Prevention through Design

in the 2020 workplace

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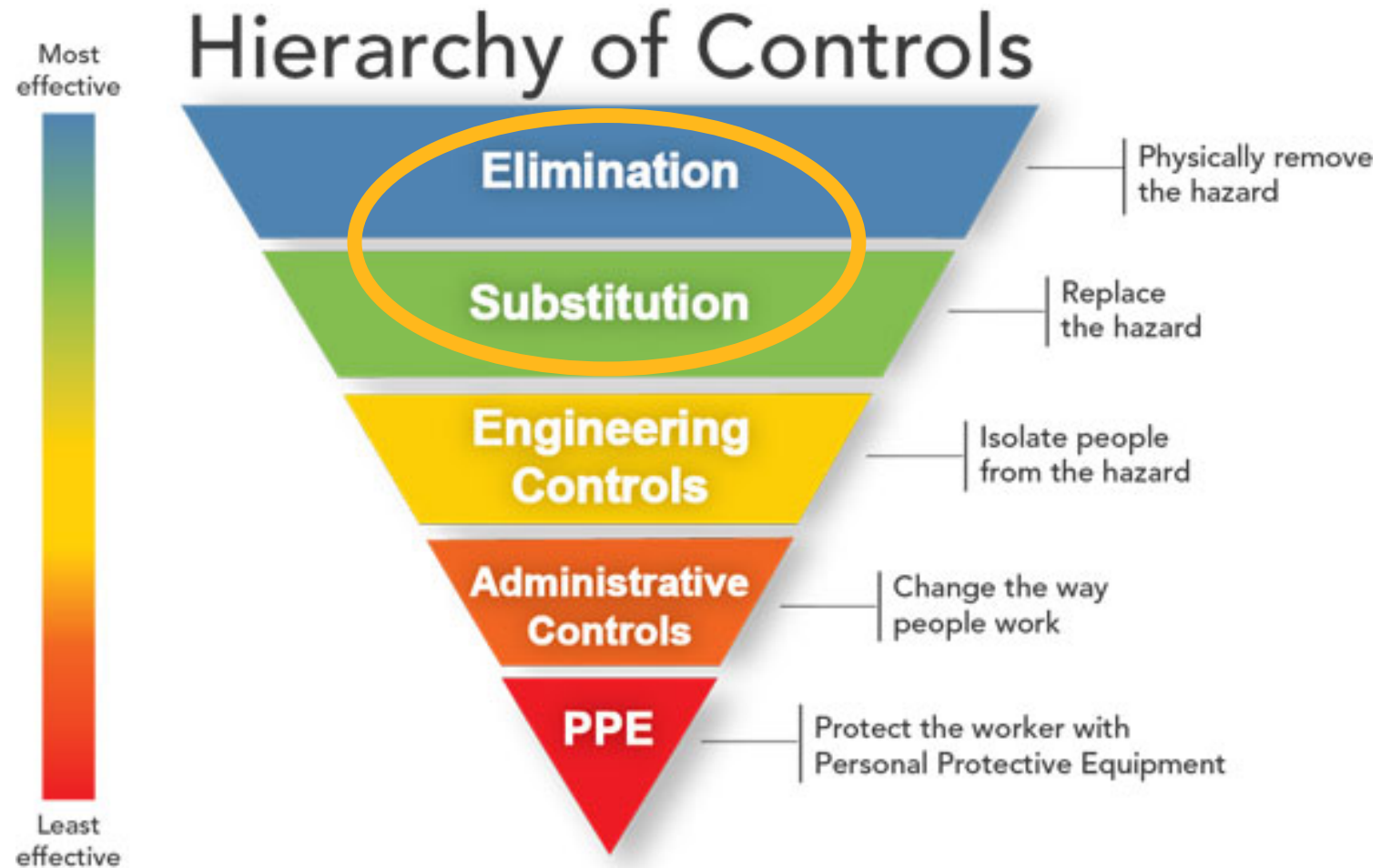JBach@cdc.gov
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Prevention through Design

DISCLAIMER: *The findings and conclusions in this report are those of the author and do not necessarily represent the official position of the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention.*

A Webinar on "Engineering Controls" ...

- By "Engineering Controls" many of us think of PASSIVE controls that work on their own without human intervention.

- "Administrative" and "PPE" controls require consistent, effective, and very ACTIVE performance by humans.

- If passive methods actually control the hazard, great!

- But what if they don't?

DESIGN *priority is* *SOURCE* *control*

Hierarchy of Controls

Most effective

Elimination — Physically remove the hazard

Substitution — Replace the hazard

Engineering Controls — Isolate people from the hazard

Administrative Controls — Change the way people work

PPE — Protect the worker with Personal Protective Equipment

Least effective
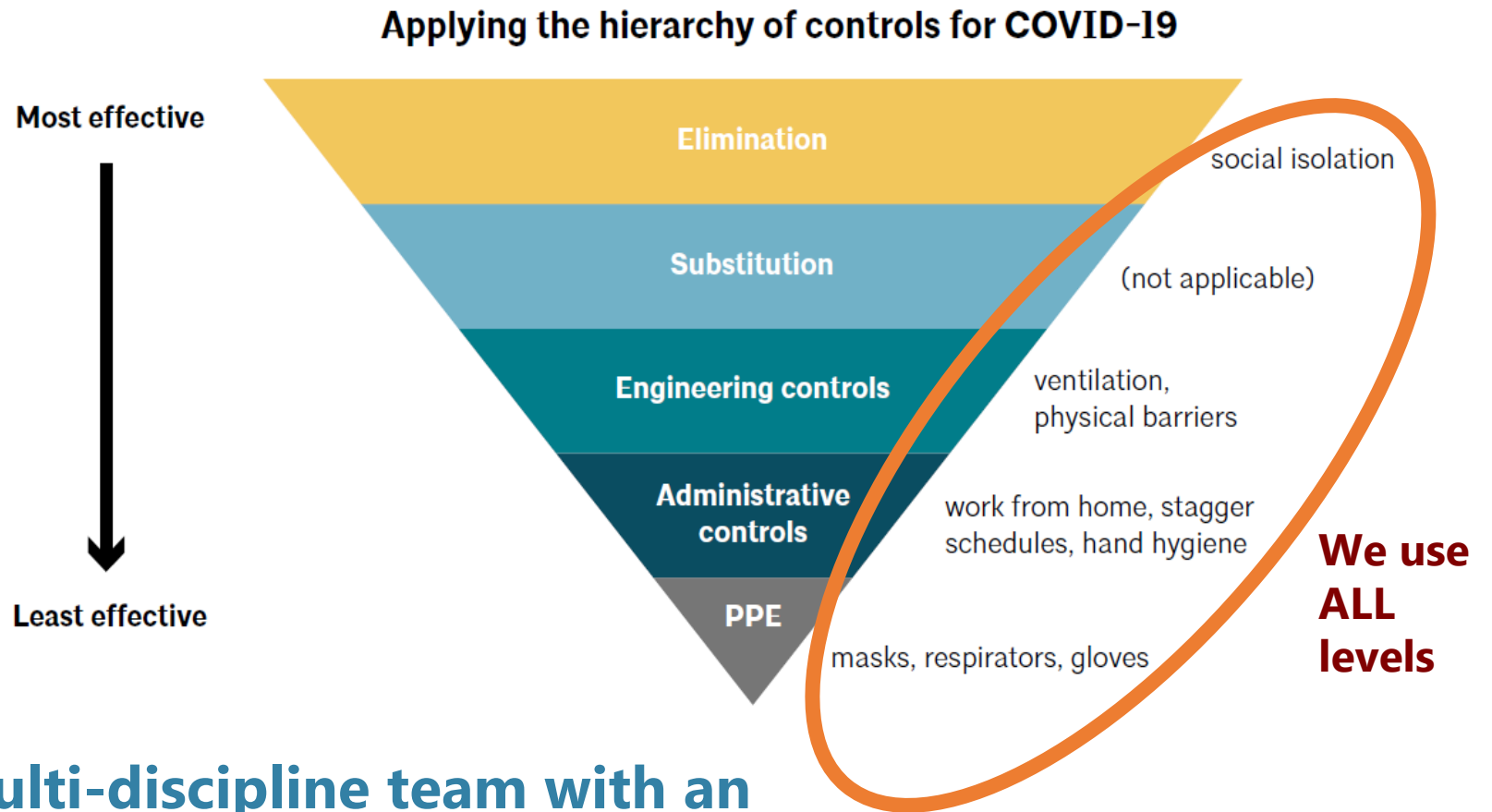
DESIGN *priority is* <u>SOURCE</u> *control*

- We prefer to eliminate the hazard SOURCE to protect workers

  But the source here <u>IS</u> the worker!

- Therefore many *actively managed* controls are needed to reach the top of the Hierarchy of Controls … organized teamwork

- ***DESIGN*** must consider the <u>entire Hierarchy of Controls</u>

American Institute of Architects (AIA) *"Reopening America: Strategies for Safer Buildings"* May 28, 2020

Figure 1: Applying the hierarchy of controls for COVID-19 (adapted from NIOSH)

Applying the hierarchy of controls for COVID-19

Most effective

Least effective

- Elimination — social isolation
- Substitution — (not applicable)
- Engineering controls — ventilation, physical barriers
- Administrative controls — work from home, stagger schedules, hand hygiene
- PPE — masks, respirators, gloves

We use ALL levels

NEEDED: A collaborative, multi-discipline team with an organized PROCESS to DESIGN your pandemic business system

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PtD Design Safety Review (DSR) *PROCESS*

Business Concepts	Design	Build	Operations & Maintenance	Decommission & Recycle
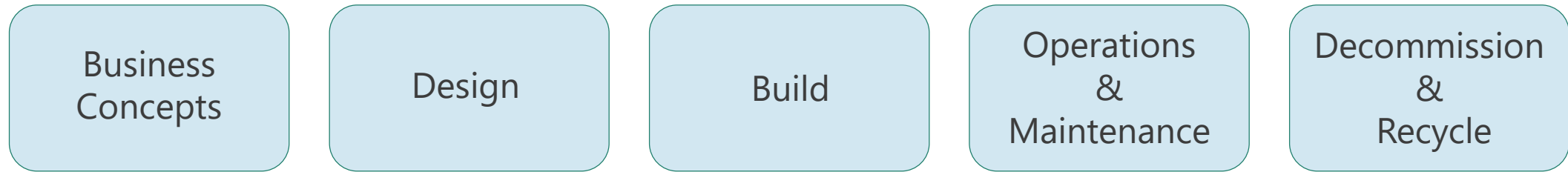
DSR Team Meetings

1. Collaborative, Multi-Discipline <=8 ?
   (Key worker/labor, OSH/Medic, Ops/Maint, Designer, Mgt, Finance, HR, Communication)
2. Hazard ID
3. Risk Assessment and Ranking
4. Alternatives Assessment
   (Design-Out, Reduce, Control, Protect)
5. Change Plans, Contract Provisions, & Purchasing Specs
6. Provide Guidance for Remaining Hazards
7. Document All *(hazard tracking table)*

Lessons Learned

- *Experience*
- *Expertise*
- *Different views*

Risk and Alternatives Assessment

1.

Hazard ID

PRELIMINARY HAZARD LIST

2.

Hazard Analysis

PRELIMINARY HAZARD ANALYSIS

3.

HAZARD TRACKING LIST							
Risk	Hazard	Cause	Design Process element affected	Impact on Project Objectives	Risk Manager	Agreed Response to Risk	Expected Resulting Risk
HIGH	Falls from roof while cleaning or maintaining skylights	Roof pitch or weather conditions	(whatever makes sense for your design methods)	Cost, Schedule Slippage	Designer, Const. Mgr, Constructor	Fixed exterior ladder. Tie-off points for work performed on roof.	LOW
HIGH	Harm from chemicals	Exposure to chemicals	Investigative, Construction	Cost, Schedule Slippage	Designer, Const. Mgr, Constructor	Add HTRW CEGS to Design Specificatio	LOW

8
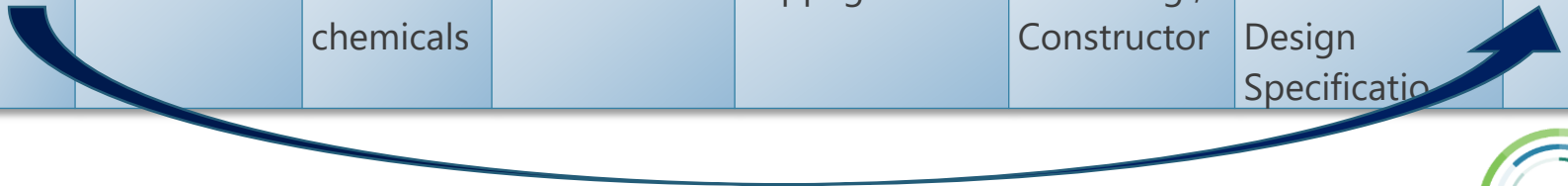
Checklists in Design Safety Reviews

- Do NOT start your first DSR team meeting with "let's brainstorm!"

- Instead, get your DSR team reviewing checklists of common problems for your project type

- Brainstorming will follow

Restart Readiness Checklist
For Coronavirus Disease 2019 (COVID-19)
Use this checklist (for non-healthcare employers) as a guide to resuming business operations as safely and healthy as possible for you, your employees, and the public. Some items may need to be ongoing, so regularly revisit the checklist while COVID-19 cases exist. Only complete those items that apply to your business. See the Resources section for links and QR codes to web resources.

1. Prevent and reduce transmission among employees

Monitor federal, state, and local public health communications about COVID-19.

Item	Completed	Ongoing	Not Started	Not Applicable
Ensure workers have access to current information.	☐	☐	☐	☐
Check local public health information [5] and the CDC COVID-19 website [1] daily, or as needed depending on local conditions.	☐	☐	☐	☐

Reinforce how employees can protect themselves and others from COVID-19 by communicating the following:

Item	Completed	Ongoing	Not Started	Not Applicable
If you have symptoms [6], notify your supervisor and stay home.	☐	☐	☐	☐
If you are sick, follow CDC-recommended steps [7], and do not return to work until you meet criteria to discontinue				

[from CDC Resuming Business Toolkit]

Sources for great "Checklist" material

- NIOSH www.cdc.gov/niosh/emres/2019_ncov.html
- CDC   www.cdc.gov/coronavirus/2019-ncov/community/
  www.cdc.gov/coronavirus/2019-ncov/community/worker-safety-support/index.html

Other:
- AIHA
  www.aiha.org/public-resources/consumer-resources/coronavirus_outbreak_resources
- NIEHS   https://tools.niehs.nih.gov/wetp/covid19worker/
- AIA   www.aia.org/resources/6299247-reopening-america-strategies-for-safer-bui
- ASHRAE   www.ashrae.org/covid19
- And more ...

This is the PtD Design *Process*

ANSI/ASSP Z590.3

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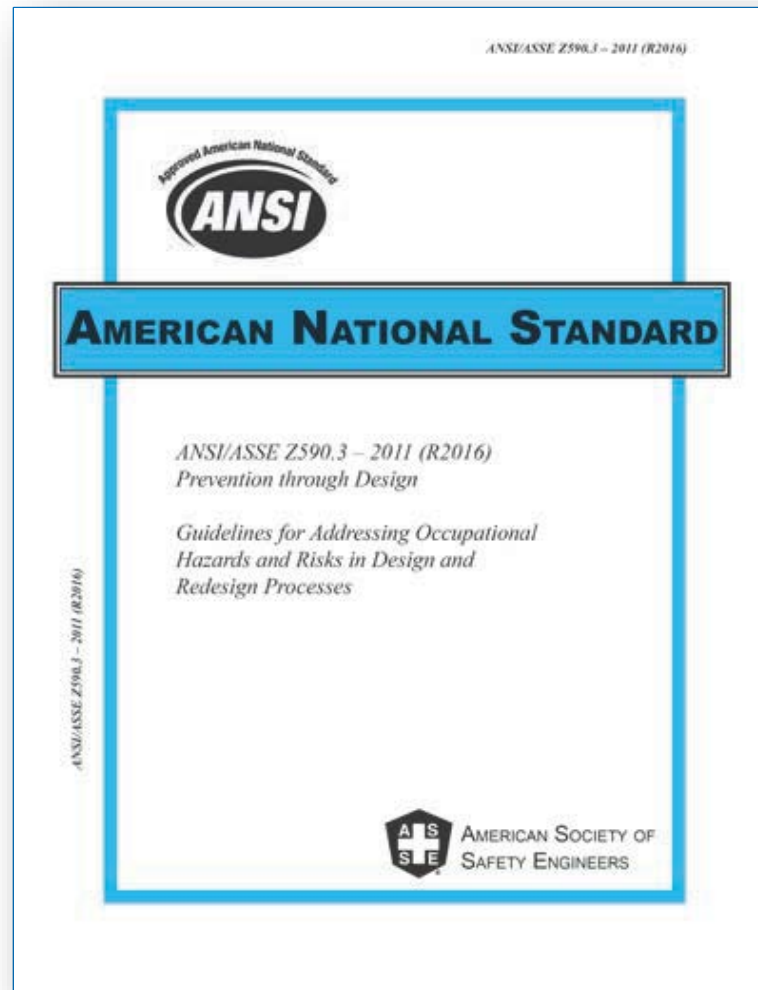
GENERAL
A *Design Safety Review* PROCESS for any business and any hazard

CONCISE
17 pages
Helpful appendices

VALUABLE
"System Safety Light"
How to DO it

Engineer's thoughts worth considering …

- Interesting webinar by Allen & Shariff (free sign-up)

https://www.allenshariff.com/general-contracting-feature-project-services/mechanical-design-to-fight-illness/

- Interesting paper by Steve Taylor (active in ASHRAE)

https://taylorengineers.com/taylor-engineering-covid-19-whitepaper

for example …

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Efficacy chart from Taylor Engineering …

MOST effective

ACTIVE, managed, SOURCE controls

(plus workplace re-configure)

PASSIVE Engineering Controls:

"No Touch"
Upper Room UVGI
Portable HEPA
MERV 13
Reset Demand-Controlled
Recommission HVAC's
Disable some zonal fans

Measure	Effectiveness in Mitigation COVID-19 Transmission	First Cost Impact	Energy/ Environmental Impact
Maintain social distancing	★★★★★	$$$ (note 1)	-
Frequently wash hands	★★★★★	–	-
Frequently disinfect common area and restroom surfaces	★★★★★	$	-
Conduct meetings via computer video, not in-person	★★★★★	–	-
Work from home as often as possible	★★★★★	$$ (note 2)	–
Require employees with symptoms or diagnosed to stay home	★★★★★	–	–
Implement flexible paid sick leave policies so sick employees stay home	★★★★	$$$ (note 3)	–
Require masks be worn at all times indoors in areas where more than one person can gather	★★★★	$	–
Reduce office workstation density and install plexiglass guards	★★★	$$$$$	–
Require and pay for employees to be regularly tested	★★★★	$$	–
Install fever warning system thermal imaging equipment at public entries	★★★	$$	–
Convert restroom fixtures, doors, and toilet seats to be automatic and touch-free	★★★	$$$$	–
Install upper-room UV-C in restrooms	★★	$$$	🏭
Install upper-room UV-C in public waiting rooms	★★	$$$	🏭
Install portable HEPA air cleaner in elevators	★	$	–
Upgrade to MERV 13 filters	★	$	🏭
Deactivate occupied-standby	★	$	🏭
Reset demand-controlled ventilation setpoint to 800 ppm	★	$	🏭
Recommission HVAC systems, update control sequences	★	$$	(note 4)
Disable zonal fans such as ceiling fans where not essential for thermal comfort	★	–	–

LEAST effective

Measure	Effectiveness in Mitigation COVID-19 Transmission	First Cost Impact	Energy/ Environmental Impact
Install portable HEPA air cleaner in workstations	★	$$	🏭
Increase ventilation rates, DOAS systems	★	$$$$	🏭🏭🏭
Increase zone ventilation rates, VAV systems	★	$	🏭🏭🏭
Increase AHU outdoor air rates, VAV systems	★	$	🏭🏭🏭
Operate ventilation systems 24/7	★	$	🏭🏭🏭🏭
Install UV-C in air handlers	★	$$$	🏭
Add humidification, control to 40%RH	★	$$$	🏭🏭🏭

Notes:
1. Cost of social distancing would be indirect in management of employee scheduling to minimize density.
2. Cost increase is for remote office setup and possible productivity reduction.
3. Paid sick leave may already be required in California.
4. Energy use is usually reduced when systems are recommissioned and substantially reduced if Guideline 36 control sequences are implemented.

Maintain a MIX of ACTIVE source controls and PASSIVE cleaning and dilution controls.

AVOID A FALSE SENSE OF SECURITY for any overly-simplistic choice.

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www.dezeen.com/2020/04/28/face-shield-joe-doucet-coronavirus/

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