EWB-USA Health and Safety Program
AnnMarie Spexet, PE, South Central TAC Chair
George Jamison, PE, GL TAC Chair/EWB-USA Health and Safety Committee Chair
Krista McKim, PE, former EWB-USA Health and Safety Committee Chair
The EWB-USA Health and Safety Committee
Mike Paddock, EWB-USA Board Member (Health and Safety)
Why Do We Care About Health and Safety?

Whose problem is it?

What is safe?
Legge 626: Laurea ad Honorem
...but, we don’t take those chances

....or do we?
Engineers Without Borders
Health and Safety Program

It’s all about the design!

EWB-JSC: Rwanda
Who do you serve?

• Engineers’ mission is to serve the betterment of the public
• Health and safety considerations in our designs are central to our training, our practice, and are our legal obligation
• ...why then do health and safety practices associated with design activities and implementation receive less attention?
Realities

We are exposed to risk
All incidents are preventable
Incidents hurt people
Inexperienced teams/communities are more vulnerable

Do we recognize risk?
Are we prepared to mitigate risk?
Do we prepare properly?
Are we as prepared to protect as we are to construct?
• Volunteer impaled on piece of rebar and punctured his lung after falling from ladder
• Entire project team contracted hookworm from footwear
• Volunteer fell through a roof not designed to support live loads
• Overloaded vehicles lead to people riding in back of truck bed
• Volunteer suffered a severe asthma attack on site without medication and flew home with pneumonia
• Project team was mugged and passports stolen
• Untreated respiratory ailments persist on teams
• During an EWB-USA project trip, a person from a different NGO was raped in the community
The Choice for Health and Safety

- H&S is a standard of care for our profession.
- It is our moral responsibility.
- It is a standard expectation in our workplace.
- If you want to participate in EWB-USA projects, following proper health and safety practices is not optional. It is a requirement.
- For students, this is great for a resume and preparation for your career.
The EWB-USA Policy

EWB-USA is committed to fostering healthy and safe project conditions, both for the EWB-USA team members and the local participants.

Health and Safety considerations are an integral part of every EWB-USA project, from initial project application through implementation.

EWB-USA projects will foster a positive and active health and safety culture.

An intrinsic goal is to protect EWB-USA, the volunteers, and the in-country partners.
Policy developed/approved in Fall 2007
Completed Program/Guidelines Submitted to EWB-USA, May ’08 (Introduced at 2008 Fall Workshops)

Starting with Nov 2009 TAC Reviews
  • Approved Health and Safety Plan (HASP) **required** for all implementation trips (review by EWB-USA H/S Committee)
  • Two CPR / First Aid trained persons on travel team

Starting in April 2010
  • Approved Health and Safety Plan (HASP) **required** for all assessment trips (Staff PMs likely reviewers)
  • Two CPR / First Aid trained persons on travel team
To implement the EWB-USA policy, a Health and Safety program established:

- An organizational framework, including roles and responsibilities
- Supportive administrative procedures
- Suggested protocols
- Training requirements and opportunities
Scope of Program

Every site!
Every trip!
Plans must be approved!
Warning

The program embodies significant need for (more) careful planning and preparation

Compliance is mandatory

Less apt to get last minute approval if there are H&S concerns

As much or more attention will be given to these concerns as to technical design
Organizational Components

An overall H&S Committee comprised of a regional (TAC) Health and Safety Officer (HSO) from each TAC.

Each TAC will identify their TAC’s HSO. Committee and TAC level HSOs are a resource to Project Managers, TACs, chapters, and teams. Two project HSOs will be identified on each project team from the outset, and must accompany the team in the field.
Establish written guidelines and protocols, including a basic outline for a project health and safety plan.

Incorporate health and safety elements into all appropriate documents, starting with project application.

Establish simple processes to document training.

Establish sound project health and safety practices as an essential element for any project approval stage.
Limited prescriptive protocols have been developed; consensus standards are additional resources for use.

Selection of protocols will be based on project analysis of health and safety hazards, including selection of PPE.

Project specific protocols will be incorporated into the Project Health and Safety Plan (HASP).

The HASP will be sensitive to cultural factors, but not to the detriment of the team members’ health and safety.

The HASP must be developed early in the project, and modified for each stage.

Health and safety considerations may influence design, schedule, cost, etc.
General program training will be provided or supported at regional and chapter levels, similar to sessions on specific technical topics.

The HASP will serve as the primary resource for project training.

Pre-mobilization training is mandatory for all deployed team members.

Daily training and monitoring will be implemented throughout any field activities.
The Board is committed to the Health and Safety Program, and realizes it is integral to the success of the organization.

To that end, a Board member has been assigned overall responsibility.

Mike Paddock is the current Health and Safety Liaison.
EWB-USA
Health and Safety

- Mentors/Professional Advisors
- Project Managers
- Project H&S Officers
- Regional H&S Subcommittee
  - Reviews Projects and Trips with eye to H&S
  - Organizes training sessions
  - Assists with project planning
- Regional TAC
  - Project Technical Reviews
  - Project Trip Reviews
- National H&S Subcommittee
  - Develops Guidelines and Policy

- Seek advice from H&S Committee
- Attend training sessions
- Project level, onsite team member in charge of H&S
Every travel team must have two in order to be approved for travel

Ideally not the project team leader or a solo mentor

- Conduct pre-trip safety briefing
- Confirm and carry copies of insurance and emergency contacts
- Investigate the health risks endemic to the project area
- Identify and schedule necessary safety training
- Be aware of serious relevant medical conditions (diabetics, severe allergies or asthmatics, etc.)
- Manage the first aid kit
- Manage procurement of PPE
- Conduct morning tailgate meeting
- Coordinate community safety discussion
- In addition to the translator, escort injured persons to medical facilities
- In the event of an emergency, contacts:
  - The designated emergency contact, EWB-USA, EWB-H/S Committee

Ensuring the health and safety of the project is the responsibility of EVERYONE
How do I get started?

• Get started by starting early.
• Read the policy, the guidelines, the plan outline and the practices...know what is required.
• Find appropriate personnel for your team...Health and Safety Officers.
• Find a mentor that knows Health and Safety.
• Research and plan for mandatory training.
• ...no, not cardboard or clay.
• A model is a framework for thought.
• The Health and Safety Plan is your model.
• The Site Specific Health and Safety Plan developed by the H&S committee is your roadmap
Health and Safety Plan

(HASP)

A document to be read, understood, and accepted by the team members that identifies:

Organization, Coordination, and Communication
Task Descriptions
Anticipated hazards and measures to be put into place to reduce risk
Necessary safety training for team members
Your community counts as part of the team!
Individuals with knowledge and authority to make decisions
Safety protocols/protective equipment
Emergency procedures
Monitoring team health
Recordkeeping

Example HASP available for download
What are the risks?
(think about what you are doing!)
Plan your tasks

• Discuss and plan your tasks, whether assessment or implementation.
• What are you doing from the time you leave until you return?
• What risks accompany each?
• ....you will likely also identify other non-H&S issues.
# Task Hazard Analysis

## Tasks

(REFER TO GANTT CHART IN ATTACHMENT J)

<table>
<thead>
<tr>
<th>TASKS</th>
<th>HAZARD CATEGORY</th>
<th>INDIVIDUAL HAZARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel to/from site</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Eating/drinking on site</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>1 Tour and Stake Out Site</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2 Excavate Footings and Wing Walls</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3 Fill Sandbags</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4 Dewater Site and Place Footing Formwork</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>5 Drive piles for each Footing</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>6 Layout and Tie Rebar for Footing &amp; Wing Walls</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>7 Pour Footings and Wing Walls</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>8 Construct Formwork for Abutment</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>9 Erect Abutment Formwork</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>10 Construct Ramp to Pour Abutment</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>11 Pour Abutment</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>12 Construct Falsework for Deck</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>13 Bend Stirrups for Bridge</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>14 Layout and Tie Rebar for Deck</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>15 Remove Formwork from Abutments</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>16 Erect Falsework for Deck</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>17 Place and Finish Tying Rebars for Deck</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Spreadsheet available for download
Understanding Chemical, Biological and Physical Hazards

• Take a few minutes now and list a few.
• Read the resource materials provided by EWB-USA.
• Consult your team mentor and other sources...if they don’t know, keep looking!
• EWB-USA staff will be building basic expertise in H&S
• The EWB-USA H&S committee is a resource, but they aren’t going to do your work.
Discuss the types of hazards (to both the volunteers and the community) that EWB-USA projects face.

Write down at least 10 different hazards, and the steps that EWB-USA (as an organization) can take to reduce the risk from that hazard.
Which Task Hazard Protocols to Include?

If there is a potential health or safety risk or hazard associated with any of the tasks or activities that may occur, then address it.

It’s that simple.
# EWB-USA Project Task Hazards

## Construction
- Excavations
- Falls
- Tool use
- Drilling equipment
- Asbestos
- Electrical
- Heat Exhaustion
- Hazardous materials

## Travel
- Diseases (Water, soil, food, airborne)
- Vehicular accidents
- Targeted attacks on project team members (foreigners, western, female, nonlocal, American, assisting a different community, etc)
- Animals (snakes/spiders/etc)
Typical safety hazards encountered on EWB-USA projects:

- Working in remote areas
  - Communications and EMS support
- Working in/on uneven/dangerous terrain
- Working with concrete
- Working with heavy equipment/building materials/tools
- Political issues and security
- Hazardous substances, agents, and environments
- Accident prevention notification
- Vehicle management and traffic control
- Safe access and fall protection

Daily “Tailgate” Safety Meetings
Recognize Risk Magnification Factors!
Risk Magnifying Factors

Construction

- **Use of Local/Novel Technologies, Materials, and Labor**
  - Safety rules not always clear (boots/bamboo scaffolding)
  - Desire by local workers to work faster or cheaper
  - Local practices/materials may be inadequate
  - Community labor that may be unskilled and/or ill-equipped (boots)

- **Students and inexperienced professionals**
  - Lack of experience in project tasks (concrete, electrical, etc)
  - Fear of looking scared/inexperienced prevents asking questions
  - Lack of experience in project management role
  - Indistinct chain of command, breakdown in chain of authority amongst volunteers

- **Time and money**
  - Overly optimistic schedule crams too much activity into an implementation trip
  - Cutting costs by taking smaller vehicles, lodging in cheaper hotels, not purchasing ladders or safety gear
Risk Magnifying Factors

Travel

- Remote locations and unfamiliar situations
  - Medical issues not frequently encountered in the US (Malaria, Chaggis, Hep A/B, Yellow Fever, parasites, etc)
  - Inadequate access to health care
  - Limited knowledge of local resources (hospitals, embassies, etc)
  - Untested quality of local NGO support (especially during the assessment trip phase)
  - Limited communication (unreliable cell service and internet access)
  - Nighttime driving or unsafe roads

- Language and cultural issues
  - Fear of being culturally “insensitive” at risk to personal safety
  - Problems translating technical terminology or other subtleties in language

- “Vacation” mindset
  - Unnecessary risktaking, bravado
  - Availability of alcohol/drugs
Overview

- Excavations
- Fall Protection/Ladders
- Electrical
- Tool Safety
- Infectious Diseases/Parasites
- Toxic and Hazardous Material
- General Safety
- Community Safety
Excavation Hazards

- Engulfment/Entrapment
- Asphyxiation
- Inhalation of toxic materials
- Vibration near excavation
- Mobile equipment near excavation
- Underground utility lines and other buried hazards
- Water accumulation
- Falls
Vehicle Safety

- Unsafe vehicles
- Overloading vehicles
- Night driving

...it’s not likely you would do the same in the US...why put yourself at risk at some remote location where emergency services are severely diminished

Source: BBC
Check that there are no underground hazards before digging, such as power lines, latrine boxes, water/sewer lines, etc.

Methods to protect an excavation against collapse include:

- **Shield** - can be permanent or portable. Also known as trench box or trench shield.
- **Shoring** - system that supports the sides.
- **Sloping** - grading sides of an excavation to the ground surface

Use signage, tape, and fences to keep people away from trenches, especially overnight

Take spoils away from the edge

Do not enter excavations that have standing water

Keep materials or equipment that might fall or roll into an excavation away from the edge, keep vibrating equipment further away.
Falls in Construction

- Falls are the leading cause of deaths in the construction industry.
- Falls from as little as 4 to 6 feet can cause serious injuries and sometimes death.
- Inadequate rails, ladders, walkways & ramps, open sides & edges, holes, concrete forms & rebar, excavations, roofs, and wall openings are all potential fall hazards
- Falling tools and equipment also represent a danger to those below
- Keep area around ladderwork clean.
- Don’t trust that the roof can support you
### Ladder Dos and Don’ts

<table>
<thead>
<tr>
<th><strong>DO –</strong></th>
<th><strong>DON’T –</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Use well maintained ladders without cracks or missing rungs</td>
<td>Use rickety ladders</td>
</tr>
<tr>
<td>Keep the area around the top and bottom of a ladder clear</td>
<td>Use broken ladders. Missing rungs, cleats, and cracked siderails are unacceptable</td>
</tr>
<tr>
<td>Place your ladder on firm, stable, dry ground.</td>
<td>Tie ladders together to make longer sections, unless designed for such use</td>
</tr>
<tr>
<td>Keep your ladders at least 10 feet away from overhead power lines</td>
<td>Load ladders beyond the maximum load for which they were built, nor</td>
</tr>
<tr>
<td>Keep ladders free from slipping hazards</td>
<td>Stand on the top step of a self supporting ladder.</td>
</tr>
<tr>
<td>Tie off the tops of ladders to add stability and security</td>
<td>Assume that roof beams can support a person’s weight</td>
</tr>
<tr>
<td>Keep the area around the ladder clear of debris</td>
<td></td>
</tr>
</tbody>
</table>

---

*Anonymous EWB-USA Project*
Electrical hazards

Electrical accidents are caused by a combination of three factors:

• Unsafe equipment and/or installations,
• Workplaces made unsafe by the environment, and
• Unsafe work practices

Clues that electrical hazards exist:

• Tripped circuit breakers or blown fuses
• Warm tools, wires, cords, connections, or junction boxes
• Worn, frayed insulation around wire or connection
• Messy or Jerry-rigged wiring
• Leaking batteries, corrosion and pitting
• Water
Hand Tools

Hazards are usually caused by misuse and improper maintenance

Do not use:

• wrenches when jaws are sprung
• impact tools (chisels and wedges) when heads have mushroomed
• tools with loose, cracked or splintered handles
• a screwdriver as a chisel
• tools with taped handles – they may be hiding cracks
• Cheater pipes
• Shovels while wearing flip flops
- Disconnect tools when not in use, before servicing and cleaning, and when changing accessories
- Keep people not involved with the work away from the work
- Secure work with clamps or a vise, freeing both hands to operate the tool
- Don’t hold the switch button while carrying a plugged-in tool
- No jewelry or loose clothing
- Long hair in a bun
- Remove damaged electric tools from use & tag them: “Do Not Use”
- Be kind to your cords and hoses
- Keep away from water
Liquid Fuel Tools/ Jacks

- Main hazard – fuel vapors
- Use only approved flammable liquid containers
- Before refilling a fuel-powered tool tank, shut down the engine and allow it to cool
- To set up a jack, ensure:
  - The base is centered on a firm, level surface
  - The jack head is placed against a level surface
  - You apply the lift force evenly
- The manufacturer’s rated capacity must be marked on all jacks and must not be exceeded
- All jacks must have a stop indicator that is not exceeded
- Immediately block the load after it is lifted. Put a block under the base of the jack when the foundation is not firm, and place a block between the jack cap and load if the cap might slip
Infectious Diseases/Parasites

- **Water Borne** (drinking, eating, swimming)
  - Giardia, Schistosomiasis, Botulism, Dysentery, Polio, Hepatitis...
  - Bottled water only, opened by *you*
  - No Swimming (especially in fresh water)

- **Soil Borne**
  - Hookworm, Roundworm, Toxoplasmosis, Tetanus, Listeria
  - Wear Shoes and check for skin breaks at night

- **Insect Borne**
  - Malaria, Dengue, Yellow Fever, West Nile, Chagas
  - Antimalarials
  - Permethryn/DEET
  - Bed Nets

- **Vaccines**
  - Hepatitis, Typhoid, Meningitis, Yellow Fever, Polio, Rabies, MMR, DPT
  - Yellow card, keep it current!

- **Sanitation**
  - Baby wipes, alcohol based hand sanitizer

http://www.cdc.gov/travel
Toxic and Hazardous Material

Local hazards

- Buried hazards
  - underground utilities
    - power lines
    - sewer lines
    - pipe lines
  - disused latrine pits
  - disused wells

- Other hazards

- Animal Hazards
  - snakes/spiders
  - rabies

Cement
Asbestos
Hazardous materials in concrete include:
- lime (calcium hydroxide)— Caustic
- trace amounts of crystalline silica— Abrasive
- trace amounts of chromium— Sensitizer

Wear protective clothing
- Alkali resistant gloves
- Waterproof boots
- Cover arms and legs
- Wear Goggles... and no contact lenses!
- Particulate Respirators

Minimize cement dust.
- Keep upwind of the cement.
- Wet cut masonry blocks whenever possible

Minimize contact with cement
- Don’t touch cement powder with your hands.
- Rinse wet cement off skin immediately.
- Use a board to kneel on wet cement.
- Don’t rinse your hands in the bucket you rinse tools in!

Provide a place to rinse off with clean water, and a place to change clothes (and bring a change of clothes!)
Keep pH paper around
Asbestos

Roofing tar/shingles
www.customtileroofing.com

Vinyl Tile
www.heimer.com

Cement/Asbestos
www.preston.gov.uk

Pipe Insulation and joint compounds
www.heimer.com

Vermiculite and Fibrous Insulation
www.epa.gov
www.newmeadowssabatement.com
General Safety

- Stay in a group/ set gathering points
- Cellular/Satellite telephones
  - local hospital
  - other team cell phones
  - emergency contacts for team members
  - walkie talkies for larger team coverage
- Listen to your local hosts
- Listen to your instincts
- Be aware and assert yourself
- Vehicle safety
- Drinking/Eating safety
- Special medical conditions
- Red Cross training/Wilderness 1st responder training
- US Consulate/Embassy, US State Department
- SOS International

http://travel.state.gov/
• Timing
• Stay hydrated
  • powdered drink packs
• Incorporate breaks
• Shade

• Learn to Recognize:
  • Heat Exhaustion
  • Heat Stroke

Unlike the Waterboy, we approve of drink mixes in addition to cool clean water for hydration.
Community Safety

- Community safety meetings
- Tape, signage, barriers, and flags
- Staging
- Proper disposal
- Construction site housekeeping
- Children
Basic Tool Safety Rules

- Use right tool for the job
- Keep tools maintained and don’t use broken tools or blunt cutting tools
- Operate according to manufacturers’ instructions
- Use guards
- Use PPE
- Keep working surfaces (including the floor) clean and clear of debris
- Store tools in dry place
- Keep working areas well lit
- Be kind to your cords and hoses
- Disconnect when not in use and when changing accessories such as blades & bits
- When a tool is not being used, put it away!
Going from Hazard to Injury/Illness
‘Hard barriers’ are more reliable than ‘soft barriers’, but all ultimately rely on people
Appropriate Controls...Managing the Risk
Pre trip safety training
Morning tailgate meetings
Evening cleanup
Incident Handling
   Near Misses and Root Cause Analysis
Organize: **Proper Preparation and Planning Prevents Problems** (PPPPP)
*Task Hazard matrix is a good resource!*
Hierarchy of Controls

Substitution/Elimination

- Use of a less harmful substance
- Do away with the process

Engineering Controls

- Use of physical medium to prevent or limit exposure to a hazard
  - Encasement of process
  - Ventilate

Administrative Controls

- Design of work practices to limit exposure to a hazard
  - Work/ Rest Regime
  - Rotation of personnel

PPE

- Last line of defense
  - Hearing protection
  - Hand Protection
  - Eye and Face Protection
  - Respiratory Protection
  - Head Protection
Personal Protective Equipment

Equipment used to prevent injuries/illnesses

Wearers must know the limits of their equipment

Different levels of PPE (A,B,C,D)

- Dependent on what tasks are being addressed
- Most of what we do can fit into “Level D”
- Almost zero chance of approving any higher level of PPE

Foot, Eye, Hand, Hearing, Respiratory Protection
Types of PPE

- Head
- Eye/face
- Hearing
- Respiratory
- Hand
- Foot
- High Visibility
- Fall
Proper head protection shall be worn to prevent against:

- falling or flying objects
- Striking fixed objects

Look for the ANSI sticker when purchasing hard hats

The plastic photodegrades over time, and the helmets must be replaced every few years, so be wary of old “donated” helmets

Make sure that the suspension system is intact (no worn straps) before every use.
Proper eye and face protection shall protect against:

- flying chips/particles
- molten metal
- acids or caustic liquids
- chemical gases or vapors
- potentially injurious light radiation (ex. sun)

Eye Protection must include side protection and comply with ANSI Z87.1-1989 rating

Remove contact lenses when working with chemicals/cement
Chronic exposure to even low levels of 85dBA (sound of traffic), can cause hearing loss.

Used whenever noise levels are expected to be above “normal voice” levels (>65 dBA)

Ear plugs or muffs can be readily obtained

Can combine plugs/muffs

Which provides more protection: earplugs or earmuffs?

Plain cotton is not an acceptable ear plug!
Hand Protection

Required for protection against

- absorption of harmful substances
- severe cuts or lacerations
- abrasions
- punctures
- chemical burns (including cement)
- thermal burns and harmful temperature extremes

Choose the right glove for the job!
Consult NIOSH for more information http://www.cdc.gov/niosh/

- Metal Mesh
- Kevlar / Leather
- Nitrile / Vinyl / Neoprene
- Rubber
Foot Protection

Used to protect the feet when working in areas where there is a danger of foot injuries due to:

- falling or rolling objects
- objects piercing the sole
- electrical hazards

Keep feet dry and clean

Common workboot terms:

- Steel Toe – protects the toes from drops
- Steel Shank – provides arch protection from continuous shocks (like shovels or ladders)
- Steel Sole – provides puncture protection from the ground
- Metatarsal – protects the top of the foot
- Nonconductive sole – for electrical workers
Respiratory Protection

Use a respirator when:

- making dust (cutting, excavation, cement mixing)
- in the presence of volatile chemicals (paints and coatings)

Make sure that you use a respirator rated for the type of hazard you are protecting from (a dust ventilator against a volatile organic hazard is useless)

For organic vapor respirators, fitting and training is absolutely essential (consult the chemistry department of your school)

Consult NIOSH for more information http://www.cdc.gov/niosh/
During the Trip...

Remember that safety should be a value, not a priority.
Health of team members should be monitored.
Everyone is involved in proper planning and effective implementation.
If an emergency occurs, know what notifications are required.
   Document any incidents that occur.
Remember...

The consequences of failure, i.e. an injury or illness out of country, are much higher than in the US.

Higher risk requires higher levels of preparation and diligence in execution.
Thank You....