

The development of the waterway sign system represents an important step in making the waterways, lakes, and rivers easier to use. Corps waterway signs are intended to complement the U.S. Coast Guard (USCG) Aids to Navigation (ATON) System; they are not intended to be a substitute for the ATON system. To find out more about the ATON system, visit the USCG website at <http://www.uscgboating.org/safety/aton/aids.htm>, or call your USCG District ATON office. See Section 15 for a detailed discussion of the use of the ATON system at Corps facilities.

The Corps waterway sign program is a fixed sign system and does not address buoys. For the use of buoys, see Section 15. Waterway signs are primarily used above and below dams to warn of dangerous conditions and to instruct boaters of local locking procedures.

The primary purpose of this program is to increase boater safety. Each element of the program has been carefully designed to be part of this comprehensive system. It employs very specific standards for legend, color, format, typography and size.

This section contains basic visual standards and signing principles. Implementation for lock, dam, and waterway signing must follow a detailed study and plan approved by the district Sign Program Manager and then submitted to the Chief of Operations for final approval.

Sign Legends

Caution, Warning, and Danger legends have been developed by the HQUSACE Chief Counsel's office and Operations personnel. The standardized sign legends in this section have been specified because of their brevity and clarity to appropriately warn, instruct, describe or identify. These sign legends cannot be changed without HQUSACE approval. If the wording of these critical safety signs is not appropriate to the condition being signed, consult the district Sign Program Manager to apply for approval of a nonstandard legend.

Sign Types

Three basic sign types are used to identify a specific zone or area around the dam. To be effective, each lock, dam and waterway configuration must be signed as a total package. The basic sign types are:

1) Warning: Used to caution boaters of impending dangerous conditions, generally placed the farthest up and downstream to notify boaters they are approaching a dam.

2a) Restricted: Placed in closer proximity to the dam and on the structures to prohibit access.

2b) Danger: To inform viewers of an

immediate and grave danger.

3a) Lock Approach: Used to direct traffic to the lock chamber, including "Arrival Point". Can be used at considerable distance from lock to ensure correct traffic flow into the lock channel.

3b) Lock Information/Instruction: Used both along the lock wall to instruct on the proper entry and within the lock chamber to describe lock procedures and indicate distance markings.

Workplace Safety signs (Caution, Danger, Notice, and Safety) as shown in Section 11, will also be used in and around a dam or navigation facility, as required, to warn or instruct Corps employees, contractors and visitors.

Shown on the following pages are the four basic dam configurations common to Corps projects. Each one uses the sign types described above in a zone pattern specific to the particular types of dam, as listed below.

- Submerged/fixed crest dam without lock
- Submerged/fixed crest dam with lock
- Gated dam with lock
- Dam with reservoir

The actual signs and zones used at the projects will depend on the type of the facility and local conditions as determined by ER/EP 1130-2-520, Chapter 10, Restricted Areas for Hazardous Waters at Dams and Other Civil Works Structures.

Placement

Extreme care should be taken to specify the correct sign, legend and size, and placement of these signs following the guidelines and specifications in this section. For the program to be successful, it is imperative that the viewer have every possible chance to read and heed the signs to help avoid potential accidents.

General sign placement guidelines are provided on pages 14-57 through 14-61. These are provided to illustrate the rationale of the system but are not intended to be implemented without a review. Existing conditions must be evaluated on a site-by-site basis, followed by the development of a sign plan, using the signs and engineering criteria contained in this section.

Color

Colors have been developed through scientific research and controlled testing. All sign colors and sign materials used must be in compliance with this manual. Color standards are described on pages 14-7 and 14-34. Viewing distance requirements and sign formats were developed by the Corps specifically for this program.

Typeface

The lettering for the sign legends adopts the Haas Helvetica Medium typeface. The exception is for smaller signs viewed from the land, which are similar to the Corps recreation signs and use the Helvetica Bold typeface. This Helvetica Medium typeface has a nearly exact 1:5 stroke-width to letter height ratio.

Alternate Letter-spacing for Waterway Signs

To increase legibility for all signs viewed from the water, a special letter- and word-spacing specification and guide has been incorporated in the size formula for these signs. In this version, the space between letters has been increased thirty percent for signs with Haas Helvetica Medium typeface legends. This differs from the standard letter- and word-spacing shown for all other signs in this manual. This alternate letter- and word-spacing guide is provided in Appendix D, pages D-29 through D-34 (Helvetica Medium: Waterway Letterspacing Matrix, and Helvetica Medium: Waterway Word Display Reproduction Art). Formulas in the matrices use values that are "rounded off", and will thus vary slightly from panels precisely calculated in Corps sign software. To prepare any large waterway sign legend, it is advisable to use the software to determine the length of the word or multiword line legend.

There is no change for signs with Helvetica Bold legends, other land viewed signs, or information and identification signs within a navigation lock.

This is a system of nonilluminated, retroreflective signs, intended for viewing from dawn to dusk. Specific locations may be illuminated using external lighting should local conditions dictate.

Sign layout adopts the standard grid formats used throughout the manual. Proportional grid layout charts are provided in Section 7, pages 7-63 through 7-65.

The net effect is an overall sign design that has good target value in the environment, high legibility, and is part of a comprehensive nationwide system.

Sign Type Specifications

Each sign is identified with a standard sign type code and related information in a matrix below the panel. Sign footings and structures for most large waterway signs will need to be engineered on a site-by-site basis because of the variation in conditions. For those signs, the note "Engineered" indicates that there is no standard specification for that sign. However, general fabrication and material specifications for waterway signs are provided in Appendix B, pages B.13 through B.13-16. The National Sign Program MCX can be consulted for help with the engineering of waterway signs.

Safety zones are determined in accordance with ER/EP 1130-2-520, Chapter 10, Restricted Areas for Hazardous Waters at Dams and Other Civil Works Structures.

The ATON system as described in Section 15, is the primary means used to identify safety zones and conditions above and below dam structures. Signs are a compliment to that system.

This section describes the use of signs for this purpose.

The diagram below illustrates the possible safety zones above and below dam structures. These zones, each progressively closer to the dam, are to be identified using signs specifically designed and worded to notify boaters of the pool and tailwater regulations for that dam.

Sign placement, the number of zones signed, and size of each respective zone will be determined by the district and will vary from one project to the next.

To the left of the diagram are the descriptions of each zone. The diagrams on the following four pages show how signs may be placed depending on the type of dam being signed.

Zone 1, Warning Area

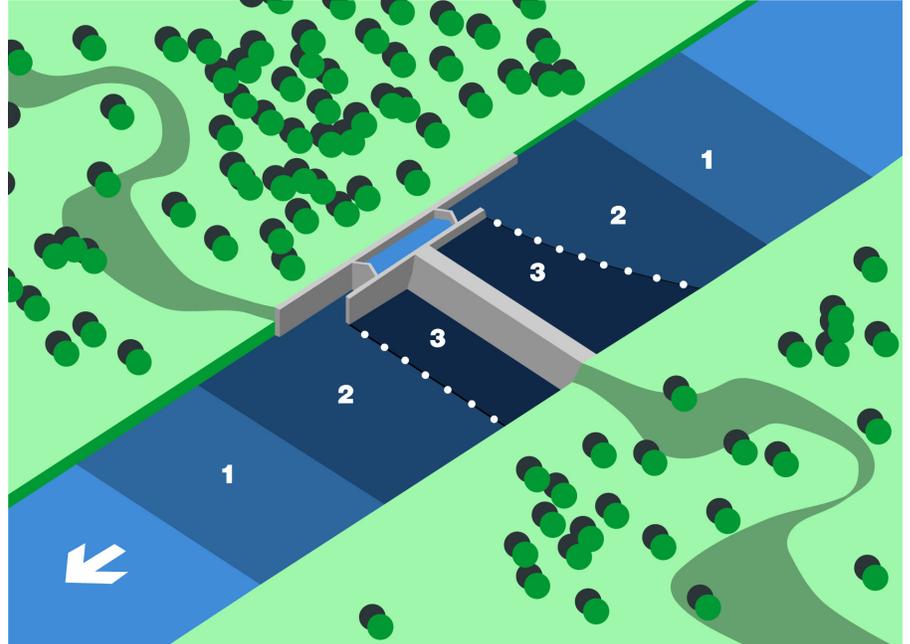
Upon entry into the zone, either up or downstream, boaters are warned that they are approaching a dam. This warning is most critical for submerged or fixed crest structures. For Zone 1 signs, see page 14-10.

Zone 2, Danger Area

Upon entry into this section of the river, the boater is notified with a Danger sign that the dam is a specific distance ahead. These signs are placed at a distance where the dam is generally perceptible if the boater is conscientiously looking for it. Refer to page 14-13 through 14-16 for examples of Zone 2 signs.

Zone 3, Restricted Area

Signs are placed both on the outside of this zone, restricting access beyond that point, and as supporting signs on the face of the dam structure or on special pylons instructing boaters to stay back the designated distance. Restricted areas are established on both the upstream and downstream side of the dam. The Restricted signs used in this zone are shown on pages 14-17 through 14-19.



Illustrated below is a typical sign plan for a submerged or fixed crest dam that is not part of a navigable waterway. Because this type of structure can be very hazardous to pleasure boaters in kayaks or canoes and small fishing boats, care should be given to placement and maintenance of

safety and Warning signs.

Pedestrian access from the river bank onto the dam itself and swimming or wading during low-water should be prohibited.

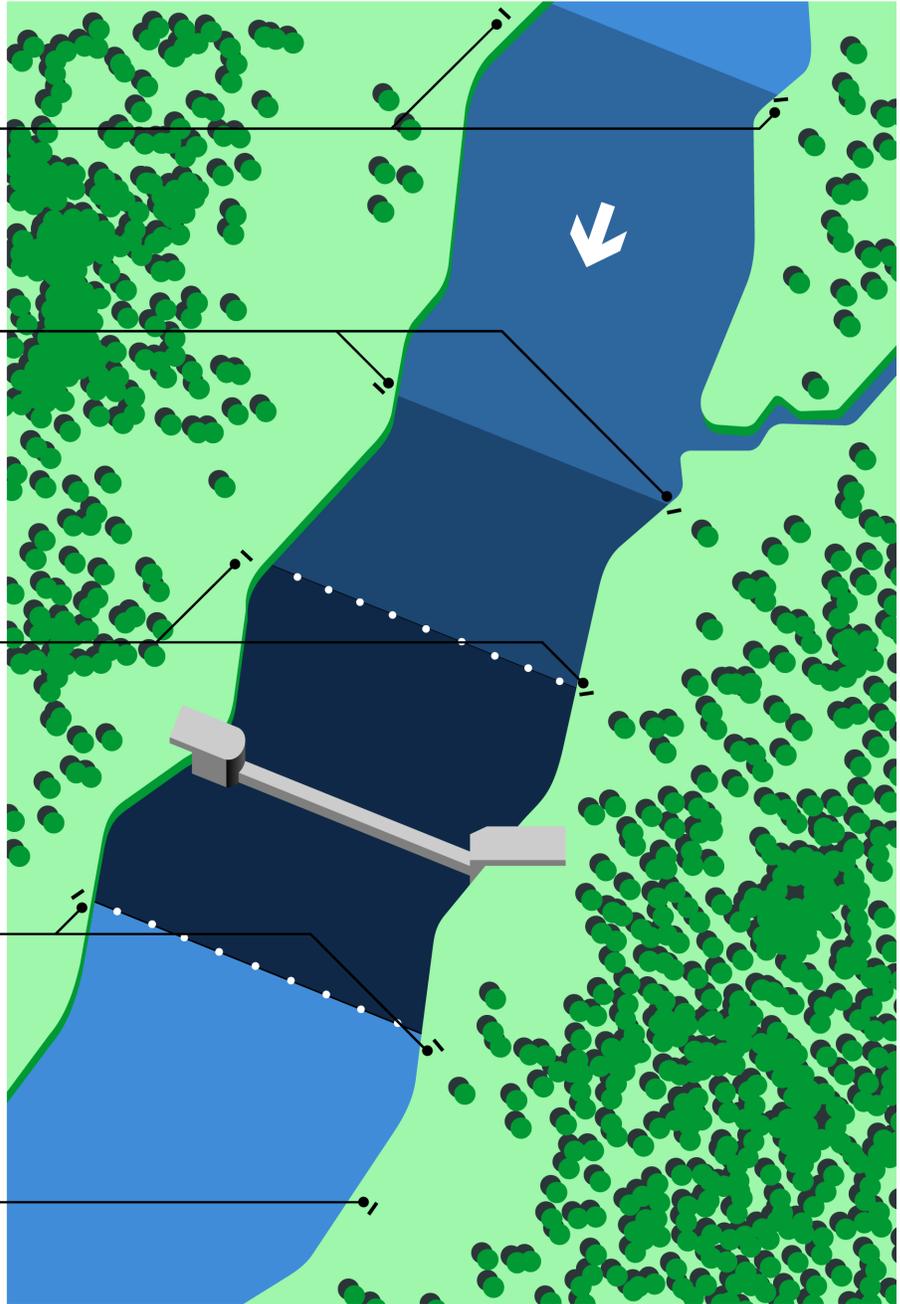
Warning
Submerged
Dam Ahead

Danger
Submerged
Dam 0000 Ft.
Ahead

Restricted
No Boats Beyond
This Sign

Restricted
No Boats Beyond
This Sign

Danger
Strong Currents
and Undertow
No Swimming
or Wading

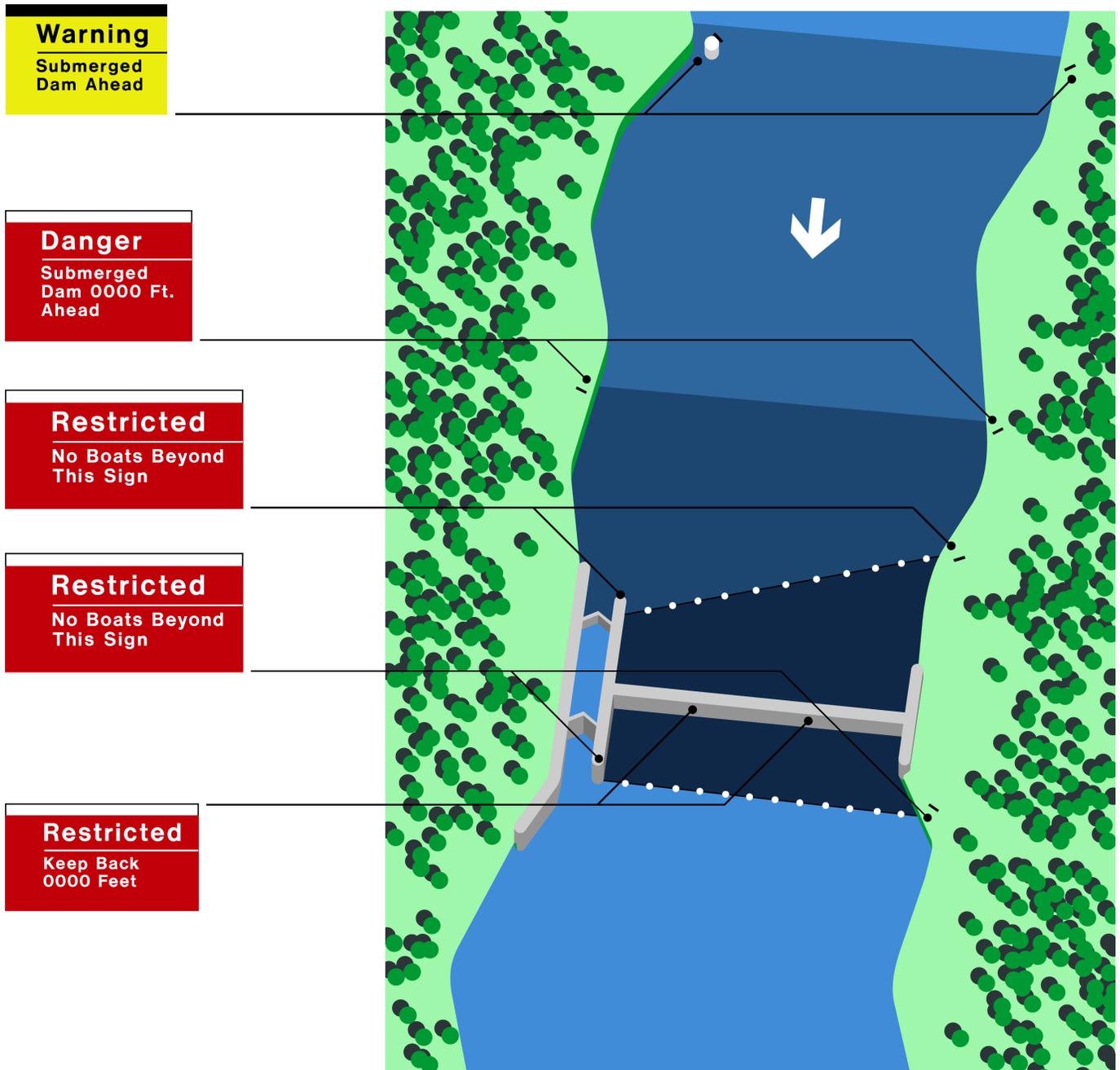


Illustrated below is a typical sign plan for a submerged or fixed crest dam with navigation lock. The configuration of safety zones is similar to a submerged dam without lock. The effective placement of the signs is much more complex because the river is generally wider. Where possible, the restricted areas should be reaffirmed with a buoy line to

inform boaters that they are at a restricted area.

Fixed crest dams are difficult to see from low riding small boats moving downriver since the crest (top of the concrete) is normally covered with a smooth ribbon of flowing water. To keep boaters from being caught in a strong current and drawn over

the dam, the safe distance away from the hazardous area should be identified using the appropriate sign. Likewise, boaters should never approach the downriver side of the dam as they may be pulled into the face of the dam by strong reverse currents which roll back toward the dam.



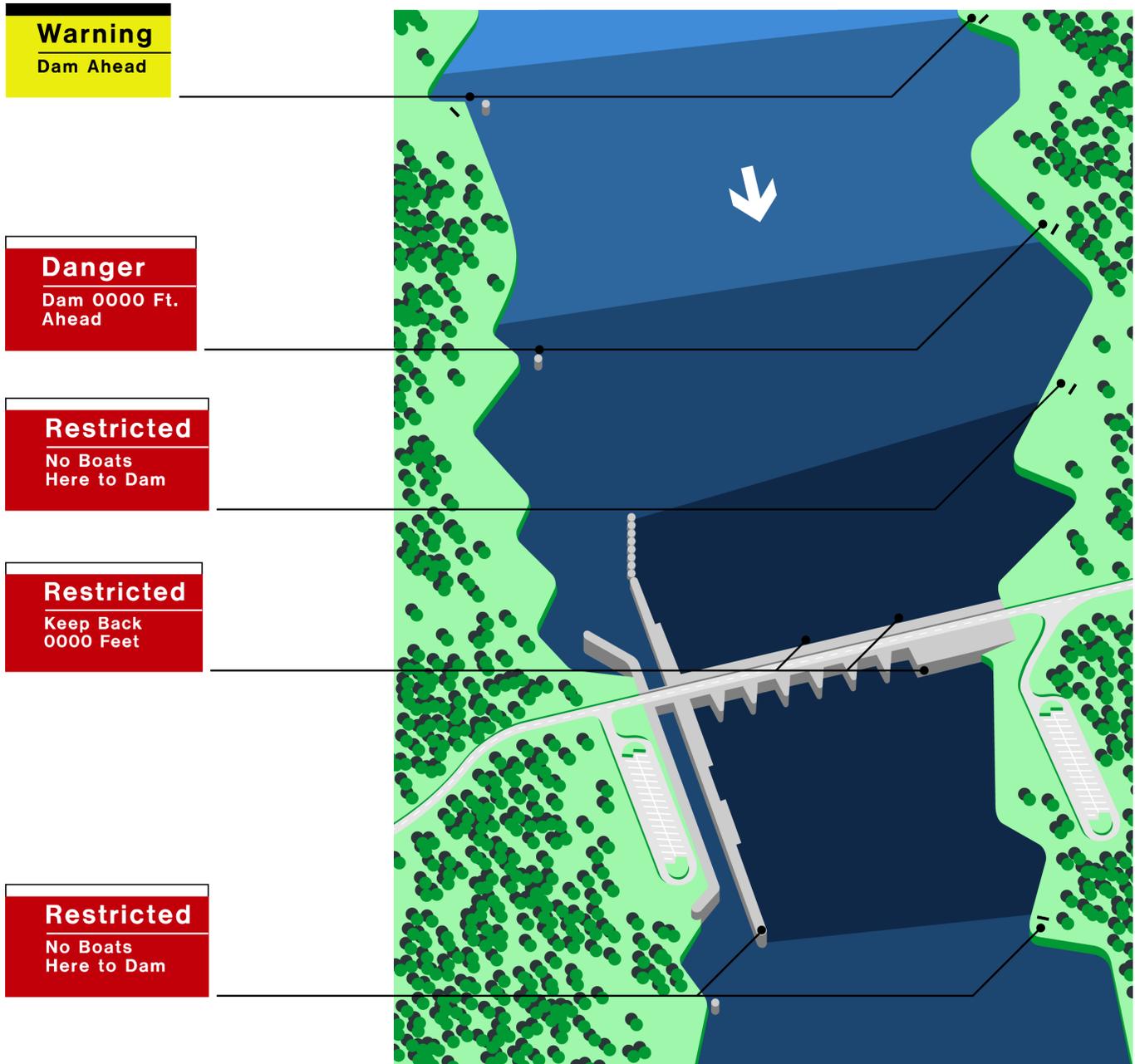
Illustrated below is a typical sign plan for a gated dam with navigation lock. Typically, there may be as many as three zones: Warning, Danger and Restricted. These areas are to be signed for boaters traveling downstream towards the dam.

The dam structure is generally visible from upstream. If hazards from open spillways and intakes can be mitigated

using fewer signs closer to the structure, there may be no need for a multizone sign warning system.

If the area around the dam is more dangerous than it appears because of strong undertows created with opened gates and intakes, the restricted areas close to the dam must be thoroughly signed.

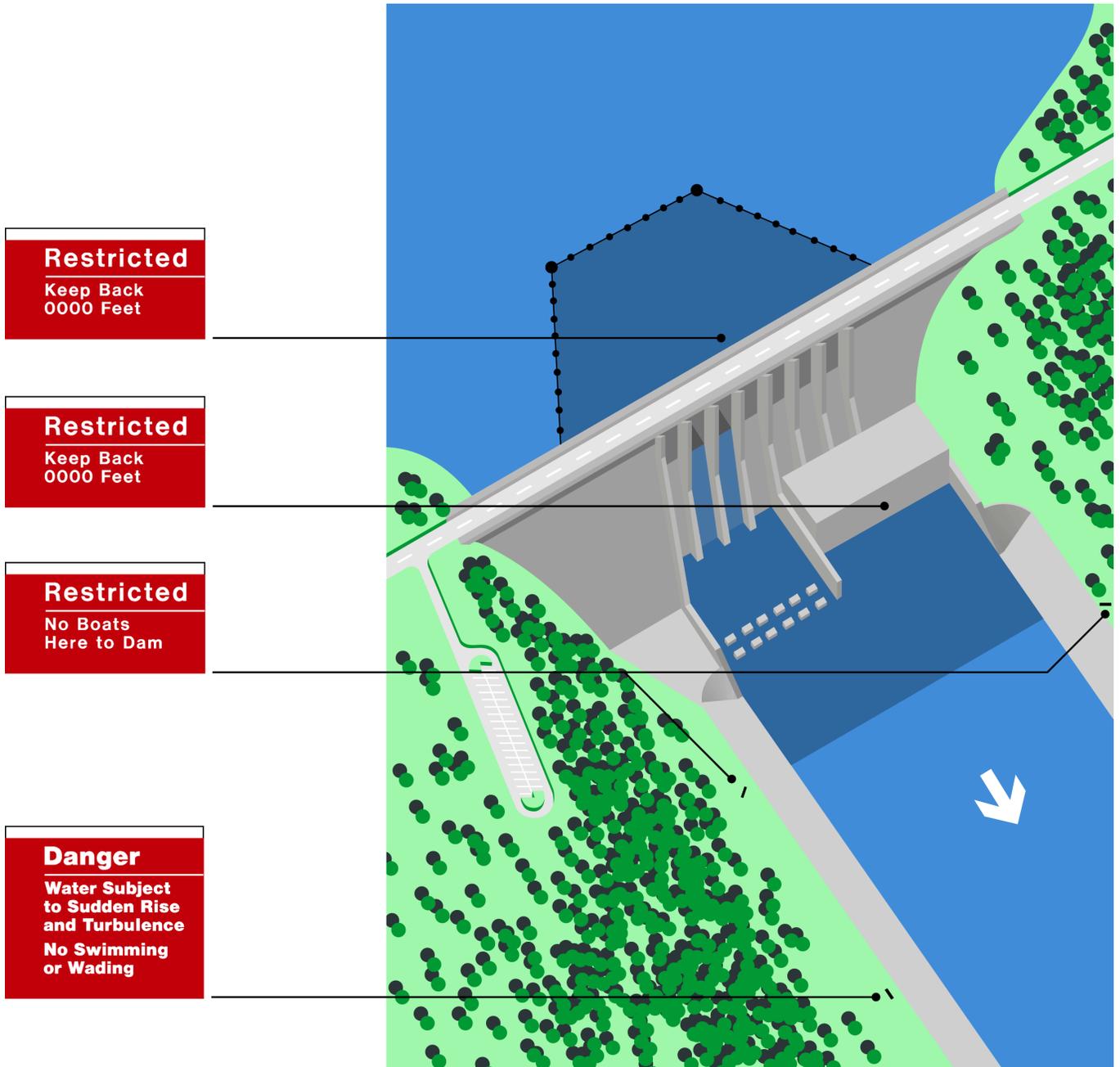
There are critical safety hazards below the dam such as turbulent discharge from the dam as well as side currents adjacent to the lock which may require site specific warnings in addition to restricted zone signs. Water access along the river bank by pedestrians can be controlled by the use of signs along the shoreline.



The major zone to be signed at a flood control dam is the tailwater area. Signs are placed to notify both the boaters in the tailwater and people along the riverbank of the restricted area.

Since the tailwater is subject to sudden rise and violent turbulence as a dam is operated, standardized Danger signs are

to be used to inform viewers along the river's edge of the hazardous conditions and restrict access to the water in this area. The size of this danger or restricted area depends on local conditions. A typical sign plan for a dam creating a lake for flood control and hydropower is illustrated below.



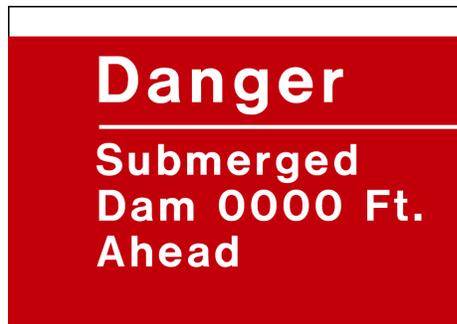
The Corps waterway safety signs are based on a standard referential color system. Consistent use of the standard colors for safety marking of waterways is important using Warning, Danger and Restricted signs for the effectiveness of this program.

Shown below are the only allowable color combinations that are to be used on signs to warn and/or restrict boaters on a Corps water project. See Section 15 for the colors to be used on daymarks and buoys.



Zone 1, Warning Signs

Lemon Yellow diamond grade retroreflective sheeting background with black nonreflective legend, overbar and rule.



Zone 2, Danger Signs

Red diamond grade retroreflective sheeting with white diamond grade retroreflective legend, overbar and rule.



Zone 3, Restricted Signs

Red diamond grade retroreflective sheeting with white diamond grade retroreflective legend, overbar and rule.

Waterway Sign Material

Diamond grade retroreflective material shall be used for all waterway sign applications. Diamond grade materials are available in Lemon Yellow, red and white (for Medium Blue, see lock signs, page 14-34).

Lemon Yellow diamond grade is a color that has an ambient light brightness that is two times (2x) brighter than engineering grade material, and the brighter (almost fluorescent) color will be more easily seen by viewers at low light levels of dawn and dusk.

White diamond grade is a bright white color. Red diamond grade also has greater ambient light brightness at low light levels than standard engineering grade products.

Most critical to waterway sign applications, diamond grade sheeting is extremely effective with ten times (10x) more retroreflective brightness, and provides high levels of performance, longer than conventional materials. The cost benefit of the material with minimal surface deterioration and reduced retroreflective fall-off makes it very cost effective for waterway signage applications.

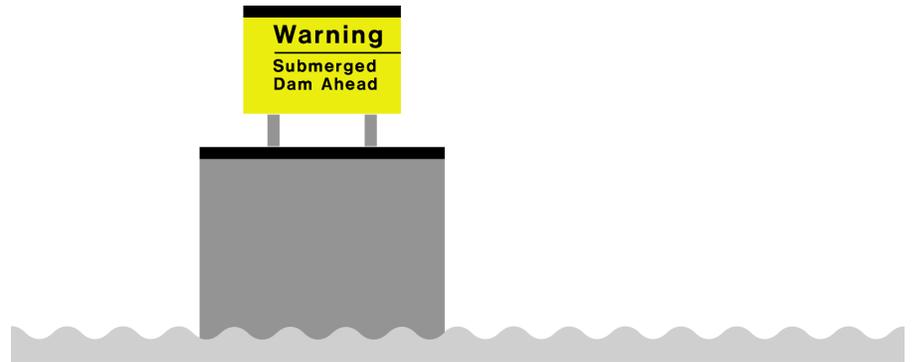
Sign material specifications are provided in Appendix B (pages B.13 through B.13-16) with product numbers and identification of manufacturers listed in Appendix E.

A display of Warning, Danger and Restricted signs is provided on pages 14-10 through 14-30.

The color that surrounds a sign should be either natural or a complement to the information shown on the sign. For example, a midriver cell on which a yellow and black Warning sign is placed should not be painted red because it will confuse the viewer of the sign's functional

intent. Shown below are the three acceptable ways cells may be painted. Local convention will determine which color system is appropriate. Where possible for visual consistency, all cells within a district or river system should be painted in the same way.

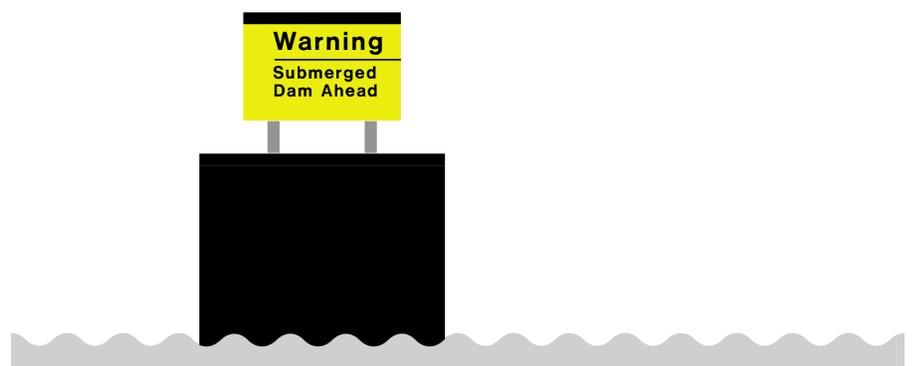
- 1) Silver or gray cell with gray sign supports



- 2) Black and white or black and yellow stripe pattern, with gray sign supports



- 3) Black cell with gray sign supports



The lock wall may be painted to visually identify this large structure on the horizon or to differentiate it from the dam. The referential color of the structure must complement, not conflict with the implied danger message in the color of the sign for structures to which Danger and Restricted signs are mounted. To this end, the use of yellow adjacent to

these types of Danger signs should be avoided. Shown below are the three acceptable ways that dams and lock walls may be painted. Local convention will determine which color system is appropriate. Where possible for visual consistency, all lock walls and abutting structures within a district or river system should be painted in the same way.

Some locations have painted the edge of the lock walls and the perimeter of the lock chamber Safety Yellow. The outer portion of any structures that have red and white Danger or Restricted signs mounted on them should not be painted. This will reduce possible confusion about the level of danger present.

- 1) Silver or gray cell with gray sign supports



- 2) Black and white stripe pattern with gray sign supports



- 3) Black cell with gray sign supports



The signs shown below are used to notify boaters traveling upstream and downstream that they are approaching a dam. This is the first advisory warning that boaters will see.

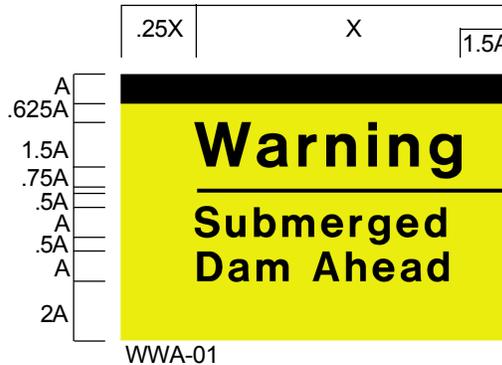
The exact size and placement distance from the dam will be determined by flow speed, width of river, and related local conditions.

These will be large ground-mounted signs placed on the river's edge, and in special cases on midriver pylons. Signs are mounted perpendicular to the boaters' approach.

Mounting size and placement guidelines are shown on pages 14-57 through 14-61.

1) For fixed-crest, nongated structures

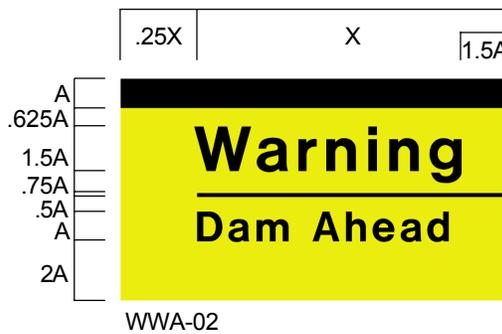
Underrule is .125A



Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-01	A	13.125Ax9A	Engineered	WTW-1/2/4	>9.5A	LY/BK
WWA-01	A	13.125Ax9A	-	WTW-6/7	>9.5A	LY/BK

2) For gated structures

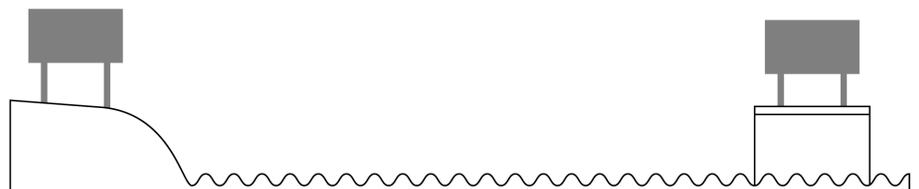
Underrule is .125A



Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-02	A	13.125Ax7.5A	Engineered	WTW-1/2/4	>7.5A	LY/BK
WWA-02	A	13.125Ax7.5A	-	WTW-6/7	>7.5A	LY/BK

Sign background color is Lemon Yellow retroreflective sheeting with black nonretroreflective legend, overbar and rule.

The typeface is Helvetica Medium and follows Corps standard letter- and word-spacing for waterway signs. The sign panel format uses standard Grid 1, Section 7.



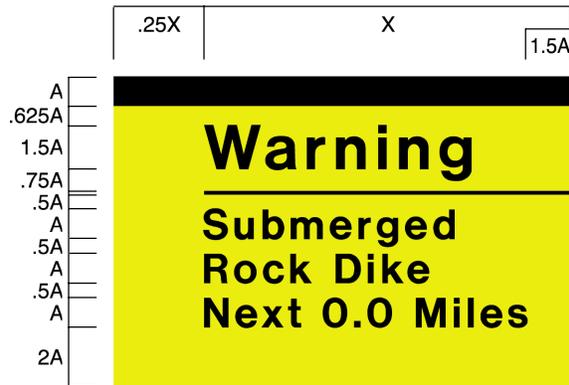
Underrule is .125A



WWA-35

Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-35	A	18.625Ax11A	Engineered	WTW-1/2/4	>7.5A	LY/BK
WWA-35	A	18.625Ax11A	-	WTW-6/7	>7.5A	LY/BK

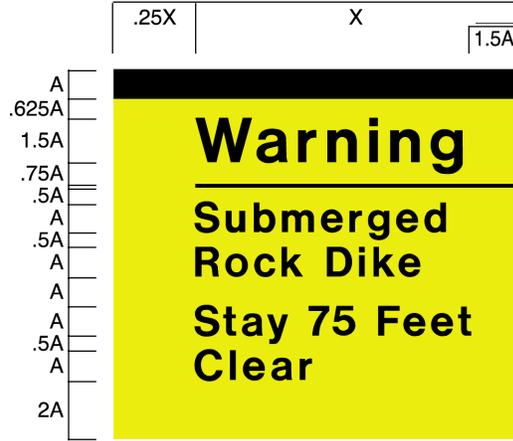
Underrule is .125A



WWA-36

Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-36	A	15.5Ax10.5A	Engineered	WTW-1/2/4	>7.5A	LY/BK
WWA-36	A	15.5Ax10.5A	-	WTW-6/7	>7.5A	LY/BK

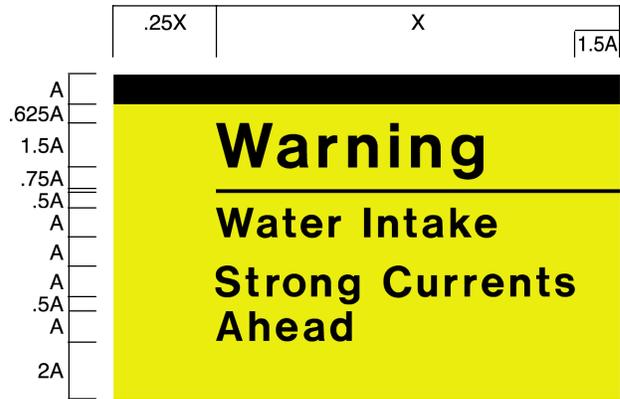
Underrule is .125A



WWA-37

Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-37	A	13.625Ax12.5A	Engineered	WTW-1/2/4	>7.5A	LY/BK
WWA-37	A	13.625Ax12.5A -		WTW-6/7	>7.5A	LY/BK

Underrule is .125A



WWA-38

Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-38	A	17.125Ax11A	Engineered	WTW-1/2/4	>7.5A	LY/BK
WWA-38	A	17.125Ax11A -		WTW-6/7	>7.5A	LY/BK

These Danger signs are used to inform boaters traveling upstream and downstream that a dam is a specific distance ahead.

This is the next sign following the initial Warning sign (Zone 1). Use of this level of safety notification is recommended

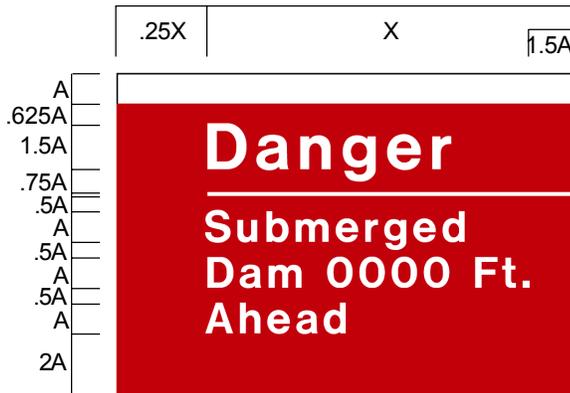
for all fixed-crest and nongated structures. Placement of this level of notification may not be necessary at gated structures where the overall level of hazard may be sufficiently controlled by the restricted areas around the dam.

This will be a large ground-mounted sign

placed on the river's edge, and in special cases on a midriver pylon, mounted perpendicular to the boaters' approach for good legibility within a 60' cone-of-vision. The exact size and placement distance from the dam will be determined by flow speed, width of river, and related local conditions.

1) For fixed-crest, nongated structures

Underrule is .125A



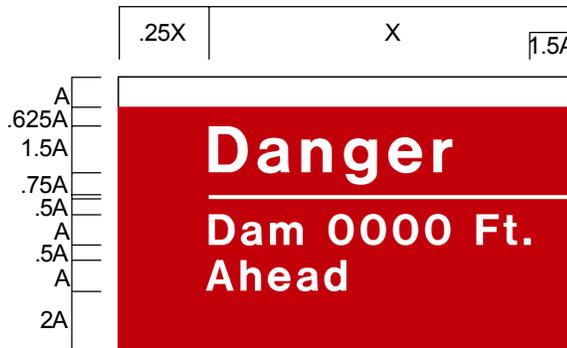
WDA-01

*Panel lengths will vary according to the distance used.

Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-01	A	*x10.5A	Engineered	WTW-1/2/4	>10.5A	RD/WH
WDA-01	A	*x10.5A	-	WTW-6/7	>10.5A	RD/WH

2) For gated structures

Underrule is .125A



WDA-02

Sign may be mounted on the bank of the river or on midriver cells as required.

Sign background color is red retroreflective sheeting with white retroreflective legend, overbar and rule. The typeface is Helvetica Medium and follows Corps standard letter- and word-spacing for waterway. The sign panel format uses standard Grid 1, Section 7.

Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-02	A	*x9A	Engineered	WTW-1/2/4	>9A	RD/WH
WDA-02	A	*x9A	-	WTW-6/7	>9A	RD/WH



Underrule is .125A



WDA-38

Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-38	A	18Ax11A	Engineered	WTW-1/2/4	>7.5A	RD/WH
WDA-38	A	18Ax11A	-	WTW-6/7	>7.5A	RD/WH

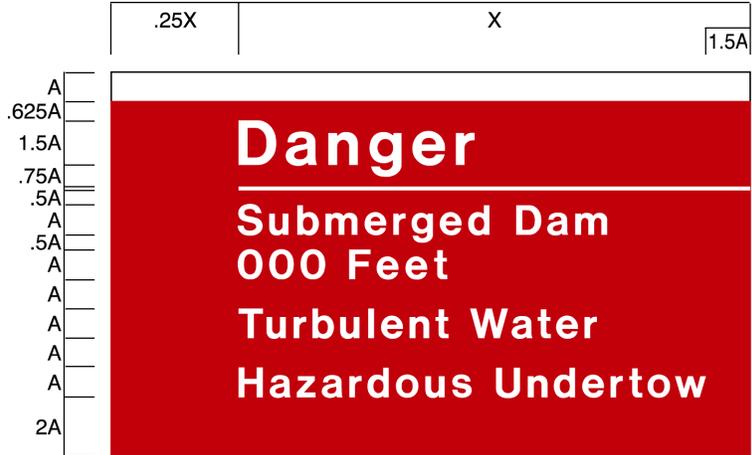
Underrule is .125A



WDA-39

Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-39	A	16.625Ax9A	Engineered	WTW-1/2/4	>7.5A	RD/WH
WDA-39	A	16.625Ax9A	-	WTW-6/7	>7.5A	RD/WH

Underrule is .125A



WDA-40

Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-40	A	21.625Ax13A	Engineered	WTW-1/2/4	>7.5A	RD/WH
WDA-40	A	21.625Ax13A	-	WTW-6/7	>7.5A	RD/WH

Underrule is .125A



WDA-41

Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-41	A	17.5Ax9.5A	Engineered	WTW-1/2/4	>7.5A	RD/WH
WDA-41	A	17.5Ax9.5A	-	WTW-6/7	>7.5A	RD/WH

Underrule is .125A



WDA-42

Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-42	A	17.5Ax11A	Engineered	WTW-1/2/4	>7.5A	RD/WH
WDA-42	A	17.5Ax11A	-	WTW-6/7	>7.5A	RD/WH

Underrule is .125A



WDA-44

Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-44	A	18.125Ax9A	Engineered	WTW-1/2/4	>7.5A	RD/WH
WDA-44	A	18.125Ax9A	-	WTW-6/7	>7.5A	RD/WH

The designated restricted area above and below a dam must be delineated for approaching watercraft. This Restricted sign may be used for this purpose.

Sign placement will depend on the configuration of the dam. For submerged or fixed-crest dams see page 14-18. Generally, the signs will be

placed on the river's edge on one side of the channel and on the end of the lock wall on the opposite side to denote the edge of the restricted area.

On wide rivers with submerged dams, additional signs mounted on midriver pylons may be required. This restricted area should be reaffirmed on the up-stream side where possible, with a buoy

line to prevent people from drifting into the dam. Signing the restricted area on both the right and left side may not be adequate for all river conditions. On gated structures, a series of "Restricted, Keep Back 0000 Feet" signs, as shown on page 14-19, may be placed on the face of the structure to reaffirm the restricted area.

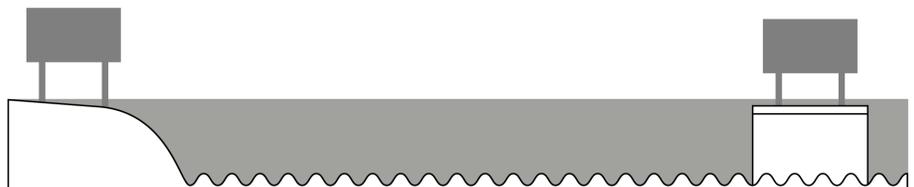
Underrule is .125A



Sign background color is red retroreflective sheeting with white retroreflective legend, overbar and rule.

The typeface is Helvetica Medium and follows Corps standard letter- and word-spacing for waterway signs. The sign panel format uses standard Grid 1, Section 7.

Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WRE-01	A	16.25Ax9A	Engineered	WTW-1/2/4	>9A	RD/WH
WRE-01	A	16.25Ax9A	-	WTW-6/7	>9A	RD/WH



Identifying the restricted area around a fixed-crest or submerged dam is difficult because there are few visible physical reference points. The edge of the dam is difficult to identify by a boater approaching from upstream. For this type of structure,

the restricted zone may need to be extended upstream for added safety; the sign shown below is placed at opposite points around a dam to denote the boundary of the restricted area.



Underrule is .125A

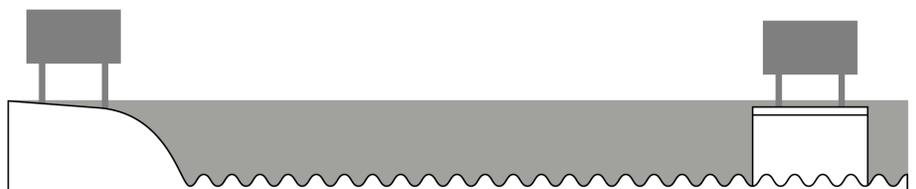
The signs will be placed on the river's edge on one side of the channel and on the end of the lock wall on the opposite side. On wide rivers with submerged dams, additional signs mounted on midriver pylons may be required. This restricted area should be reaffirmed, where possible, with a buoy-line to prevent people from drifting into the dam.

The signs are placed facing upstream, mounted perpendicular to the boaters' approach for good legibility. The exact size and placement distance above the dam will be determined by flow speed, width of river, and related local conditions.

Sign background color is red retroreflective sheeting with white retroreflective legend, overbar and rule

The typeface is Helvetica Medium and follows Corps standard letter- and word-spacing for waterway signs. The sign panel format uses standard Grid 1, Section 7.

Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WRE-02	A	18Ax9A	Engineered	WTW-1/2/4	>9A	RD/WH
WRE-02	A	18Ax9A	-	WTW-6/7	>9A	RD/WH



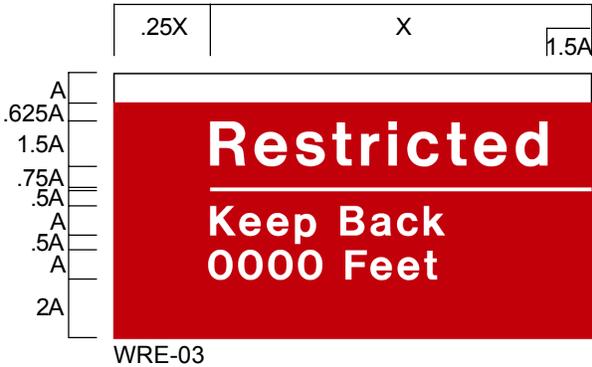
The restricted area immediately above and below a dam is identified by the signs specified on pages 14-17 through 14-18. Because of the inherent dangers of this restricted area, a redundant level of information identifying area restrictions may be added if the district feels it is necessary. These signs are to be placed flush on both front and back of the structure to give notification of the

designated restricted area. These are optional signs to be used in conjunction with the signs shown on pages 14-17 through 14-18, and should never be used as a substitute for these signs.

The size of the restricted area will be determined by local conditions. At the very least, the legend must be sized to be legible when viewed from outside the

boundary of the restricted area being signed. The number of signs required will depend on the width of the dam, flow speed, sign height above water level, and other local conditions. If mounting this sign is not possible, careful controlling of the restricted area will need to be done with the signs outside the area.

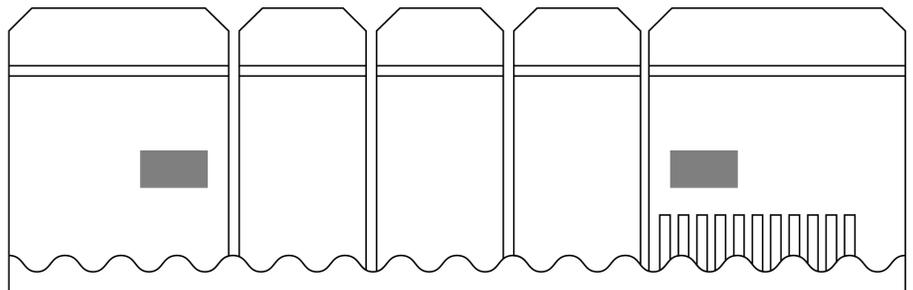
Underrule is .125A



Sign background color is red retroreflective sheeting with white retroreflective legend, overbar and rule.

The typeface is Helvetica Medium and follows Corps standard letter- and word-spacing for waterway signs. The sign panel format uses standard Grid 1, Section 7.

Sign Type	Legend Size (A)	Panel Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WRE-03	A	16.25Ax9A	Engineered	WTW-1/2/4	>9A	RD/WH
WRE-03	A	16.25Ax9A	-	WTW-6/7	>9A	RD/WH



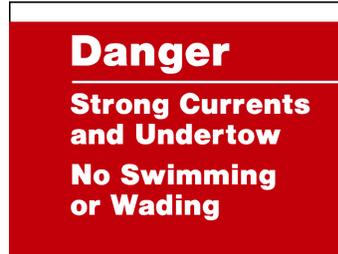
The Danger signs shown below are used to identify a dangerous waterway or shoreline condition, and establish prohibitions for swimming or wading.

These ground-mounted signs are placed for viewing by people approaching the water's edge from the land-side.

Three legend formats are provided for use to identify this dangerous shoreline condition. Selection of the appropriate sign will be determined by local requirements.

These signs may be mounted to face away from the water's edge, or be placed in a double face configuration and mounted perpendicular to the bank. Placement should be high enough to keep sign above high water levels while accommodating for special conditions when the shoreline is dramatically different at low water.

As a land-viewed sign, it is preferable that several smaller signs be placed closer to the viewer in series, instead of one overly large sign viewed from a greater distance.



WDA-21

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-21	2"	33.25"x25"	Engineered	WTW-1/3/5	36"-60"	RD/WH
WDA-21	2"	33.25"x25"	-	WTW-6	36"-60"	RD/WH
WDA-21	3"	49.875"x37.5"	Engineered	WTW-1/3/5	36"-60"	RD/WH
WDA-21	3"	49.875"x37.5"	-	WTW-6	36"-60"	RD/WH



WDA-22

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-22	2"	33.25"x22"	Engineered	WTW-1/3/5	36"-60"	RD/WH
WDA-22	2"	33.25"x22"	-	WTW-6	36"-60"	RD/WH
WDA-22	3"	49.875"x33"	Engineered	WTW-1/3/5	36"-60"	RD/WH
WDA-22	3"	49.875"x33"	-	WTW-6	36"-60"	RD/WH

Sign background color is red retroreflective sheeting with white retroreflective legend, overbar and rule.

The typeface is Helvetica Bold and follows Corps standard letter- and word-spacing, Appendix D, page D-9. The sign panel format uses standard Grid 1, Section 7.



WDA-30

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-30	2"	33.25"x28"	Engineered	WTW-1/3/5	36"-60"	RD/WH
WDA-30	2"	33.25"x28"	-	WTW-6	36"-60"	RD/WH
WDA-30	3"	49.875"x42"	Engineered	WTW-1/3/5	36"-60"	RD/WH
WDA-30	3"	49.875"x42"	-	WTW-6	36"-60"	RD/WH

These signs are specified for use along the shoreline below the dam for viewing by pedestrians. Their function is to identify dangerous conditions resulting from sudden increases or decreases in water flow from turbine discharges and/or gate openings and closings.

The sign is mounted on the bank facing away from the water's edge or as a double-face sign mounted perpendicular to the bank.

As a land-viewed sign, it is preferable that several smaller signs be placed closer to the viewer in series, instead of one overly large sign viewed from a greater distance.

These ground-mounted signs are to be placed for viewing by people approaching the water's edge from the land side.

The Danger, Caution, and Warning signs used in this manual cannot be changed without HQUSACE approval. For all signs listed below, identical legends are approved as both Danger and Warning signs.

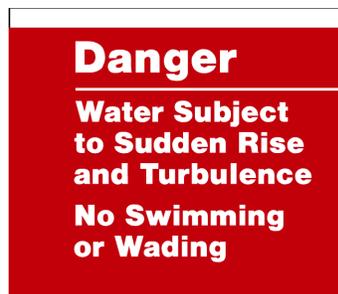
- WDA-23 (right) and WWA-30 on page 14-51.
- WDA-31 (below) and WWA-23 on page 14-50.

Determination of whether a Danger or Warning sign is to be used will be made by the project manager after considering the conditions and severity of the hazard. Please refer to the discussion of safety signs in Section 2, pages 2-13 through 2-15.

At locations where people do not swim or wade, the smaller sign shown at the right may provide all notification required.

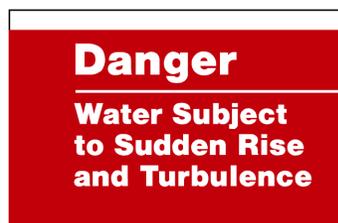
Sign background color is red retroreflective sheeting with white retroreflective legend, overbar and rule.

The typeface is Helvetica Bold and follows Corps standard letter- and word-spacing, Appendix D, page D-9. The sign panel format uses standard Grid 1, Section 7.



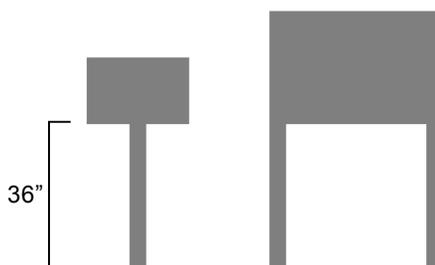
WDA-23

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-23	2"	32.375"x28"	Engineered	WTW-2/3/5	36"-60"	RD/WH
WDA-23	2"	32.375"x28"	-	WTW-6	36"-60"	RD/WH
WDA-23	3"	48.5"x42"	Engineered	WTW-2/3/5	36"-60"	RD/WH
WDA-23	3"	48.5"x42"	-	WTW-6	36"-60"	RD/WH

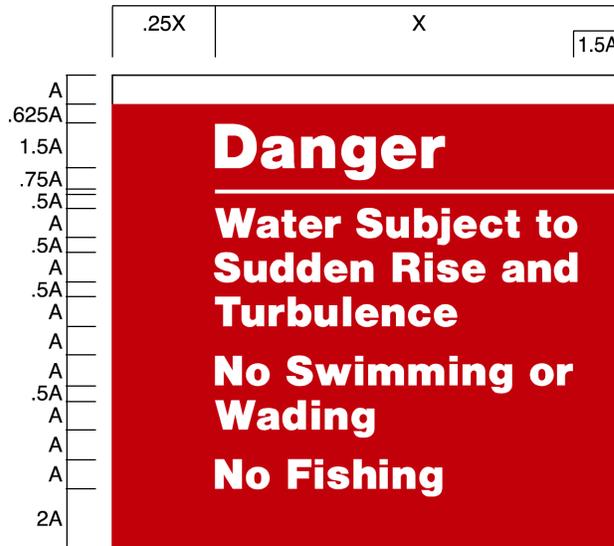


WDA-31

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-31	2"	32.375"x21"	Engineered	WTW-2/3/5	36"-60"	RD/WH
WDA-31	2"	32.375"x21"	-	WTW-6	36"-60"	RD/WH
WDA-31	3"	48.5"x31.5"	Engineered	WTW-2/3/5	36"-60"	RD/WH
WDA-31	3"	48.5"x31.5"	-	WTW-6	36"-60"	RD/WH



Underrule is .125A



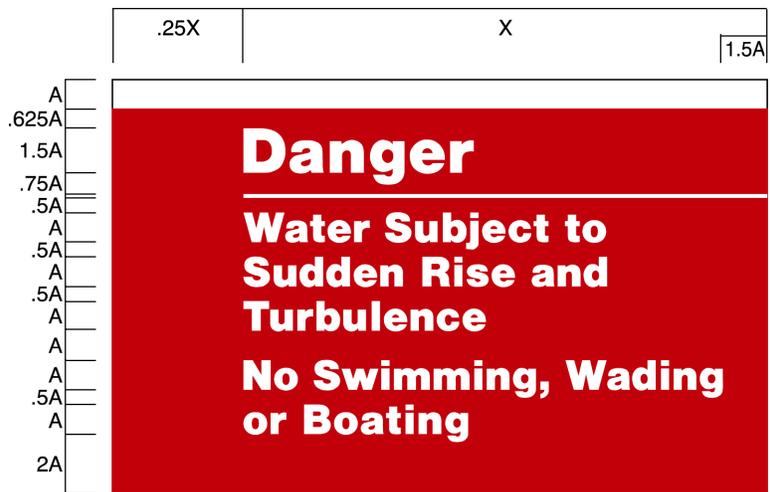
WDA-36

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-36	2"	34.5"x32"	Engineered	WTW-2/3/5	36"-60"	RD/WH
WDA-36	2"	34.5"x32"	-	WTW-6	36"-60"	RD/WH
WDA-36	3"	51.75"x48"	Engineered	WTW-2/3/5	36"-60"	RD/WH
WDA-36	3"	51.75"x48"	-	WTW-6	36"-60"	RD/WH

Sign background color is red retroreflective sheeting with white retroreflective legend, overbar and rule.

Underrule is .125A

The typeface is Helvetica Bold and follows Corps standard letter- and word-spacing, Appendix D, page D-9. The sign panel format uses standard Grid 1, Section 7.



WDA-37

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-37	2"	44.25"x29"	Engineered	WTW-2/3/5	36"-60"	RD/WH
WDA-37	2"	44.25"x29"	-	WTW-6	36"-60"	RD/WH
WDA-37	3"	66.375"x43.5"	Engineered	WTW-2/3/5	36"-60"	RD/WH
WDA-37	3"	55.375"x43.5"	-	WTW-6	36"-60"	RD/WH

The function of the signs illustrated below (and on the following page) is to warn project visitors about hazards at a specific functional area at a Corps project. **These signs are only to be used in locations where siren, horn and/or flashing light warning systems already exist.** Because of the potentially serious consequences

which may occur if the signs are not heeded, it is important that the principles and guidelines in this manual be followed. While these signs are shown here, the use of additional horns, sirens, and flashing light systems is not encouraged. The primary warning system should be signs alone.

Signs must be mounted for ease of view so viewers entering an area are advised of the potential hazard and are aware of the warning systems used at this location. These may be double face panels mounted perpendicular to the edge of the shoreline or single face signs directed toward a viewer's approach. It is preferable that several smaller signs be placed along the shoreline in series instead of fewer overly large signs placed at a greater distance from each other.



WDA-32

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-32	2"	39.625"x21"	Engineered	WTW-2/3/5	36"-60"	RD/WH
WDA-32	2"	39.625"x21"	-	WTW-6	36"-60"	RD/WH
WDA-32	3"	59.375"x31.5"	Engineered	WTW-2/3/5	36"-60"	RD/WH
WDA-32	3"	59.375"x31.5"	-	WTW-6	36"-60"	RD/WH

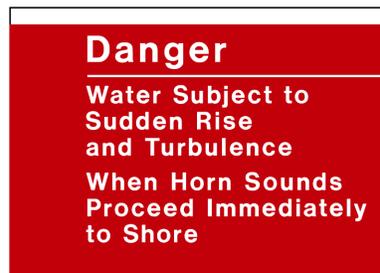


WDA-33

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-33	2"	39.625"x21"	Engineered	WTW-2/3/5	36"-60"	RD/WH
WDA-33	2"	39.625"x21"	-	WTW-6	36"-60"	RD/WH
WDA-33	3"	59.375"x31.5"	Engineered	WTW-2/3/5	36"-60"	RD/WH
WDA-33	3"	59.375"x31.5"	-	WTW-6	36"-60"	RD/WH

Sign background color is red retro-reflective sheeting with white retro-reflective legend overbar and rule.

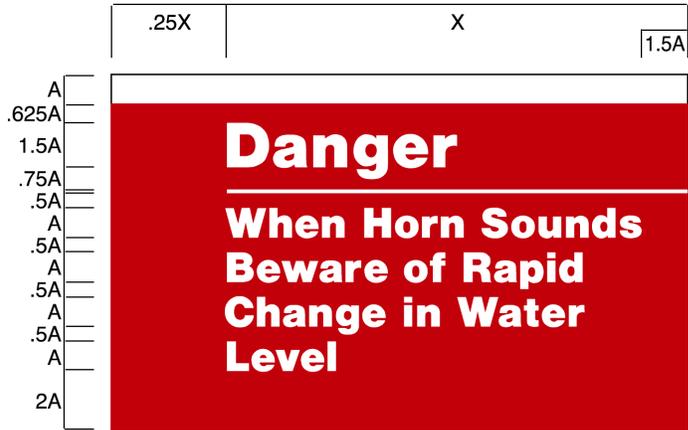
The typeface for signs viewed from the water is Helvetica Medium. Helvetica Bold is used for signs viewed from the land. Refer to Appendix D for Corps standard letter- and word-spacing for both waterway and land applications. The sign panel format uses standard Grid 1, Section 7.



WDA-34

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-34	2"	43.875"x31"	Engineered	WTW-2/3/5	36"-60"	RD/WH
WDA-34	2"	43.875"x31"	-	WTW-6	36"-60"	RD/WH
WDA-34	3"	65.875"x31.5"	Engineered	WTW-2/3/5	36"-60"	RD/WH
WDA-34	3"	65.875"x31.5"	-	WTW-6	36"-60"	RD/WH

Underrule is .125A



WDA-47

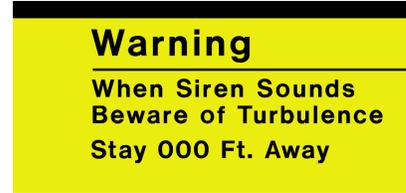
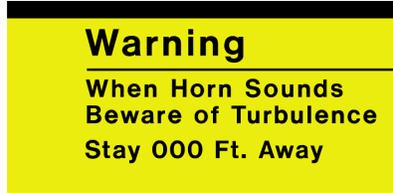
Sign background color is red retroreflective sheeting with white retroreflective legend, overbar, and rule.

The typeface is Helvetica Bold and follows Corps standard letter- and word-spacing, Appendix D, page D-9. The sign panel format uses standard Grid 1, Section 7.

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-47	2"	39"x24"	Engineered	WTW-2/3/5	36"-60"	LY/BK
WDA-47	2"	39"x24"	-	WTW-6	36"-60"	LY/BK
WDA-47	3"	58.375"x36"	Engineered	WTW-2/3/5	36"-60"	LY/BK
WDA-47	3"	58.375"x36"	-	WTW-6	36"-60"	LY/BK

Signs may be used where existing auditory or visual systems are used to notify viewers of signal system procedures. For use, see guidelines provided on page 14-23.

Distance to be displayed on this sign will be determined by the project Sign Program Manager on a site-by-site basis.



WWA-27

WWA-28

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-27/28	2"	45.125"x22"	Engineered	WTW-2/3/5	36"-60"	LY/BK
WWA-27/28	2"	45.125"x22"	-	WTW-6	36"-60"	LY/BK
WWA-27/28	3"	67.75"x33"	Engineered	WTW-2/3/5	36"-60"	LY/BK
WWA-27/28	3"	67.75"x33"	-	WTW-6	36"-60"	LY/BK



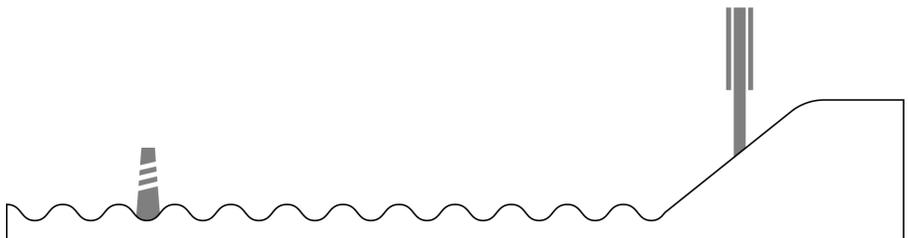
WWA-29

Sign background color is Lemon Yellow retroreflective sheeting with black nonretroreflective legend, overbar and rule.

The typeface for signs viewed from the water is Helvetica Medium. Helvetica Bold is used for signs viewed from the land. Refer to Appendix D for Corps standard letter- and word-spacing for both waterway and land applications. The sign panel format uses standard Grid 1, Section 7.

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-29	2"	39.375"x21"	Engineered	WTW-2/3/5	36"-60"	LY/BK
WWA-29	2"	39.375"x21"	-	WTW-6	36"-60"	LY/BK
WWA-29	3"	59"x31.5"	Engineered	WTW-2/3/5	36"-60"	LY/BK
WWA-29	3"	59"x31.5"	-	WTW-6	36"-60"	LY/BK

When using the Warning signs that indicate a distance that a viewer must stay back from, the sign must be readable from the prescribed distance and a marker must be placed to designate the area for which it applies.



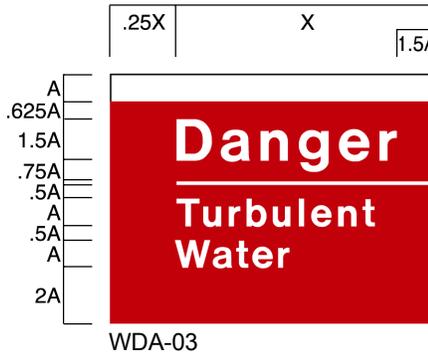
Specific locations, both within and outside restricted areas surrounding a dam or a lock may be individually signed to notify boaters and pedestrians of dangerous, turbulent water conditions. This includes areas that are very hazardous but may appear calm on the surface.

pages 14-17 through 14-18 at dangerous locations adjacent to a lock or dam. Other uses will depend on local conditions.

The signs should be sized and mounted for viewing outside the area being signed (see size charts on page 2-6 and the placement guidelines in this section pages 14-57 through 14-61).

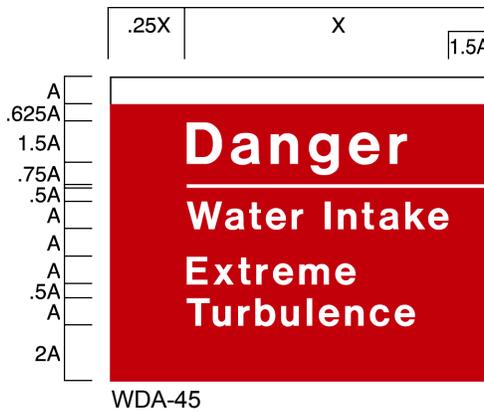
These signs are primarily used in addition to the Restricted signs shown on

Underrule is .125A



Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-03	A	11.875Ax9A	Engineered	WTW-3/5	>9A	RD/WH
WDA-03	A	11.875Ax9A	-	WTW-6/7	>9A	RD/WH

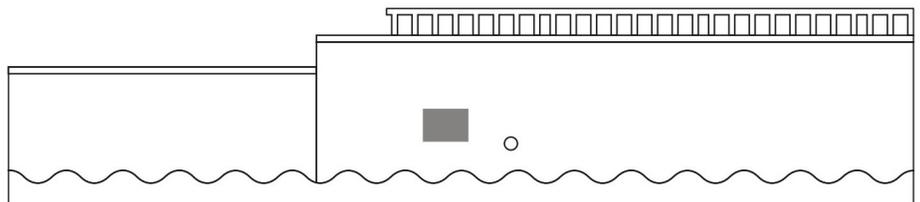
Underrule is .125A



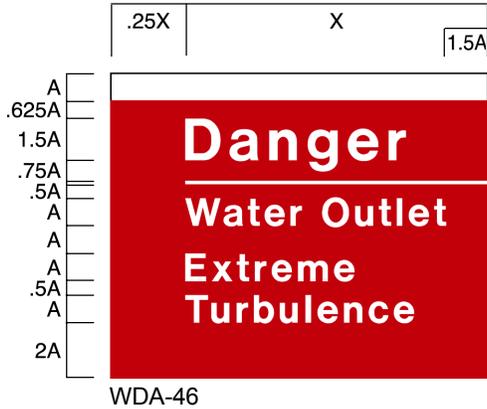
Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-45	A	13.75Ax11A	Engineered	WTW-3/5	>9A	RD/WH
WDA-45	A	13.75Ax11A	-	WTW-6/7	>9A	RD/WH

Sign background is red retroreflective sheeting with white retroreflective legend, overbar and rule.

The typeface is Helvetica Medium and follows Corps standard letter- and word-spacing for waterway signs. The sign panel format uses standard Grid 1, Section 7.



Underrule is .125A



Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-46	A	13.625Ax11A	Engineered	WTW-3/5	>9A	RD/WH
WDA-46	A	13.625Ax11A	-	WTW-6/7	>9A	RD/WH



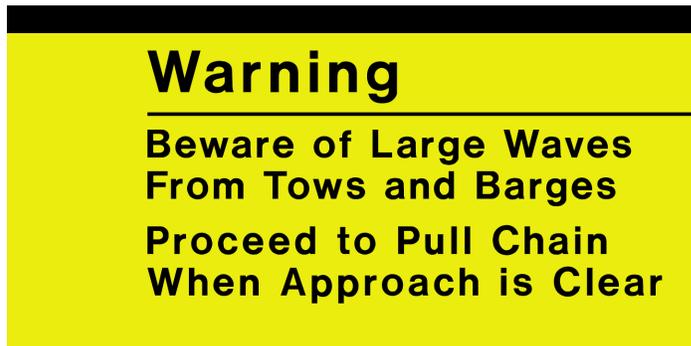
WWA-31

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-31	A	12.75Ax9A	Engineered	WTW-3/5	>9A	LY/BK
WWA-31	A	12.75Ax9A	--	WTW-6/7	>9A	LY/BK



WWA-32

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-32	A	16.75Ax9A	Engineered	WTW-3/5	>9A	LY/BK
WWA-32	A	16.75Ax9A	--	WTW-6/7	>9A	LY/BK



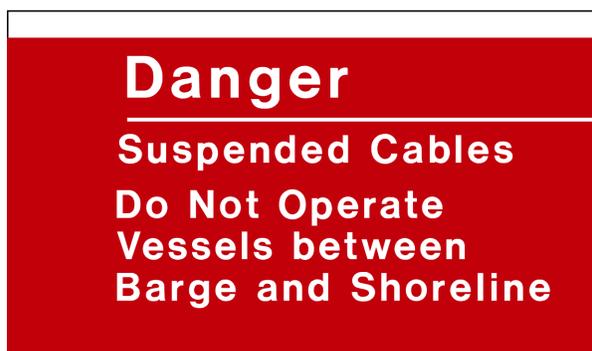
WWA-34

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-34	A	22.25Ax12.5A	Engineered	WTW-3/5	>9A	LY/BK
WWA-34	A	22.25Ax12.5A	--	WTW-6/7	>9A	LY/BK



WDA-35

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-35	A	18.125Ax10.5A	Engineered	WTW-3/5	>9A	LY/BK
WDA-35	A	18.125Ax10.5A	--	WTW-6/7	>9A	LY/BK



WDA-43

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-43	A	21.5Ax12.5A	Engineered	WTW-3/5	>9A	LY/BK
WDA-43	A	21.5Ax12.5A	--	WTW-6/7	>9A	LY/BK

Trespassing on locks, dams or other United States Government property at Corps projects is strictly prohibited. Access to restricted or hazardous areas around a dam or waterway should be controlled using the appropriate combi-

nation of fencing and signing. The primary use of these signs is for mounting on dam structures, fences or pylons to deter people from climbing on to the dam or entering into dangerous areas around a water project.

These land viewed signs are generally placed for pedestrian viewing and need not be overly large; see Viewing Distance Guide, page 2-6.

1) Sign background color is red retroreflective sheeting with white retroreflective legend, overbar and rule.

Underrule is .125A



Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WRE-22	.75"	11.875"x7.375"	4"x4"	HDO-5	36-60"	RD/WH
WRE-22	.75"	11.875"x7.375"	-	HDO-6*	36-60"	RD/WH
WRE-22	1.5"	23.875"x14.625"	4"x4"	HDO-5	36-60"	RD/WH
WRE-22	1.5"	23.875"x14.625"	-	HDO-6*	36-60"	RD/WH

2) Sign background color is Medium Blue retroreflective sheeting with white retroreflective legend, overbar and rule.

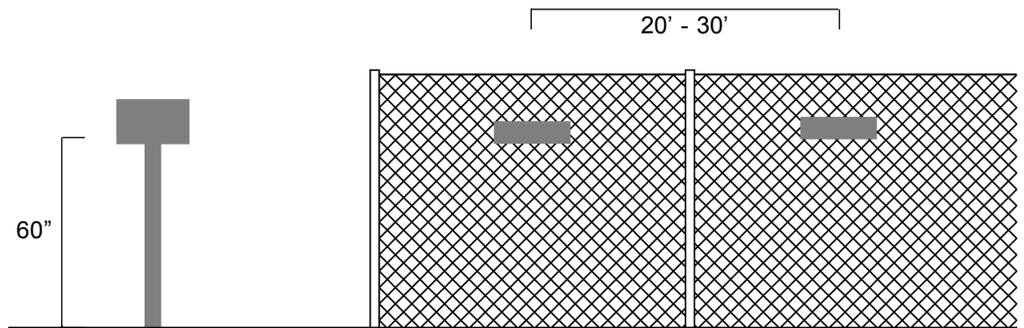
Underrule is .125A



Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
REG-04	.75"	19.25"x5.625"	4"x4"	HDO-5	60"	MB/WH
REG-04	.75"	19.25"x5.625"	-	HDO-6*	60"	MB/WH
REG-04	1.5"	38.375"x11.25"	4"x4"	HDO-5	60"	MB/WH
REG-04	1.5"	38.375"x11.25"	-	HDO-6*	60"	MB/WH

*Fence mounting detail shown on page B.7-5, detail 14.

These signs are to be fabricated using engineering grade reflective sheeting only. These signs may be screen printed on white retroreflective sheeting or fabricated using white cut graphics applied to base color.



The following guidelines specify the signs used to direct boaters to the lock and instruct them as they lock through. Although the basic principles of locking are common to most locks, regardless of size or location, the procedures and rules differ somewhat from one project to the next project.

There are two types of signs placed in and around a lock. The first are signs informing boaters of the lock approach including the "Arrival Point" sign. This sign is a large panel designed for viewing from midriver by approaching lock traffic. The use of optional traffic flow instruction signs should be determined on a site-by-site basis depending on the project and river configuration.

All of the other signs specified within the immediate area around the dam are provided to give boaters information and instructions for entering the lock channel, chamber, and locking through. These signs are intended for viewing from relatively short distances by boaters moving at low speed. Signs in the lock area are mounted on the lock wall, on posts placed specially for the signs, or on the guard-railing around the lock chamber.

To help maintain an orderly appearance, the capital letter height (A) for signs with similar viewing distance should be the same. Where more than one sign is used in an area, they should be mounted at a common height and aligned on top of the panel.

Should any information or instruction type sign (other than Caution, Warning, Danger or Restricted) be required that is not shown in this manual, it should be prepared using standard grid formats provided in Section 7.

Use only the Haas Helvetica Medium typeface for lock, dam and waterway signs, and the Helvetica Bold typeface for land viewed signs. Letter- and word-spacing must follow the Corps standards, Appendix D, page D-9 through D-12. Use the Viewing Distance Guide shown in Section 2, page 2-6, to determine proper legend size for each respective sign.

Information and instruction signs placed on the lock structure use standard signs that should not require custom engineering. A size matrix for each sign type is shown on the respective display page for each individual type of sign.

Sign background color for all lock information and instruction signs is white diamond grade retroreflective sheeting with Medium Blue diamond grade retroreflective sheeting legend, arrow and overbar. For an overview of the diamond grade retroreflective material see page 14-7. Sign material specifications are provided in Appendix B (pages B.13 through B.13-16), with product numbers and identification of manufacturers provided in Appendix E.

When placing signs, it is important that each sign is visible from its proposed viewing location. To maximize the effectiveness, the overall installation must be uncluttered and orderly in appearance. This can be achieved by uniformly aligning the top of adjacent panels, and where appropriate, using a common size panel throughout an installation.

When developing a sign plan for a lock or structure, it is advisable to field test complicated situations to ensure good legibility. This includes sign placement in a lock chamber and areas with changing water levels.

Signs can be placed either above high water level in lock chambers, or attached to the guard railing on top of the lock structure. When placed within the lock chamber, placement should be such as to prevent damage to signs by passing vessels.

The diagram below shows the three primary areas of a lock to be signed. These include: approach area, entry channel and lock chamber. At each project, the sign requirements will vary depending on lock and dam configuration, and the river conditions.

Area 1, Lock Approach

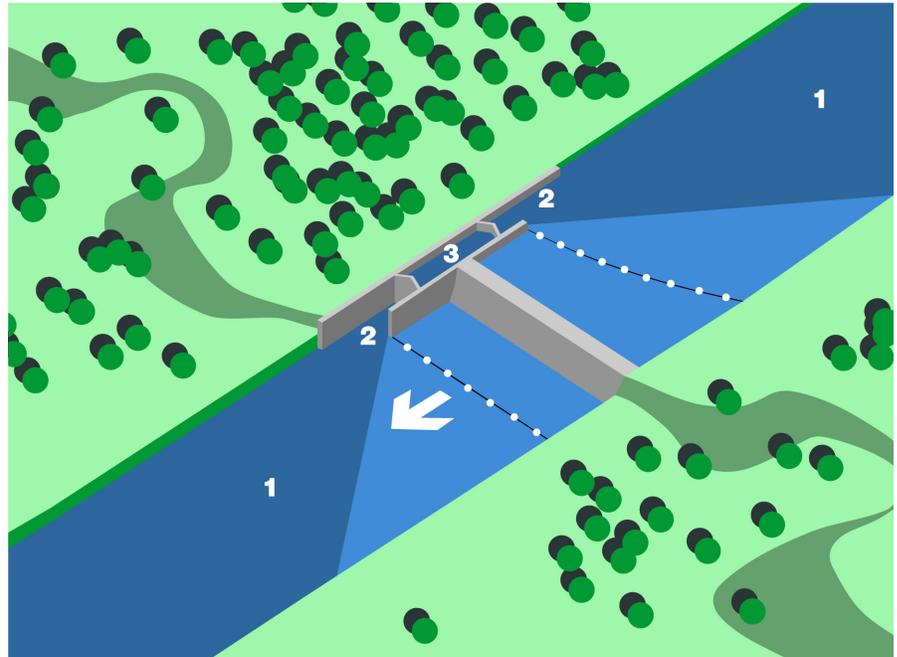
Primarily used to identify arrival point and direct boat traffic upstream and downstream. These signs are placed on the river bank, on the end of the lock walls, on midriver pylons or on mooring cells as appropriate.

Area 2, Lock Entry

Within this area the boaters are instructed, as required, how to manually signal for lockage, and informed about entry procedures. Entry channel signs generally placed along the lock wall are located for easy viewing. Mount panels so that they will not be damaged by passing boats and barges.

Area 3, Lock Chamber

These signs are located within the chamber area and include length increments, related safety signs, and locking instructions. Signs within the chamber should be kept to a minimum and placed to provide greatest visibility to boaters locking through.



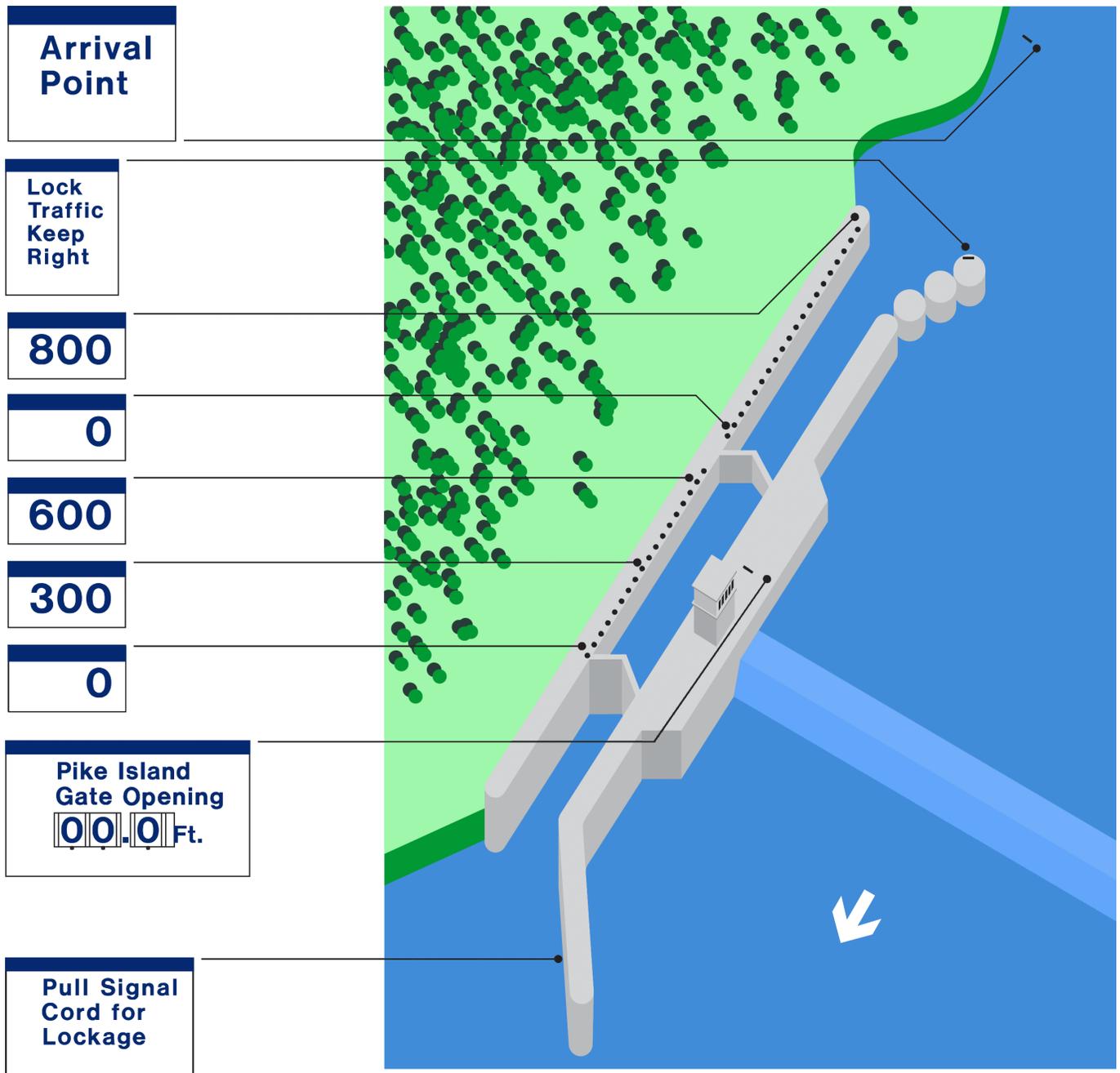
The number of signs placed in any area of a lock will vary depending on chamber size, local conditions and type of boater traffic. Where there is more than one sign needed at a specific location, place signs in a logical order, giving the viewer time to respond to each message as needed. Carefully select placement and size of the signs. Keep in mind that the signs are intended for

the first time user and that signs placed on lock walls parallel to the viewer are more difficult to read than signs placed perpendicular to a viewer. These constraints may require placement of several smaller panels, repeating the message, instead of one big panel.

Signs placed in advance of a lock are used primarily to identify the arrival point

and to guide boat traffic to and into the lock channel. Secondary signs may be provided to identify signal locations and/or procedures, as well as locking through (queuing) regulations.

Inside the lock chamber and on the approach walls are chamber length markers, gate opening and required Workplace Safety signs.



These signs are provided to display general lock information to boaters. They augment waterway safety signs.

All lock approach, lock entry channel and lock chamber signs use a color combination of Medium Blue and white. Depending on function, the figure and background relationship will vary. Consistent use of these color standards

is important for the effectiveness of this program.

All regulated information, instruction and guide signs will have a white retroreflective background with Medium Blue retroreflective legend and overbar.

A lock area sign installation will also include Workplace Safety signs as required (see Section 11).

Information Signs

White retroreflective background with Medium Blue retroreflective legend and overbar. These signs are to be used in the approach into a lock beginning at the arrival point. Refer to page 14-36 for sign display.



General Instruction Signs

White retroreflective background with Medium Blue retroreflective legend and overbar. These signs are optional and are to be used in the approach channel to the lock chamber. Refer to page 14-37 through 14-38 for sign displays.



Workplace Safety Signs

These signs are used to augment the two basic types of lock signs described above. Refer to page 14-39 for sign display, with additional safety signs provided in Section 11.



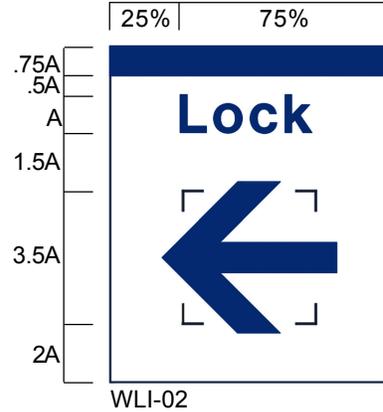
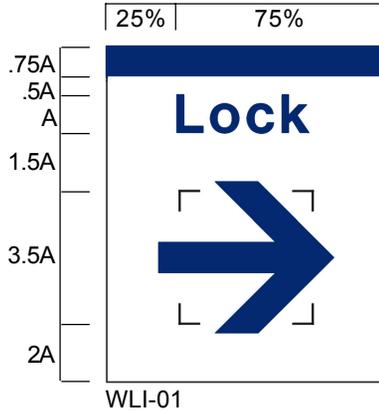
The signs shown below may be used to advise traffic to the arrival point or into the lock channel. These signs, placed on bridge piers, lock walls, river banks and midriver pylons, are used to direct traffic and provide an orderly flow of boats towards and into the lock.

It is recommended to use the signs with arrows (shown below) for locations viewed from midriver (distances greater than 200') because their legibility is three times greater than worded signs. Viewed from close range, either sign format can be used.

1) Information signs with arrows for viewing from midriver and at close proximity to lock channel.

Capital letter height not recommended larger than A=12"

Refer to guidelines on page 4-13 for arrow sizing.



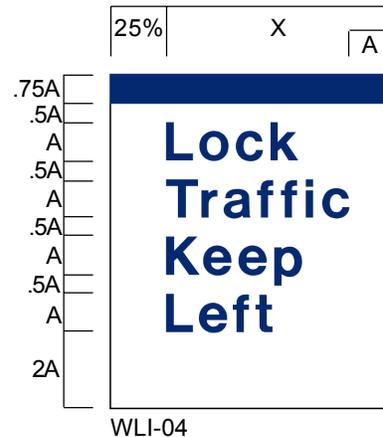
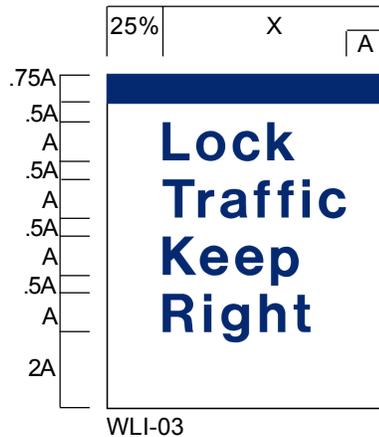
2) Information signs with worded legend for viewing at distances less than 200'.

Capital letter height not recommended larger than A=8"

Sign background color is white retroreflective sheeting with Medium Blue retroreflective sheeting legend, arrow and overbar.

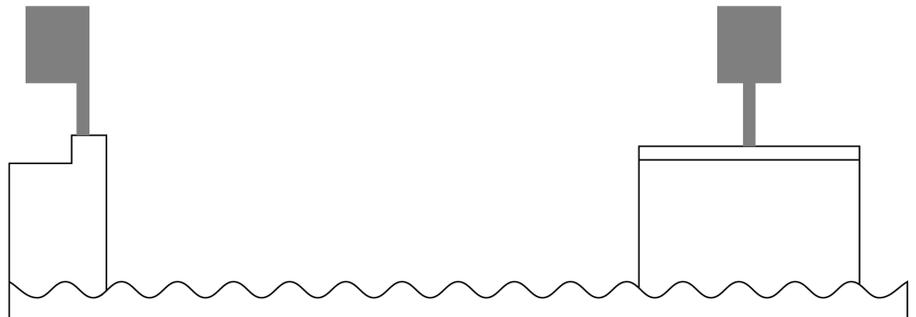
The typeface is Helvetica Medium and follows Corps standard letter- and word-spacing for waterway signs. The sign panel format uses standard grid 3, Section 7.

Reproduction artwork for the Helvetica Medium Arrow is provided on page F.141.



Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WLI-00	A	7.25Ax8.75A	Engineered	WTW-2/4/5	>8.75A	WH/MB
WLI-00	A	7.25Ax8.75A	-	WTW-6/7	>8.75A	WH/MB

Signs placed along the edge of the lock wall may be flag mounted away from the edge to prevent damage from passing boats.



For the purpose of lock regulations, the lock area is considered to be the area between the upstream and downstream arrival points.

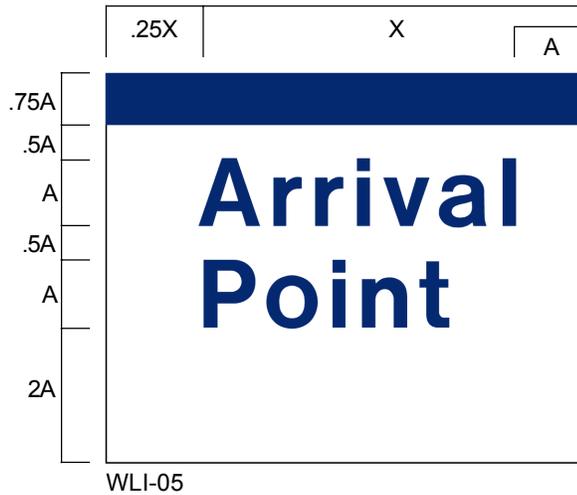
requirements at this point. The signs are to be viewed from midriver and should be sized accordingly.

Shown below is the standard sign to identify the arrival point. The navigation regulations for each location dictates the

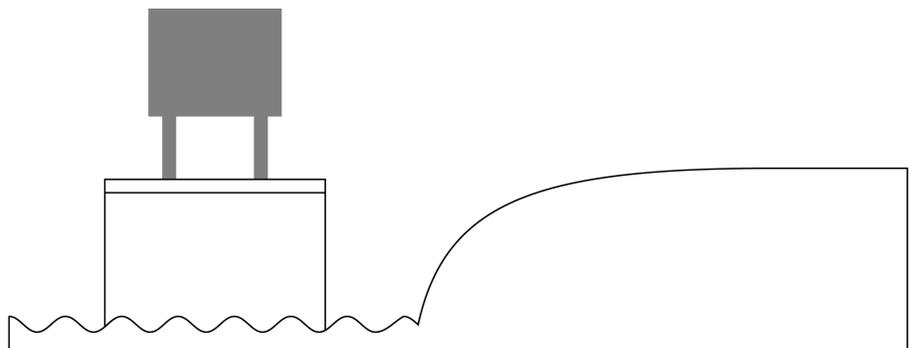
Arrival point signs are to be mounted perpendicular to the boaters' approach on the river's edge or midriver cells.

Sign background color is white retroreflective sheeting with Medium Blue retroreflective legend and overbar.

The typeface is Helvetica Medium and follows Corps standard letter- and word-spacing for waterway signs. The sign panel format uses standard Grid 3, Section 7.



Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WLI-05	A	7.125Ax5.75A	Engineered	WTW-2/4/5	>5.75A	WH/MB
WLI-05	A	7.125Ax5.75A	-	WTW-6/7	>5.75A	WH/MB



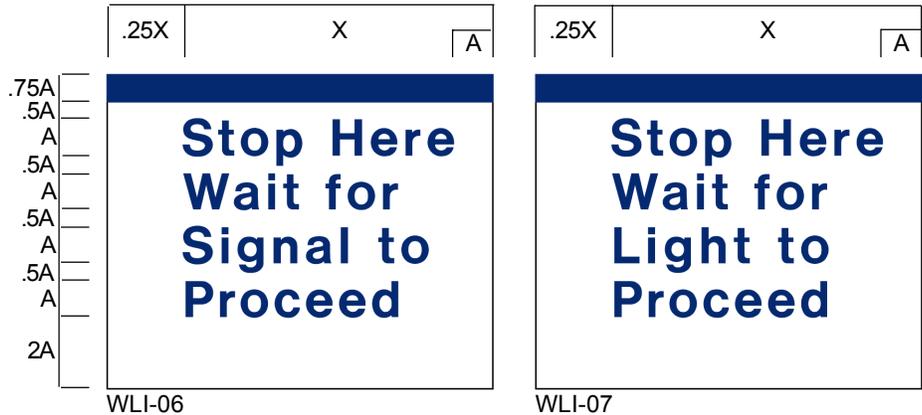
The four standard signs shown below are used to instruct boaters within the lock access channel. These signs may be placed as required on a site-by-site basis.

by passing barge tows. In areas with multiple signs, visual order should be created by sizing and aligning signs with the same capital letter height (A) for an orderly looking installation.

(50'-125'). Signs should not be larger than necessary to prevent sign clutter around the entrance to the lock.

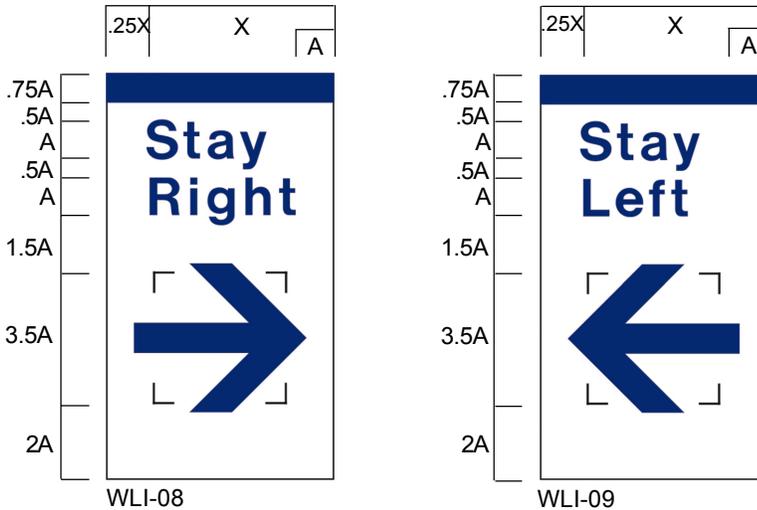
Mount within the boaters' field of view. Care should be taken when mounting signs so that they will not be damaged

These signs are primarily intended to instruct the recreational boater and are viewed at relatively short distances



Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WLI-06/07	A	10.75Ax8.75A	Engineered	WTW-4/5	>8.75A	WH/MB
WLI-06/07	A	10.75Ax8.75A	-	WTW-6/7	>8.75A	WH/MB

Guide signs for boats entering lock chamber.

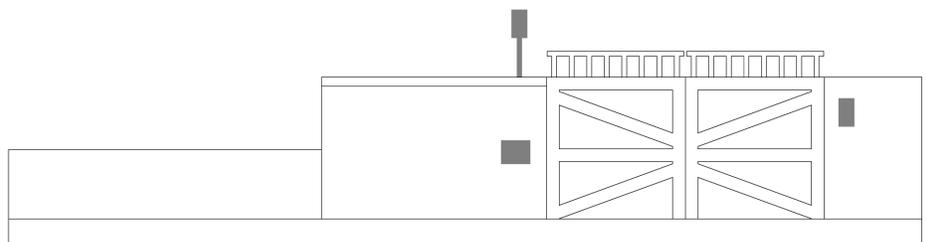


Refer to guidelines on page 4-13 for arrow sizing.

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WLI-08/09	A	6Ax10.75A	Engineered	WTW-4/5	>11.25A	WH/MB
WLI-08/09	A	6Ax10.75A	-	WTW-6/7	>11.25A	WH/MB

Sign background color is white retroreflective sheeting with Medium Blue retroreflective legend, arrows, and overbar.

The typeface is Helvetica Medium and follows Corps standard letter- and word-spacing for waterway Signs. The sign panel format uses standard Grid 3, Section 7.



The signs below are used to identify the location of manual signal devices, and are generally located on the lock wall for boaters unable to use radio communications to signal the lock operator.

These signs are primarily intended to instruct the recreational boater and are viewed at relatively short distances (50'-125'). Signs should not be larger than necessary to prevent sign clutter around the entrance to the lock.

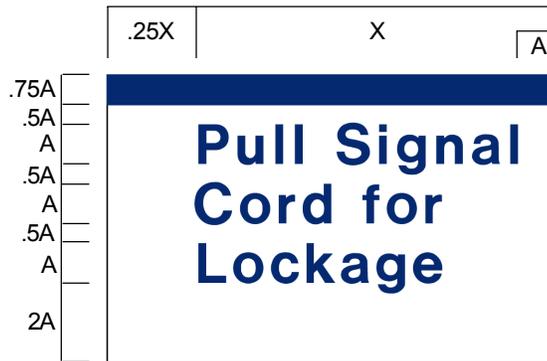
Mount within the boaters' view when approaching the lock. Care should be taken when mounting signs so that they will not be damaged by passing barge tows. In areas with multiple signs, visual order should be created by aligning the sign panels and sizing the signs to a uniform capital letter height (A).

Sign background color is white retroreflective sheeting with Medium Blue retroreflective legend and overbar.



WLI-10

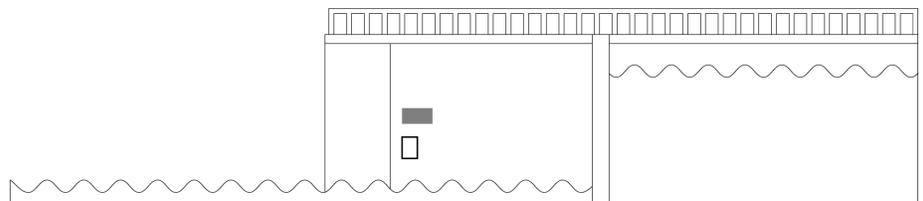
Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WLI-10	A	12.625Ax7.25A	Engineered	WTW-4/5	>7.25A	WH/MB
WLI-10	A	12.625Ax7.25A	-	WTW-6/7	>7.25A	WH/MB



WLI-11

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WLI-11	A	11.375Ax7.25A	Engineered	WTW-4/5	>7.25A	WH/MB
WLI-11	A	11.375Ax7.25A	-	WTW-6/7	>7.25A	WH/MB

The typeface is Helvetica Medium and follows Corps standard letter- and word-spacing for waterway. The sign panel format uses standard Grid 3, Section 7.



The safety signs shown below are used within the lock entry channel and lock chamber to instruct boaters of local safety regulations and are to be placed as needed on a site-by-site basis.

These signs follow the standard format for Corps Workplace Safety signs as

shown in Section 11. The typeface is Helvetica Bold and follows Corps standard letter- and word-spacing (see Appendix D, page D.9). For grid formats and viewing distance information, refer to page 11-3, with color standards provided on page 11-2.

Place signs within the boat operator's field of view, and mount so that passing boats and lock equipment and vehicles will not damage the sign panel. Where possible, mount signs with common alignments for visually uniform installations. For additional Workplace Safety signs, see Section 11.

Danger: These signs indicate immediate and grave danger, a hazard capable of producing irreversible damage or injury. Danger signs are intended to prohibit harmful activities.

It is recommended that "Danger, No Smoking During Lockage" (SDA-25) be used in the observation area or on the upper deck, and "Danger, No Smoking, or Open Flame" (SDA-04) be used in the lock chamber.

Warning/Caution: These signs are used to call attention to a potential danger or a hazard capable of resulting in moderately severe injury or damage. In some instances, the hazards may be the same as those associated with Danger signs but are of significantly less magnitude.

Notice: These signs are used to control or define access and circulation. They are used primarily for information and are not placed to identify a hazard.

Panels are to be used in and around lock chamber area, and are not intended to be used in place of no wake zone buoys.



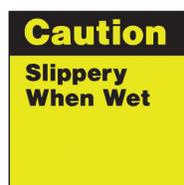
SDA-04



SDA-25



SDA-24



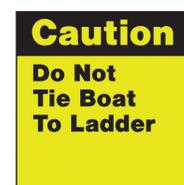
SCA-17



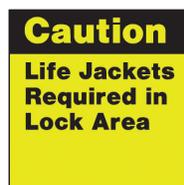
SCA-25



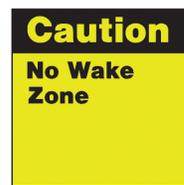
SCA-26



SCA-27



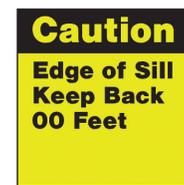
SCA-28



SCA-29



SCA-30



SCA-31*



SNO-07



SNO-14

*Add distance for each installation (SCA-31)

Specific sign type code is to be inserted when ordering sign.

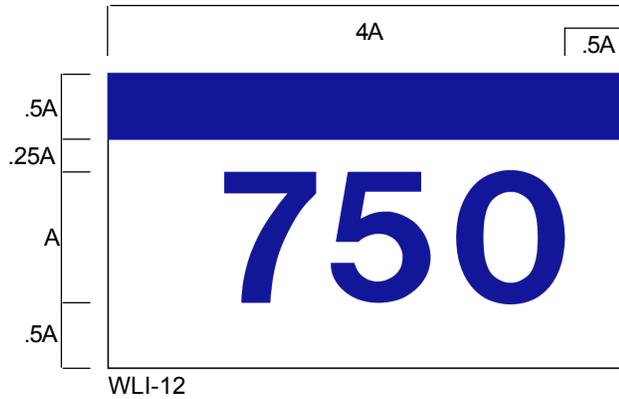
Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
-	.75"	8"x8"	-	ALU-6	65"	varies
-	1.125"	12"x12"	-	ALU-6	65"	varies
-	1.5"	16"x16"	-	ALU-6	78" min	varies
-	2.25"	24"x24"	-	ALU-6	78" min	varies

The signs shown below are used to identify the length of the lock chamber, at 50' increments.

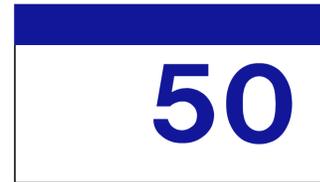
They are placed along the upper portion of the guide walls. Within the chamber, the distance markers will be placed in ascending order beginning 50 feet from the downstream end and continuing to the upstream end. Signs are to be

placed 50' on-center on mounting posts that are inside the guard railing and at a common height. Existing hand rails and cables may also be used. Calculate placement locations carefully to give accurate information to the boat operator while he is navigating through the lock chamber. Where chamber markers cannot be viewed from low water level, additional submergible indicators may be

placed in recessed areas along the lock chamber. 3" x 5" durable high brightness pavement markers are fastened to the chamber wall in groups of nine (3 x 3). These markers are placed between 12-20 feet above low water level, following manufacturers specifications. Product numbers and manufacturer's are provided in Appendix E.



One digit



Two digits



Three digits



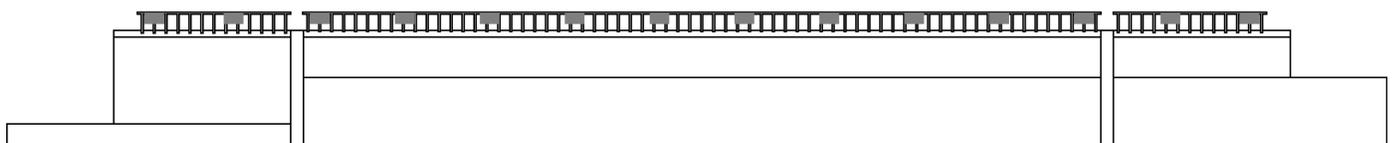
Four digits

Sign background color is white retro-reflective sheeting with Medium Blue retroreflective number and overbar.

The typeface is Helvetica Medium and follows Corps standard letter- and word-spacing, Appendix D page D. 12.

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WLI-12	9"	36"x20.25"	3"x3"	WTW-3	20-25"	WH/MB
WLI-12	12"	48"x27"	3"x3"	WTW-3	27"	WH/MB

*See engineered example, page B.13-13

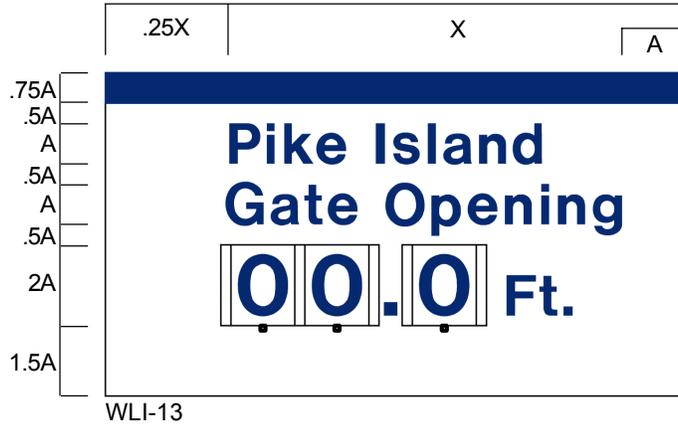


The gate opening sign shown below is used to inform boaters of the size of the gate opening at the next dam, and is used to calculate the flow speed to the next lock. This sign is used primarily by commercial operators with barge tows.

The name of the next facility is also shown on the sign to aid orientation. This sign is generally placed on the walkway beside the lock chamber within the sightline of the boat operators entering and leaving the lock when the chamber is at the high water level.

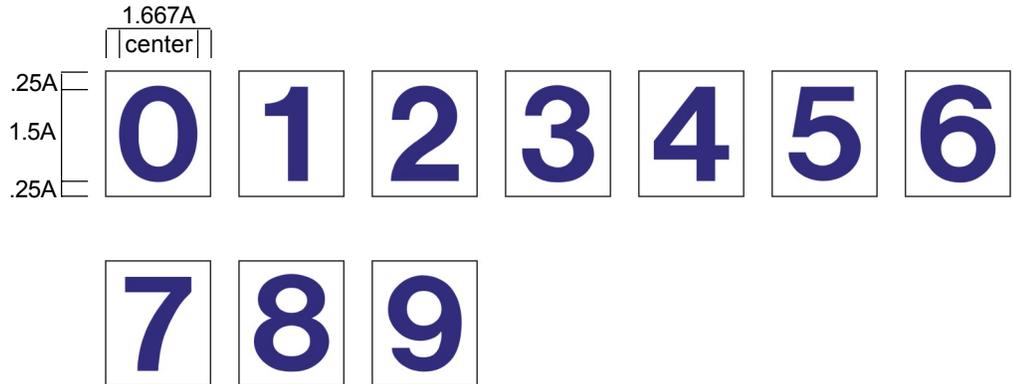
The gate opening is indicated in feet. These increments are displayed on individual aluminum insert panels that can be easily changed by lock personnel. The bracket on the sign panel consists of a vertical retainer or guide with a fixed stop at the base of each guideway. The open assembly prohibits the collection of dirt, moisture on the panel, maintaining the life and overall appearance of the sign.

Sign background color is white retroreflective sheeting with Medium Blue retroreflective legend and overbar.



The insert panels are sheet aluminum with white retroreflective background and Medium Blue retroreflective numbers mounted to the surface.

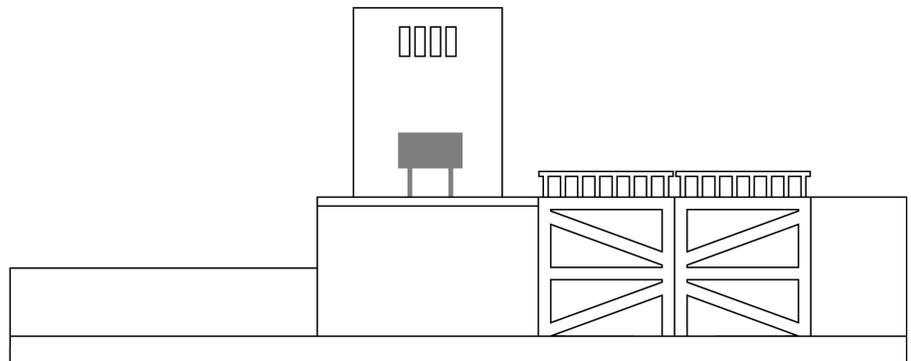
The typeface is Helvetica Medium and follows Corps standard width letter- and word-spacing, Appendix D, page D-12. The sign panel format uses standard Grid 3, Section 7.



* Panel length may vary with longer dam names

**See engineered example, page B.13-10

Sign Type	Legend Size (A)	Panel Size*	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WLI-13	6"	86.25"x48"	3"x3"***	WTW-2	6"	WH/MB
WLI-13	6"	86.25"x48"	-	WTW-6	6"	WH/MB



For the unfamiliar user, orientation for boaters on a lake project can be very confusing. This problem is compounded on lakes that have inlets or secondary channels that appear as large as the main channel when viewed from the water.

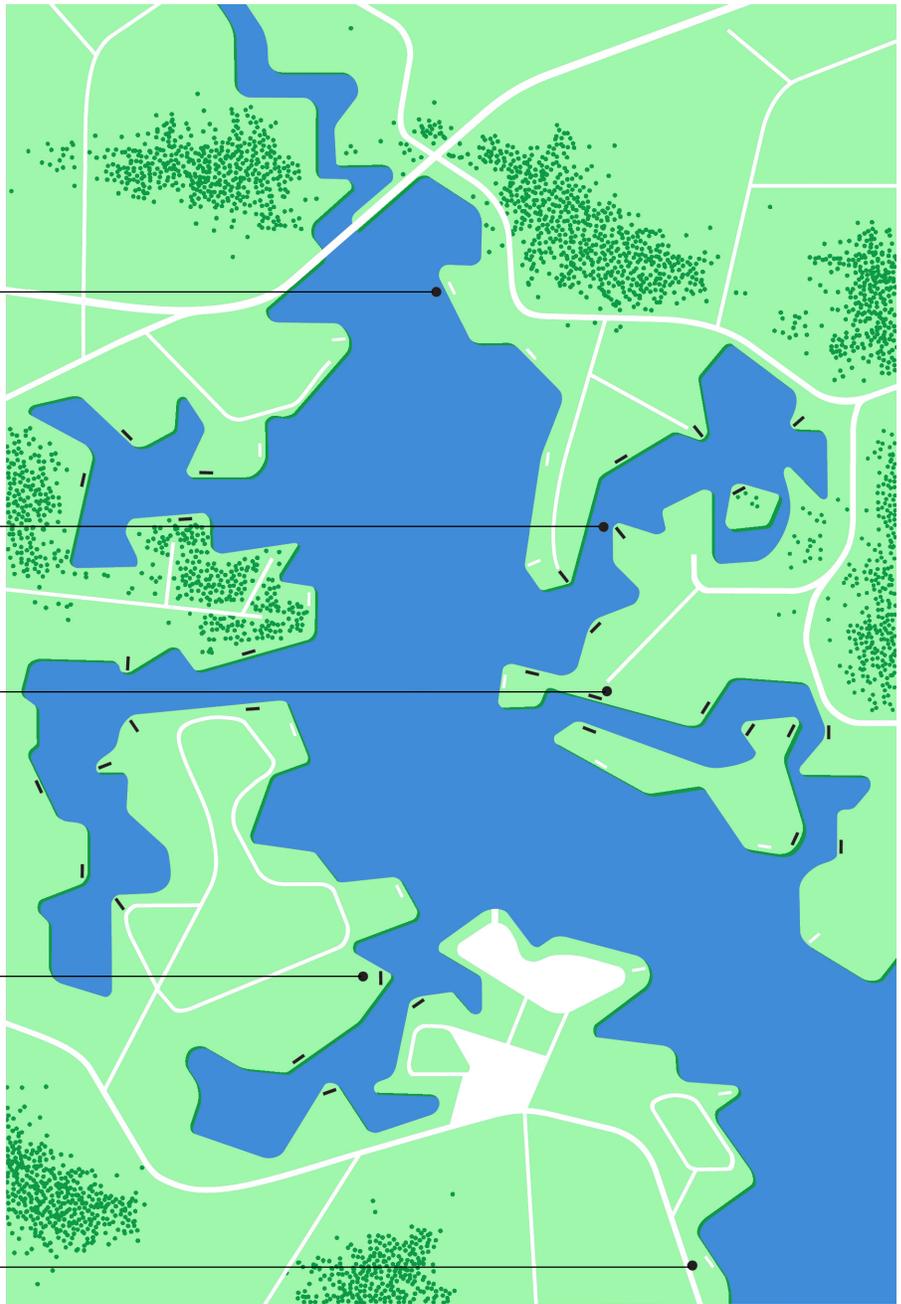
The two types of signs shown below are provided for use on lakes. These are

optional and include shoreline mile markers and guide signs to principal lake services, using a limited group of recreation symbols. The mile and inlet marker system is intended to aid navigation by boaters who are unfamiliar with the project. These signs are placed along the shore at prominent points at appropriate increments. Although the mile marker indicates the mile point, exact placement

should be conspicuous and may not be at the precise mile point. Mile markers are used in addition to USCG Aids to Navigation, and are not to be used as a substitute.

The guide signs are used to direct boaters to key service destinations or designated recreation areas on the lake.

To introduce a marking system, the mile marker and guide sign program may also be illustrated in the project folder map, showing the location of each point for boaters reference.



Mile markers are used as a guide for lake visitors and as reference points for law enforcement and emergency personnel. The most common approach to planning a mile marker program is to place mile marker signs in increments from the dam to the upper end of the lake. The first mile marker would typically be one mile from the dam. Local conditions will dictate distance between mile marker signs and if signs should be mounted on both

sides of the main lake channel.

Secondary channels are differentiated by using a reversed color format, and smaller size panel, and may be shown with a letter used in conjunction with the mileage from the mouth to its upper extent at the respective mile points as illustrated.

Mile markers are designed as single face

signs mounted parallel to the shoreline. Certain locations may require a double face assembly for optimal viewing from all approaching directions.

Consult with the district Sign Program Manager if this method of marking a lake project is not appropriate to a specific project because of unique characteristics of the shoreline that may dictate an alternate method of marking.

The mile marker has a broad border and uses the Helvetica Medium typeface for maximum legibility when viewed from a long distance. Refer to Corps standard letter-spacing, Appendix D, page D-12.

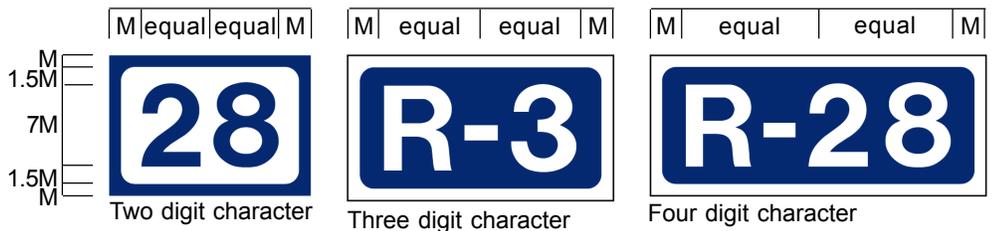
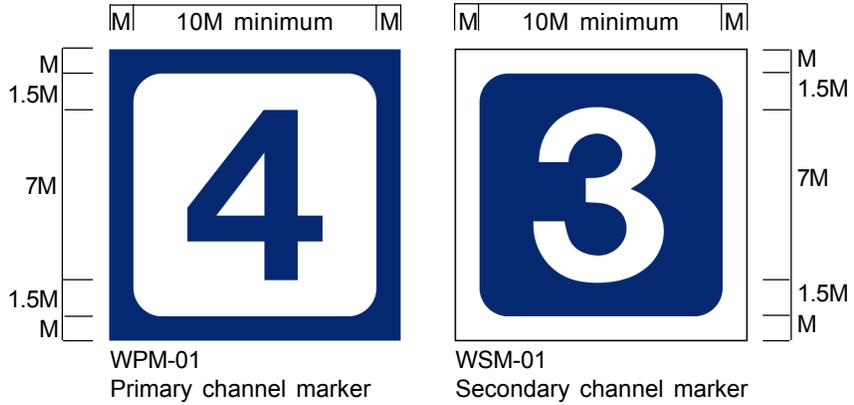
The design of both the mile markers and the symbols are built on a square format. Mile markers with multiple digit legends will be wider depending on the length of the legend. The legend is always centered on the panel. The minimum distance between the number or letter and the inside edge of the border is never less than 1.5M.

The panel color is shown with Medium Blue figure and border on a white field for primary channel marking. Secondary channel markers use the same colors, only in reverse with white border and legend on a Medium Blue field. The panel graphics are fabricated using retroreflective sheeting.

The size of the panels for primary channels should be uniform throughout. The size of the secondary channel signs may be smaller if the channel width is appreciably reduced. For example, if a 60" panel is necessary for the primary channel, then a 48" panel may be more appropriate for the secondary channels. Mile markers are sized using the standard viewing calculation (1 inch per each 28 feet of distance). The basic goal is to provide the marker as a reference point, even though the sign may not always be easily read from every mile point along the channel.

To minimize wind load, the mounting height above grade level (HAGL) is kept low, reducing the need for overly elaborate footings, and preventing too much disruption of the quality of view. The base of the sign panel is to be mounted above the high water line of normal recreation pool. Carefully plan placements so that during low water the installation will not be so far from the waterline that its function is not easily understood.

For placement guidelines refer to page 14-57.



Sign Type	Margin Size (A)	Legend Size (A)	Panel Height Formula	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
*	2"	14"	24"	2"x2"***	WTW-2	48"	***
*	3"	21"	36"	2"x2"***	WTW-2	48"	***
*	4"	28"	48"	2"x2"***	WTW-2	48"	***
*	5"	35"	60"	2"x2"***	WTW-2	48"	***
*	6"	42"	72"	2"x2"***	WTW-2	48"	***

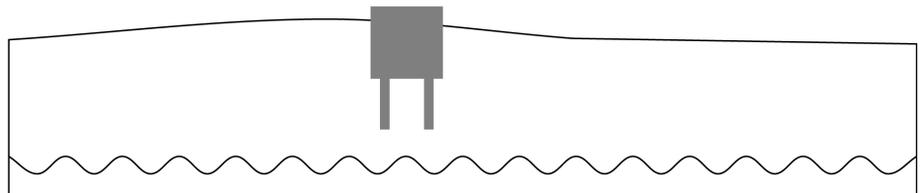
* WPM-01 for primary channel, WSM-01 for secondary channel

** See Engineered example, page B. 13-11

*** Secondary channel, W/B

Viewing Distance Guide

Panel Size	Viewing Distance
24" x 24"	400'
36" x 36"	600'
48" x 48"	800'
60" x 60"	1,000'
72" x 72"	1,200'



These guide signs are used to eliminate the need for guide and identification signs with worded legends, and any commercial signing being placed along Corps lakes and waterways.

The guide signs provide a uniform format directing boaters to key destina-

tions including marinas, boat ramps, and where appropriate, to designated swimming and waterskiing areas. These signs are the same as the recreation symbols shown in Section 8, although they are built to a different format for this shoreline application.

The size of the panels, scaled for long distance viewing is similar to the mile markers using the simple size formula provided below, and are to be placed at key decision points only, and not along the length of the shoreline.

The sign color is Medium Blue with a white figure, outline border and arrow. It is always shown with a lower panel containing the directional arrow to guide boaters to the specific destination. The panel graphics are fabricated using retroreflective sheeting.

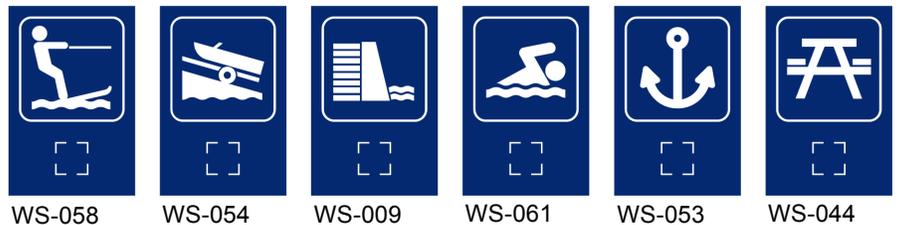
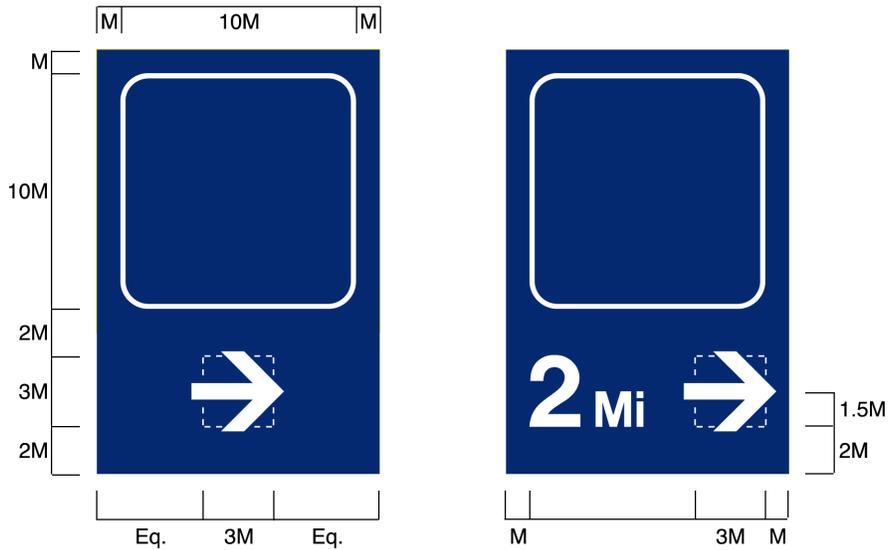
Two formats are shown for the section of the panel below the symbol. Standard applications use only a Helvetica Medium arrow centered on the panel. Where applicable, distance to the services or special areas may be displayed in the format illustrated.

The typeface is Helvetica Medium and follows Corps standard letter-spacing, Appendix D, page D-12. Reproduction artwork for the six symbols and the Helvetica Medium arrow are provided in Appendix F.

These panels are to be mounted low to the ground to reduce wind loading and the need for overly large foundations. Make sure signs are mounted above the high water line of normal recreation pool. Signs are mounted parallel (single face) or perpendicular (double face) to the shoreline. For placement guidelines, refer to page 14-57.

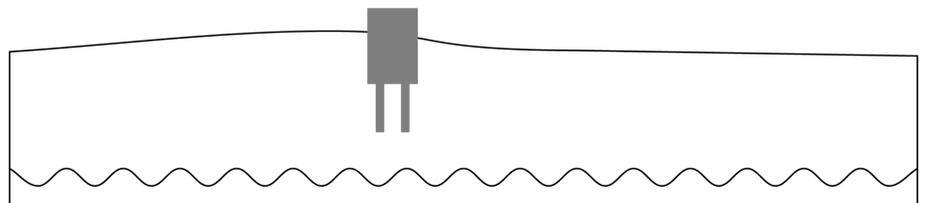
Viewing Distance Guide

Panel Size	Viewing Distance
24" x 36"	400'
36" x 54"	600'
48" x 72"	800'
60" x 90"	1,000'
72" x 108"	1,200'



Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WS-000	2"	24"x36"	2"x2"*	WTW-5	48"	MB/WH
WS-000	3"	36"x54"	3"x3"*	WTW-5	48"	MB/WH
WS-000	4"	48"x72"	3"x3"*	WTW-2	48"	MB/WH
WS-000	5"	60"x90"	4"x4"*	WTW-2	48"	MB/WH
WS-000	6"	72"x108"	4"x4"*	WTW-2	48"	MB/WH

* See engineered example, page B. 13-12



It is the policy of the Corps to operate and maintain jetties, groins, and breakwaters to aid navigation and to protect shorelines in a manner that does not enhance or encourage recreational or other public use unless a nonfederal entity has sponsored recreation.

Authority

As described in Engineer Pamphlet 1130-2-520, Chapter 3, Protection of Public Health and Safety at Jetties, Groins and Breakwaters, the Division Commander may select one of three alternative approaches as described in this section to meet minimum health and safety needs, including the placement of Danger, Restricted and Warning signs at Corps maintained jetties, groins and breakwaters. The determination of which alternative or combination of alternatives to select is based upon site-specific rationale.

Program Implementation

At each location, the district or project office should analyze and select one of the below listed alternative approaches to safety marking the area or structure.

No Action: This “do nothing” alternative provides the lower end of a range of options and may be appropriate for instances where the district considers that negligible safety hazards exist or public access is not readily provided.

Post Danger Signs: Under this alternative, Danger signs would be posted, regularly inspected and replaced as often as necessary to inform and alert the public of hazardous conditions related to the jetty, groin or breakwater. This alternative provides safety information for public visitors while not encouraging public use of these structures. Because recreational use of jetties, groins and breakwaters is normally not encouraged, this alternative should be carefully considered before being selected.

Deny Entry or Access: This alternative is to be employed normally. Consideration should be given to the extent of public use and determination of potential hazards. Installation of a fence, barricade or other suitable construction that precludes entry or access onto jetties, groins and breakwaters on an individual project basis, may be necessary in dealing with a particularly dangerous jetty, groin or breakwater.

Evaluation Criteria

Conditions at each structure will need to be evaluated on a site-by-site basis to determine what restrictions, warnings, or type of access may be allowed at a particular structure.

The evaluation of each structure should be carefully formulated against locally developed criteria. Once an approach is defined, a sign plan and appropriate controls and maintenance systems must be developed to implement and support the plan.

Listed below are criteria that may be used to determine what level of control is implemented at a location to restrict or allow access.

Restrict Access: Because these facilities were not built for recreational use, they do not include the standard provisions for public safety such as guardrails, wide or smooth walkways, or the availability of lifesaving equipment. To this end, access should be allowed only when the following conditions are not considered to be extreme.

a) Water subject to sudden rise and cresting over the structure during storm conditions.

b) Strong currents, violent turbulence or air-entrainment on either side of the structure would prohibit someone from treading water until they are rescued.

c) Dangerous breaks in the structure, sharp, unprotected drops, unsafe pavement, or possible slippery surface conditions.

d) Length of the structure is so long that safe egress under storm conditions is not possible.

e) Winter season access is unsafe because of icing, waves cresting over structure, or other hazardous environmental conditions.

f) Water above a normal level may dictate access limitations.

g) No nearby electronic communications, emergency medical services or related lifesaving equipment within a reasonable time or distance zone.

h) History of severe accidents on the structure that could be avoided if access were prohibited.

i) No local assistance provided for costs associated with recreation related uses of the structure.

Allow Access: Access to a structure is allowed only when it is determined to be appropriately safe for the general public. Listed below are the conditions under which public access may be allowed.

a) The adjacent water conditions are determined to be safe for use within the posted limitations and cautionary warnings.

b) Policed and managed by cost share sponsor.

c) Available for use within the posted recreation season.

d) Access allowed out to, but not beyond a certain point.

e) Structure has appropriate guardrails, safe walking surfaces and good maintenance of these systems as to not entrap the public or falsely create the appearance of safety.

f) Access to communications equipment and medical services within proximity to the structure.

Sign Types

The signs used to restrict access or identify a danger will follow Corps standards for white on red Danger and Restricted Area signs. The signs used to alert the public of a potential hazard will follow Corps standards for black on Lemon Yellow Warning signs. For a description of Safety Signs and their application, refer to page 2-13 through 2-16 of this manual.

Prohibition Symbol signs as specified in Section 8, may also be used when signing jetty and breakwater structures where appropriate.

Sign Format

Signs on jetties and breakwaters use the standard grid formats as shown in Section 7. The typeface is Helvetica Bold and follows Corps standard letter- and word-spacing, Appendix D, page D-9.

Aids to Navigation

It is the responsibility of the Coast Guard to properly mark all jetties, dikes, groins and breakwaters for navigation purposes.

All Corps safety signs used on or around jetties, groins and breakwaters are to be used in conjunction with the United States Coast Guard Aids to Navigation. Generally the signs placed by the Corps are intended for viewers approaching these structures from land, not water, and should not conflict with Aids to Navigation (see Section 15).

Weather and Vandalism

Signs mounted on structures are subject to accelerated wear and damage by harsh weather conditions and are frequently defaced through malicious acts. The design, selection of materials and mounting of these signs should be such that these problems will be minimized.

Maintenance

Once signs are placed on or around a navigation structure, they must be inspected and maintained on a routine schedule that minimizes the chance that the sign will be damaged beyond usefulness. For general maintenance planning and procedures refer to Appendix C.

Materials and Sign Fabrication

The materials generally specified for normal Corps recreation project signing may not be adequate because of harsh environmental or weather conditions or because of presence of excessive vandalism. Where these conditions require, alternate material specifications may be used. The fabrication and material specifications should use heavier gauge materials for both sign panel and posts with welded construction to overcome actions that destroy normal structures. Most sign faces that are defaced or destroyed can be resurfaced in the field at minimal cost. Although the initial cost will be higher for these types of installations, the long term benefits should outweigh this one-time investment.

Since jetty and breakwater signs are intended for pedestrian viewing, smaller panels that are less easily vandalized may be used, or where possible be mounted beyond the normal reach of visitors. The welded construction will limit access to mechanical hardware for purposes of tampering.

Placement

Place jetty or breakwater safety signs on the structure or in close visual proximity to the access point. The function is to identify dangerous conditions on or around the structures. The signs may be placed for viewing from land-side or water-side depending on viewers' approach and conditions identified. The sign is mounted on the bank facing away from the water's edge or as a double face sign mounted perpendicular to the bank. As a land-viewed sign, it is preferable that several smaller signs be placed closer to the viewer in series, instead of one overly large sign viewed from a greater distance.

Illustrated below is a schematic plan showing both an improved and an unimproved jetty, and an unconnected breakwater.

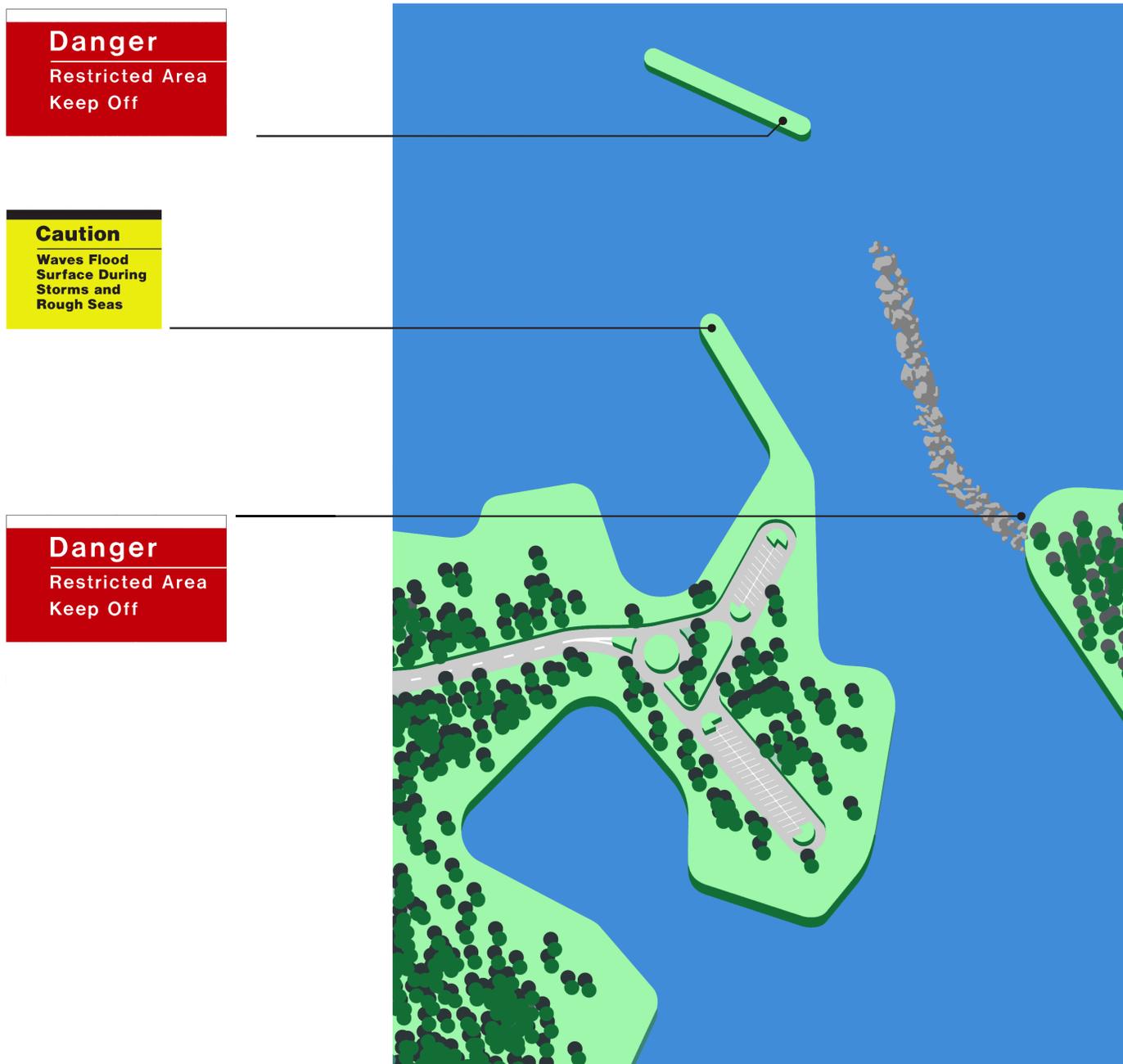
and is appropriately marked around the perimeter with "Danger: Restricted Area, Keep Out" signs.

jetty are very unsafe.

The jetty extending out into the water on the left side of the diagram is adjacent to a state park and is considered safe enough for controlled recreational use during the recreation season.

Access to the freestanding breakwater at the mouth of the harbor is not allowed,

The jetty on the right is also designated as a restricted area, and has been signed accordingly because conditions on the



If access is prohibited onto a structure for purposes of maintaining reasonable public safety, signs and appropriate fences and barricades may be limited to the structure's access points. Once public access has been restricted, all signage and physical barriers should be maintained. Shown below are the

various signs that may be used for this purpose. If the structure is too dangerous to allow access, the restrictive signs are Danger signs, not Warnings.

Signs are placed to clearly notify that access is not allowed. They should be sized for easy reading from an appropri-

ately safe distance. A sign that is under-sized relative to viewing requirements may not be seen as needed. Conversely, an overly large sign can unnecessarily overwhelm an area. To properly size signs for a location, refer to the Viewing Distance Guide on page 2-6.

The sign background color is red retroreflective sheeting with white retroreflective legend, overbar and rule. Sign to use the standard grid formats as shown in Section 7.

The typeface for WDA-24 and WRE-24 below is Helvetica Bold and follows Corps standard letter- and word-spacing, Appendix D, page D-9.



WDA-24

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-24	2"	32.25"x18"	Engineered	WTW-3/5/6	36"	RD/WH
WDA-24	3"	48.5"x27"	Engineered	WTW-3/5/6	36"	RD/WH

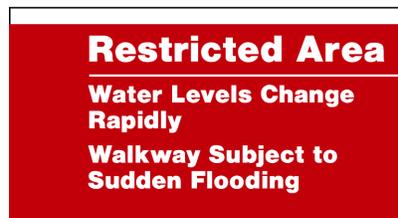
For viewing from water. For larger sizes refer to standard Grid 1 in Section 7.

The typeface for WDA-25 is Helvetica Medium and follows Corps standard letter- and word-spacing for waterway signs.



WDA-25

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-25	2"	33"x19"	Engineered	WTW-3/5/6	36"	RD/WH
WDA-25	3"	49.5"x28.5"	Engineered	WTW-3/5/6	36"	RD/WH



WRE-24

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WRE-24	2"	46.625"x25"	Engineered	WTW-3/5/6	36"	RD/WH
WRE-24	3"	69.875"x37.5"	Engineered	WTW-3/5/6	36"	RD/WH

If the public is permitted to use a jetty or breakwater for recreation purposes, they are instructed that they are proceeding at their own risk (see 14-49). If the Corps allows public access, specific hazards or dangerous conditions must also be marked in such a way that the public is not endangered or unaware of the nature of the hazard-

ous condition. For this purpose, standard Corps Danger signs are provided in Section 7 and on pages 14-20 through 14-27 of this section. Additional Danger signs are shown below for use on jetties and breakwaters.

(see Section 8), while only using the standard Danger signs where they are necessary.

Signs are sized for easy reading from an appropriately safe distance. To properly size signs for a location, refer to the Viewing Distance Guide on page 2-6.

Some prohibitions may more appropriately be signed using Prohibition Symbol signs

The sign background color is red retroreflective sheeting with white retroreflective legend, overbar and rule. Sign to use the standard grid formats as shown in Section 7.

The typeface is Helvetica Bold and follows Corps standard letter- and word-spacing, Appendix D, page D-9.

These signs are intended for relatively short viewing distances. If a long structure is to be signed, use smaller signs more frequently rather than a few larger signs. Place an appropriate number of signs to adequately identify the hazard without over-signing the structure. However, balance is required because if there are too many signs, viewers may disregard the most important ones.

The Danger, Caution, and Warning signs used in this manual cannot be changed without HQUSACE approval. For all signs listed below, identical legends are approved as both Danger and Warning signs.

WDA-28 (right) and WWA-21 on page 14-50.

Determination of whether a Danger or Warning sign is to be used will be made by the project manager after considering the conditions and severity of the hazard. Please refer to the discussion of safety signs in Section 2, pages 2-13 through 2-15.



WDA-26

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-26	2"	32.75"x23"	Engineered	WTW-3/5/6	36"	RD/WH
WDA-26	3"	49.125"x34.5"	Engineered	WTW-3/5/6	36"	RD/WH



WDA-27

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-27	2"	30.5"x24"	Engineered	WTW-3/5/6	36"	RD/WH
WDA-27	3"	45.75"x36"	Engineered	WTW-3/5/6	36"	RD/WH



WDA-28

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-28	2"	32.75"x21"	Engineered	WTW-3/5/6	36"	RD/WH
WDA-28	3"	49.25"x31.5"	Engineered	WTW-3/5/6	36"	RD/WH



WDA-29

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WDA-29	2"	30.125"x25"	Engineered	WTW-3/5/6	36"	RD/WH
WDA-29	3"	45.125"x37.5"	Engineered	WTW-3/5/6	36"	RD/WH

At locations where public access is allowed, Warning or Caution signs are used on jetties and breakwaters to call attention to a potential hazard or a hazard capable of resulting in injury or damage. In some instances, the hazards may be those associated with Danger signs but

are of a significantly less magnitude to warrant only using a Warning sign.

Shown below are a group of Warning signs specified for use on jetties and breakwaters on a site specific basis.

Signs should be sized for easy reading from an appropriately safe distance. To properly size signs for a location, refer to the Viewing Distance Guide on page 2-6.

The sign background color is Lemon Yellow retroreflective sheeting with black nonreflective legend, overbar and rule. Sign to use the standard grid formats as shown in Section 7.

The typeface is Helvetica Bold and follows Corps standard letter- and word-spacing, Appendix D, page D.9.

For viewing from water. For larger sizes refer to waterway sign specifications on pages B. 13 through B. 13-13.

The Danger, Caution, and Warning signs used in this manual cannot be changed without HQUSACE approval. For all signs below, identical legends are approved as both Danger and Warning signs.

- WWA-21 (above) and sign WDA-28 on page 14-49.

- WWA-22 (right) and DNG-12 in Section 7.

- WWA-23 (below) and WDA-31 on page 14-21.

Determination of whether a Danger or Warning sign is to be used will be made by the project manager after considering the conditions and severity of the hazard. Please refer to the discussion of safety signs in Section 2, pages 2-13 through 2-15.



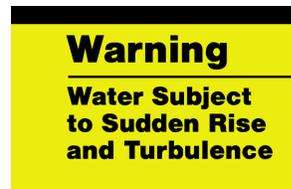
WWA-21

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-21	2"	32.75"x21"	Engineered	WTW-3/5/6	36"	LY/BK
WWA-21	3"	49.125"x31.5"	Engineered	WTW-3/5/6	36"	LY/BK



WWA-22

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-22	2"	26.375"x26"	Engineered	WTW-3/5/6	36"	LY/BK
WWA-22	3"	39.5"x39"	Engineered	WTW-3/5/6	36"	LY/BK



WWA-23

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-23	2"	32.375"x21"	Engineered	WTW-3/5/6	36"	LY/BK
WWA-23	3"	48.5"x31.5"	Engineered	WTW-3/5/6	36"	LY/BK



WWA-24

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-24	2"	24.625"x21"	Engineered	WTW-3/5/6	36"	LY/BK
WWA-24	3"	37"x31.5"	Engineered	WTW-3/5/6	36"	LY/BK

The sign background color is Lemon Yellow retroreflective sheeting with black nonreflective legend, overbar and rule. Sign to use the standard grid formats as shown in Section 7.

The typeface is Helvetica Bold and follows Corps standard letter- and word-spacing, Appendix D, page D.9.

The Danger, Caution, and Warning signs used in this manual cannot be changed without HQUSACE approval. For all cases below, identical legends are approved as both Danger and Warning signs.

WWA-30 (right) and sign WDA-23 on page 14-21.

Determination of whether a Danger or Warning sign is to be used will be made by the project manager after considering the conditions and severity of the hazard. Please refer to the discussion of safety signs in Section 2, pages 2-13 through 2-15.



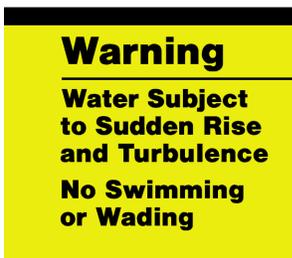
WWA-25

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-25	2"	32.5"x24"	Engineered	WTW-3/5/6	36"	LY/BK
WWA-25	3"	48.75"x36"	Engineered	WTW-3/5/6	36"	LY/BK



WWA-26

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-26	2"	31.375"x24"	Engineered	WTW-3/5/6	36"	LY/BK
WWA-26	3"	47"x36"	Engineered	WTW-3/5/6	36"	LY/BK



WWA-30

Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWA-30	2"	32.375"x28"	Engineered	WTW-3/5/6	36"	LY/BK
WWA-30	3"	48.5"x42"	Engineered	WTW-3/5/6	36"	LY/BK

Two symbols have been developed to communicate specific hazards of jetties and breakwaters. They have been formatted as slat signs or symbol signs. These signs may be placed near the entry to jetties or breakwaters.

The use of symbols in regions that contain diverse populations where multilingual barriers exist is an effective way of conveying a message and eliminates the need for separate signs for each language.

The sign background color is Lemon Yellow retroreflective sheeting with black nonreflective legend and symbol. Sign to use the standard grid formats for symbol and slat signs as shown in Section 8.

The typeface is Helvetica Bold and follows Corps standard letter- and word-spacing.



HS-001



HS-002

Deadly Waves at Any Time
HS-001



Jetty Unsafe for Walking
HS-002



The Waterway Identification sign is used to identify Corps managed waterway and navigation channels to auto traffic on bridge and causeway crossings. This is part of an ongoing effort by the Corps to comprehensively identify the nation's waterway system in a uniform way, showing that it is part of a nationwide navigation system.

A secondary benefit is to enhance the image of the Corps and identify the Corps as the primary managing agency of this waterway system. The hundreds of waterway viewpoints at bridge crossings provide an excellent opportunity to identify the Corps and its facilities to the thousands of people crossing at these various points.

The sign developed for this purpose follows the basic design used to identify the Corps recreation and flood control projects. This includes the name of the waterway shown in a one-to-three line flush-left format using the Corps Standard Helvetica Bold typeface. To the left of the waterway name is the Corps Communication Mark and Signature. No district or division names are placed on these panels.

The coastal and inland waterway systems should be identified only where signs can be placed effectively. These signs are generally mounted adjacent to the approaches to bridges and causeways that cross the arteries of this system. Although the signs should not be overly large, they must afford a driver "glance recognition" at

normal roadway speeds. A sign with a 4" primary legend will be the standard size for most locations.

These signs are to be placed on the right side of roadways, perpendicular to the approaching viewer. Signs are placed on both sides of the bridge for viewing from each respective approach. They should be

located within the approaching viewer's cone of vision. This means that the left edge of the sign will generally be between 10'-14' off the paved right-of-way.

Local approvals may be required prior to placing signs. Consult with the local highway department on all Waterway Identification sign placements.

A smaller sign with 2" primary legend may be mounted on a guard rail or post if there is not adequate space for the larger sign.



For most two-to-four lane roads, a sign with a 4" primary legend (initial capital letters) is appropriate.



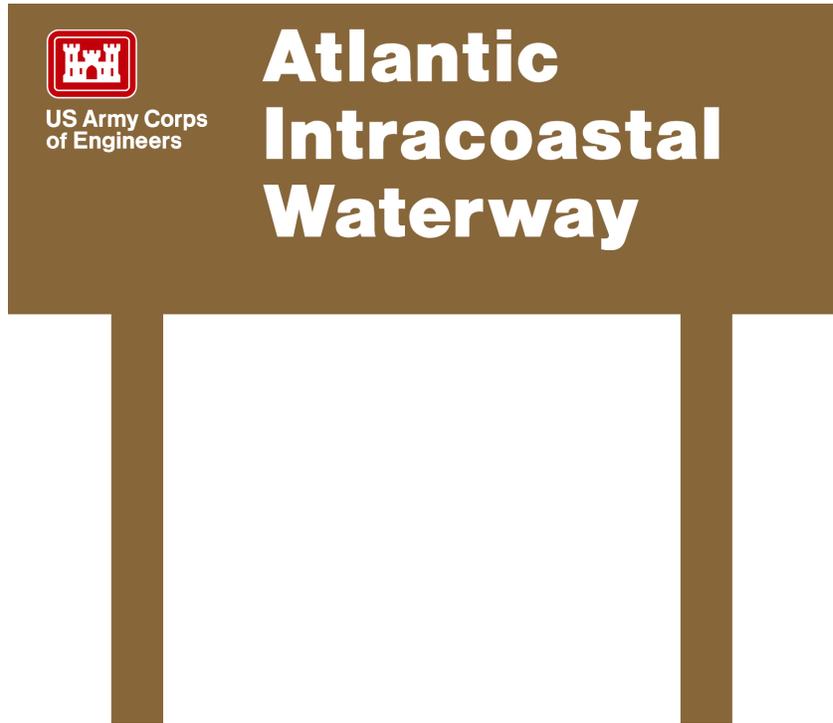
On wider, high-speed roads a sign with a 6" primary legend may be easier to read without appearing too large or out of place. Larger panels are placed at least 100 feet in advance of the crossing.



Displayed below are examples of a Waterway Identification sign. As shown, the name on the sign may differ from the legislated project name. These modifications are made in an attempt to communicate clearly and succinctly to passing traffic.

On many waterway systems such as the Monongahela River where the Corps manages the locks and dams, but not the bridges, placement of the Waterway Identification sign may not be appropriate at each crossing.

The sign has a Corps Brown retroreflective background with white retroreflective legend. The Corps Mark is Communication Red, as shown on page 4-3.



The layout grid format for the Waterway Identification sign has been modified from the Standard Identification sign in Section 5 with the following modification to increase glance legibility. For this application, a third line has been added to the layout grid for the primary legend for longer legends. This allows the

width of the panel to be slightly shorter for the few legends that would normally be placed on a sign with a two-line primary legend like Tennessee-Tombigbee Waterway. The procedure for calculating a sign panel's length and height follow the standards shown in Section 5. Because secondary legends place too many words

on a sign that is being read at a glance, their use is discouraged for this type of sign. If a secondary legend is placed on a sign, follow the Standard Identification sign grid format as provided in Section 5.

Grid diagram for a panel with three-line primary identification legend. Panel width and size of Corps Signature follows Standard Identification sign grid format provided in Section 5 with allowance of third line of primary legend.

Because these signs are to be mounted to the right side of the roadway edge, local site conditions such as rapid fall-off of grade, drainage culverts, and rocky fill may make placement difficult. Each installation should be carefully planned to ensure the most appropriate sign location.

The assembly method follows the HDO-4 or ALU-4 specification code. The legs of the HDO-4 and ALU-4 sign are closer together making the sign easier to mount on steep grades common to the edges of roads. This assembly also requires fewer structural members, resulting in lower installations costs.

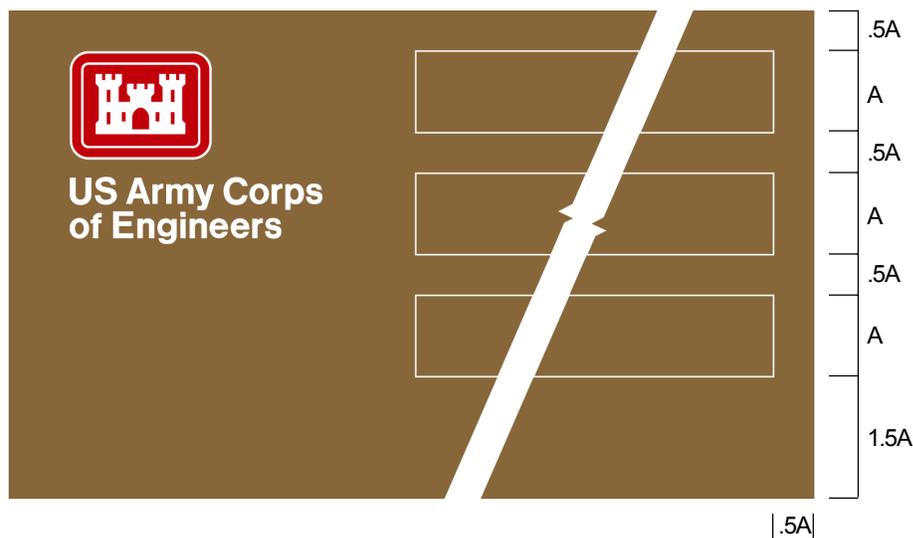
Since this sign is always placed to the right of the approaching lane of traffic, a double face assembly should not be required.

Mounting posts are attached to the sign panel at an inboard distance of twice the legend height (if A=4, then 8") from the outside edge of the post to the edge of the sign panel.

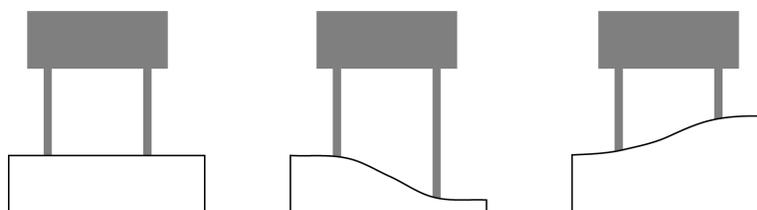
* Panel size varies with legend length and configuration.

** Post size and number of posts required will depend on size of the sign panel. Refer to specifications in Appendix B.

This diagram illustrates mounting of the Waterway Identification sign using the HDO-4 or ALU-4 assembly as applied to various grade configurations.



Sign Type	Legend Size (A)	Panel Size	Post Size	Specification Code	Mounting Height	Color Bkg/Lgd
WWWSTID	2"	*	**	HDO-4/ALU-4	36"	CB/WH
WWWSTID	4"	*	**	HDO-4/ALU-4	36"	CB/WH
WWWSTID	6"	*	**	HDO-4/ALU-4	36"	CB/WH



The actual plan for sign placement will be developed for each project site on a site-by-site basis. The guidelines on the following pages determine the best size, location, and viewing distance for maximum sign legibility. Other sign type and placement information is provided on the respective display pages in this section.

It is impossible for these guidelines to anticipate all conditions. Questions concerning interpretation of these guidelines relative to a specific site should be referred to the project Sign Program Manager. Please note that to effectively sign many locations will be a difficult design and engineering challenge that may require considerable field work and the assistance of district and division specialists before the most effective approach is developed and refined.

Once a sign plan is developed, refer to the waterway sign sections of Appendix B: Materials and Specifications for engineering intent reference materials for each respective mounting.

Small safety signs are placed on the riverbank, dam and on lock structures. Most of these signs are intended for viewing at relatively short distances and need not be overly large. Standard signs have been specified in common sizes on the respective display pages for each sign type in this section. They can also be specified in larger sizes and engi-

needed for placement on site-by-site basis.

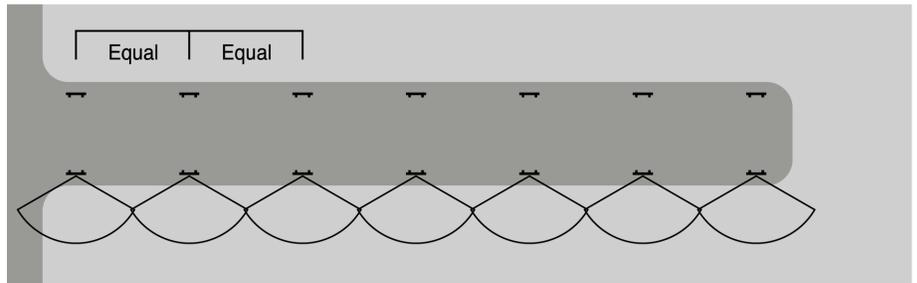
Local conditions will dictate whether this sign is placed parallel to the edge of a river or structure (single-faced panel), or perpendicular (double-faced sign). It is recommended that signs not be oversized. Place several smaller signs along

a structure or riverbank. More frequent placement is more effective because viewers are provided with the information close to the area being signed. Generally, smaller signs are also easier to maintain and less expensive to install. Placement should be such that the sign is not submerged during high water or placed too far from the water's edge during low water levels.

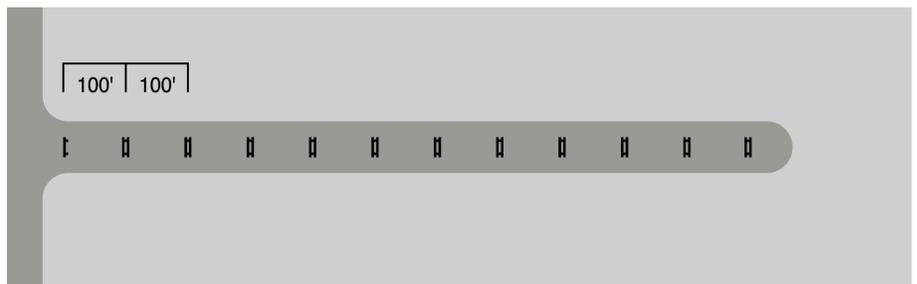
Single face signs mounted perpendicular to entry of an area being signed. Restricted access should be posted in conjunction with the appropriate fencing or buoy lines.



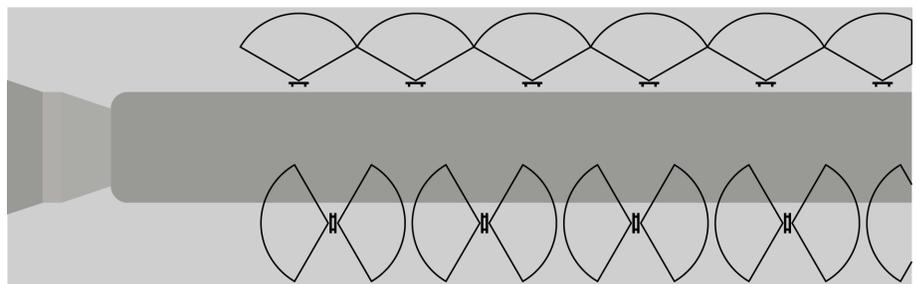
To control access or warn of hazards, single face signs are placed at equal increments along a waterline.



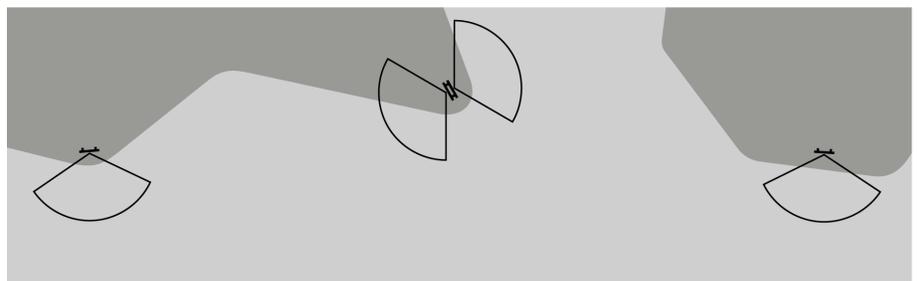
To periodically warn viewers or restrict access, single or double face signs may be placed at appropriate increments along a structure or shoreline. These signs are placed perpendicular to the viewers approach. If access is allowed, warnings should be affirmed along the entire area of exposure.



Depending on configuration of the site, shorelines below a dam may be signed for viewing perpendicular to the waters edge or parallel. Signs mounted perpendicular to the edge are generally double face. Signs parallel may be double or single face depending on the needs for warning.



Lake mile markers are placed parallel to the shoreline. Symbol directional signs may be placed either perpendicular or parallel to the shoreline depending on the site lines of the specific location.



Water-viewed safety signs are placed on river banks and/or on midriver stanchions in approach to a dam. Sign panels identify hazards and provide information for boaters within each respective safety zone as described on pages 14-2 through 14-6. Determination of need, location and size for these large Warning, Danger and Restricted signs are identified and engineered on a project-by-project, site-by-site basis. Sign size and placement guidelines and calculations are provided in this section. Local conditions will dictate the precise number of safety zones needed to be signed above a dam (as illustrated below).

The dam structure is generally visible from upstream. If hazards from open spillways and intakes can be mitigated using fewer signs closer to the structure, there may be no need for a multi-zone sign warning system.

Sign panels are sized using a standard viewing distance/legend size formula (as shown on the following page), but the large number of variables makes the preparation of a sign plan specific to each location.

Placement of these signs requires a review of high and low water levels. The sign must be positioned so that during high water level the sign panel is not submerged, while at low water level the distance of the sign to the boater does not create a confusing viewing condition. Vegetation in front of and next to a sign will need to be properly controlled to ensure good visibility.

Compared to signs viewed from land, placement and sizing for water-viewed signs is extremely difficult. Varying water flow, fluctuating river widths, structural obstacles, extreme light conditions and unpredictable viewing situations make this a complex environment in which to effectively place signs. These issues influence the specific safety zones including warning, danger and restricted areas. These random viewing conditions necessitate the planning for a "worst case condition" to accommodate the multiple viewing constrictions that may occur. Through scientific research and field testing, general standards in this manual have been developed to create a system that accommodates the appropriate legend size, panel format and correct sign placement.

Although many unsafe conditions resulting from poor judgement, such as

navigating under the influence of alcohol or proceeding during storm conditions, cannot be controlled, standards have been developed around conditions that can make the sign more effective during difficult viewing conditions. This includes sizing legends for viewers with 20/40 visual acuity, using common referential colors that use viewers' prior experience, making legends succinct and simple, placing signs visible across an entire area and providing a sign placement system with adequate warning so viewers are not entrapped within unsafe areas. In summary, the safety of boaters is enhanced if they can see a sign, read the message, understand or interpret the information and respond accordingly, all within a calculated margin of safety before they enter the indicated safety zone.

Selection of the appropriate sign size and placement is described below. First, determine the appropriate size of the safety zones for each unique dam configuration. Mark these safety zones on a site plan of the waterway and verify the river widths at the indicated zones, see Diagram 1.

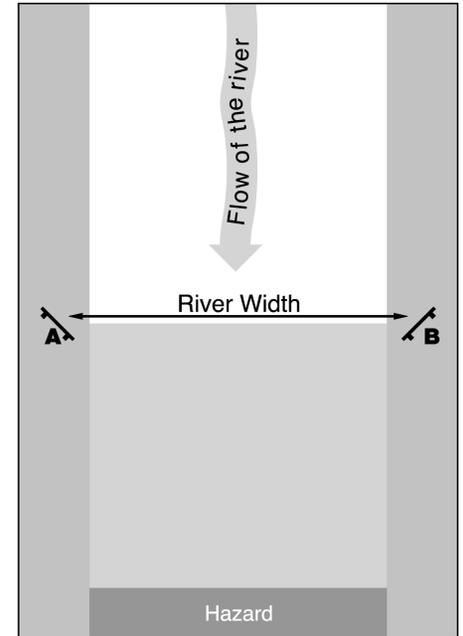
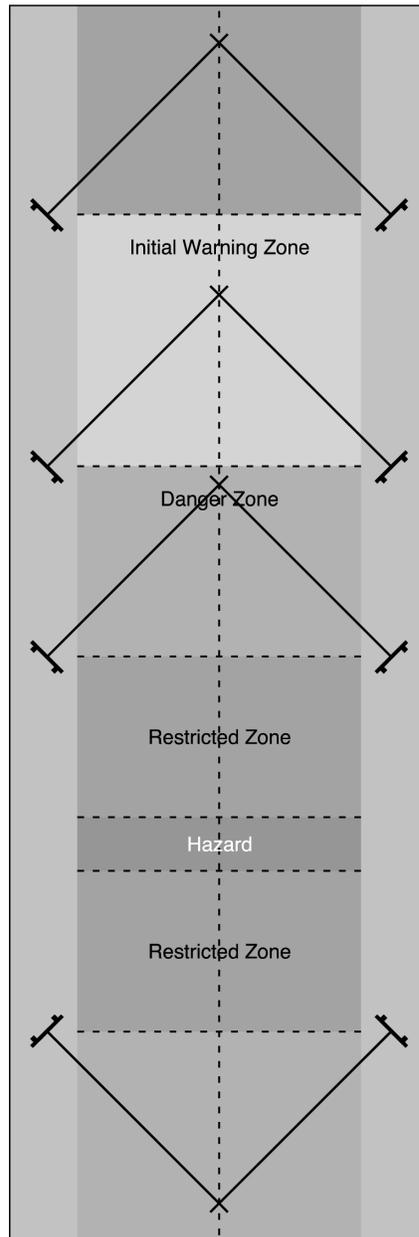


Diagram 1

Signs are to be placed at an angle of 45° to the river, thus creating a 90° angle (AM1-B), see diagram 2. This will allow for use of the smallest size panel that is needed in this particular location while allowing for good legibility within the area being



Safety zone diagram

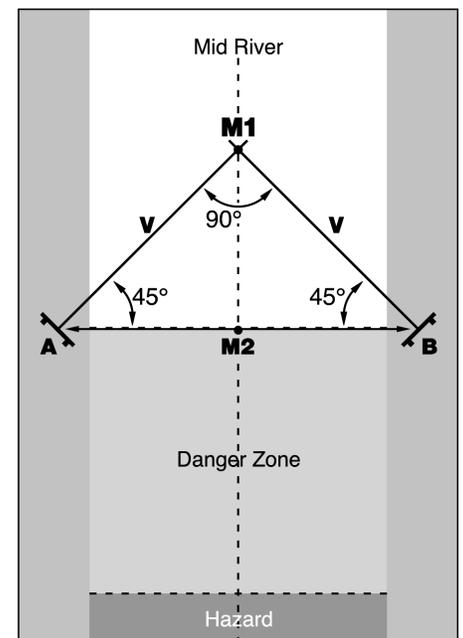


Diagram 2

signed. By placing both sign panels at the same angle to the river, the farthest viewing distance from the sign is at a midriver location (M1) under most conditions. Do not exceed the angle to the river by 45° since this will deteriorate the legibility of the sign panel. The viewing distance (V) from midriver (M1) to the sign panel is now:

$$V = (M1 - M2) / \cos 45^\circ$$

$$M1 - M2 = 0.5 \text{ River width (for } 45^\circ \text{ only)}$$

$$V = (0.5 \text{ River width}) / 0.707$$

For example, a river width of 300 feet, results in a viewing distance of 150 feet divided by 0.707 = 212 feet (rounded off). Once the viewing distance is determined, the capital letter height (A) and the correct panel dimensions can be calculated. A is defined as $A = V / 28$ where 28 feet has been determined as the distance a person with 20/40 visual acuity can read a one (1) inch high letter that has a 1:5 ratio of stroke width to letter height adjusted to accommodate upper and lower case legends (initial capitals only). Translating (A) to a number gives the exact size for each sign panel, using the proportional dimensions provided on the specific sign display page.

In summary, the smallest sign panel is acquired by using an angle to the river of 45°. The viewing distance is then calculated by using the indicated formula. This system results in a reaction distance (M1 - M2) which is equal to half the river width. Reaction time is the time used to view a sign, read the message, process the information and act, before the indicated safety zone is reached and should be accomplished on a project-by-project basis as local conditions dictate. Due to local conditions, it may sometimes be desirable to enlarge this reaction time to allow the boater more time to respond to a message. Such conditions are, but are not limited to:

Water Flow

The speed of the water will affect the reaction time of the boater. Fast flowing water at high water levels will shorten the reaction time, in which case a longer reaction distance is needed to give the boater more time to respond to a warning. This problem is a primary concern for fixed crest dams where a boater needs time to avoid the spillway or intake area.

River Width

Distances to location will affect the reaction time of the boater. At midriver location on a wide river, a boater will need more time to get to a safe location than a boater located close to shore. This also results in a larger sign panel to warn the boater earlier.

Natural or Structural Elements

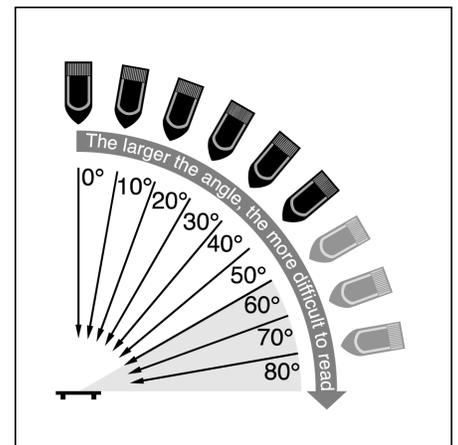
Obstructions in the river can require placement of multiple signs or expanding the length of the safety zone. Midriver islands may create the need to sign each side of the river as an independent channel. Structural elements such as bridge piers can create an additional hazard as well as lend themselves to convenient sign placement that may otherwise require the use of midriver pylons. It is therefore crucial to make a thorough field study to investigate local conditions and determine possible alternatives for sign placements. Do not sacrifice safety for the convenience of an inappropriate mounting location.

Light Conditions

At critical locations rising and setting sunlight can obscure a clear line of sight to a sign or the dam itself. Placement of multiple signs, height to panel base and angle of sign panel should be reviewed on a site-by-site basis to make sure the sign is fully readable at critical periods when the sun is low in the sky.

Angle of Vision

This indicates the maximum angle at which a sign panel can be viewed without unacceptable distortion and loss of legibility. An angle of 60° to the normal of the sign face has been established as the maximum readable rotation.



Angle of vision diagram

To accommodate these conditions, several approaches are possible.

1) Enlarge the danger zone and move the sign panels further up- and down-stream, see Diagram 3.

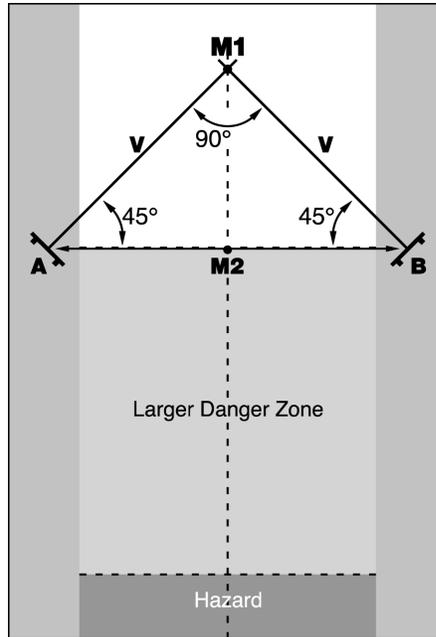


Diagram 3

2) Enlarge the reaction distance by rotating the sign panels, see Diagram 4, reducing the angle and enlarging the sign panels.

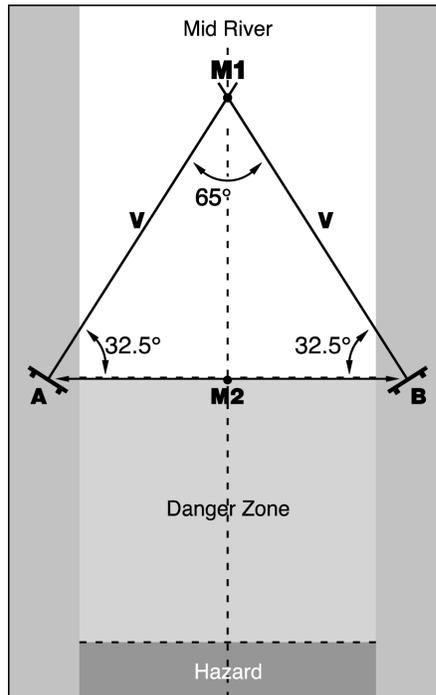


Diagram 4

3) Make use of existing structures such as bridges, to mount multiple sign panels across a river. Enlarge the size of the sign to increase the viewing distance, see Diagram 5.

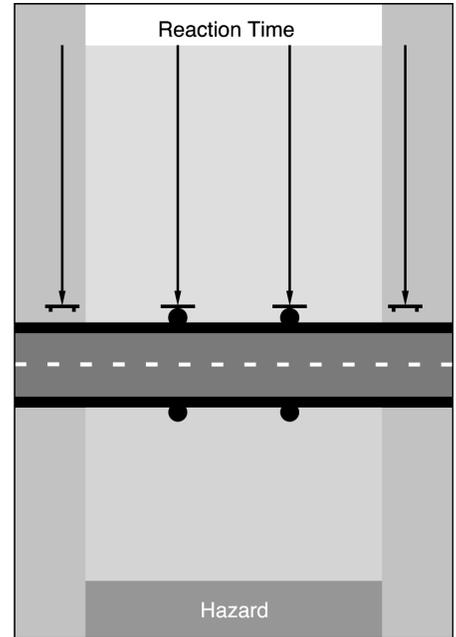


Diagram 5

Extreme care should be given to both the size calculation and sign placement location(s) in the attempt to implement an effective waterway sign system.