- Part 2 -

Brewery Safety Bootcamp – ONLINE!

Physical Safety, Material Handling, Chemical Safety

May 14, 2020

#CraftBrewersCon
CRAFT BREWERS CONFERENCE
& BrewExpo America®
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BIRKO®
your partner in craft brewery sanitation

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PHYSICAL HAZARDS

ELECTRICITY, PRESSURE, NOISE, MOVING PARTS AND GRAVITY
# ELECTRICAL HAZARDS

At least 1 person is electrocuted at work every day.

<table>
<thead>
<tr>
<th>U.S. workers</th>
<th>Number</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yearly</td>
<td>4,000</td>
<td>Non-disabling electrical shock injuries</td>
</tr>
<tr>
<td>Yearly</td>
<td>3,600</td>
<td>Disabling electrical shock injuries</td>
</tr>
<tr>
<td>Every year</td>
<td>2,000+</td>
<td>Electrical burns require stay at burn centers</td>
</tr>
</tbody>
</table>
ELECTRICAL HAZARD ASSESSMENT

**TASKS**

- Grist mill, conveyors
- Pumps, mixers
- Chillers
- Power tools
- Packaging lines
- Office/retail equipment
- Kitchen appliances

**OUTCOMES**

- Electric shock
- Electrocution
- Arc flash/blast
- Damage to equipment
- Building fire

**CONTROLS**

- No openings in boxes or covers
- Rated for amps required
- Switches, GFCIs, Disconnects, Grounds
- Equipment access in emergency
- No cords through doors, openings, walls…
LOOK AT YOUR PUMP MOTOR:
HIGHER VOLTAGE USES LOWER AMPERAGE
### WHEN DO I FEEL A SHOCK?

<table>
<thead>
<tr>
<th>CURRENT</th>
<th>PHYSIOLOGICAL RESULT</th>
<th>FEELING OR LETHAL INCIDENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mA</td>
<td>Perception threshold</td>
<td>Tingle</td>
</tr>
<tr>
<td>2 – 10 mA</td>
<td>Sensation of shock</td>
<td>Maintain muscle control, not painful</td>
</tr>
<tr>
<td>5 mA</td>
<td>GFCI trips</td>
<td></td>
</tr>
<tr>
<td>10 – 20 mA</td>
<td>Paralysis threshold of arms</td>
<td>Cannot release hand grip, may be thrown clear</td>
</tr>
<tr>
<td>20 – 50 mA</td>
<td>Respiratory paralysis</td>
<td>Breathing stops, usually fatal</td>
</tr>
<tr>
<td>50 – 200 mA</td>
<td>Fibrillation threshold</td>
<td>Heart beat uncoordinated, usually fatal</td>
</tr>
<tr>
<td>&gt;200 mA</td>
<td>Tissue burns</td>
<td>Non-fatal unless are vital organs</td>
</tr>
</tbody>
</table>
KEEP CLEAR ACCESS FOR AN EMERGENCY

RIGHT

[Image of a clear access area]

WRONG

[Image of a blockage to clear access]

CAUTION

AREA IN FRONT OF THIS ELECTRICAL PANEL MUST BE KEPT CLEAR FOR 36 INCHES. OSHA-NEC REGULATIONS
EXTENSION CORDS

SELECTION

• Protective jacket over insulated conductors
• Read instructions for use and amps.
• Select cords rated for your current
• Thick, round, big gauge, high amp cords are best
EXTENSION CORDS

READ THE CORD!

- S – Flexible cord
- W – Outdoor use
- J – 300V insulation
- No J – 600V insulation
- P – Parallel wire construction, used in air conditioner cords and household extension cords

- T – vinyl thermoplastic Jacket
- E – thermoplastic elastomer rubber (TPE)
- O – Cord is oil-resistant

- Wire Gauge and Number of Conductors e.g. 18/3, 8/4

On this cord, SJTW indicates the jacket type and AWG 18/3 indicates the gauge rating.
CORD CARE
• Outlet, cover plate get hot
• Plug ends get hot at outlet box
• Both plugs get hot
• Entire cord gets hotter
• Transfer of electricity across a gap creates heat

LOVE YOUR CORD
• Pull on the plug
• Unplug from outlet first, then tool
• Power arcs across the connection
• Avoid touching when wet
• Unplug it
• Cords are temporary; add more outlets

ROLLED CORDS
• Current heats cords
• Inductive coupling magnifies heat
• Stop using hot cord

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GROUNDING AND CIRCUIT INTERRUPTORS

- Switch
- Ground
- Disconnect
- GFCI
- Breaker
GROUNDING AND CIRCUIT INTERRUPTORS

SWITCH

1-Pole Switch
Diagram #1
Ask-the-Electrician.com

DISCONNECT

Fused Disconnect Switch

BREAKER

solenoid
core
iron lever
pivot
reset button
spring
springy metal
fixed point
contacts
BREAKER

- solenoid
- core
- iron lever
- pivot
- reset button
- spring
- springy metal
- fixed point
- contacts

grounding and Circuit Interrupters, continued

GFCI

- What's in the GFCI?
  (Plug-in)
- Push-to-test Button

GROUND

- kWh Meter: Utility
- Junction Box
- PV Service Fused Disconnect
- 240 VAC Inverter
- AC Service Entrance:
**ELECTRICAL HAZARD CONTROLS**

**SWPs**
- Squeegee floors
- Reduce water
- Close panels
- Clean dust out of panels
- Minimize extension cords
- Dust off outside of equipment

**RESPECT “WASHDOWN”**
- Motors are not water-tight
- Drain holes in bottom
- You can get shocked

**SHUTOFFs**
- Disconnect not a switch
- “within sight of” equipment
- “easy to reach”
- Clearly indicates OFF
- OFF is always down
PINCH, CRUSH, CUT AND ERGONOMICS HAZARD ASSESSMENT

TASKS

• Grain Milling & Conveying
• Pumping, Mixing
• Material Handling
  • Grain bags, boxes, pallets
  • Lifting beer kegs, cartons
• Packaging Beer
• Taproom, Kitchen Activities

OUTCOMES

• Crushed, Amputated Parts
• Broken Bones
• Eye Injury
• Laceration, Infection
• Back, RMD
• Forklift – “caught between”
• Damage to equipment

CONTROLS

• Use proper fittings, not hardware store fixes
• Machine guarding
• Hands out of moving equipment
• LO/TO
• Safe knife use
• PM schedules

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MACHINE GUARDING

- How large can the openings be?
- If can touch, what bites?
- Emergency shutoff
MACHINE GUARDING ENGINEERING CONTROLS

- Machine guarding, safety windows
- Interlocks, process logic controls
- Good repair / with PM program
- Lockout/tagout
- Guards limit water travel
- Body protection
- Sound barrier
NOISE HAZARDS

NOISE SOURCES
- Grist mills
- Pumps
- Centrifuges
- Packaging Lines
- Air Compressors
- Loud Music Systems
- Personal Listening

NOISE CONTROLS
- Isolate workers from noise
- Insulated rooms, walls
- Hearing protection
  - Voluntary
  - HPP
- Hearing rule of thumb

You need to be able to hear your brewing systems: mill, pumps, bearings, HLT/CLT, co-workers, etc.!
HAND AND POWER TOOL HAZARDS

MECHANICAL

ELECTRICAL

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## Hand and Power Tool Hazard Assessment

### Tasks
- Maintenance / Repair
- Custodial
- Building Trades
- Special Construction
  - R & D
  - Festival Decoration
  - Seating
  - Security

### Outcomes
- Tool Related Injury
  - Flying objects
  - Electric shock
  - Laceration or puncture
  - Noise
- Damage
  - Stripped fasteners
  - Damage to tool itself

### Controls
- Eye and hand protection
- Trained in tool use
- Regular inspection
  - Power cord
  - Fittings, couplings
  - Wear and tear
- Repair and replacement
Thanks to our generous sponsor
HAZARD WARNING SIGNS

BREWERY HAZARDS

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CAUTION
Minor to Moderate Injury Potential

WARNING
Death or Serious Injury is Possible

DANGER
Death or Serious Injury Likely

Black on Yellow
Black on Orange
Black and Red on White Background
Standardized Key Words and Color Schemes

NOTICE
General Information

Blue Panel on White

INSTRUCTION
General Safety Recommendations

Green Panel on White

ELECTRICAL & FIRE SAFETY
No Standard Format

Often Red on White
SIGN IT or REDESIGN IT!

- **DANGER** is for likely fatal or likely serious injury hazard
- **SAFETY FIRST**
  - LIFT WITH YOUR LEGS
  - NOT YOUR BACK
- **Caution**
  - Slippery surface

- **YES** – **INSTRUCTIONAL** sign giving safe lifting instructions
- **YES** – **CAUTION** Describes a likely non-fatal hazard

#CraftBrewersCon
Andrew Dagnan
Environmental and Safety Manager
Wicked Weed Brewing Co.
Asheville, North Carolina
MATERIAL HANDLING

MANUAL AND MECHANIZED MOVEMENT OF MATERIALS
HAZARDS

- Lifting/moving heavy objects
- Bending, twisting, turning
- Falling objects
- Lifting, pushing, pulling
- Improperly stacked materials
- Struck-by or caught-in/-between hazards
- Falls, slips, trips, or loss of balance
- Repetitive motion
- Overexertion

INJURIES

- Sprains, strains, tears
- Soreness and pain
- Bruises and contusions
- Cuts, lacerations, punctures, crushing, and amputations
ERGONOMIC HAZARDS

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ERGONOMIC HAZARDS STUDY – AT A COLORADO BREWERY

CONCLUSIONS

• Employees at increased risk for upper extremity (shoulder and wrist) Work-related Musculoskeletal Disorders (WMSDs)

• Employees exposed to combination of ergonomic risk factors

• Survey indicated that 50% of employees felt safety training received was not adequate and safety procedures in place don’t work
TYPICAL HEAVY OBJECTS

- Case of Beer – 30 lb.+
- Hop Box – 44 lb.
- Malt Bag – 50/55 lb.
- Keg (1/6 bbl) – 55 lb.
- Keg (1/2 bbl) – 160 lb.
- Full Barrel – 500 lb.+
- Brewing Hoses – can be very heavy
- Various Others – packaging change-over parts, waste or recycling containers
LIFTING HAZARD CONTROLS

• Reduce / Eliminate lifts
  • Automate processes
  • Keg Vacuum Lift or Robot
  • Hoists / lifts
  • Bulk (silos, super sacks)
• Two-person lifts
• Training on proper lifting
• Redesign tools / areas within appropriate heights
  • Above knees, below shoulders
• Rotate employees
• Encourage micro breaks
ADVANTAGES OVER MANUAL MATERIAL HANDLING

- Lower Cost of Labor
  - Higher Efficiency
  - Capital Expense is Greater
- Mechanized Material Handling
  - Adds its own new hazards
  - Extra Certification / Training
- Other Advantages
  - Fewer Injuries
  - Lower Workers Comp Premium
  - Increased Productivity
“ROLL OUT THE BARREL” – EQUIPMENT EXAMPLES
"KEG PARTY!" – EQUIPMENT EXAMPLES
STILL MORE EQUIPMENT EXAMPLES
• Check capacity plate – Never overload
• Protective footwear
• Inspect before use
  • Look for cracks or other defects
  • Ensure wheels are in good condition
• Check floor for ruts, bumps, imperfections
• If view is obstructed, have a spotter assist
• Not for human transportation
• When going down an incline, push, don't pull
• Hand Truck – Place load over axle – the operator should only balance and push
POWERED INDUSTRIAL TRUCKS (PITs)

- **PIT**
  - Mobile
  - Power-propelled truck
  - Can carry, push, pull, lift, stack materials

- **Includes**
  - Forklifts
  - Powered Stackers
  - Powered Pallet Jacks
<table>
<thead>
<tr>
<th>MUST DO</th>
<th>YES, DO</th>
<th>SWPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Written Program</td>
<td>• Seat Belt, Horn, Lights, Backup Alarm, Safety</td>
<td>• Hands inside the Cage</td>
</tr>
<tr>
<td>• Training Documentation</td>
<td>• Capacity, Low and Centered</td>
<td>• Travel at Appropriate Speeds</td>
</tr>
<tr>
<td>• Inspections</td>
<td>• Forks</td>
<td>• Anticipate Pedestrians</td>
</tr>
<tr>
<td>• Daily</td>
<td>• &lt;6” operating</td>
<td>• Make eye contact</td>
</tr>
<tr>
<td>• Shiftly</td>
<td>• On the floor when parked</td>
<td>• No mirrored eyewear</td>
</tr>
<tr>
<td>• Packaging Beer</td>
<td></td>
<td>• Use traffic mirrors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• In and Out Carefully</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Replace Pallets</td>
</tr>
</tbody>
</table>
P.I.T. “CRASH COURSE” – NO, DON’T CRASH!

SEPARATE

- PITs from Pedestrians
- Indicate On
  - Floors
  - Wall Signs
  - Barricades
- Protect With
  - Bollards
  - Dock Boards
  - Wheel Chocks
**REQUIRED TRAINING**

- **PITs**
  - Before Use
  - Every 3 years
  - Re-training in certain cases

- **CRAINS/HOISTS**
  - Before First Use
  - Annual Refresher

**RECOMMENDED TRAINING**

- **GENL MATL HANDLING**
  - How to Recognize / Avoid Material Handling Hazards

- **HAND TRUCKS, PALLET JACKS**
  - Before Use

- **BACK SAFETY**
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Chris Bogdanoff
Head Brewer & BA Safety Subcommittee Chair
Heroes Restaurant and Brewery
Anaheim, California
CHEMICAL HAZARDS

SAFETY DATA SHEETS AND PERSONAL PROTECTIVE EQUIPMENT
CHEMICAL USAGE HAZARD ANALYSIS

**TASKS**

- Routine cleaning and sanitizing
- Brewing and filtering operations
- SS passivation
- Draught line cleaning
- Lab assays
- Shipping/receiving and warehousing
- Maintenance projects

**OUTCOMES**

- Skin, eye damage
- Respiratory distress
- Damage to brewery equip.
- Beer contamination
- Slippery surfaces

**CONTROLS**

- Substitution and Elimination
- Good housekeeping
- SWP – caution
- Maintaining SDSs, labels, signs, and placards
- Proper PPE use, selection, inspection, replacement
### CHEMICALS IN BREWERIES/PUBS

**1. CORROSIVES**
- Acid Cleaners
- Caustic Cleaners
- Alkaline Powders

**2. OXIDIZERS**
- Hydrogen Peroxide
- Peracetic Acid
- Nitric Acid / Iodine
- Ozone
- Chlorine Dioxide

**3. OTHER BEER PRODUCTION**
- Non-Oxidizing Sanitizers (Quats)
- Glycol Coolant
- Lab Reagents
- Water Treatment
- Filter Aids
- Glues
ASPHYXIANTS
- SIMPLE
  - Carbon Dioxide
  - Nitrogen
- CHEMICAL
  - Carbon Monoxide
- OXYGEN
  - Ambient: 20.9%
  - Deficient: <19.5%
  - Enriched: >23%

FLAMMABLES
- Alcohols
- Propane
- Natural Gas
- Lab Reagents

FACILITIES
CHEMICALS
- Lubricants
- Paints
- Janitorial
- Pest Control
- Food Service
SAFE WORK PRACTICES – ATTENTIONING THE HAZARDS

HOUSEKEEPING

• Keep Labels Visible
• Keep Clear Pathways
• Put Away Equipment

WALKING, WORKING AND EXITING

• Avoid Spills
• Rehearse Emergency Procedures

HYGIENE

• Wash PPE and Hands After Chemical Use
ENGINEERING CONTROLS FOR BREWERY CHEMICALS

Secondary Containment

Chemically Compatible Equipment

Ventilation and Monitoring
ADMINISTRATIVE CONTROLS FOR BREWERY CHEMICALS

SDS

Safety Data Sheet
Chemical Company, Inc.

LABEL

CAUSTIC CLEANER FP

WARNING

Do not breathe mist, vapors or spray. Wash hands and any exposed skin thoroughly after handling. Wear protective gloves. Wear eye/face protection. Wear protective clothing. Keep in original or other corrosion resistant container. IMMEDIATELY CALL A POISON CENTER.

Hazardous Ingredients:

Hazard Statements:

Precautionary Statements:

Response:

Health

Flammability

Reactivity

Personal Protection

NFPA

HMIS

1

1

1

OX

3

3

3

Corrosive

Oxidizer

5.1
LIMITATIONS

• NOT Failsafe

• Last Line of Defense

• Poor Understanding
  • Selection
  • Use
  • Cleaning
  • Inspection
  • Replacement
EYE PROTECTION

FROM SPLASHES

- Standard Safety Glasses
- Indirect Vented Goggles
- Face Shield
HAND PROTECTION

FROM DIRECT CONTACT

- Inexpensive disposable nitrile
- Neoprene hybrid over woven or latex base
- Heavy duty reusable nitrile
FOOT PROTECTION

FROM SPILLS, PUDDLES, CONTAINER WEIGHT

- Sturdy leather or synthetic work shoes/boots with reinforced toe and shank
- Knee-high rubber (PVC) with reinforced toe and shank
- Low-rise rubber (PVC) with reinforced toe and shank or rubber pullover over sturdy work boot
OTHER PROTECTION

VARIOUS HAZARDS

- Splash protection apron
- Fall protection harness, lanyard, and anchoring
- Hearing protection, disposable or reusable
RESPIRATORY PROTECTION

FROM DUSTS, MISTS, VAPORS, AEROSOLS

- Chemical Mists/Vapors
  - Brewery Washdown
  - Paints, Coatings, Solvents

- Particulate protection
  - Grain Dust
  - DE Filter Aids
  - Metal, Wood, Plastic Fabrication/Welding

None of These Work in the Absence of Sufficient Oxygen!!
Facial Hairstyles and Filtering Facepiece Respirators

Intended for workers who wear tight-fitting respirators

SOME FACIAL HAIR STYLES CAN BE USED WITH ½-FACE RESPIRATORS

- Respirator surface contact area must be 100% against clean shaven skin
- Only disposable dust masks can be worn without fit testing, medical evaluation, and special training