace



Faded

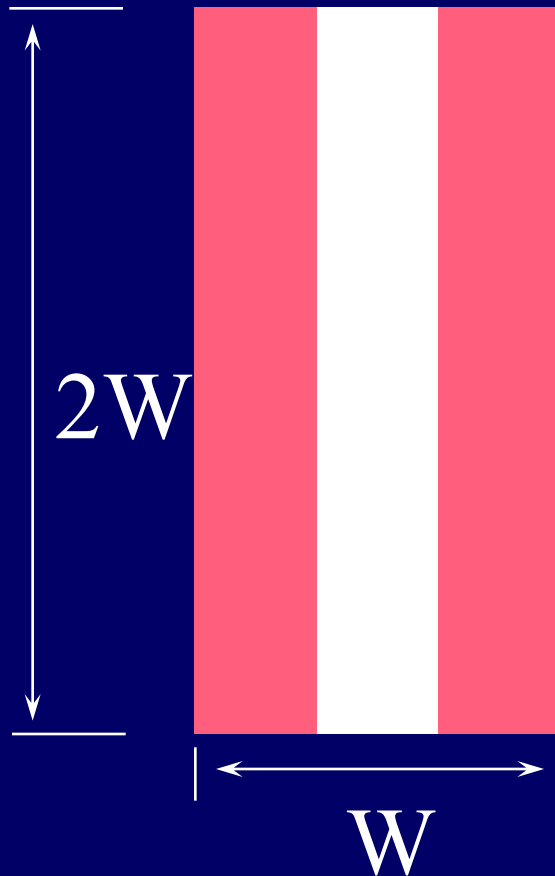
Dayboards

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



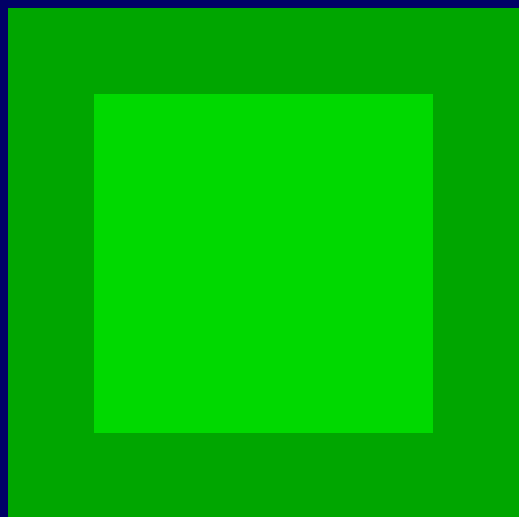
Range dayboards

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

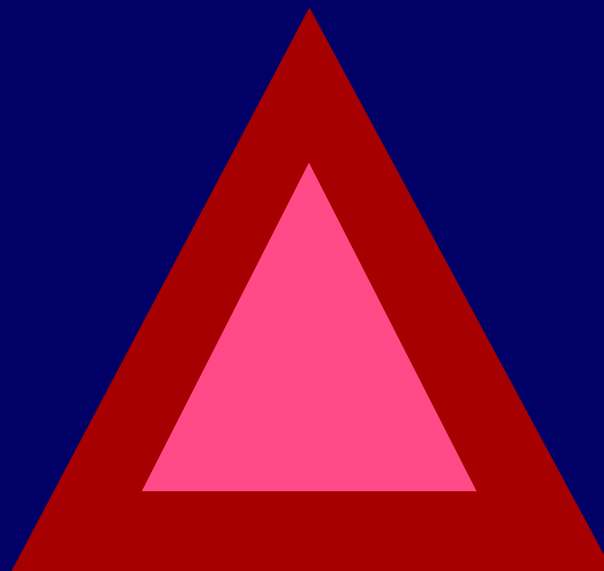


REVIEW

Port and Starboard Markers

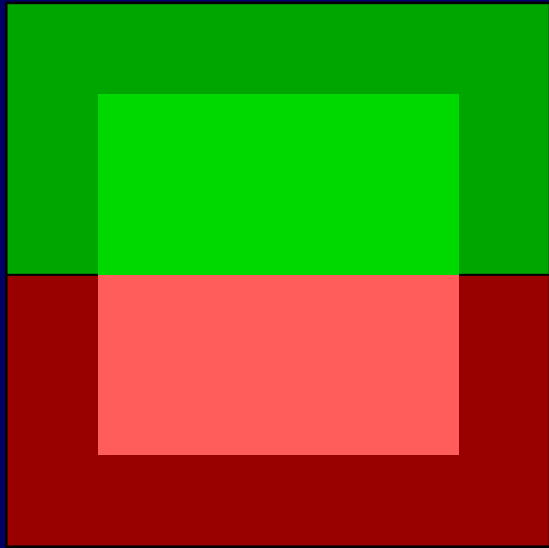


SG

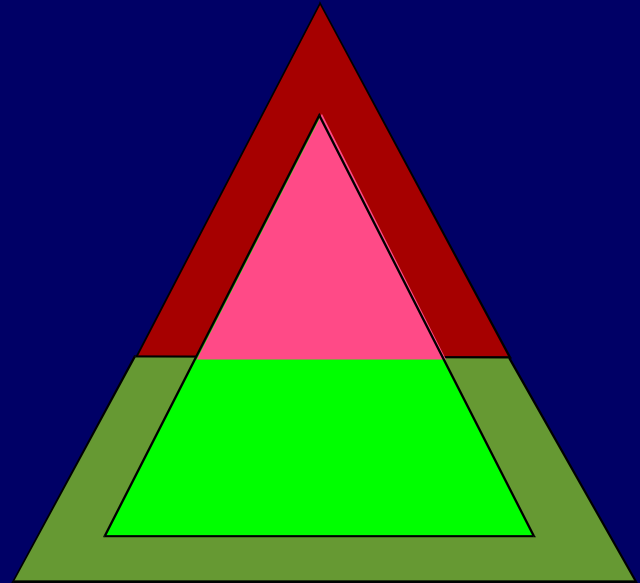


TR

Junction Markers

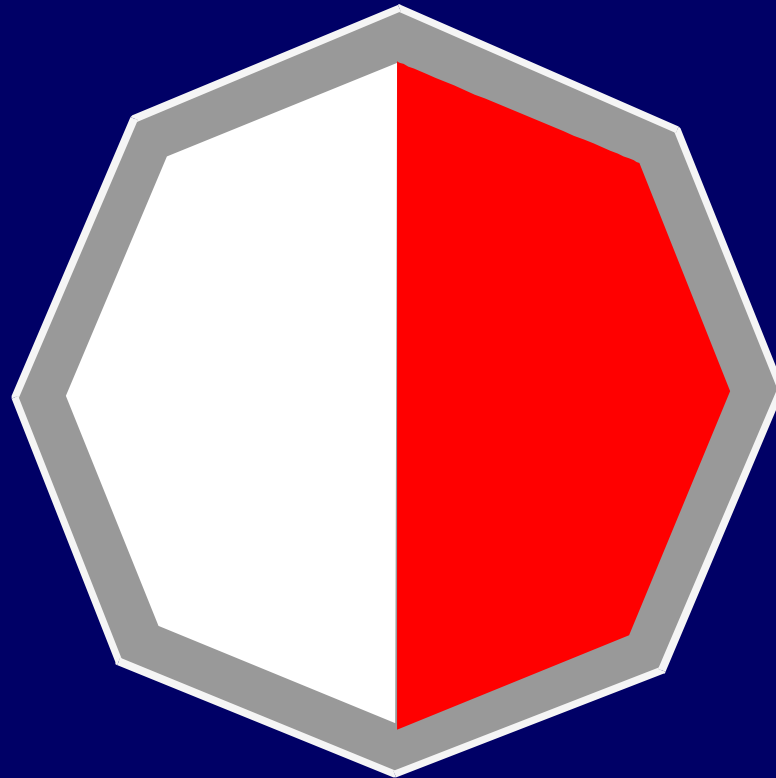


JG



JR

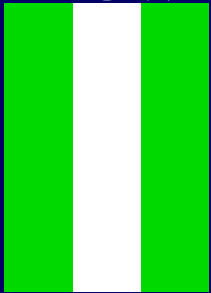
Mid - Channel Markers



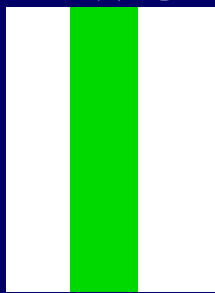
MR

Range Dayboards

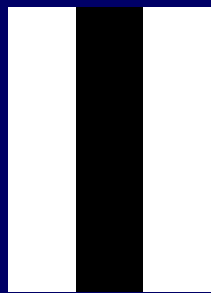
KGW



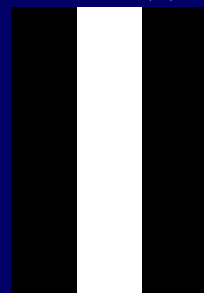
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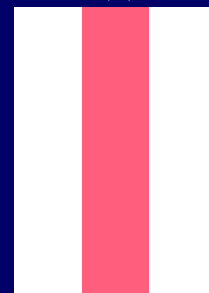
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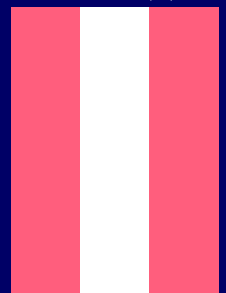
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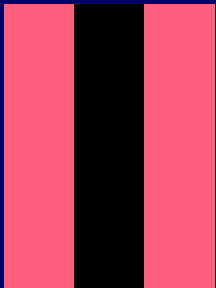
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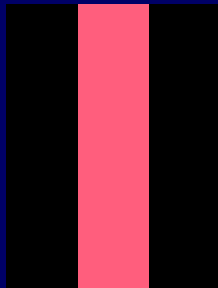
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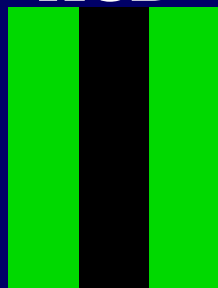
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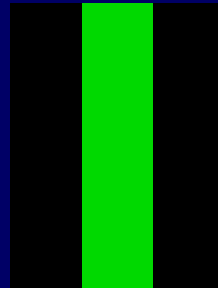
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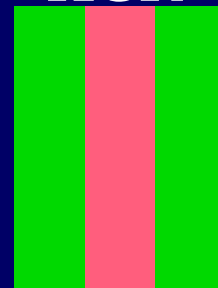
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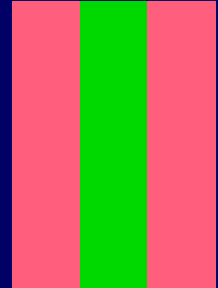
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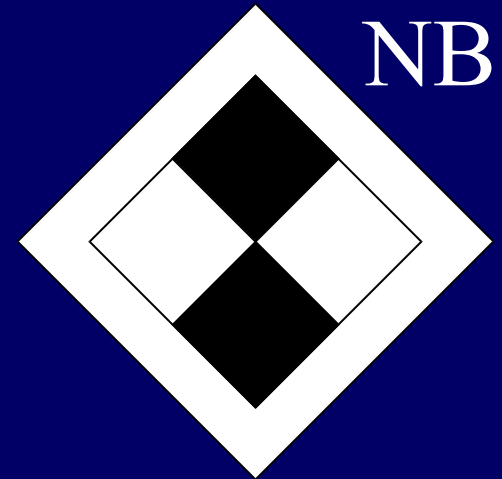
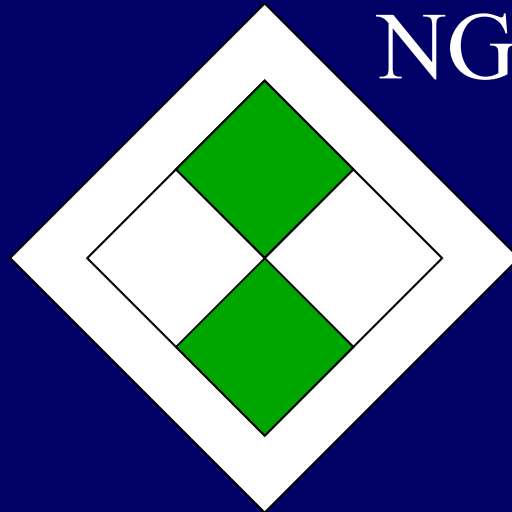
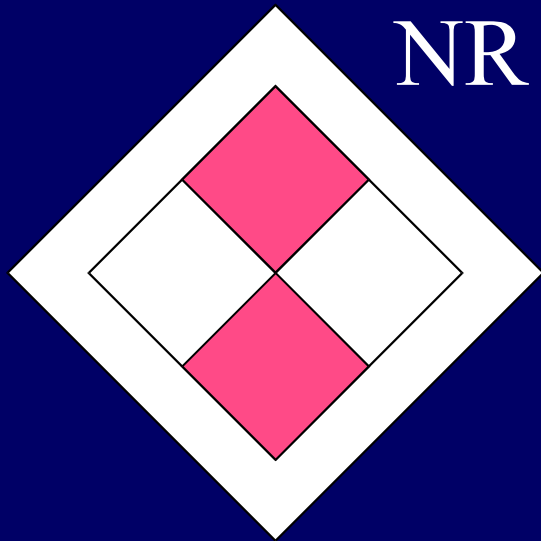
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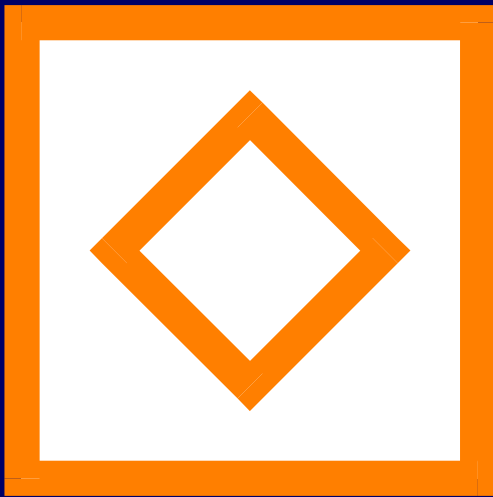
KRG



No Lateral Significance markers



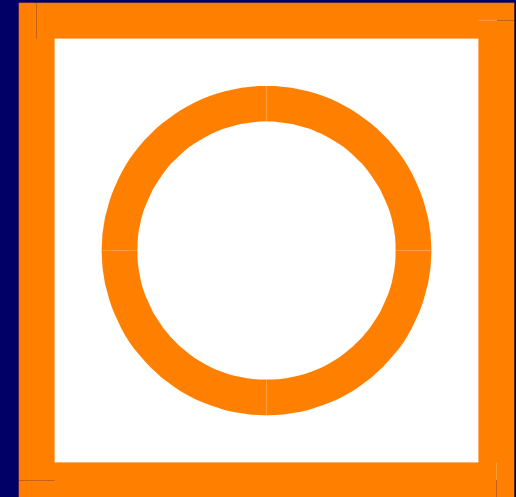
Information and Regulatory Markers



Danger

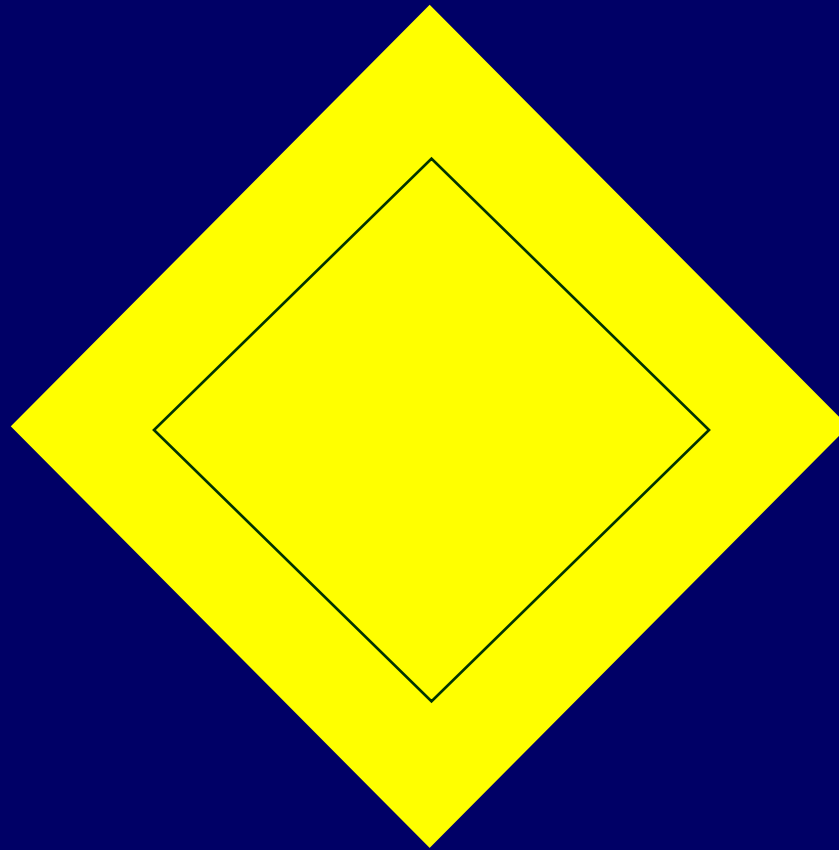


Exclusion
Area



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.