THE NATION'S URANIUM PROCESSING FACILITY

UPF PROJECT PROCEDURE

Title:	**BARRICADES AND SIGNS**
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Revision History

Revision	Reason/Description of Change
005	This revision is a complete rewrite, therefore no revision bars are shown. This revision further describes the application of tags, signs, rope, tape, and barricades for warning, restricting, and/or controlling entry into areas that contain safety hazards, abnormal conditions, or where unusual operations are being performed.
004	Adopted initial issue from Bechtel Core Process 214 at its current revision 4.

Table of Contents

1.0 PURPOSE

This procedure describes the application of tags, signs, rope, tape, and barricades for warning, restricting, and/or controlling entry into areas that contain safety hazards, abnormal conditions, or where unusual operations are being performed.

2.0 GENERAL

2.1 Description

This procedure applies equally to office, workshop, construction site or roadways used by UPF construction site personnel, to include subcontractors, during the course of the project.

2.2 Applicability

Describe the extent of applicability of the procedure. This section may also address limitations on applicability or effectivity. A grandfather clause may be used, as needed.

2.3 Acronyms/Definitions

Acronyms

CM	Construction Manager
DS	Discipline Superintendent
FSM	Field Safety Manager
FSR	Field Safety Representative
OSHA	Occupational Safety and Health Administration

Definitions

Barricade (Barrier)	A system designed to warn of a hazard and physically identify the hazard's parameters.
Concrete Vehicle Barriers (CVB)	A hard barricade generally used adjacent to roadways to provide increased protection against vehicles or equipment.
Guardrail System	A barrier with a top rail at 42 inches, +/- 3 inches, and a mid-rail capable of withstanding 200 pounds of force applied.
Hard Barricade	A solid barrier, made of metal or wood or concrete and used to protect against exposure to long-term hazards, restriction of access, and/or fall protection. (Examples of a hard barricade include but are not limited to; chain link fencing or traffic guardrail, concrete blocks, or wooden railing capable of withstanding a 200 pound force from any direction).
Soft Barricade	A system of tape, rope, chain, cable, or other flexible materials to identify, warn, restrict, or control worker access to an area where a hazard exists. Soft barricades shall be installed at a sufficient height with signs/tags posted on all approachable sides, to warn workers, typically between 36 and 60 inches above grade. Soft barricades shall not be used as edge protection.
Temporary Fencing	Plastic or metal fencing supported by posts, used to establish a temporary control zone/area, such as, an excavation that is properly sloped or benched.

Warning Line	A boundary, used for low slope roof work, established by rope, wire or chain with visible flagging and supported by stanchions.
Cautionary Condition	A condition or process that does not present an immediate hazard to life and/or health but has the potential to cause injury/illness either because of its operating configuration or due to possible changes in surrounding conditions that would allow development of a hazardous environment. Cautionary conditions are posted by barricades of yellow and black tape/rope and/or signs/tags.
Danger Condition	A condition or process that presents a high probability to cause serious injury, illness, death, significant property damage, and/or significant environmental impact. Imminent danger areas will be barricaded using the appropriate red and black tape or rope and signs/tags.
Isolate	To place barricading (soft or hard) around all sides of an area to restrict or control worker access.
Low Slope Roof	"Low-slope roof" is defined as a roof having a slope less than or equal to 4 inches to 12 inches (vertical to horizontal).
Signs	A posting bearing information, advisory or a warning of hazards, which are temporarily or permanently affixed or placed, at locations where the hazards exist.
Tags	Temporary postings, usually attached to a piece of equipment or part of a structure (e.g. scaffolding), to warn or inform workers of a condition or requirement. Tags are also used in conjunction with barricades to provide specific warnings and/or other essential information about the hazard(s) that exist beyond the barricade.
Warning Line System	A warning line erected on a low slope roof to warn employees that they are approaching an unprotected roof side or edge, and which designates an area in which roofing work (including other trades working on roof) may take place without the use of a guardrail, body harness, or safety net system to protect employees in the area.

3.0 RESPONSIBILITIES

3.1 Construction Manager (CM)

The CM has the overall responsibility for ensuring the implementation of this procedure by all UPF construction site personnel.

3.2 Field Safety Manager (FSM)

The FSM has the overall authority for interpretation of the regulations associated with the procedure and the interpretation of the procedure as to intent and application.

3.3 Field Safety Representative (FSR)

The FSR will review compliance with the procedure through periodic field inspections and assist the supervisor and workers to determine the appropriate barrier protection for the recognized hazards.

3.4 Discipline Superintendent (DS)

The DS is responsible for being thoroughly familiar with this procedure and their individual responsibilities regarding compliance with and implementation of this procedure, pre-planning work activities to identify the appropriate barricade to use, authorizing the use of danger

barricades, overseeing the installation and removal of danger barricades and communicating the identified hazards to supervisors and/or work crews.

NOTE: Superintendents may delegate authority to authorize the use of danger barricades to designee supervision (general foremen/foremen); however, the delegation of such authority does NOT relieve the DS of the responsibility to ensure that danger barricades are used in accordance with the provisions of this procedure.

3.5 Supervisor

The Supervisor is responsible for identifying activities or conditions that may create a barricade requirement, directing the installation and removal of barricades, signs/tags and ensuring that the identified control measures are in place and maintained until the completion of the job task.

3.6 Worker

A worker is responsible for understanding the requirements of this procedures and how it applies to the work they perform, identifying emerging hazards during work activities, pausing or stopping work until hazards are addressed, and complying with all postings, signs/tags, and barricades.

4.0 PROCESS

4.1 Tags and Signs

4.1.1 Tag and Sign Types

Tags and signs can be used independent of barricades, but barricades shall utilize tags and signs to provide specific warnings and/or other essential information about the hazard(s) that exist beyond the barricade.

There are several different types of tags and signs available and include: Danger, Caution, Warning, Notice, Information Only, and Restricted Access. Each of these signs can have either pre-printed or hand written hazard identification. Tags and signs utilized on the UPF construction project include, but are not limited to:

- **Danger** – Shall be used only where an immediate hazard exists. Examples include: High Voltage, Hexavalent Chromium, Permit Required Confined Space, and Respiratory Protection Required.

- **Caution** – Shall be used only to warn against potential hazards or to caution against unsafe practices. Examples include: Hearing Protection Required, Non-Permit Confined Space, and Trip Hazard.

- **Warning** – Indicates a potentially hazardous situation, which, if not avoided, could result in serious injury, possibly death. Examples include: Warning line system, Road work.

- **Restricted Access** – Used for safety of personnel or protection of property. Examples include: Wet Paint Do Not Enter; Limited Approach Boundary, or Authorized Personnel Only.

- **Notice / Information** – Provides safety information. Examples include: Construction Free Zone, No PPE Required, No Dark Lenses Beyond this Point, Designated Smoking Areas, and Laydown areas.

Additional signs include:

- **Directional Signs** – Shall be white with a black panel and a white directional symbol. Any additional wording on the signs shall be black letters on the white background.
- **Exit Signs** – When required, shall be lettered in legible red letters, not less than 6 inches high, on a white field and the principal stroke of the letters shall be at least three-fourths inch in width.
- **Traffic and Road Signs** – Provide information to operators of motor vehicles including, but not limited to, Speed Limit, Pedestrian Crossing, Stop, Curve, One Way, Two Way, and Do Not Enter.
- **Fire Signs** – Provide information on fire extinguishers.
- **Prohibition Signs** – Provide information on prohibited actions such as no smoking and no parking.
- **Emergency Signs** – Provide information on emergency equipment such as eyewash/shower stations, automated external defibrillators (AED) and emergency stokes baskets.

4.1.2 Tag and Sign Requirements

When installing tags or signs, ensure that tags/signs are printed on a material suitable for the environment. Ensure that the following information is provided on all signs:

- Description of the hazard(s).
- Instructions for reader as applicable.
- Permanent Construction Signs

  Permanent signs are provided for hazards, labeling requirements, or where information is needed for an indefinite or extended period of time. These signs are mounted for long periods and preprinted to minimize fading. Examples of a fixed sign include:
  - Labeling fixed propane tanks
  - Labeling of fire extinguishers
  - Noise exposure for fixed equipment (e.g., pedestal grinder)
  - Mobile Equipment (e.g., light plants, compressors, generators)
- Semi-Permanent (Temporary) Construction Signs and Tags

  Semi-Permanent signs are used where a hazard is created from construction activities or the use of mobile equipment for a specific hazard which may extend beyond a single shift. Examples of activities that would require temporary signs include:
  - Open Excavations
  - Roof Work
  - Overhead hazards
  - Welding operations

- Use of electric or pneumatic powered hand tools
- Operation of mobile equipment

Besides the information listed above (Section 4.1.2), also include the following:

- Contact Name (Position or name); Contact Information (Phone number or radio channel)

4.2 Signs and Barricade Application

4.2.1 Facility Signs (without Barricades)

Signs may be erected independent of barricading where hazards are associated with specific plant equipment, and require identification of the hazard to inform employees when placed at the distance that the control is required (See Section 4.2.2). Examples of these include but are not limited to:

- Fabrication and repair shops
- Propane or liquid natural gas bulk storage pads
- Fixed equipment
- Mechanical and Ventilation Rooms
- Electrical Panels
- Confined Spaces (Non-Permit and Permit Required)

4.2.2 Signage Implementing a Controlled Distance

Signs may be affixed to mobile equipment and machinery independent of barricading to identify hazards and may establish specific distances where controls are utilized. If the hazard has a distance associated with the machine or equipment, then the boundary distance is to be included on the sign. As such, legibility of the sign, hazard identification, and boundary distance is to be legible at the distance where the controls are to be implemented. Use Appendix C to determine the approximate size of the lettering needed for the distance application. Examples of these include:

- Vacuum Truck
- Concrete placing boom truck
- Soil Compaction Equipment
- Excavation Machinery (Loader, Trackhoe, etc.)

4.2.3 Barricades and Signs for Daily Activities

- Many construction activities involve working in locations for short durations of a few hours to a couple of weeks. Soft barricades and tags, for both cautionary or danger conditions, are used to protect worker from distractions and outside intrusion, and also protect pedestrians from hazards that result from the work activities. Examples of these situations include:
  - Work from ladders
  - Use of power tools (e.g., grinding and cutting)
  - Welding
  - Excavating work
  - Crane swing areas
- Supervision, with the assistance from an FSR as requested, determines temporary worksite barricade and tagging requirements.
- Tag information is to meet the requirements presented in Section 4.1.2.

- Barricades and tags can remain up during the shift, but removed and stored at the end of the work or shift, unless the hazard remains when work stops, at which time follow instructions provided in Section 4.3.1., bullet 9.

4.3 Barricade Requirements

4.3.1 General Barricade Requirements

- Barricades are to be established prior to creating hazards.
- During the planning process, the responsible supervisor evaluates work activities and conditions to identify any caution or danger hazards. For any cautionary or dangerous conditions or processes that are identified, include actions in the plans for barricade placement, installation, and removal after task completion.
- Barricades must be complete.
  - The work area shall be entirely isolated and identified.
  - Permanent structures that prevent entry may be used as part of the barricade.
  - The barricaded area will be of sufficient size to afford appropriate protection. If this condition cannot be met, consideration must be given to keeping materials from falling or protruding outside of the barricaded area. A general rule for barricade erection is: 1 foot out for every 2 feet up. If that is not possible, the supervisor should be contacted for help.
- The use of Caution or Danger tape is prohibited as edge protection.
- Install barricades/signs to be visible and warn workers. Appendix A presents examples of conditions requiring danger and cautionary barricades, respectively.
- Secure barricade boundary markers (tape, rope, chain, cable, etc.) to stanchions or fixed structural points.
- Workers using the barricade may leave the area unattended for breaks and lunch by following these steps:
  - If hazards, for which the barricade was erected, do not exist while workers are away, reconfigure the barricade to allow passage. Avoid laying barricades and signage onto floors or other walking surfaces, but rather relocate and store away from walkways.
  - If hazard(s) for which the barricade was erected continues to **exist** while workers are away, barricade remains intact.
- Separate construction barricades are not required when working within a permanent (hard) barricade. However, appropriate barricade signs will be posted.
- If caution or danger soft barricades are expected to exist past the work crew's shift, then:
  - The responsible supervisor evaluates the hazard level and determines whether the existing soft barricade is adequate or if a hard barricade is needed to protect personnel from the exposed hazard.
  - If a hard barricade is needed, then establish using wooden or metal guardrails. Attach or post signs or tag(s) to identify the hazard(s), responsible supervisor, method of contact, and other pertinent information.
  - On the next scheduled work shift, with the direction and approval of the responsible supervisor, remove the hard barricades and re-establish the temporary caution or danger barriers to allow work to resume.

  NOTE: If a hard barricade cannot be achieved and a soft barrier will remain beyond shift, the DS and FSR shall provide authorization to allow the use of the soft barricade. This activity shall be documented on the STARRT card and one of the signs/tags on

the barricade shall be signed providing an expiration date not to exceed 7 calendar days. General foremen/foremen are not authorized to approve this activity.

4.3.2 Caution Barricade Requirements

- Use Caution Barricades to ensure workers are aware of physical hazards or changing conditions. Appendix A, Section 3, presents examples of caution barricade and sign applications.
- Personnel can pass through a caution barrier only after they have recognized the hazard and determined that it is safe to proceed through the area.
- Caution barricade tape or rope is used for overhead work when the potential for dropped material does not create a danger hazard.
- When the hazard, for which a cautionary barrier was established, no longer exists (completion of the task or activity), completely remove the tape or rope and properly store or disposed of it. This is the responsibility of the user and verified by supervision.

4.3.3 Danger Barricade Requirements

- A Danger Barricade protects personnel from a condition or process that has the potential to cause serious injury or illness. Appendix A, Section 2, presents examples requiring danger barricades and signs.
- Other than authorized workers, FSRs have unrestricted access to conduct observations/inspections of work activities after review of STARRT card. All other personnel not authorized or associated with the work are required to STAY OUT of the area.
- When danger conditions or processes exist, the responsible supervisor assigns and instructs workers on the erection and placement of barricades and signs/tags.
- Workers shall post the required tags and/or signs, with all required information (section 4.1.2), so that they are visible from all approaches to the hazard area.
- Responsible supervisor verifies the barricade and postings are made and documented on the STARRT card.
- When the hazard, for which a danger barrier was established, no longer exists (completion of the task or activity) completely remove the tape or rope and store or dispose of it. This is the responsibility of the user and verified by supervision.
- If an individual, who is not part of the work activity requires access into a danger barricaded area, the workers shall perform the following:
  - Pause the work activity and place the danger hazard in a safe configuration.
  - Remove a portion of the barricade to provide access and then allow the individual requiring access into the area. (Example: An engineer performing an inspection.) If an aerial lift or scissor lift is required for the inspection an overhead safety watch can be utilized as a standalone action without the need for additional barricading.
  - When the individual finishes their task and leaves, the work area is again established as danger-barricade area and work is resumed.

  NOTE: Danger barricades shall only be established for single work scope task(s). Multiple scopes of work shall not use the same barricaded boundary.

4.3.4 Hard Barricade Fabrication Requirements

Guardrail systems are constructed using wood, metal or a combination of both. Wooden top and mid-rails must be made from 2- by 4-inch boards, a toe plate must be used on all guardrails for floor holes/openings, or wall openings (including platform level) and must be made from 1- by

4-inch or 2- by 4-inch board, or equivalent and vertical support posts made from 2- by 4-inch board or greater. Metal top and mid-rails must be made from 1½ inch nominal size or larger, a toe plate must be used on all guardrails for floor holes/openings, or wall openings (to include platform level) and made from ¼- by 4- inch flat metal plate, or equivalent, and vertical support posts made from 1½ inch nominal size or larger. Guardrail systems requirements are as follows:

- Top edge height of top rails, or equivalent guardrail system members, shall be 42 inches plus or minus 3 inches (i.e., 39 to 45 inches) above the walking/working level. When conditions warrant, the height of the top edge may exceed the 45-inch height, provided the guardrail system meets all other criteria of this section.
- Mid-rails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members shall be installed between the top edge of the guardrail system and the walking/working surface when there is no wall or parapet wall at least 21 inches high.
  - Mid-rails, when used, shall be installed at a height midway between the top edge of the guardrail system and the walking/working level.
  - Screens and mesh, when used, shall extend from the top rail to the walking/working level and along the entire opening between top rail supports.

  NOTE: If screen or mesh (e.g. pearl weave) is used in lieu of a toe board, it must be approved and installed by a competent person.
  - Intermediate members (such as balusters), when used between posts, shall be not more than 19 inches apart.
  - Other structural members (such as additional mid-rails and architectural panels) shall be installed such that there are no openings in the guardrail system that are more than 19 inches wide.
- Guardrail systems shall be capable of withstanding, without failure, a force of at least 200 pounds applied within 2 inches of the top edge, in any outward or downward direction, at any point along the top edge.

4.4 Warning Line System

Fall protection/prevention hazards will be assessed and evaluated for each elevated work situation based upon the work activity to be performed. When establishing and using warning line systems, comply with the following provisions:

- Erect the warning line no closer than 6 feet measured perpendicularly from the roof's edge.
- When erecting a warning line, do the following:
  - Use warning lines made of rope (cannot be red, yellow or combined yellow and magenta in color), wire, or chain
  - Affix high-visible flagging at no less than 6 foot intervals along the warning line system and intermittent warning signs from all approach directions along the warning line system.
  - Use stanchions to support the warning line
  - The warning line is supported such that its lowest point (including sag) is no less than 34 inches from the walking/working surface and highest point no more than 39 inches from the walking/working surface.
- With the warning line (rope, wire, or chain) attached, the stanchions are to resist, without tipping over, a force of at least 16 pounds applied horizontally against the stanchion, 30 inches above the walking/working surface, perpendicular to the warning line, and in the direction of the roof edge.

- The warning line rope, wire, or chain is to have a minimum tensile strength of 500 pounds, and, when attached to the stanchions, be capable of supporting, without breaking, the loads applied to the stanchions as prescribe in step 3 above.
- Workers outside (beyond) the warning line system are required to utilize a fall protection system.
- After the fall hazard is eliminated, the worker responsible for eliminating the hazard is to remove the warning line system.

4.5 Roadway Barricade Requirements

- Barricades across or next to a roadway will be semi-permanent wooden barricades or CVB barricades and include signs or equivalent (i.e., temporary fencing, Jersey barricade or CVB block).
- Flashing amber lights will be required at semi-permanent barricades left after dark on roadways to alert vehicle traffic to their presence.
- Place Jersey barricades (or CVB blocks) adjacent to roadways to provide increased protection for vehicles or equipment. Jersey barricades may also be spread apart and interconnected with wire cable to provide a continuous barrier.

4.6 Excavation Barricades

- Install barricade at least 6 feet from open edges of excavations, whenever possible.
- Excavation barricades across or next to site access ways with foot traffic only will be made of semi-permanent material and include signs or equivalent (i.e., temporary fencing).
- Excavation barricades across or next to a roadway will follow the controls in section 4.5 Roadway Barricade Requirements.

5.0 RECORDS

All records generated as a result of this procedure are maintained in accordance with Y15-101, *Records and Controlled Documents*, and Y15-95-800, *UPF Document Management.*

None.

6.0 REFERENCES

6.1 Source References

- 29 CFR 1926 Subpart G – Signs, Signals, and Barricades
- 29 CFR 1926 Subpart M – Fall Protection
- ANSI Z525.2-2002 – Environmental and Facility Safety Signs
- Bechtel ES&H Core Process 214 – Barricades and Signs
- 10 CFR 851 – Worker Safety and Health Program

7.0 EXHIBITS / APPENDICES / FIGURES

Appendix A, *Examples of Danger and Caution Barricades and Sign Postings*

Appendix B, *Barricade and Sign Flowchart*

Appendix C, *Letter Heights Based on Viewing Distance (per ANSI Z535.2-2002)*

Appendix A
Examples of Danger and Caution Barricades and Sign Postings
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1. Signage – Both Caution and Danger Conditions (Permanent Structures)

In the construction of facilities, there are areas (roadways, gas storage locations, compressor systems, welding units, etc.) that are established in a fixed configuration and require either danger or caution signs, depending on exposure severity. Examples are:

- Non-permit required confined space sign placed at the access location - CAUTION
- Permit-required confined space postings placed at the access location - DANGER
- Fuel and liquid gas storage locations - DANGER
- Shop Signage – Hearing Protection, Safety Glasses Required, etc. - CAUTION
- Areas of elevated noise conditions >100db – DANGER
- High Voltage and Motor Control Areas - DANGER
- Restricted or Radiation Access Controls – DANGER

2. Danger Barricades and Signs

Danger Barricades and signs are used when there is a potential for serious injury or illness, significant property damage, and/or environmental impact such as:

- Environments having potential exposure to toxic or oxygen depleted atmospheres
- Locations where possible engulfment exists
- Abrasive blasting activities
- Coating activities that require respiratory protection (e.g., special coatings that create vapors or mist)
- Environments having live electrical systems
- Installing structural steel at heights
- Installing concrete form panels, rebar curtains, or embeds at heights
- Use of powder-actuated tools, where workers are below or adjacent to the activity
- Within the swing radius of a crane’s counterweight
- Pressure testing, including hydro and pneumatic testing
- Excavation of unknown materials
- Scaffold erection and disassembly
- Grinding or Chipping Activities
- Overhead work at any height where the potential of dropped tools and/or materials creates a danger hazard

3. Caution (non-life threatening) Barricades and Signs

The following situations are examples of conditions or processes where caution-barricade and caution postings are required to ensure worker awareness of physical hazards or changing conditions:

- Work activity where specific personal protective equipment is required, (e.g., hearing protection)
- Slippery conditions (e.g., water, snow, or ice on stairs and walkways)
- Potential slip or trip hazards in laydown areas or where materials are stored or stacked
- Low clearance areas
- The use of caution barricade tape to identify overhead work areas when the potential for
- Dropped material may occur but does not create a danger condition.

Appendix B
Barricade and Sign Flow Chart
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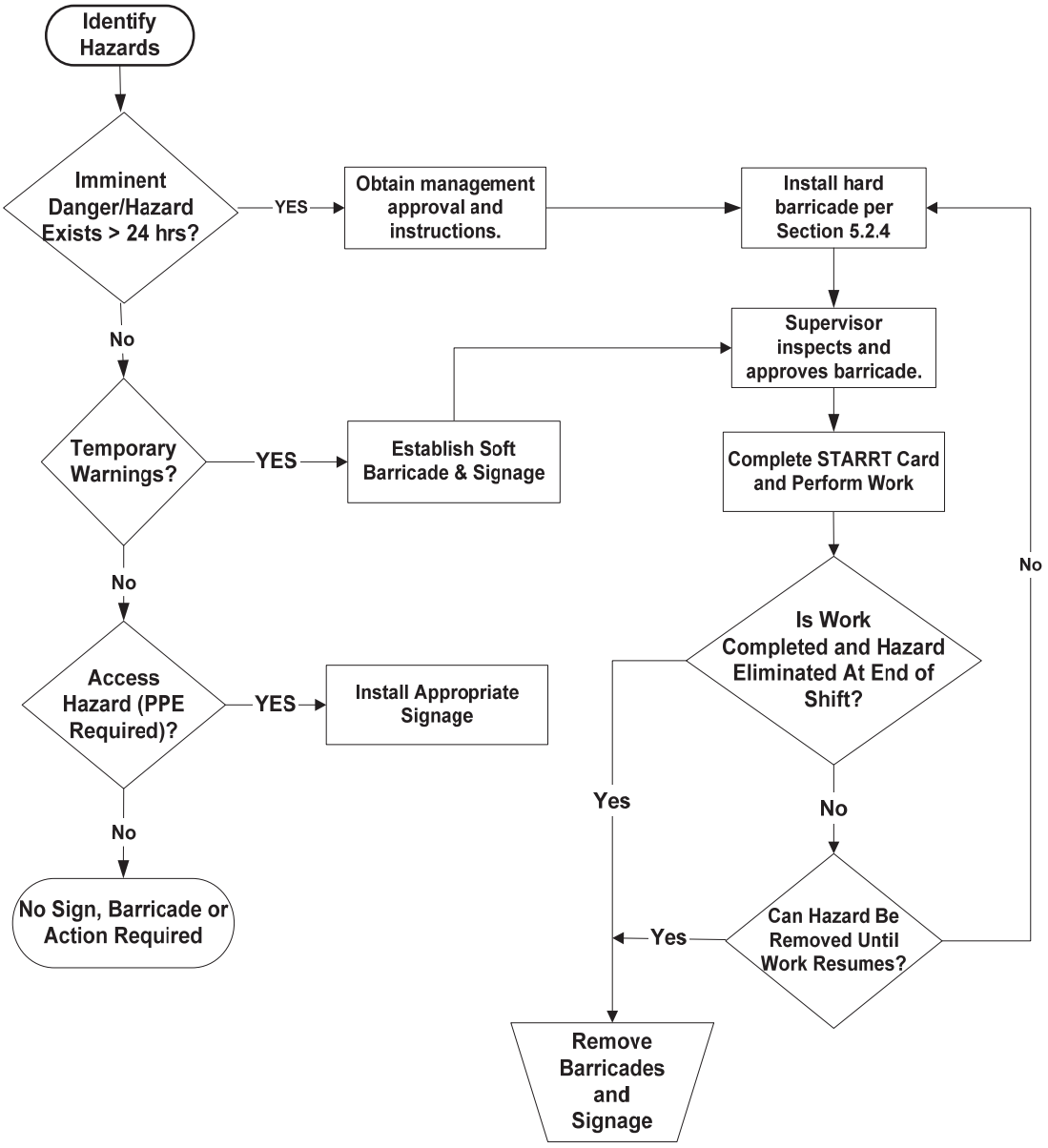

Appendix C
Letter Heights Based on Viewing Distance (per ANSI Z535.2-2002)
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Signal Word (DANGER, WARNING, CAUTION)

Signal Word Letter Height (In.)	Viewing Distance (Ft.)
4.00	50.00
3.00	37.50
2.50	31.25
2.00	25.00
1.50	18.75
1.00	12.50
0.75	9.375
0.50	6.25
0.25	3.125

Minimum letter height for the signal word (danger, caution, notice, etc.) shall be one unit of height for every 150 units of safe viewing distance.

Words Height for the Body of the Sign

Word in Body Letter Height (In.)	Viewing Distance (Ft.)
2.0	50.00
1.0	25.00
0.8 (default to 1” or Greater)	20.00
0.4 (default to 0.5” or Greater)	10.00
0.2 (default to 0.25” or Greater)	5.00

Minimum letter height for other words on the sign shall be one unit of height for every 300 units of safe viewing distance.