Project Safety and the Triple Bottom Line

ASCE Toledo Section
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WWW.DESIGNFORCONSTRUCTIONSAFETY.ORG

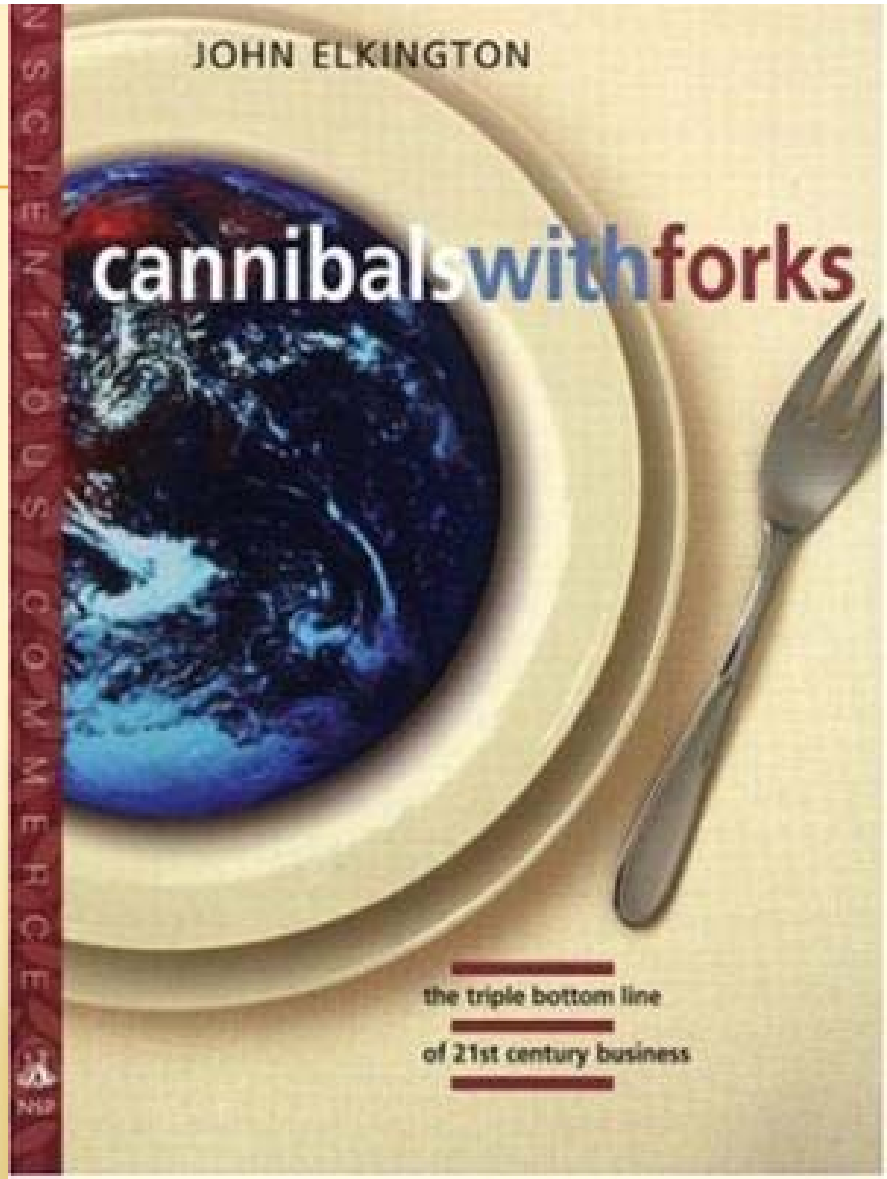
THE PTD CONCEPT | PROCESS AND WORK PRODUCT | HISTORY AND FUTURE OF PTD | CHALLENGES

PTD INFORMATION AND PUBLICATIONS | DESIGN TOOLS | INTERNATIONAL GUIDELINES | PRESENTATION FILES

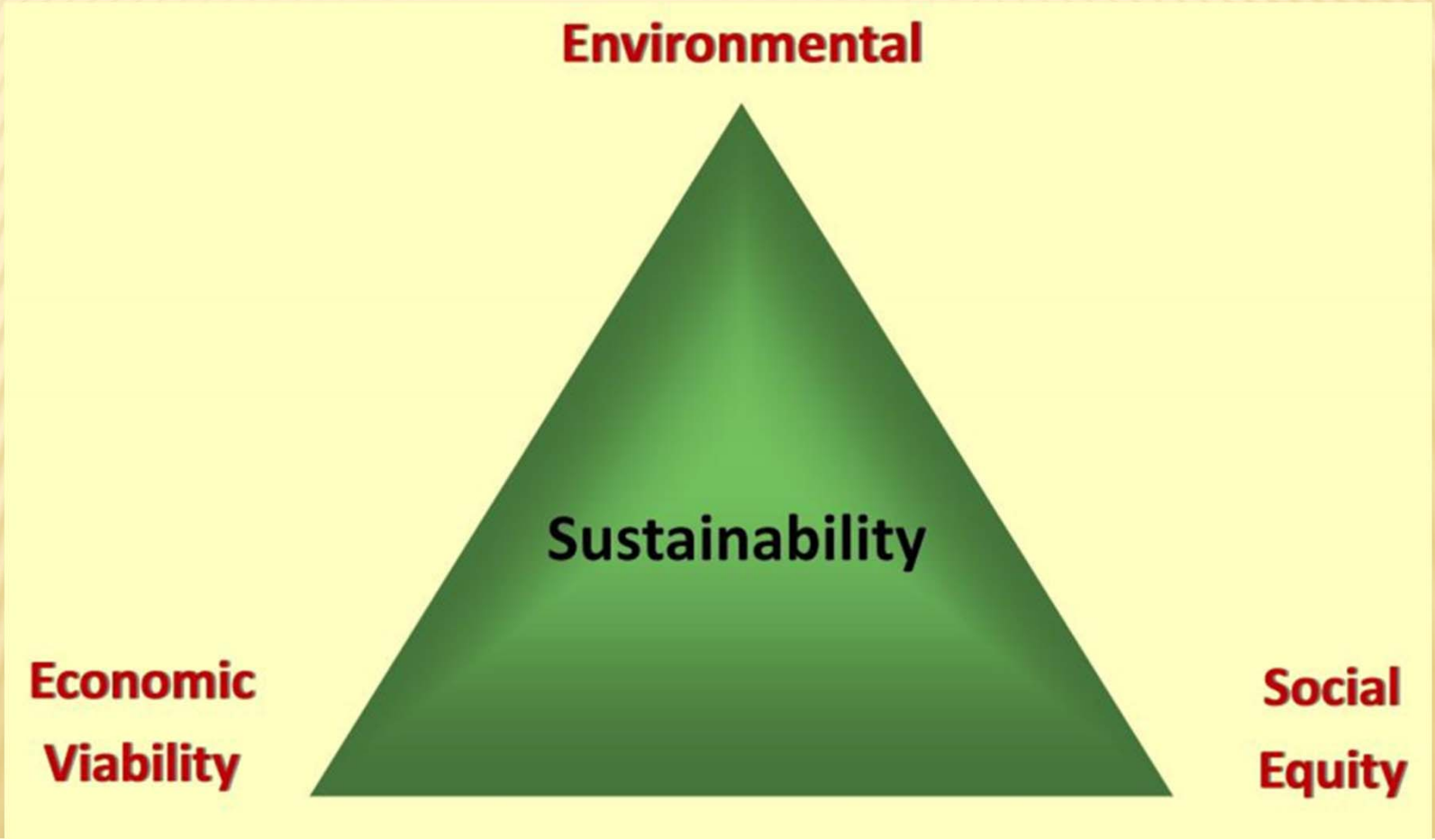
TRIPLE BOTTOM LINE

"All businesses can and must help society achieve three goals that are linked – **economic** prosperity, **environmental** protection and **social** equity."

http://blueandgreentomorrow.com/features/book-review-cannibals-with-forks-john-elkington-1999/

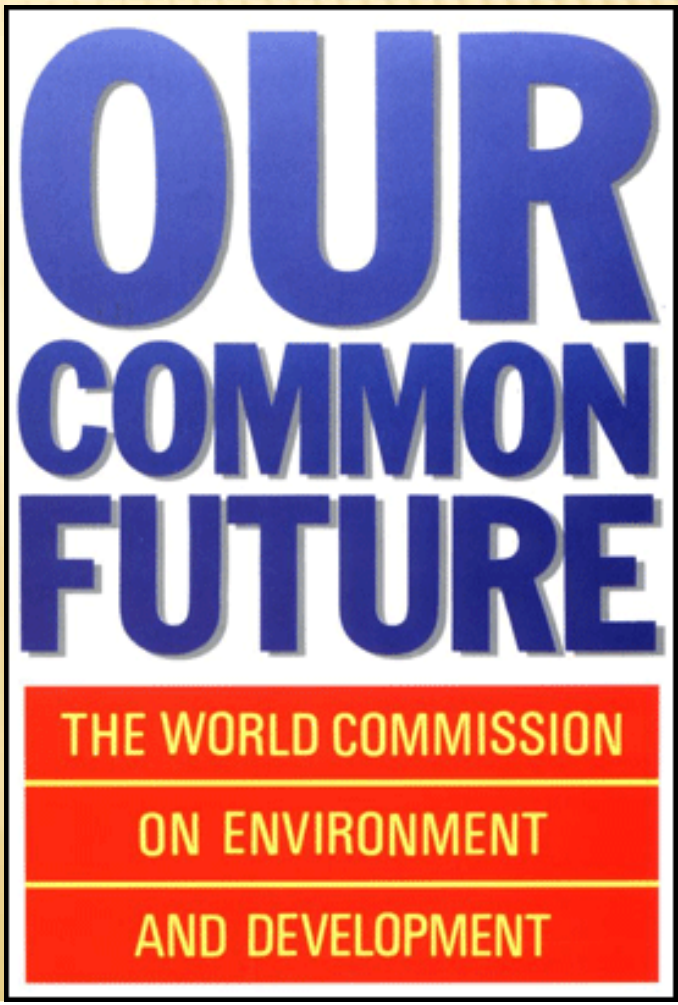


SUSTAINABILITY AND THE TRIPLE BOTTOM LINE



SOCIAL SUSTAINABILITY AND CONSTRUCTION SAFETY

- Definition of Sustainable Development in Brundtland Commission Report (1987)
- Focus on people as much as on the environment
  - Meet the needs of people who can't speak for themselves



CORPORATE SOCIAL RESPONSIBILITIES

- "Commitment by business to behave ethically and contribute to economic development;
- "Improve quality of life of the local community and society at large."
- "Improve quality of life of the workforce and their families;

Source: World Business Council for Sustainable Development

Sustainable Development

Design and construction that doesn't unfairly affect people who are not at the table

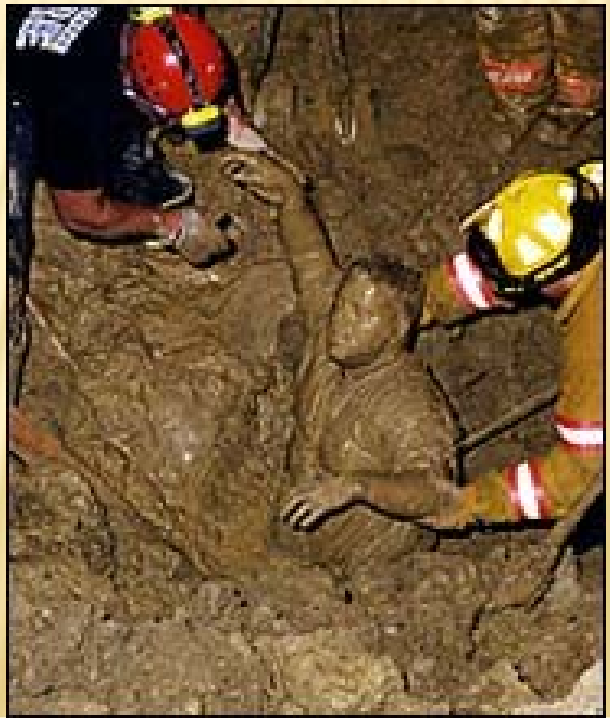
Further reading:
Toole, T. M. and G. Carpenter (2013). "Prevention through Design as a Path Towards Social Sustainability." *ASCE Journal of Architectural Engineering* 19(3):169-173.

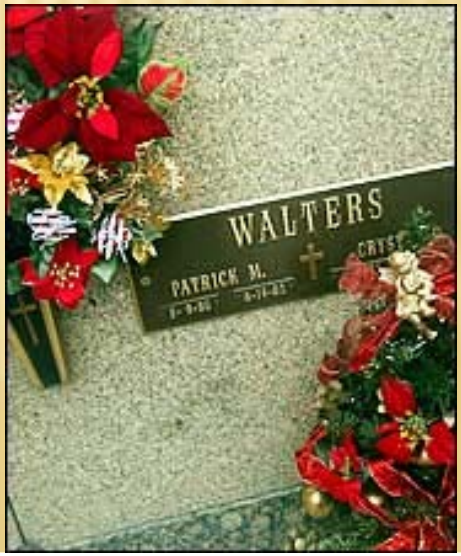
SOCIAL SUSTAINABILITY ISSUES

- How will we convince all stakeholders that our project will not unfairly affect people who are not at the table during the concept development, design and construction planning?
  - Building occupants
  - Local politicians and regulators
  - Financiers
  - Nearby residents
  - Our employees
  - Construction workers
  - Maintenance workers

ANNUAL CONSTRUCTION ACCIDENTS IN U.S.

- Nearly 200,000 serious injuries
- 1,000+ deaths





SOCIAL SUSTAINABILITY FUTURE ISSUES

- Do not our duties include minimizing all risks (especially to people) that we have control over?
- Do not we have the same duties for construction and maintenance workers as for the “public”?

PREVENTION THROUGH DESIGN (PTD)

"Addressing occupational safety and health needs in the design process to prevent or minimize the work-related hazards and risks associated with the construction, manufacture, use, maintenance, and disposal of facilities, materials, and equipment."

(http://www.cdc.gov/niosh/topics/ptd/)

PtD
Prevention through Design

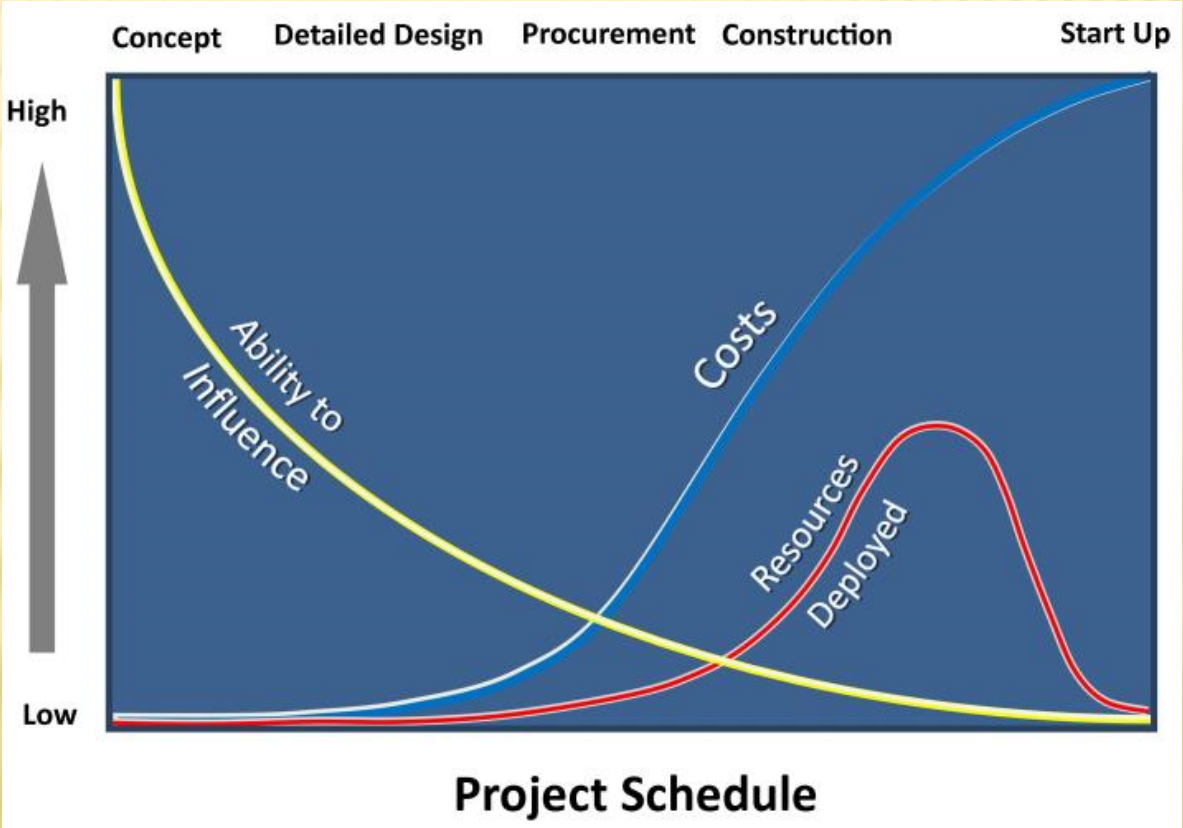
PTD IN CONSTRUCTION IS…

- Explicitly considering construction and maintenance safety in the design of a project.
- Being conscious of and valuing the safety of construction and maintenance workers when performing design tasks.
- Making design decisions based in part on a design element's inherent safety risk to construction and maintenance workers.

"Safety Constructability and Maintainability"

DESIGN HAS MAJOR LEVERAGE

- Ability to influence key project goals is greatest early in the project schedule during planning and design (Szymberski, 1997)



HIERARCHY OF CONTROLS

Reliability of Control

Higher

Lower

Elimination
Eliminate the hazard during design

Substitution
Substitute a less-hazardous material or form during design

Engineering Controls
"Design-in" engineering controls, Incorporate warning systems

Administrative Controls
Well-designed work methods & organization

PPE
Available, effective, easy to use

Prevention through Design

PTD AROUND THE GLOBE

- Required in UK since 1995
- Required now in:
  - European Union
  - Australia
  - South Africa
  - Singapore

USACE FACILITY SYSTEMS SAFETY

To incorporate systems safety engineering and management practices into a facility life cycle process used in the conceptual phase, planning stages, construction of facilities, and facility reduction (demolition).

UFC 1-200-01
1 July 2013
Change 3, 1 August 2015

UNIFIED FACILITIES CRITERIA (UFC)

GENERAL BUILDING REQUIREMENTS

NATIONAL INITIATIVES AND ACTIVITIES

- NIOSH
  - PtD National Initiative
  - PtD Workshops: July 2007 and August 2011
  - NORA Construction Sector Council CHPtD Workgroup
- OSHA Alliance Program Construction Roundtable
  - *ASCE founded this group when it had an alliance with OSHA in the early 2000s!*
- ANSI/ASSE PtD Standard (Z590.3-2011)

ECONOMIC BENEFITS OF DESIGNING FOR SAFETY

- Reduced site hazards
  - Fewer worker injuries and fatalities
- Reduced workers' compensation premiums
- Increased productivity and quality
- Fewer delays due to accidents
- Improved operations/maintenance safety

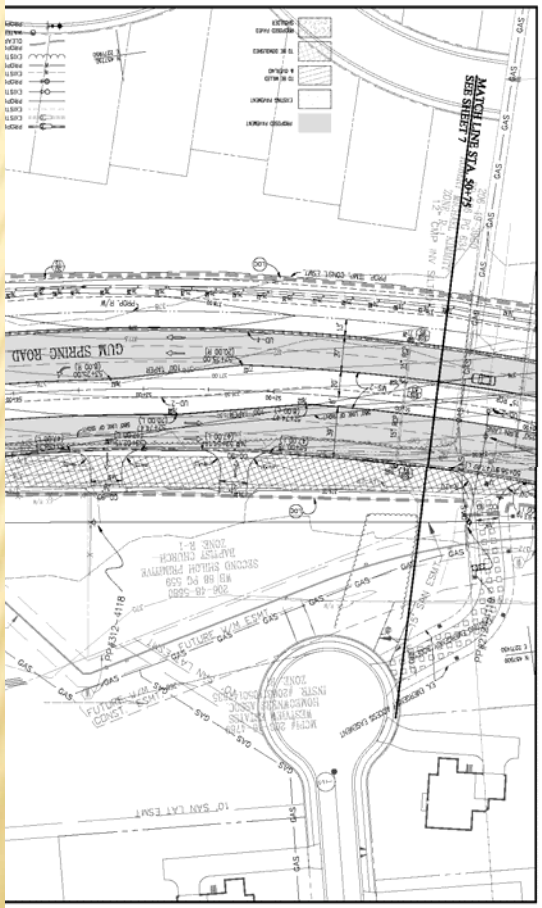
ASCE CODE OF ETHICS AND CONSTRUCTION SAFETY

Canon 1: Hold Safety Paramount

- Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.

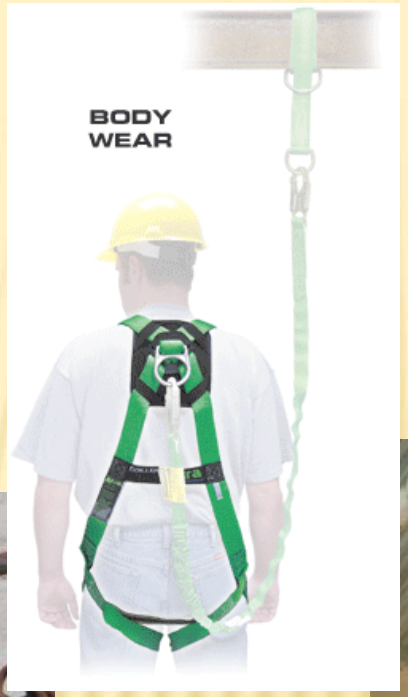
- a. Engineers shall recognize that the lives, safety, health and welfare of the general public are dependent upon engineering judgments, decisions and practices incorporated into structures, machines, products, processes and devices.

EXAMPLE OF THE NEED FOR PTD



- Design spec:
  - Dig groundwater monitoring wells at various locations.
  - Wells located directly under overhead power lines.
- Accident:
  - Worker electrocuted when his drill rig got too close to overhead power lines.
- Engineer could have:
  - specified wells be dug away from power lines; and/or
  - better informed the contractor of hazard posed by wells' proximity to powerlines through the plans, specifications, and bid documents.

PTD EXAMPLE: ANCHORAGE POINTS



PTD EXAMPLE: ROOFS AND PERIMETERS

Skylights

Upper story windows

Parapet walls

PTD EXAMPLE: STRUCTURAL STEEL DESIGN

Detailing Guide for the Enhancement of Erection Safety

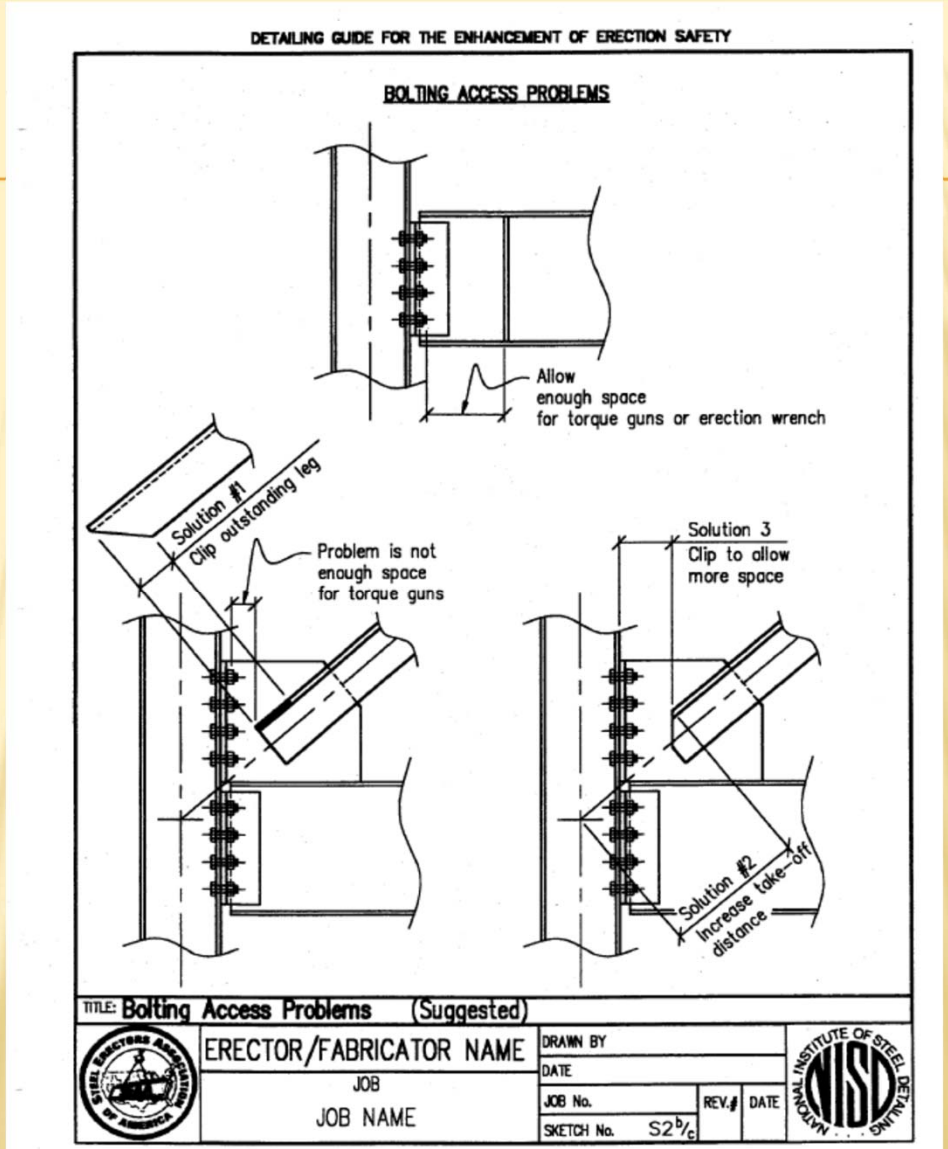
Published by the National Institute for Steel Detailing and the Steel Erectors Association of America

The Erector Friendly Column

- Include holes in columns at 21” and 42” for guardrail cables and at higher locations for fall protection tie-offs
- Locate column splices and connections at reasonable heights above floor

Photo: AISC educator ppt

- Provide enough space for making connections



- Know approximate dimensions of necessary tools to make connections

Photo: AISC educator ppt

ENVIRONMENTAL SUSTAINABILITY AND CONSTRUCTION SAFETY

- Environmental Sustainability has helped us to take a life cycle approach
- Research has shown that green building has new hazards
- LEED BC has a pilot credit for prevention through design

PREFABRICATION: THE LINK BETWEEN ENVIRONMENTAL SUSTAINABILITY AND SAFETY

- Prefabricated construction is inherently safer than “stick-built.”
- Work is shifted from dangerous work environments to engineered work environments and processes.
  - at height
  - in trenches
  - in confined spaces
  - exposed to weather (wind, water, ice, mud, lightning)
- Prefabricated construction has
  - lower construction waste
  - lower embodied energy
  - lower embodied greenhouse gases
- Effective prefabrication often requires designer-constructor collaboration

PTD EXAMPLE: PREFABRICATION

Steel Stairs

Concrete Wall Panels

Concrete Segmented Bridge

SO WHAT DOES THIS MEAN FOR YOU?

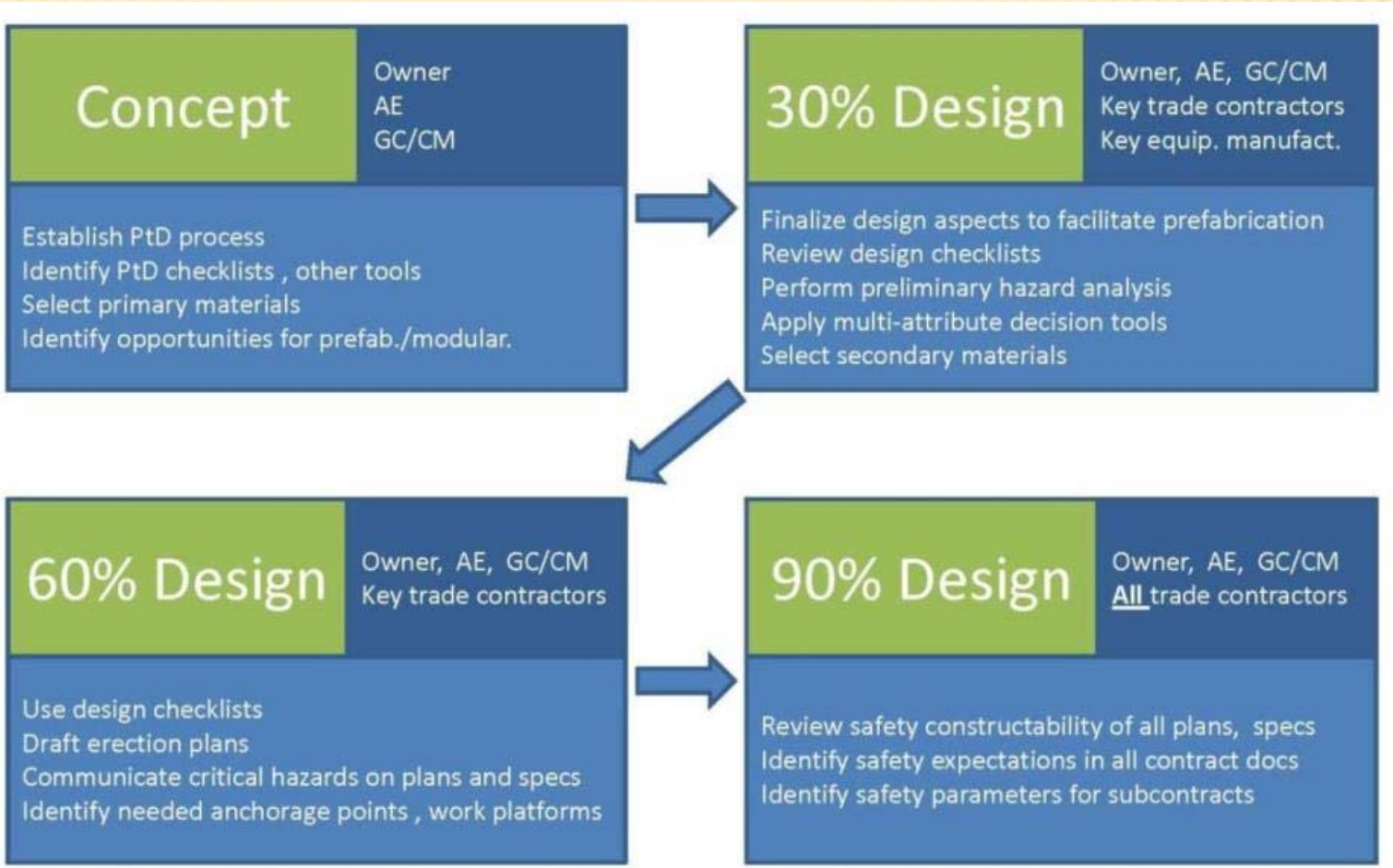
- Every one (owners, designers, constructors) should be thinking about all three aspects of sustainability.
- We must collaborate DURING DESIGN to maximize a project's sustainability, including performing prevention through design to achieve social sustainability

PTD PROCESS

Get the right people
talking about the right things
at the right time!

www.seagrave.com/

PTD PROCESS



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SO WHAT DOES THIS MEAN FOR YOU?

- Every one (owners, designers, constructors) should be thinking about all three aspects of sustainability.
- We must collaborate DURING DESIGN to maximize a project's sustainability.
- We should consider participating in design-build and integrated project delivery projects.
- We should participate in Design-Assist and similar processes to enable needed collaboration even on Design-Bid-Build projects.

CLOSING

- Our clients, employees and children will increasingly be demanding that we proactively consider the triple bottom line in the design and construction of our projects.
- Prevention through Design is a promising way to achieve economic, social and environmental sustainability.
- Improving the reputations of the civil engineering profession and construction industry require collaborative approaches to construction safety.
- ASCE's "Vision for Civil Engineering in 2025"
  - "Entrusted by society to create a **sustainable** world and enhance the global quality of life, civil engineers serve competently, **collaboratively**, and **ethically**

THANK YOU FOR YOUR TIME!

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