PREVENTION THROUGH DESIGN:
A Different Side of Steel's Sustainability

NASCC
THE STEEL CONFERENCE

PDH CODE 28236

March 24, 2017

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Bucknell UNIVERSITY

Based on past presentations with

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OSU Oregon State

DOWNLOAD THIS PRESENTATION NOW FROM WWW.DESIGNFORCONSTRUCTIONSAFETY.ORG

Prevention through Design

Design for Construction Safety

Home | Concept | Process | History & Future | Challenges | Resources | Links | Contacts

News and Updates:

An op-ed piece on DfCS was recently published in a national blog.

The OSHA Construction Alliance Roundtable has created materials for a short course on Designing for Construction Safety. A slide deck, student manual and instructor manual can be downloaded here.

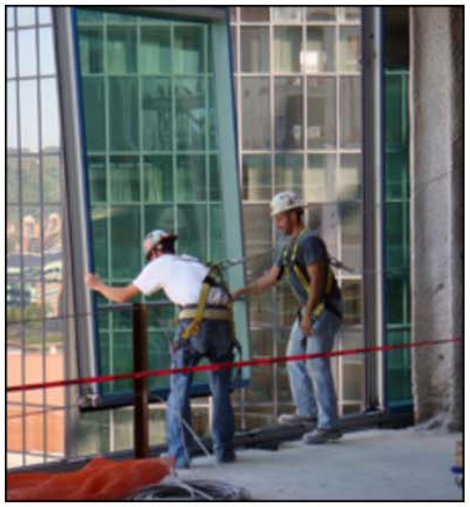
A very thorough bibliography has been compiled by Dr. Nicholas Tymvios at UNCC and is posted on the Resources page.

PtD has been added to the LEED rating system! You can earn professional continuing education credits by completing an online module.

A webinar focusing on PtD in concrete was given through the ACI University on January 10, 2017.

A presentation on PtD will be given on March 15, 2017 at the Ohio Construction Conference in Columbus, OH.

A presentation focusing on PtD in steel construction was given on March 24, 2017 at the North American Steel Construction Conference in San Antonio, TX.



OVERVIEW

- PtD Concept
- Motivation
- Examples
- Leaders
- Tools and Processes
- Moving forward in your company
- Moving AISC forward

Prevention through Design

= Design for Safety

= Safety by Design

IMPORTANT MANAGEMENT CONCEPTS UNDERLYING PTD

- Sustainability
- Collaboration
- Innovation and Managing Change
- These are themes of the NASCC!

PTD IN CONSTRUCTION IS…

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

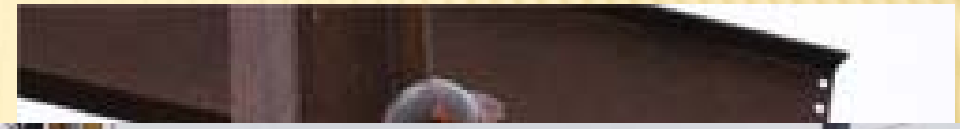
“Safety Constructability”

WHAT PTD IN CONSTRUCTION IS NOT

- Having designers take an active role in construction safety **DURING** construction.
- An endorsement of future legislation mandating that designers design for construction safety.
- An endorsement of the principle that designers can or should be held partially responsible for construction accidents.

WHY PTD? ANNUAL CONSTRUCTION ACCIDENTS IN U.S.

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



WHY PTD? DESIGN-SAFETY LINKS

- 22% of 226 injuries that occurred from 2000-2002 in Oregon, WA, and CA[1]
- 42% of 224 fatalities in US between 1990-2003[1]
- 60% of fatal accidents resulted in part from decisions made before site work began[2]
- 63% of all fatalities and injuries could be attributed to design decisions or lack of planning[3]

[1] Behm, M., "Linking Construction Fatalities to the Design for Construction Safety Concept" (2005)

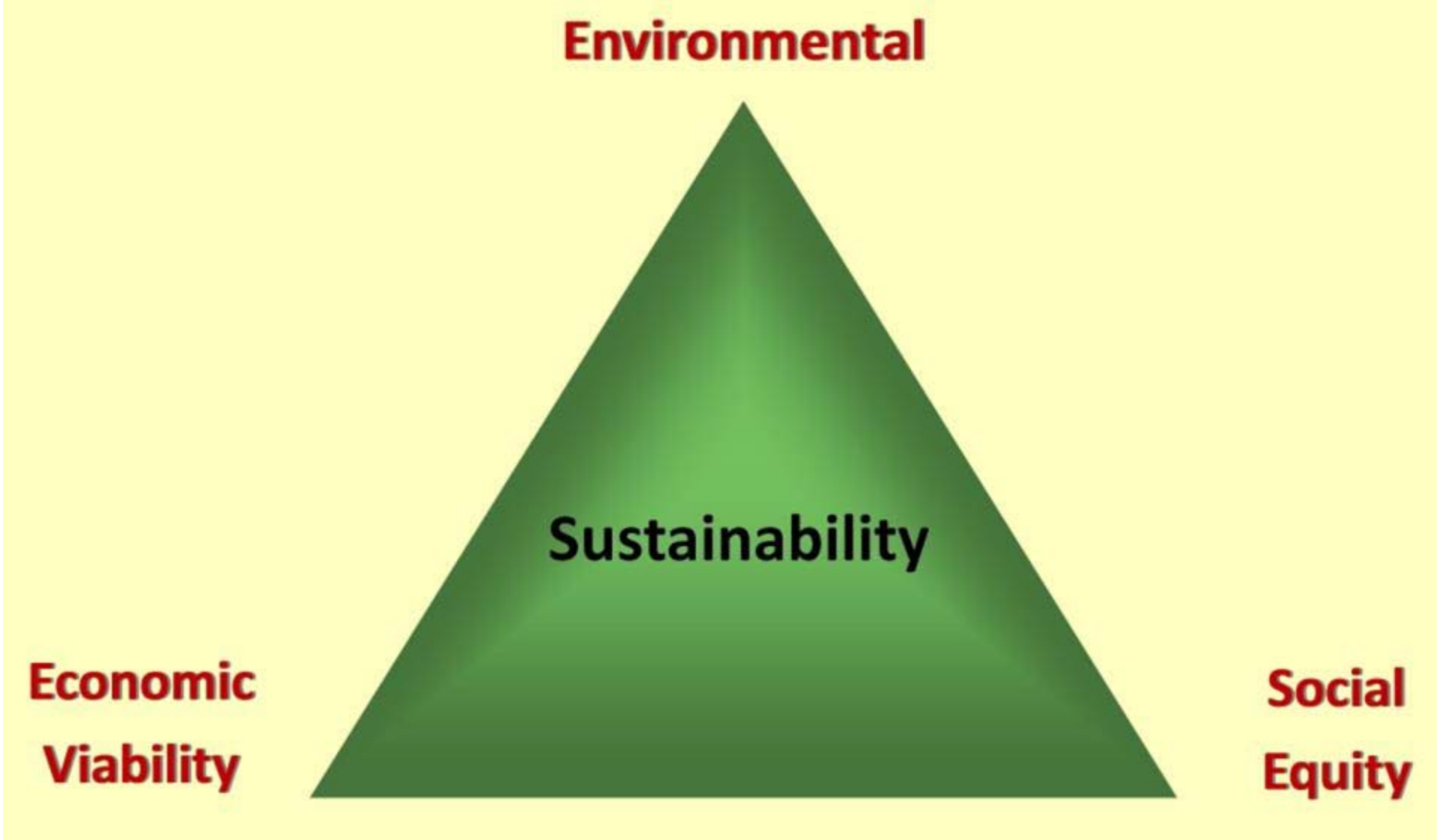
[2] European Foundation for the Improvement of Living and Working Conditions

[3] NSW WorkCover, *CHAIR Safety in Design Tool*, 2001

WHY PTD? PROFESSIONAL ETHICS

- National Society of Professional Engineers (NSPE) Code of Ethics:
  - **Engineers shall hold paramount the safety, health, and welfare of the public.**
- American Society of Civil Engineers (ASCE) Code of Ethics:
  - **Engineers shall recognize that the lives, safety, health and welfare of the general public are dependent upon engineering decisions ….**

WHY PTD? SUSTAINABILITY



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

PTD AND SOCIAL SUSTAINABILITY/EQUITY

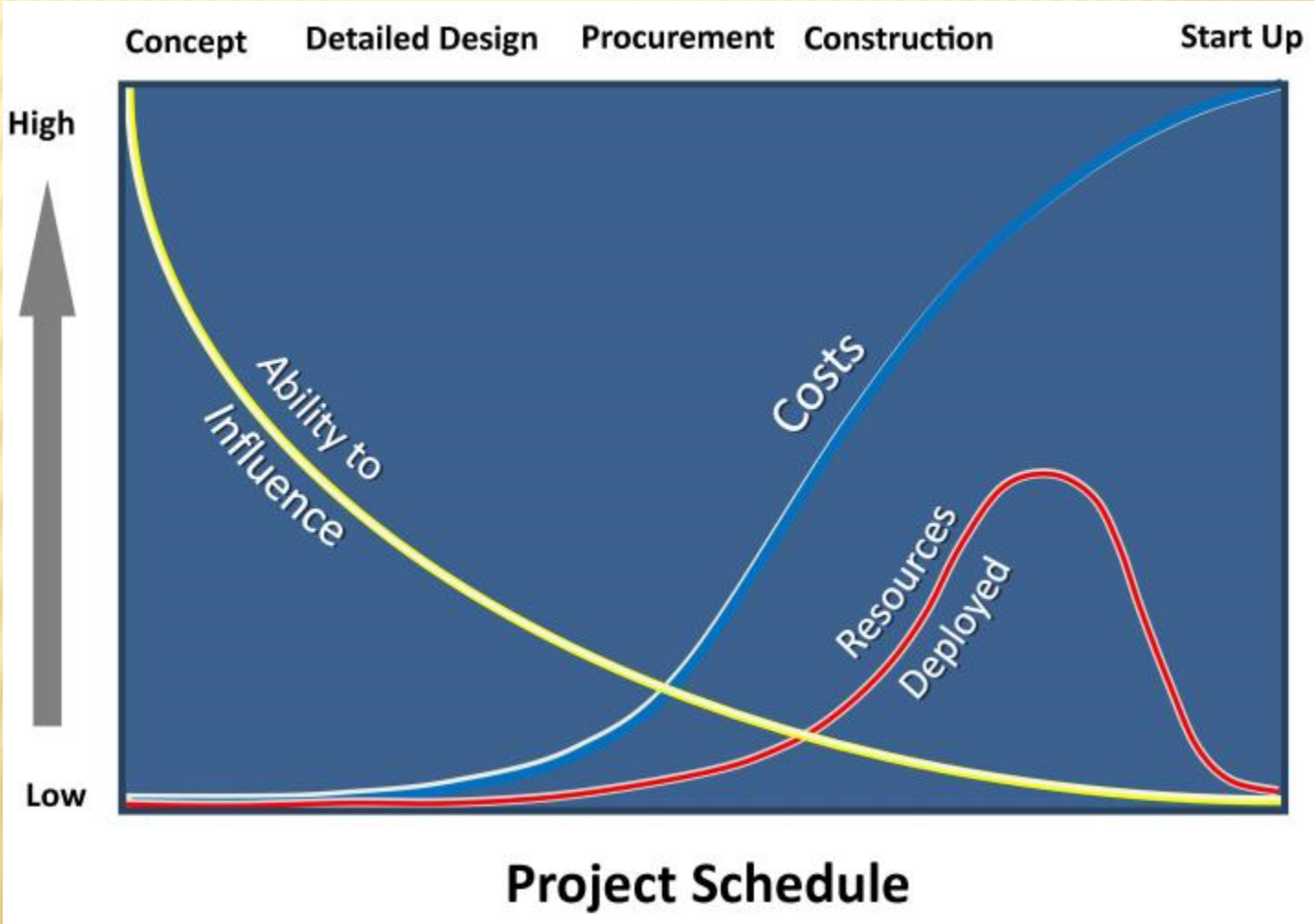
- Do not our duties include minimizing all risks that we have control over?
- Do not we have the same duties for construction workers as for the “public”?

DESIGN HAS MAJOR LEVERAGE

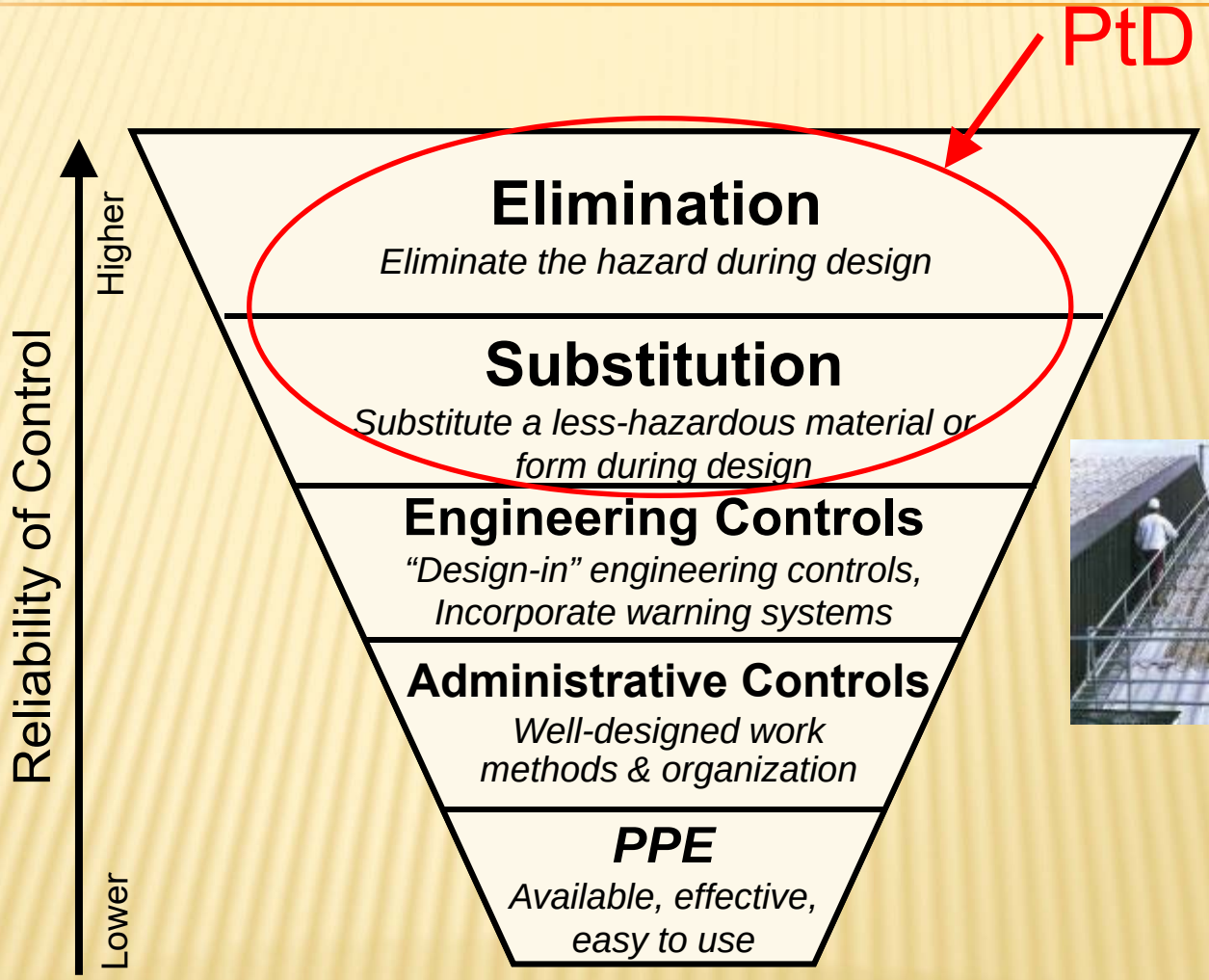
- The Right thing to do and…
- The Smart thing to do

WHY PTD? BANG FOR THE BUCK

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



HIERARCHY OF CONTROLS



WHY PTD? TANGIBLE BENEFITS

- Reduced site hazards
  - Fewer worker injuries and fatalities
- Reduced workers' compensation premiums
- Increased productivity and quality
- Fewer delays due to accidents
- Encourages designer-constructor collaboration
- Improved operations/maint. safety

PTD IS GAINING MOMENTUM

- Required in UK, Europe for since 1995
- Required in Australia, S. Africa, Singapore
- OSHA DfCS Workgroup since 2005
- NIOSH PtD Workshops and Funding
- ANSI Standard and Technical Report
- LEED Pilot Credit

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Prevention through Design

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STRUCTURAL STEEL EXAMPLES

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

Locate column splices and connections at reasonable heights above floor

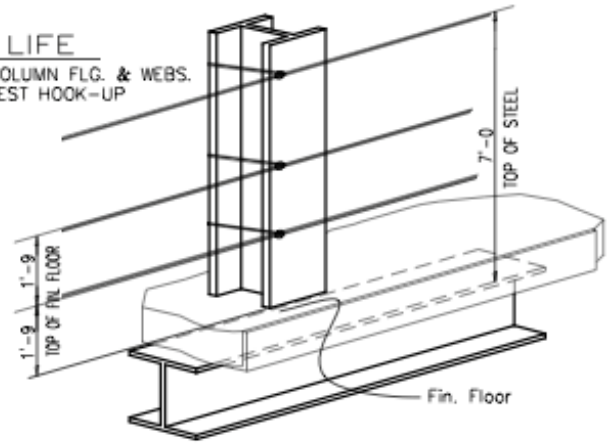
Photo: AISC educator ppt

- Include holes at 21 inches and 42 inches for guardrails.
- Additional higher holes can also be included for lifeline support.
- Drill holes in beam flanges for lifeline support

DETAILING FOR ERECTION SAFETY and EFFICIENCY

SAVE YOUR LIFE
WE HAVE PROVIDED HOLES IN COLUMN FLG. & WEBS.
FOR SAFETY LINES & FALL ARREST HOOK-UP

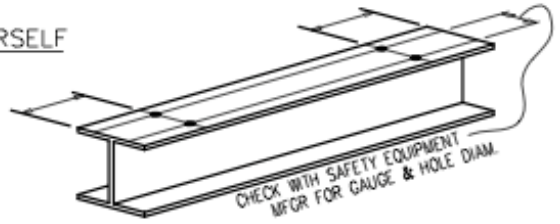
ATTACH YOURSELF



TYPICAL SAFETY LINE HOLES ON COLUMN

SAVE YOUR LIFE
WE HAVE PROVIDED HOLES IN BEAM FLG.
FOR FALL ARREST HOOK UP.

ATTACH YOURSELF

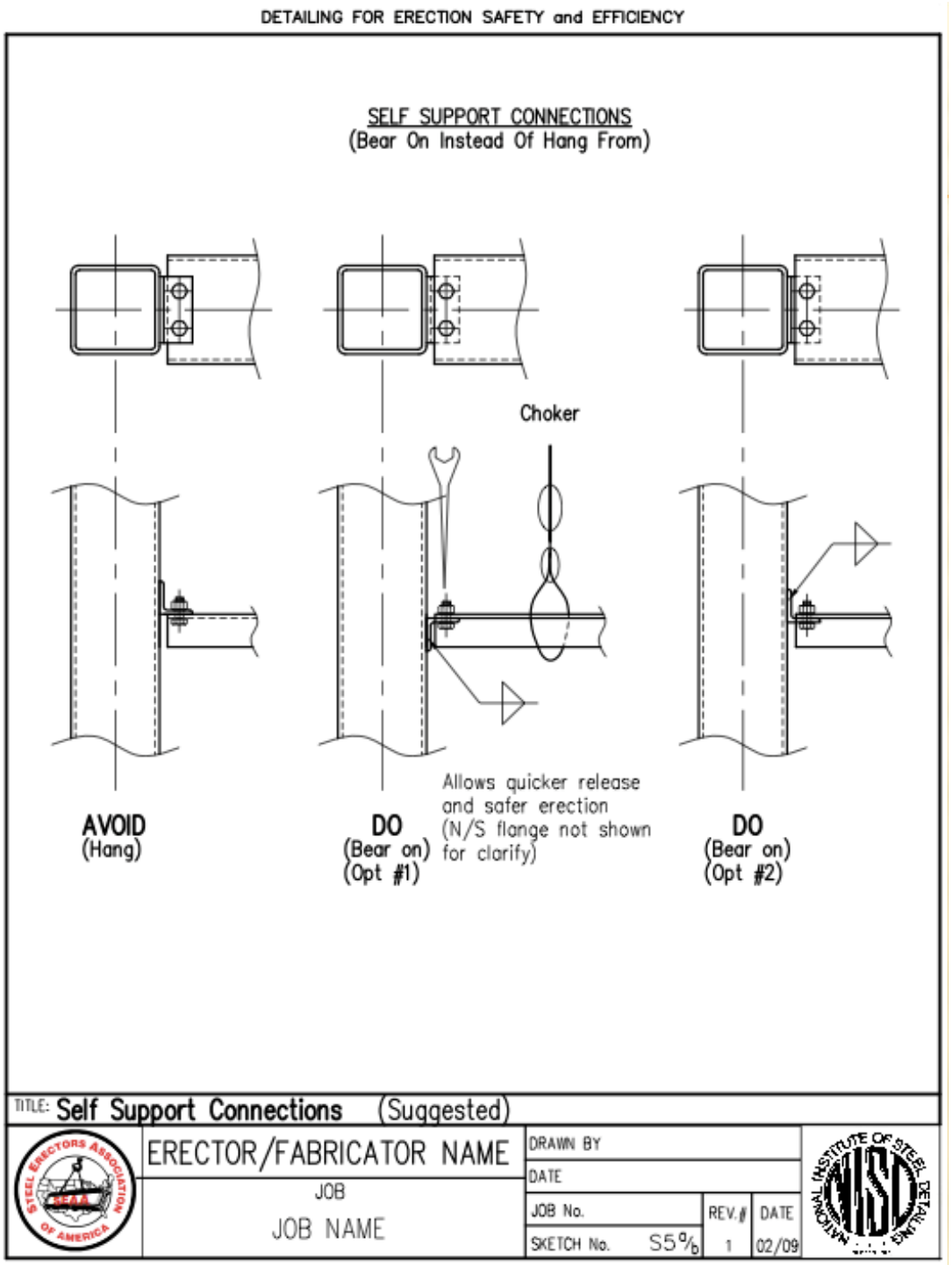


TYPICAL SAFETY TIES HOLES ON BEAM

TITLE: Typical Safety Line Holes On Beam / Column

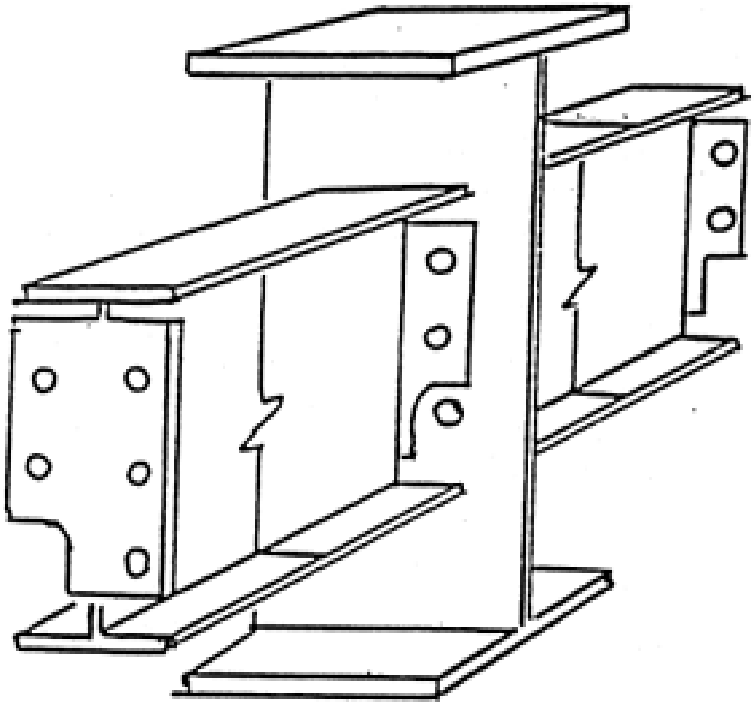
	ERECTOR/FABRICATOR NAME	DRAWN BY		
		DATE		
	JOB	JOB No.	REV.#	DATE
	JOB NAME	SKETCH No. A3b	1	02/09

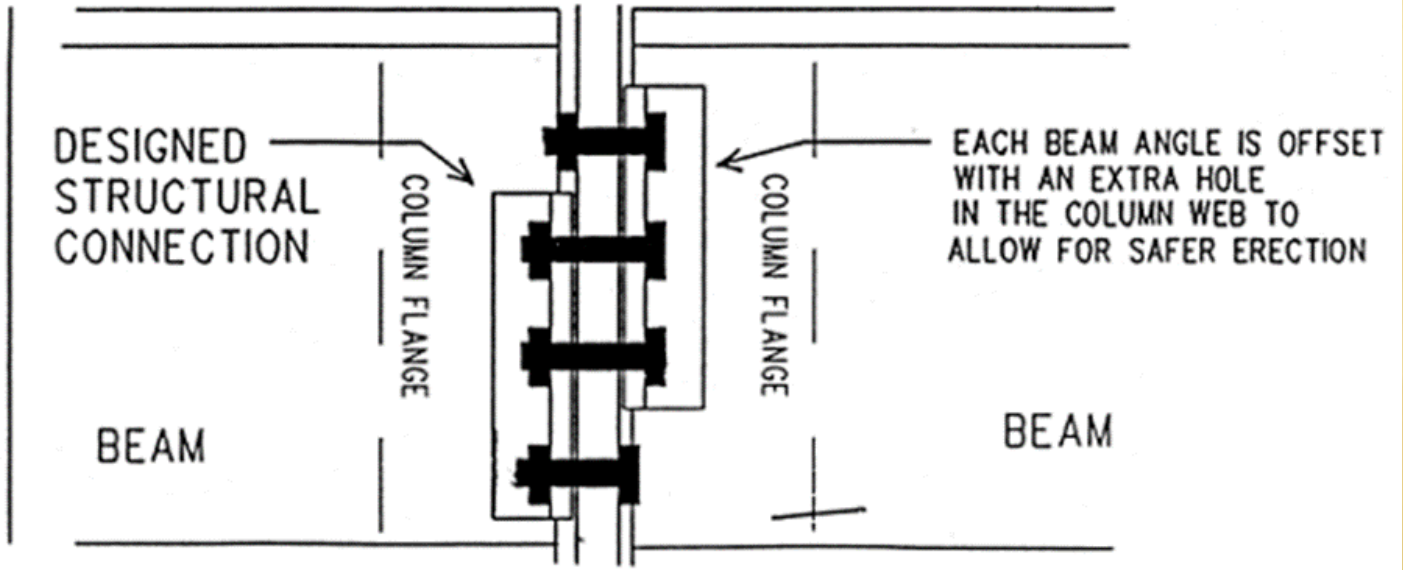
Avoid hanging connections; design to bear on columns instead



DOUBLE CONNECTIONS

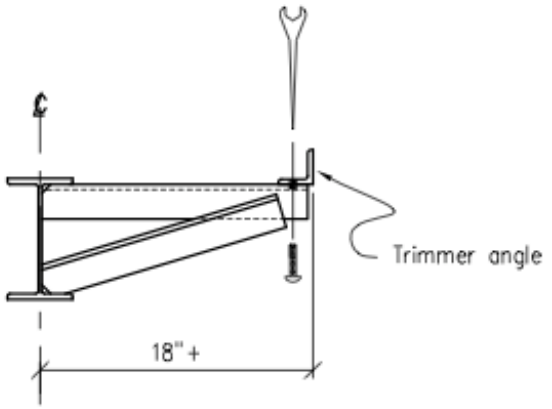
- Clipped angle
- Staggered angles



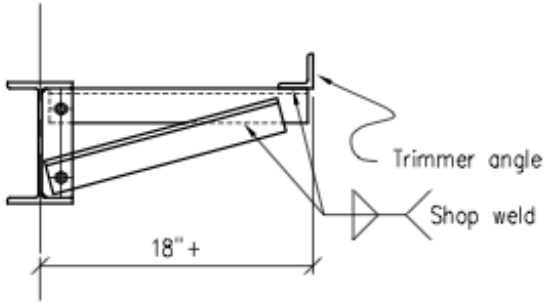


Avoid awkward and dangerous connection locations

DETAILING FOR ERECTION SAFETY and EFFICIENCY



Problem: Bolting or welding at this location forces connector or welder to hang his body weight out of position.



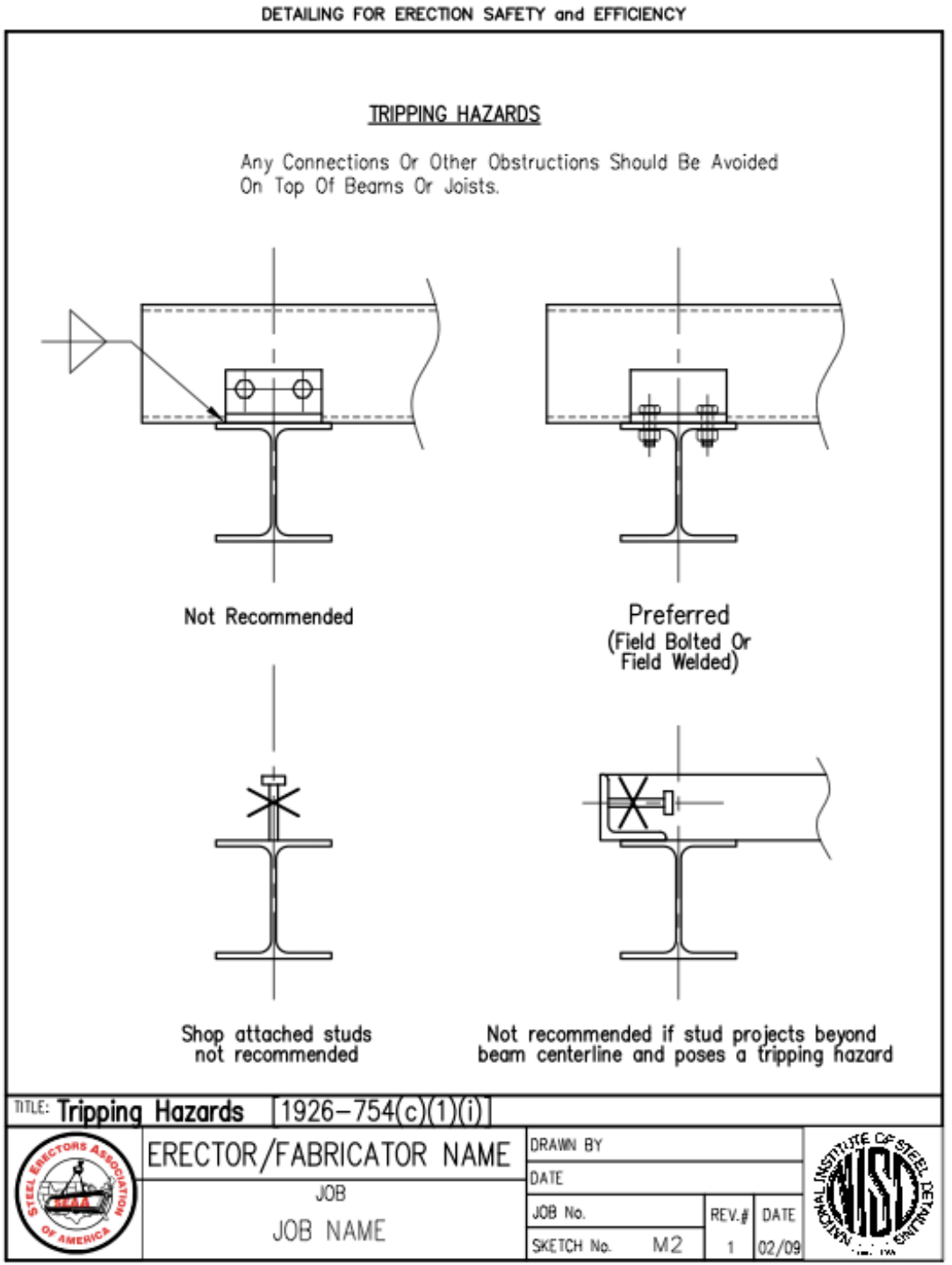
Solution: Could be to shop weld trimmer angle with bracket angles and field bolt to a tab plate or stiffener where the connector does not have to "Hang Out" to make connection always consider the erector's access.

TITLE: **Out Of Position Bolting / Welding**

STEEL ERECTORS ASSOCIATION OF AMERICA SEAA	ERECTOR/FABRICATOR NAME JOB JOB NAME	DRAWN BY DATE JOB No.	REV.#	DATE
		SKETCH No. S8	1	02/09

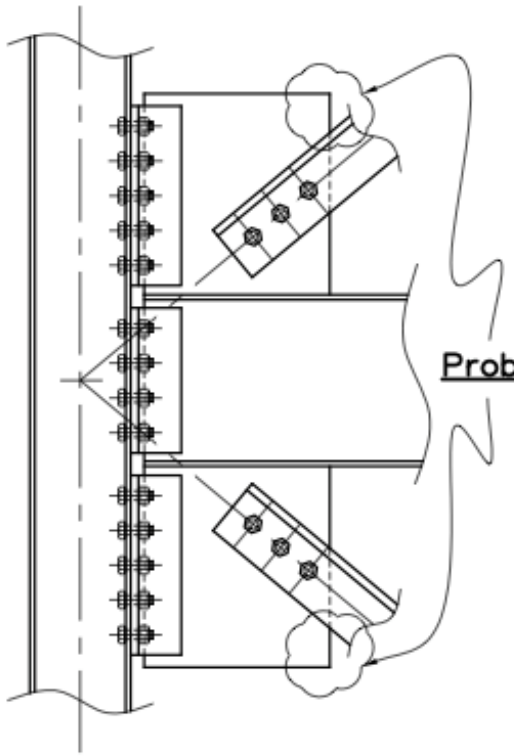
NATIONAL INSTITUTE OF STEEL DETAILING NISD

Avoid tripping hazards by not having connections on top of beams and joists.

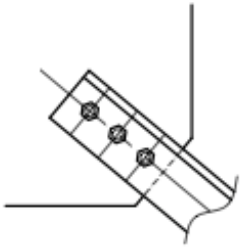


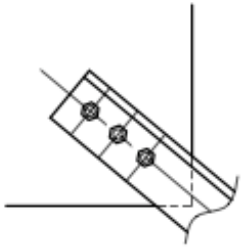
Avoid Sharp Corners

DETAILING FOR ERECTION SAFETY and EFFICIENCY



Problem: Dangerous corners can snag clothes or puncture skin in field or shop.





Solutions: Could be to clip gussets corner

Or: Hide the gusset corner within the bracing depth

TITLE: Puncture / Snagging Hazards

STEEL ERECTORS ASSOCIATION OF AMERICA SEAA	ERECTOR/FABRICATOR NAME	DRAWN BY		NATIONAL INSTITUTE OF STEEL DETAILING NISD
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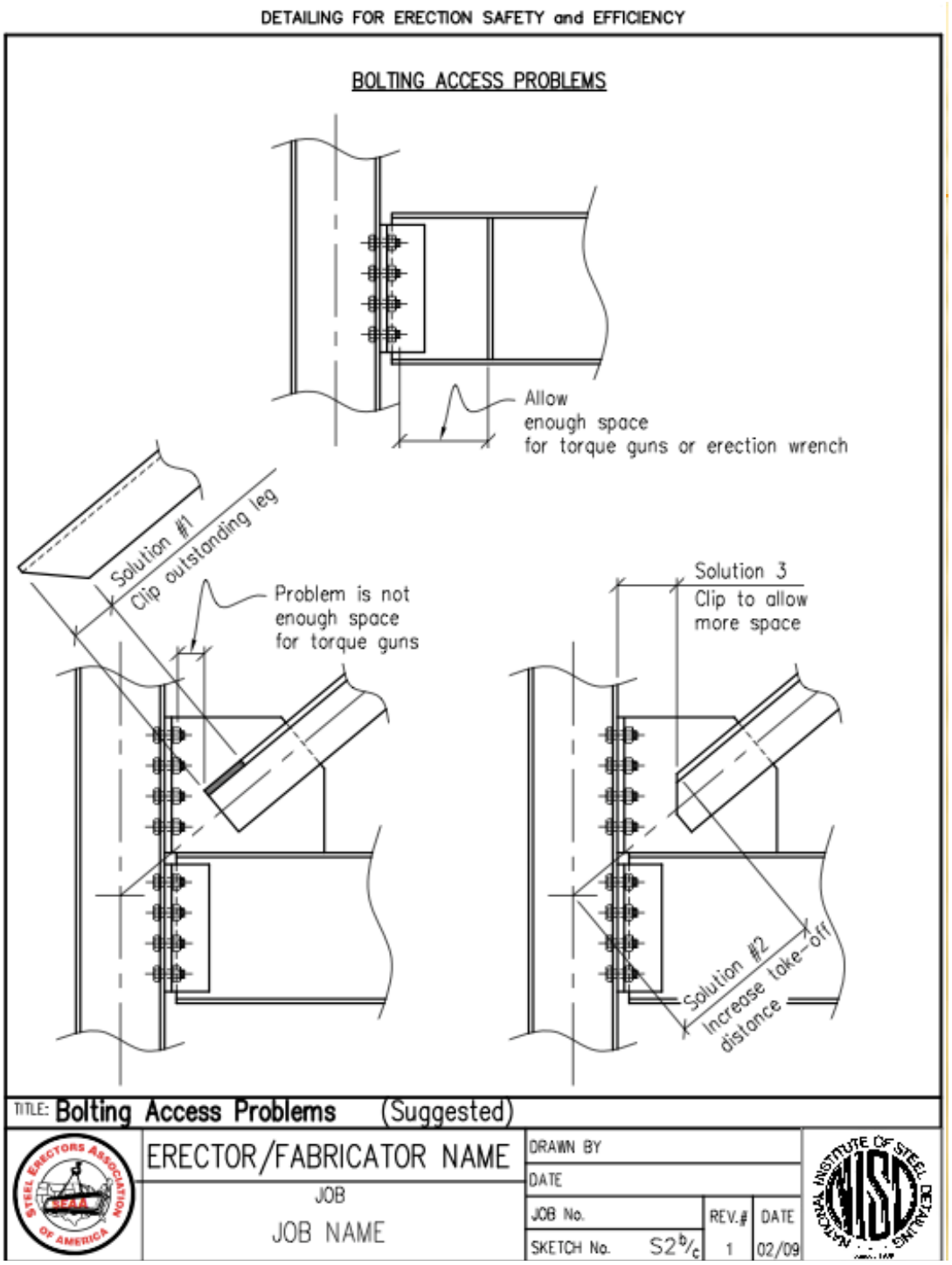
	JOB NAME	JOB No.	REV.# DATE	
		SKETCH No. S4 %	1 02/09	

Provide enough space for making connections



- Know approximate dimensions of necessary tools to make connections

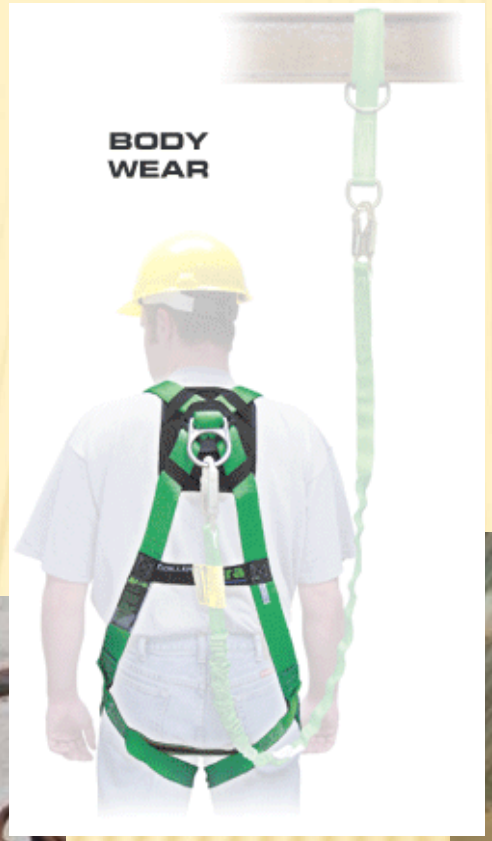
Photo: AISC educator ppt

MISCELLANEOUS

- Bolts: One size, one grade when possible
- Uniform floor layout
- Consider having top flange at least 6” wide for safer walking
- Consider fall protection attachment points around openings, perimeter

https://myconstructionphotos.smugmug.com/Construction-Galleries/Steel-Construction-erect

PTD EXAMPLE: ANCHORAGE POINTS



EXAMPLES: PREFABRICATION

Bridge Trusses

www.ultimateengineering.com

Steel Stairs

PEB

test.jedinstvo.com

Roof Trusses

www.niconengineering.com

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USE OF PTD BY OWNERS

- Intel
- ExxonMobil
  - MWCS
- USACE
- Southern Co.
- BHP Billiton

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

SOUTHERN CO.'S DESIGN CHECKLISTS

DESIGN SAFETY CHECKLIST

CIVIL

THIS HAZARD OR CONCERN NEEDS TO BE ADDRESSED ON THIS PROJECT? Y=YES; N=NO

↓ THIS HAZARD OR CONCERN:

↓ HAS BEEN ADDRESSED IN OUR DESIGN

↓ ↓ WILL BE ADDRESSED IN OUR DESIGN

↓ ↓ ↓ OTHER

↓ ↓ ↓ ↓

Design Lead:

Project No.:

Plant:

Date:

STEEL-RELATED CHECKLIST ITEMS					
	☐	☐	☐	17.	Coating systems for structural steel (hot dipped galvanized or painted) meet the OSHA 1926 Subpart R Steel Erection requirement. The **coated surface** has a minimum average **slip resistance** of .5 when measured with an English tribometer.
	☐	☐	☐	18.	**Monorails** and **trolley beams** are stenciled with the loading capacity on the beam webs.
	☐	☐	☐	19.	Special **attachments** or holes are required in structural framing to attach the following **construction equipment:** lifelines, concrete form, temporary floors, support vessels or equipment.
	☐	☐	☐	20.	Areas requiring **temporary railing** are identified by a Construction Services representative. (Examples: wall, floor, or roof openings.)
	☐	☐	☐	21.	Drawing **release dates** are coordinated with **material delivery schedule** and installation allowing safe construction practices (elevated floors, stair treads/landings/railing, etc.).
	☐	☐	☐	22.	The design of the structural **material thickness** has considered the corrosion rate due to the environment.
	☐	☐	☐	23.	**Field welding** of structural steel will be eliminated or minimized when the steel has galvanized coating.

BHP BILLITON'S PTD INITIATIVES

- PtD staff embedded in procurement and design
- Communication and training
- PtD in technical specifications
- Design reviews includes 3D models

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STEEL PTD RESOURCES

- SEAA/NISD Designing Steel guide
- Modern Steel Construction articles
- NIOSH Steel PtD Educational Module

MODERN STEEL CONSTRUCTION JUNE 2006

Designing for Construction Safety

Taking construction safety into account during the design phase of a project is become more and more common.

BY T. MICHAEL TOOLE, NICOLE HERVOL, AND MATTHEW HALLOWELL

STRUCTURAL ENGINEERS, STEEL DETAILERS, AND OTHER DESIGN PROFESSIONALS ARE STARTING TO EXPLICITLY CONSIDER THE SAFETY OF CONSTRUCTION WORKERS DURING THE DESIGN PHASE OF PROJECTS. There are practical and ethical reasons why designers should consider the "design for construction safety" concept, and there are practical and specific ways that structural engineers and steel detailers can put it into practice.

What is designing for construction safety?

Designing for construction safety is defined as the deliberate consideration of construction site safety in the design phase of a construction project, with the goal of reducing inherent risk to construction workers. It represents a change from custom and practice: the design professional becomes involved in facilitating construction site safety at the earliest stages of a project's life cycle.

Most people are familiar with the term constructability, which refers to the idea of incorporating construction expertise into the design process to ensure that the design is cost-effective and buildable. Designing for construction safety incorporates design decisions that are made based partially on how construction worker safety may be affected and places the project's safety aspects within the constructability review.

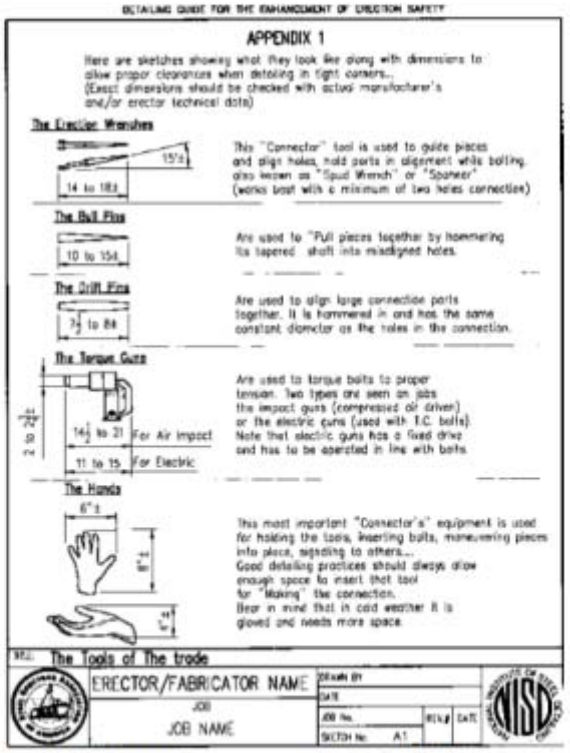
It is important to note that the design for safety concept applies only to the design of the permanent facility; that is, to the aspects of the completed building that make a project inherently safer to build. This initiative does not focus on how to make different methods of construction engineering safer. For example, it does not focus on how to use fall protection systems, but it does include design decisions that influence how often fall protection will be needed. Similarly, designing for safety does not address how to erect safe scaffolding, but it does relate to decisions that influence the location and type of scaffolding needed to accomplish the work.

Why should designers take responsibility?

Structural engineers and steel detailers have not actively managed site safety issues in the past for several reasons. For one, model contracts, such as those promulgated by ASCE through the Engineers Joint Contracts Documents Committee, clearly state that designers have no responsibilities for means and methods affecting the safety of construction workers. OSHA standards also support this position by clearly ascribing primary safety responsibility for construction workers to their employers (Toole 2002).

However, researchers and practitioners in the United States and elsewhere have demonstrated that design decisions do affect construction safety (Gambatese 2000; Gambatese Behm and Hinze 2005).

- A 1996 paper showed that 50% of general contractors interviewed identified poor design features as affecting safety (Smallwood 1996).
- A European study published in 1991 found that 60% of accidents studied could have been eliminated or reduced with more thought during design (European Foundation 1991).
- Researchers in the United Kingdom found that design changes would have reduced the likelihood of 47% of the 100 construction accidents studied (Gibb et al 2004).
- An American researcher found that design was linked to accidents in approximately 22% of 226 injury incidents in Oregon,



Sketch A1 from the *Detailing Guide for the Enhancement of Erection Safety*. (See item 9, p. 57.)

MODERN STEEL CONSTRUCTION JUNE 2014

When safety is addressed during design,
it can become easier to implement during construction.

Safety Hazard Prevention, BY DESIGN

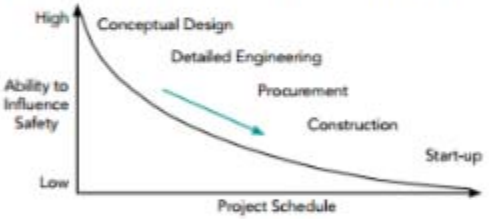
BY JIE ZUO

THE CONTROLLING CONTRACTOR is typically responsible for the means, method and overall safety of construction on the job site.

They must direct, coordinate and monitor the work of the subcontractors in a safe and efficient manner, knowing that the success of the project is often made by intricate planning and critical decision-making while on-site. However, the controlling contractor is actually just one of many influences on construction safety.

Personal protective equipment is often the most visible evidence of the safety efforts undertaken on a job site. In fact, this equipment more truly represents the last line of defense against working hazards. Other mechanisms that can prevent hazards from developing should be implemented to create hazard protection much earlier.

Over the course of a project schedule, the ability to influence construction safety decreases as the schedule progresses (see Figure 1). This creates a conundrum. While safety is the responsibility of the construction team and not the design team, the decisions made in the design phase can improve and reduce safety hazards. Safety hazards anticipated in the design phase often can be eliminated if they are recognized; if they are not addressed by the time the construction phase begins, safety hazards must instead be planned around and prepared for. Thus, as the designer chooses the plan and layout of the structure, safety can be improved through careful consideration of the procedures, equipment and techniques required to build it.



▲ Figure 1. The influence of safety over a project schedule.

Jie Zuo is graduate engineer with Walter P Moore in Kansas City; previously, he was staff engineer at AISC.

Figure 2 shows a hierarchy of safety controls in the order of their effectiveness, emphasizing that the most effective way to address a working hazard is by eliminating it at its source, when possible, in the design phase. If this cannot be done, each solution below that in the hierarchy is slightly less effective but still necessary.

In 2007, the National Institute of Safety Hazards (NIOSH) partnered with a number of industry organizations and state governments to launch a national initiative aimed at reducing occupational hazards and controlling risks at the source where they are created—or as early as possible in the schedule of a construction project. Recognizing the aforementioned conundrum, the program calls for a new construction model based upon extensive collaboration between the designer and controlling

MODERN STEEL CONSTRUCTION JANUARY 2017

conference preview

MINIMIZING HAZARDS, BY DESIGN

BY WAYNE J. CREASAP II

Safety can and should be just as important in the design process as it is during manufacturing and construction.

BY NOW, ALMOST EVERYONE in the industrial maintenance and construction industry is familiar with OSHA's "Focus Four" hazards: falls, struck-by, caught-in-between and electrical.

These four culprits account for the majority of construction-related fatalities and severe injuries and can be easily encountered throughout the construction process—so much so that OSHA has developed several resources to help companies identify and eliminate them. These include specialized training modules dedicated to the Focus Four as part of the required training in OSHA's 10-hour and 30-hour training courses for construction, general industry and maritime work.

But remember, OSHA standards cover the minimum requirements for an employer to eliminate or control hazards on the job. By using these standards as a baseline to build from, companies can implement risk-management practices to help identify hazards and further reduce or eliminate them before they become problems on the job.

Safe for All

The focus of any building project is on who will be occupying the structure after it is built, but it often fails to account for the health and safety of those building it, those who have to maintain it or ultimately, those who have to remove it. The American Society of Safety Engineers (ASSE) has been working on American National Standards Institute (ANSI) standards aimed at implementing risk-management practices and prevention-through-design techniques to drill down on leading practices that will assist employers in gauging risk and eliminating common hazards on the job. Several of these components are aimed at reducing hazards throughout the life-cycle of a building, from design through construction, operation, demolition and waste treatment. Often, the hierarchy of controls is used to help eliminate or reduce hazards, with the use of personal protective equipment (PPE) as the last line of defense.

Wayne Creasap (wcreasap@tauc.org) is senior director of environmental health and safety with The Association of Union Constructors (TAUC).

Steel fabricators and erectors are faced with several safety and health challenges when fabricating and building a project. The International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers Union developed a list of "Deadly Dozen" hazards for both steel fabrication and erection activities. Many of these hazards are related to various OSHA standards, and the majority of them are Focus Four-related. Here, we'll take a look at some of these hazards and determine how we can preplan and come up with design solutions that will better protect shop workers during fabrication and ironworkers during steel erection.

Shop Hazards

Here are the Deadly Dozen in the shop:

1. Exposure to toxic welding fumes that create serious health hazards
2. Striking hazards during material handling and loading and unloading of trucks
3. Dismemberment by shear presses, punch presses and other equipment
4. Rigging failure and use of chains, slings, plate dogs and other rigging equipment
5. Hazards related to overhead rail cranes, gantry cranes and other cranes
6. Hazards pertaining to use of forklifts and jacks
7. Exposure to toxic paints and chemicals through inhalation and skin absorption
8. Exposures to airborne metals, dust and compounds during grinding and hot-work operations
9. Electrical hazards, de-energizing equipment and lockout tag-out systems
10. Improper signals, communication and clearances
11. Exposure to heat illness and dehydration
12. Lack of protective eyewear, leathers, gloves, hearing conservation equipment and other PPE

Several items on the list involve exposure to welding fumes and toxic metals from grinding and hot work, as well as chemical exposure to paints and other coatings. Employing the hierarchy of controls, can we design systems that will eliminate these hazards? If not, can we substitute a different product that will be just as effective, but not as harmful to the employees working on or around it? With a little preplanning, we can de-

NIOSH STEEL PTD MODULE

Photo courtesy of Thinkstock

PtD
Prevention through Design

Structural Steel Design

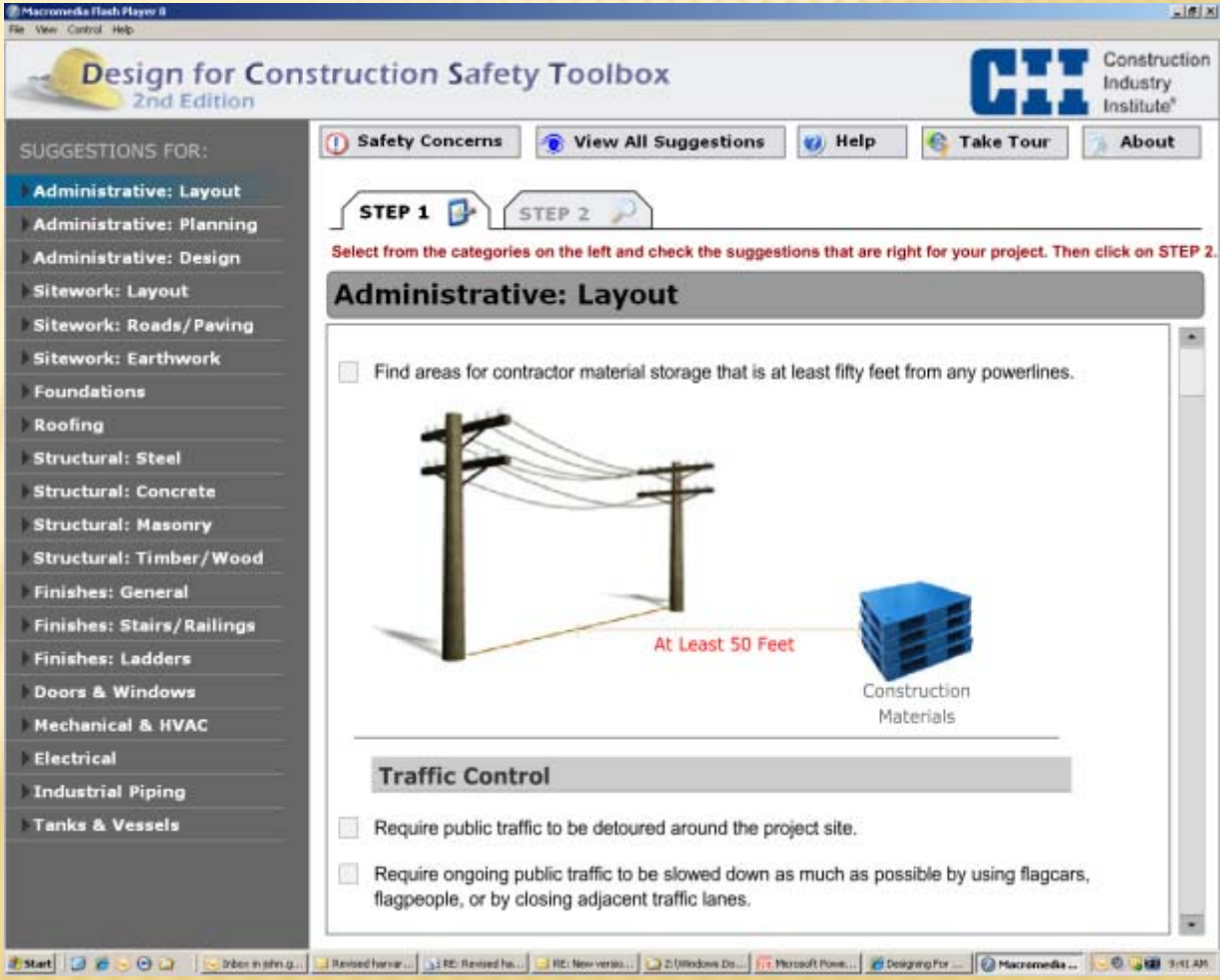
EDUCATION MODULE

Developed by T. Michael Toole, Ph.D., PE
Daniel Treppel
Stephen Van Nosdall
Bucknell University

CDC Workplace NIOSH

DESIGN FOR CONSTRUCTION SAFETY TOOLBOX

- Created by Construction Industry Institute (CII)
- Interactive computer program
- Used in the design phase to decrease the risk of incidents
- Over 400 design suggestions



PTD PROCESS

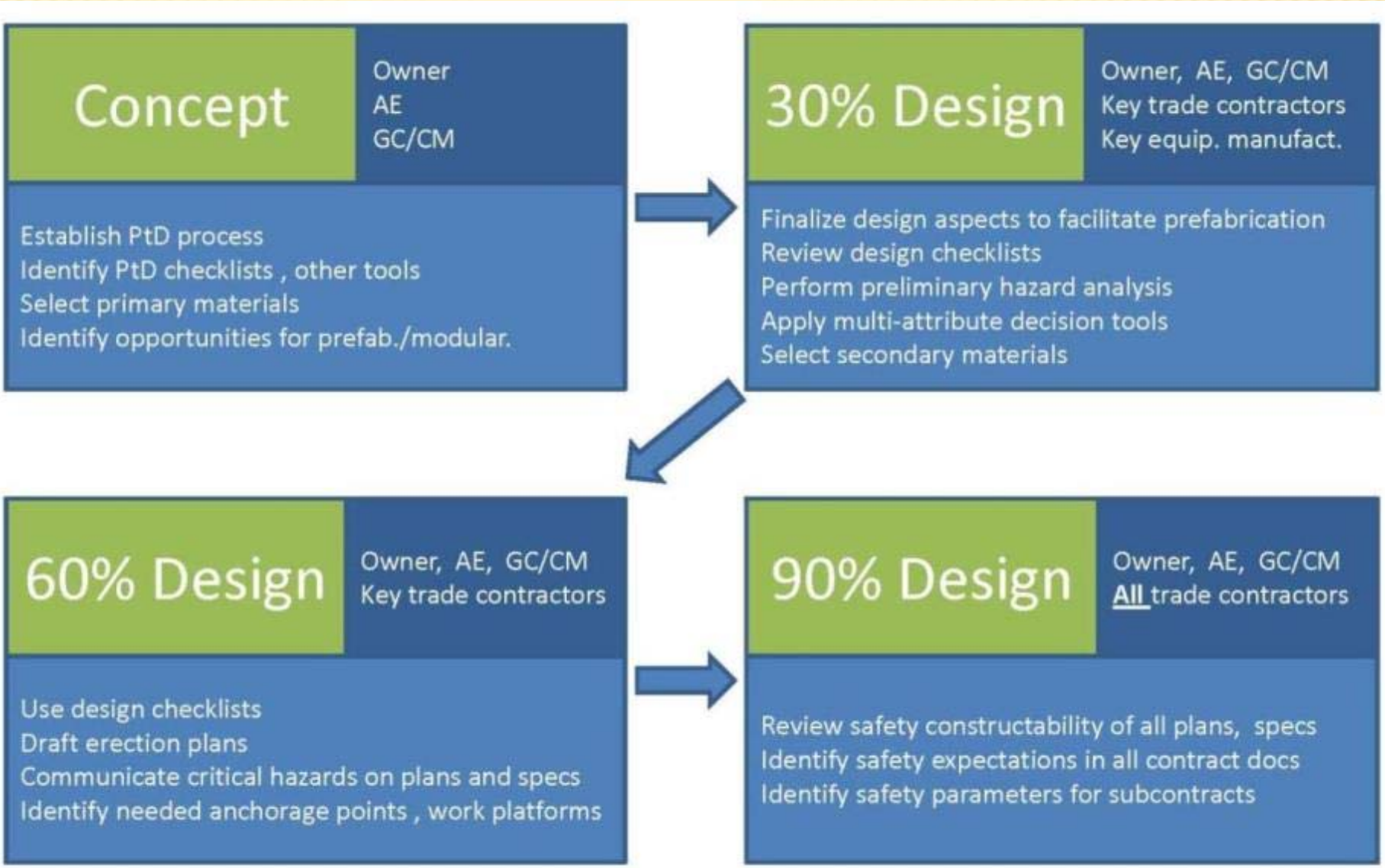
Get the right people

talking about the right things

at the right time!

www.seagrave.com/

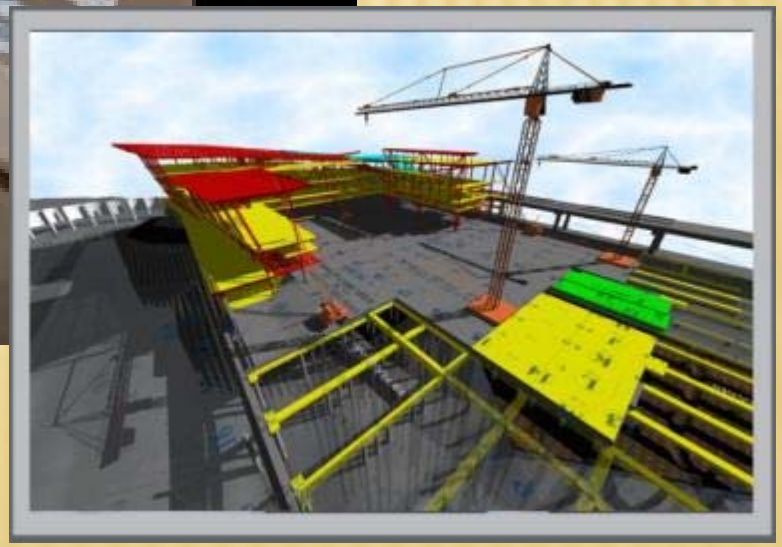
PTD PROCESS



PTD DESIGN REVIEW

- Hazard identification
  - What construction safety hazards does the design create?
- Risk assessment
  - What is the level of safety and health risk associated with each hazard?
- Design option identification and selection
  - What can be done to eliminate or reduce the risk?
  - Remember the hierarchy of controls.....

PTD TOOLS – BIM AND VISUALIZATION



PTD INFORMATION SOURCES

Prevention through Design

Design for Construction Safety

Home | Concept | Process | History & Future | Challenges | Resources | Links | Contacts

News and Updates:

PtD has been added to the LEED rating system!

Here's a new online course on PtD offered by East Carolina University that allows participants to earn CEUs.

The American Society of Civil Engineers are sponsoring a student essay contest on PtD!

Consider attending a CIB W099 conference on PtD: International Health and Safety Conference: Benefitting Workers and Society through Inherently Safe(r) Construction 10th - 11th September 2015, Jordanstown Campus, Northern Ireland

PtD was one of the presentations at the NY/NJ Educ. Research Center Scientific Meeting at Mt. Sinai Hospital in NYY on March 20.

PtD will be one of the presentations at the Safety Executives of New York Professional Development Conference on March 24.

An ANSI A10 Prevention through Design Workgroup has been formed, with the

www.designforconstructionsafety.org

OVERVIEW

- PtD Concept
- Motivation
- Examples
- Leaders
- Tools and Processes
- Moving forward in your company
- Moving AISC forward

Prevention through Design

= Design for Safety

= Safety by Design

THREE STEPS TOWARDS PTD

1. Establish a lifecycle safety culture
2. Establish enabling processes
3. Team with organizations who value lifecycle safety

Culture

Processes

Partners

ESTABLISH A LIFECYCLE SAFETY CULTURE

- Instill the right safety values
- Secure management commitment
- Training
- Confirm Life Cycle Costing criteria
- Ensure recognition that designing for safety is the smart thing to do and the right thing to do
  1. Professional Codes of Ethics
  2. Payoff data

ESTABLISH ENABLING PROCESSES

- Designer/Detailer training and tools
- Qualifications-based contracting
- Negotiated or Cost-Plus contracting
- Collaborative decision processes
- IPD or enabled safety constructability input

DB, DA AND IPD ENABLE PTD

- Design-Build, Design-Assist and Integrated Project Delivery facilitate collaboration of design and construction professionals during design
  - Processes and norms for candid feedback
  - Common success criteria
  - Trust
  - Sufficient time
  - Life cycle costing criteria
  - Co-located

CHOOSE YOUR PARTNERS WISELY

- Commitment to safety
- Collaborative culture and experiences
- Open to change

WHAT CAN A DESIGN ENGINEER DO?

- Secure commitment from your leadership
- Train your employees
- Create PtD program document
- Secure and/or develop design checklists
- Partner with clients who value safety
- Participate in DB or IPD projects

WHAT CAN A FABRICATOR DO?

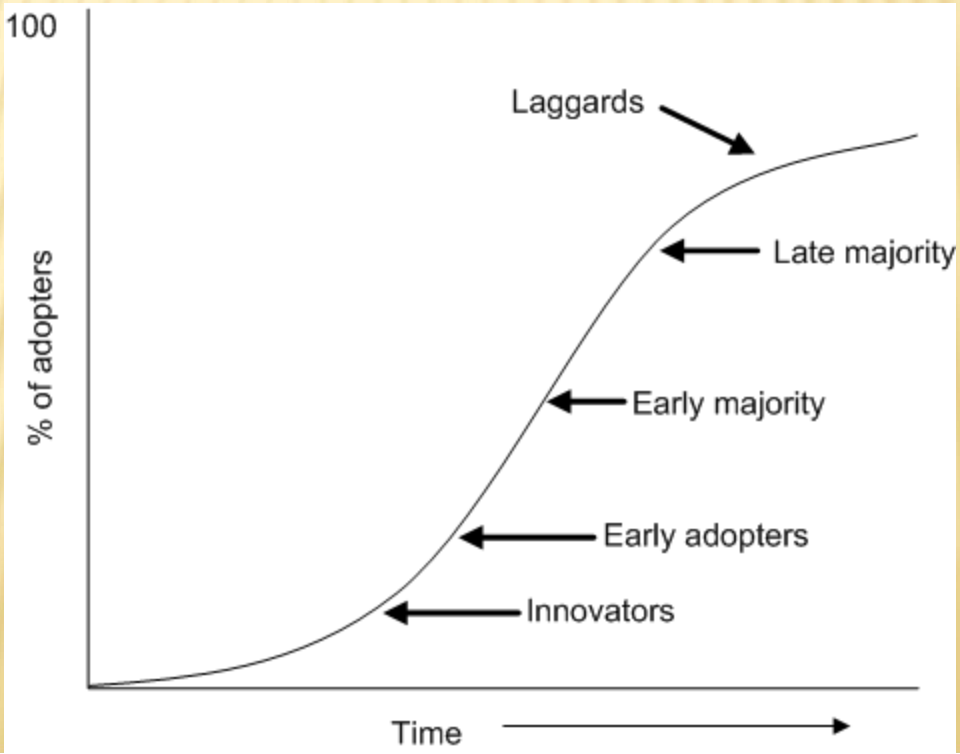
- Educate and enable your detailers
- Educate and collaborate with structural engineers
- Collaborate with your erectors
- See projects that are not DBB

WHAT CAN A DETAILER DO?

- Secure buy-in to PtD from your fabricator(s)
- Use the NISD/SEAA book
- Secure and/or develop design checklists
- Collaborate with designers and erectors

PTD: AN OPPORTUNITY FOR YOU AND YOUR FIRM

- All organizational change starts with individual initiative
- Will you be a leader or a laggard?



www.healthknowledge.org.uk/public-health-textbook/disease-causation-diagnostic/2h-principles-health-promotion/prevention-paradox

SUCCESSFUL INNOVATION AND ORGANIZATIONAL CHANGE

- An Organizational Culture driven by Leadership and Vision
- Risk Perspective
- Resources
- Collaborative Partnerships and Processes
- Organizational Learning

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MOVING AISC FORWARD ON PTD

- 1. Recognize that PtD can help AISC members
- 2. Educate AISC members
- 3. Educate owners, design engineers and GCs
  - Add PtD to Safety Committee webpage
  - Online training module
- 4. Create better tools
  - Create a PtD Process guidance document
  - Create an improved design checklist

SUMMARY

- PtD is tied with sustainability, CSR, ethics
- PtD offers safety bang-for-the-buck by applying the Hierarchy of Controls
- Successful organizations have implemented PtD
- Three first steps to implementing PtD
  - Culture, Processes, Partners
- AISC can help its members and their clients by advancing PtD

THANK YOU FOR YOUR TIME!
Let's talk!

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PDH Code 28236

COURSE DESCRIPTION

The presentation will summarize the PtD concept and the ethical and sustainability-related reasons for PtD, provide common examples, summarize tools and processes that enable PtD, and identify potential barriers to performing PtD. The presentation will conclude with suggestions for how to move forward with implementing PtD in your organization.

LEARNING OBJECTIVES

Participants will be able to:

- Define Prevention through Design (PtD)
- Identify common examples of PtD
- Describe tools and processes that enable PtD
- Discuss potential barriers to PtD
- Summarize steps in implementing PtD in an organization.