Introduction

Standard operating procedures (SOP) are intended to provide you with general guidance on how to safely work with a specific class of chemical or hazard. This SOP is generic in nature. It addresses the use and handling of substances by hazard class only. In some instances multiple SOPs may be applicable for a specific chemical (i.e., both the SOPs for flammable liquids and carcinogens would apply to benzene).
If compliance with all the requirements of this standard operating procedure is not possible, the principal investigator must develop a written procedure that will be used in its place. This alternate procedure must provide the same level of protection as the SOP it replaces.

Description
An alkali is a basic, ionic salt of an alkali metal or alkaline earth metal element that dissolves in water. A strong alkali is an alkali that ionizes completely when dissolved in water. Chemicals that fall under this SOP (but are not limited to) include:

- Sodium hydroxide (CAS No. 1310-73-2)
- Potassium hydroxide (CAS No. 1310-58-3)
- Calcium hydroxide (CAS No. 1305-62-0)
- Ammonium hydroxide (CAS No. 1336-21-6)
- Tetramethylammonium hydroxide (TMAH) (CAS 10424-65-4)

Potential Hazards
- Extremely corrosive (causes burns to any area of contact – skin, eyes, mucous membranes)
- Irritant (skin, eyes, and respiratory tract)
- Unlike acids, hydroxides do not coagulate protein which impedes penetration. Metal hydroxide may not be immediately painful during skin penetration, producing severe and slow-healing burns.
- Ammonium hydroxide is a solution of ammonia (NH3) in water. Only a small fraction actually exits as ionic NH4+ and OH-. Concentrated ammonium hydroxide contains approximately 29% ammonia and has a pungent odor. With increasing temperature, more ammonia evaporates. Ammonia gas is flammable and has a narrow explosive range in air of 15–25%. The vapors of aqueous ammonia solutions are irritating and toxic.
- Tetramethylammonium hydroxide pentahydrate is a solid that is highly toxic if ingested and toxic by skin contact. An aqueous TMAH solution has a high acute oral and dermal toxicity. Skin contact of a solution of >1% TMAH to a small area of the body surface or ingestion can be fatal.

Engineering Controls
All operations involving sodium hydroxide should be carried out in a chemical fume hood with the sash in the down position, between your chest and what you are handling in the hood.
- If the hood's sash cannot be adjusted horizontally, protective eyewear is required.

Work Practice Controls
- Avoid heat sources and moisture.
- Reaction with aluminum or magnesium generates flammable and potentially explosive hydrogen gas; reaction with nitromethane and nitrophenols produces shock-sensitive explosive salts.
- Do not mix with acids or organic materials.

- When mixing with water, always add caustics/alkalines slowly to the water and stir continuously. Never add water in limited quantities to solid hydroxides. Adding water to concentrated bases may cause violent boiling of the solution and splashing.
- When preparing solutions from solid hydroxides, the container has to be cooled with ice or under cold water. The container should be swirled constantly until the pellets are dissolved to prevent them from getting stuck to the bottom where they can generate excessive heat, possibly leading to container rupture.

Storage

Store bases separated from acids and label the cabinet "bases-corrosive." Use secondary containment for aqueous base solutions and other strong liquid bases. Hydroxides must be separated from oxidizers. **NEVER** store hydroxide solutions in metal containers because of the possibility of hydrogen gas evolution, container leakage, and rupture.

Decontamination

- Wipe any residual sodium hydroxide off of balance after use. Neutralize contamination, as necessary.
- Regular or intermittent use of strong alkalines warrants on-site supplies – neutralizing powder or liquid, absorbent powder, personal protective equipment/garb. Also, see neutralizing powder in the spill clean-up kit located in your building.

Refer to the MSDS/SDS sheets for recommended personal protection.

Refer to the following glove guide for hand protection.

http://www.ansellpro.com/download/Ansell_7thEditionChemicalResistanceGuide.pdf

https://eta-safety.lbl.gov/sites/all/files/VWR%20Chemical%20Resistance%20Gloves%20Chart.pdf

FOR SPILL INFORMATION SEE

EWU EH&S Hazardous Chemical Spill Cleanup Guidelines

FOR WASTE DISPOSAL INFORMATION SEE

EWU EH&S Guidance; Hazardous Waste Management Program
EWU EH&S Guidance; Hazardous Waste Satellite Accumulation Manager Responsibilities

RELATED DOCUMENTS:

EWU EH&S Guidance; Disposal of Laboratory Containers
EWU EH&S Guidance; Disposal of Laboratory Glassware
EWU EH&S Procedure; Chemical Hazard Communication Program
EWU EH&S Guidance: Standard Operating Procedures for Fume Hoods
Specific department chemical hygiene plan and building emergency contingency plans