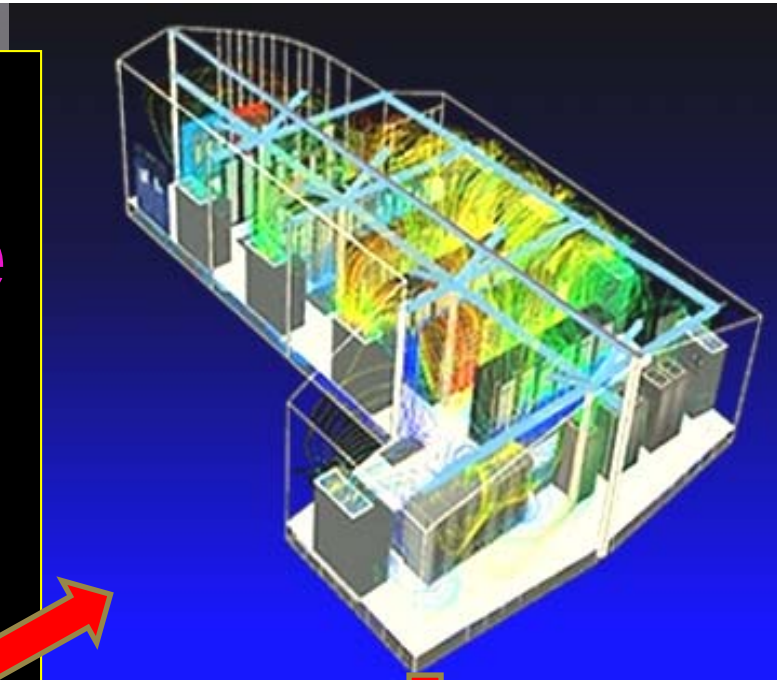
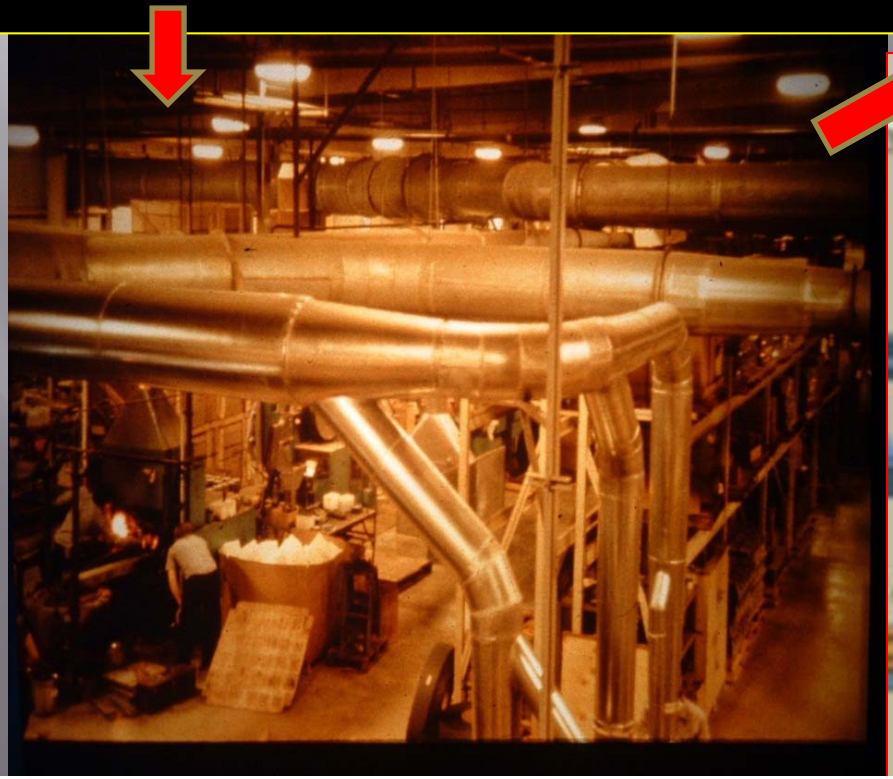
IH Engineering
Past, Present, Future
"IHE"

January 2014





Many changes in
"IH Engineering" have
Occurred in last 30 years

Let's explore what / why:

-- Factors?

-- Past Conditions?

-- Present Conditions?

-- What about the future?

gineering =
pplications of
entific, economic, and
chnical knowledge to
e design, building, and
aintaining of
uipment, systems,
aterials and
ocesses.” or...

Background Info - 1

actical Applications of Science”

anches of ngineering

Background -2

Chemical Engineering

Mechanical Engineering

Industrial Engineering

Civil & Env. Engineering

..... + ...

Safety Engineering

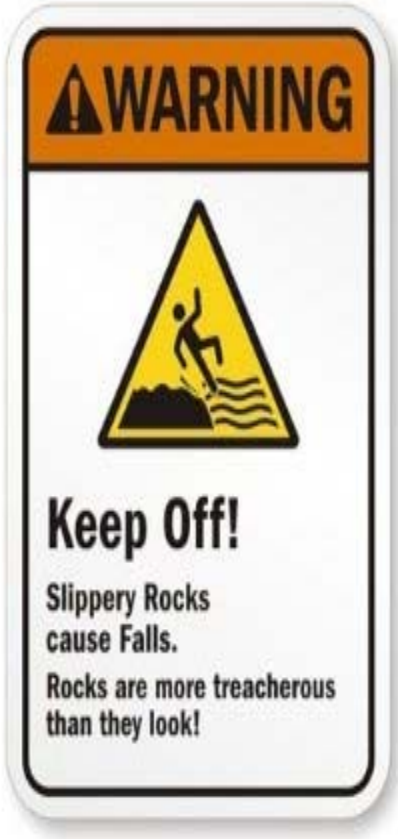
IH Engineering

+ about 15-25 more

hat is “Safety gineering?”

Background - 3

n engineering discipline hich assures that gineered systems ovide acceptable levels safety. It is strongly lated to mechanical, dustrial and systems gineering.” -- ASSE



hat is IH Engineering?

actical Applications of
cience ... to control
nd protect the health
people in the work
vironment.

Background - 5

e:
giene" = "Science of ... Health" and
= "... Preservation, management ..."

Background - 4

ny historical career
ecialties have existed in
e IH field:

H Chemist (e.g, Calif)
ndustrial Toxicologist
Occupational Physician
H Engineer
ndustrial Epidemiologist

More recently:

Consultant
Manager
resnic IH

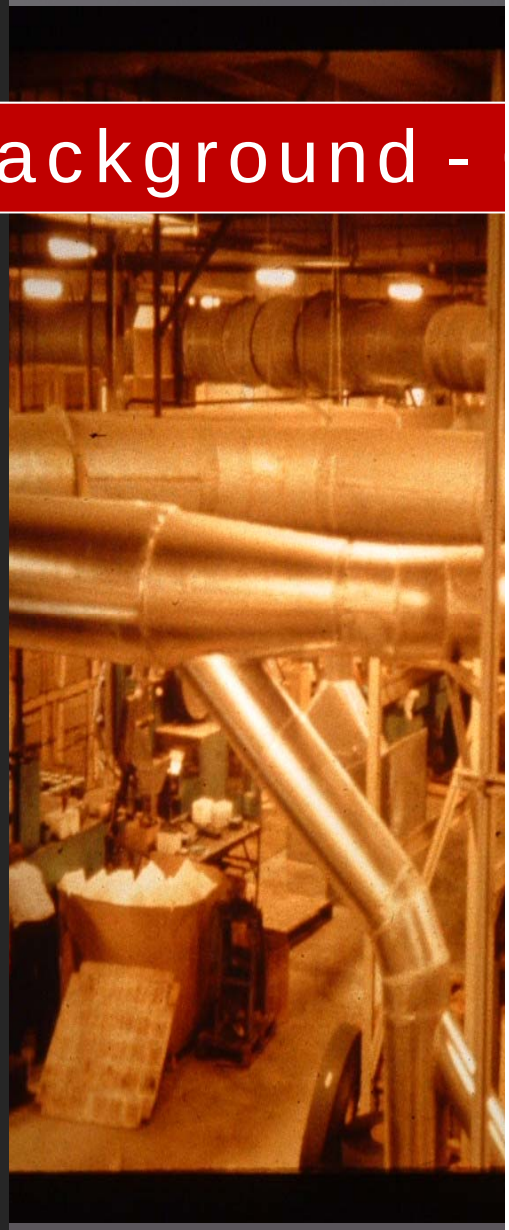
Background -

hat types of control
d / does IHE cover?

- Chemical Emissions
- Excessive Noise
- Thermal Stress

to a lesser degree *today*:

- Ergonomics
- Illumination
- Radiation
- Hazardous waste
- Costs
- Air pollution

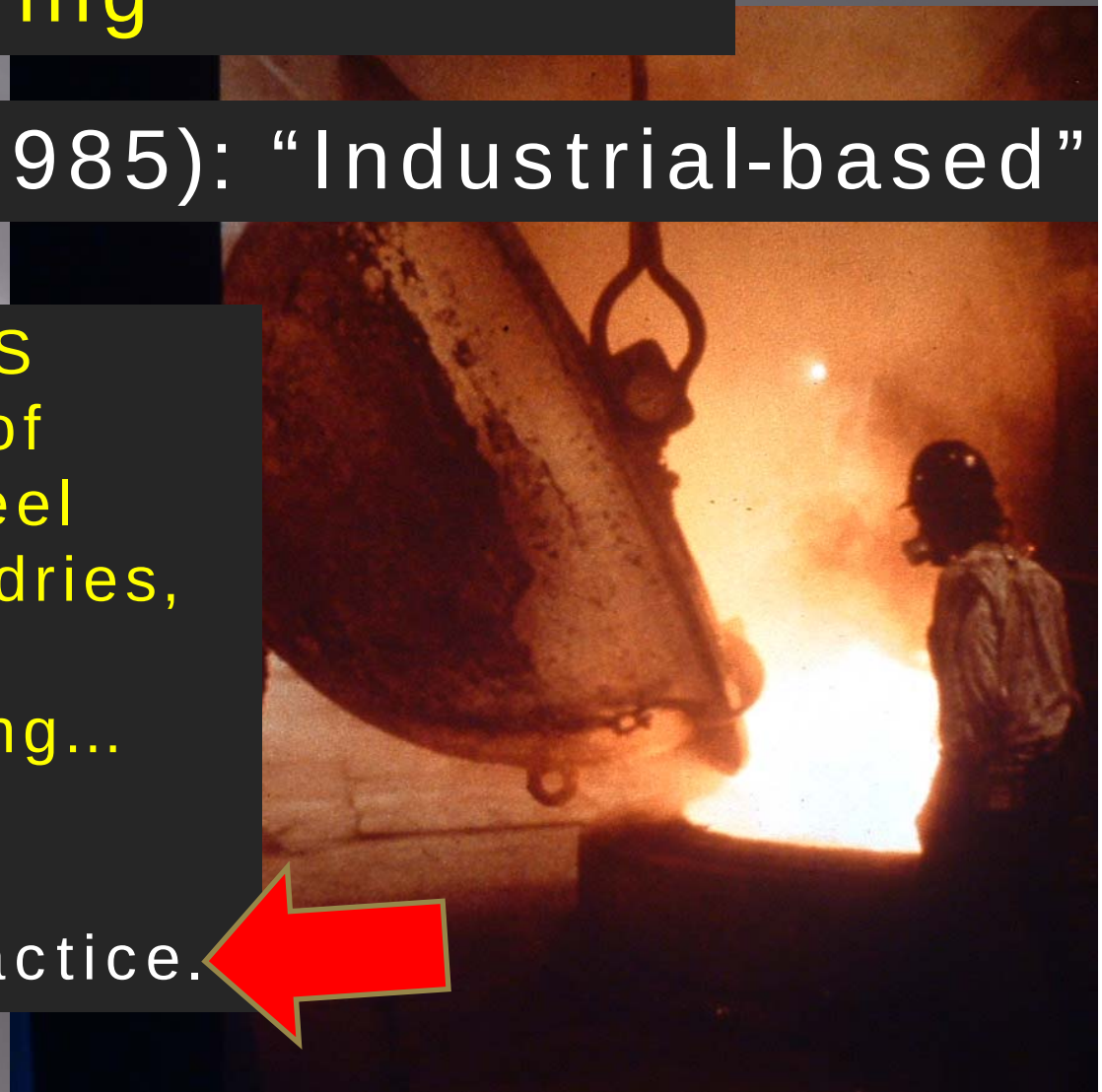


S Workplace and its impact n IH Engineering

he Past (pre-1985): “Industrial-based”

-1980, much of US onomy consisted of dustries,” e.g., steel ls, smelters, foundries, chine shops, auto nufacturing, mining... d others.

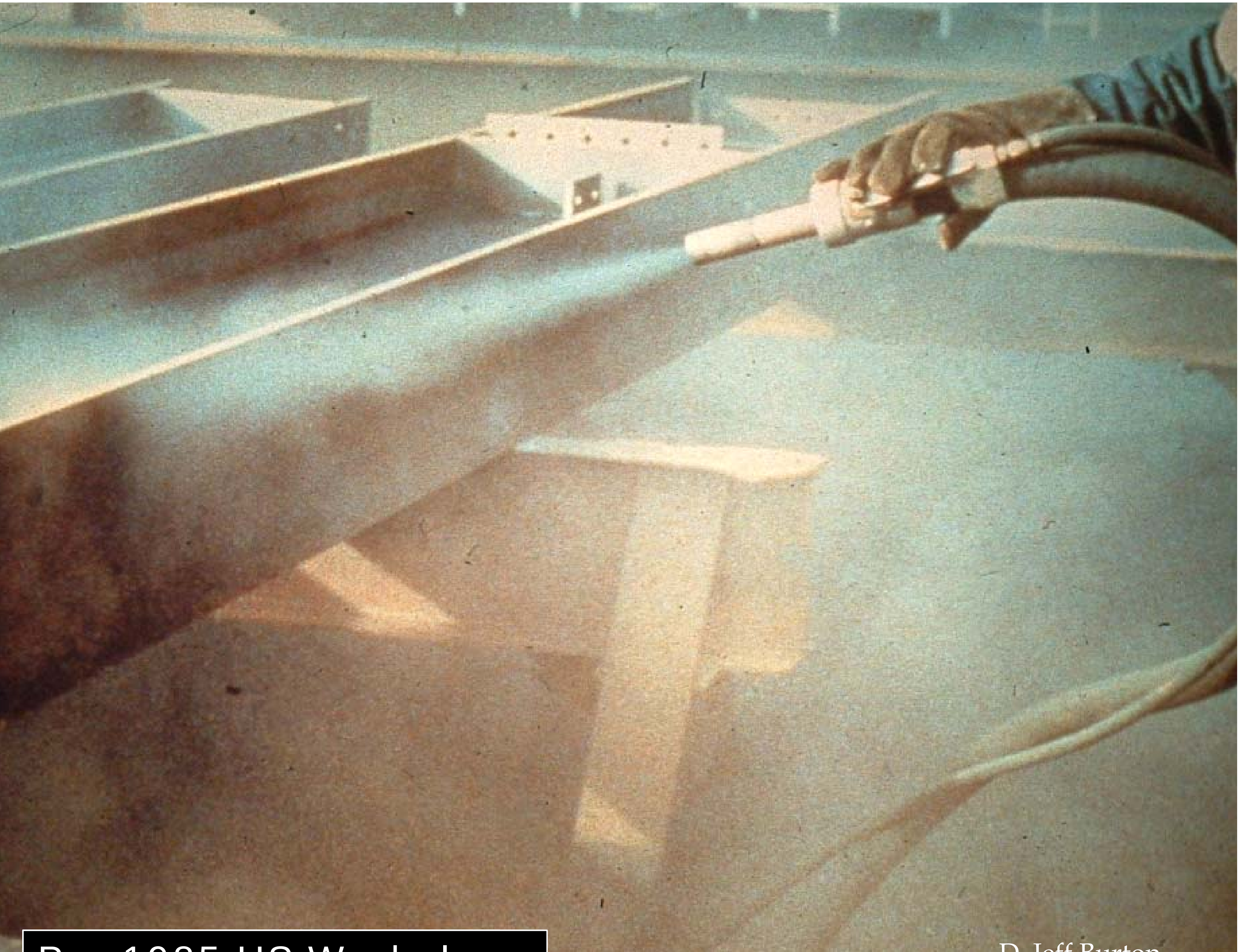
ese defined IH practice.



Rear 1985 HS Wash bay

D. Jeff Burton

D. Jeff Burton


D. Jeff Burton


Pre 1985 US Workplace


985 US Workplace

ost design work: “drafted by hand” using
andbook” reference materials.

+ “IAQ” issues arose 1975-1980 after ASHRAE lowered OA requirements to 5 cfm/person

S Workplace and its mpact on IH Engineering

The Present: “knowledge-based”

day, many of our work ces are “high tech,” e.g., omation, CADD, CFD, IT, fessional offices, semi- nductor, food production, arma, labs, plus add IAQ and AC, green building, and er issues.


Today’s US Workplace

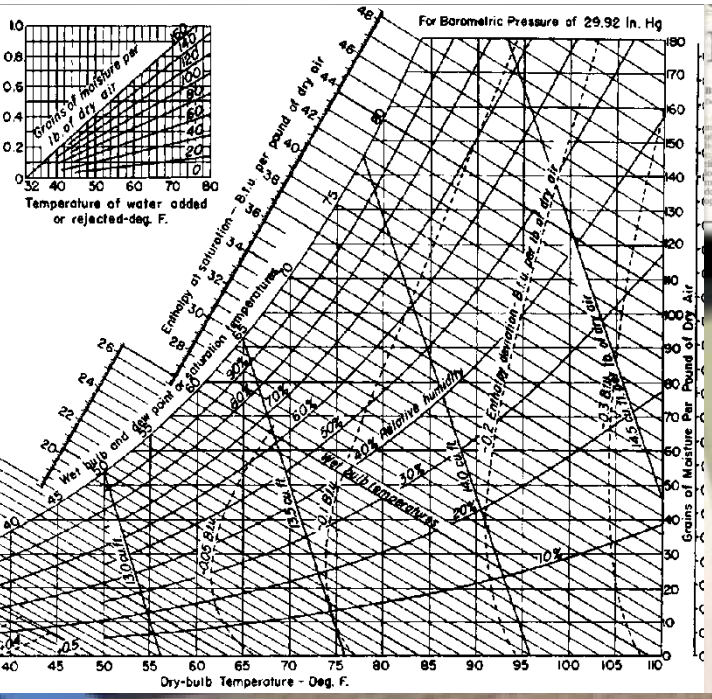
Today's US Workplace

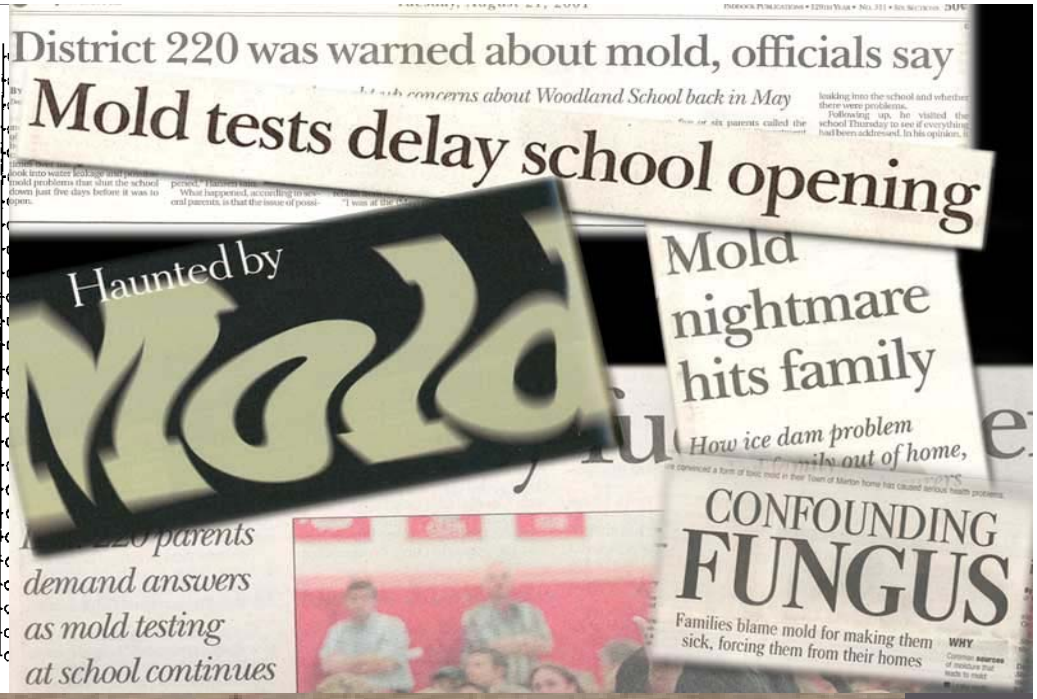
Today's US Workplace

Today’s US Workplace

Today's US Workplace

IT and Office Spaces





IAQ" issues are
25% - 40% of IH
workload today

Still: Ventilation!

Today's US Workplace: "Green"

Some IHs: "LEED-Certified"

e Past (pre-1980) Sources of IHs:

aduate engineers as IHs highly valued:

Chemical Engineering
the ideal base for
ecoming an industrial
ygienist.” – Alice
amilton

araphrased, date unknown)

he Past

5% of IHs have
grees in engineering."
Andy Hosea (Circa 1970,
rsonal Communication.)

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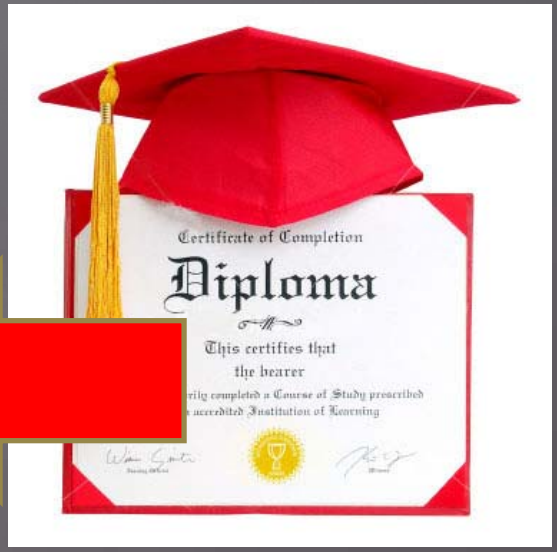
ntil 1980, Exxon hired *only* "IH
gineers" for IH positions." – Rod
son, Univ. of Utah



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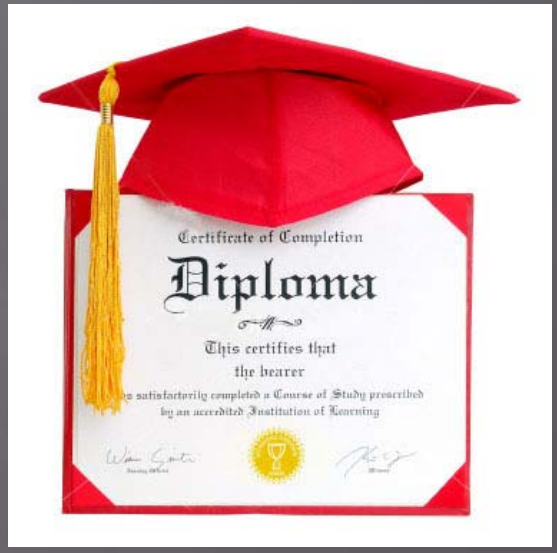


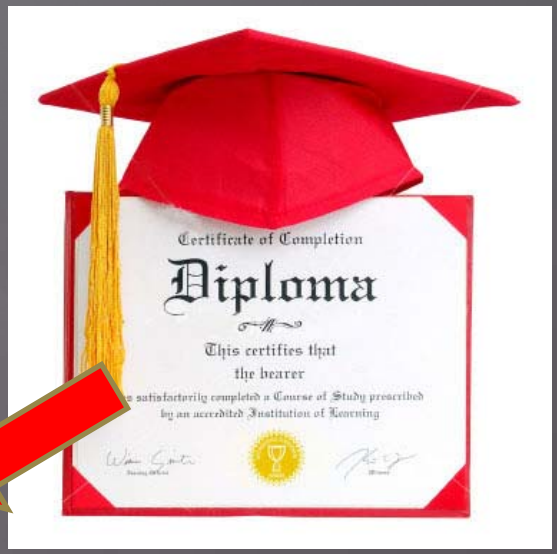
The Present

try level IHs:

5% have basic degrees
engineering fields.

most all have some
ckground in sciences.

ata/sources in a minute



The Past

IHA ?

ad an “Engineering
ommittee” until 2012

CGIH?

951 - Had the “Vent
ommittee” consisting
f “Gov’t” IHs with
ngineering degrees.
K. Caplan, et al.)

The Present

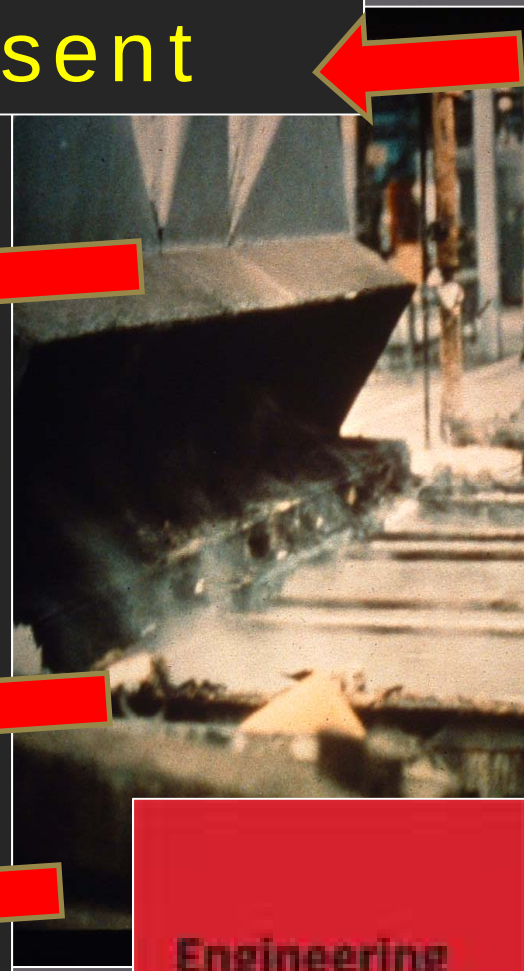
HA ?

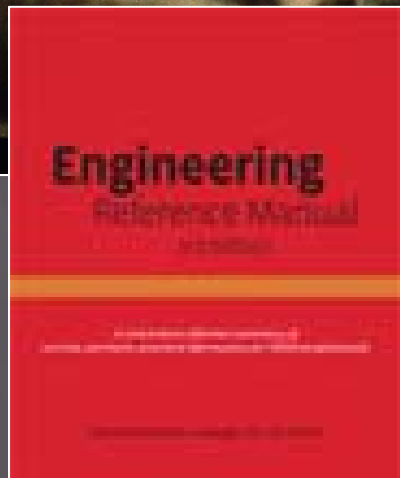
Has “Hazards Prevention
d Engineering Controls
mmittee” [“H-PEC” Com.]
See AIHA.org for details

Engineering Industry”

G = 138 members (1.4%)

235 members list “PE”
(2.4%)



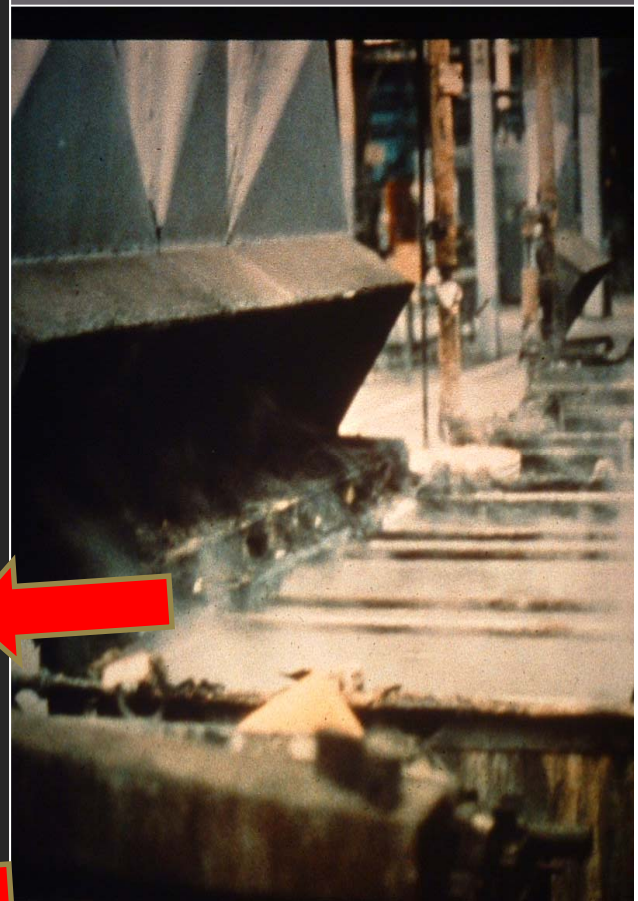


IH

8 members (1.4%)
5 have PE (2.4%)

The Present

GIH?
Vent Committee? –
l have PE, several have
H, all consider
emselves ME or CE
her than IH Engineer”
– Gerry Lanham, Chair
2% of ACGIH members
t profession as
ngineering”
2.5% list “PE” title



of ACGIH members list profession
ngineering”
% st having PE

SE?

Engineers” is in name

Members w/ Eng.

degrees: “unknown”

% list “PE”

ow prefers “Safety

fessional”

ets Tech Standards for

&S

!

The Present

he Past

pers on “IHE” were routinely published

dustrial hygiene engineering in the trochemical industry

1978

ARD S. BRIEF and JEREMIAH LYNCH
n Corporation, Medical Department, Research and Environmental
h Division, Linden, New Jersey 07036

purpose of this paper is to illustrate how strial hygiene engineering can be practically ied during the development of new ochemical technology, during the design of or modified chemical manufacturing units, ng routine and non-routine production rations, and during plant turnaround edures. Further, this paper will illustrate the ons available to the designer depending on legree of data base gaps which need to be .

appropriate for potential releases. Thes should relate the likely period of exposur biological effect. Thus different ex periods, such as one minute, 15 minute hours and 24 hours should have corresp limits, based on the toxicological rate pr which occur.

The next step in the process is to detern potential for exposure by assessi probability of release. The frequency

he Present

pers related to “engineering controls” e published regularly. Mostly from ternational sources. None use “IHE.”

alysis of Factors Affecting Containment with Extracted rtial Enclosures Using Computational Fluid Dynamics

Rachel L. Batt* and
Adrian Kelsey
hor Affiliations

1. *Health and Safety Laboratory, Harpur Hill, Buxton, Derbyshire SK17 9JN, UK*

*Author to whom correspondence should be addressed. Tel: +44-(0)-1298-218318; fax: +44-(0)-1298-218840; e-mail: rachel.batt@hsl.gsi.gov.uk

Received May 30, 2013.
Accepted July 6, 2013.

tract

est papers (9) from the
EH
c 2013 AIHA+ACGIH

of nine papers are
ted to "engineering
rol" in some way.

cs:
go (lifting)
b Ventilation (testing)

ember: 1/7 eng
rom non-USA sources

1/3

hat did IH Engineers Do? IHs?

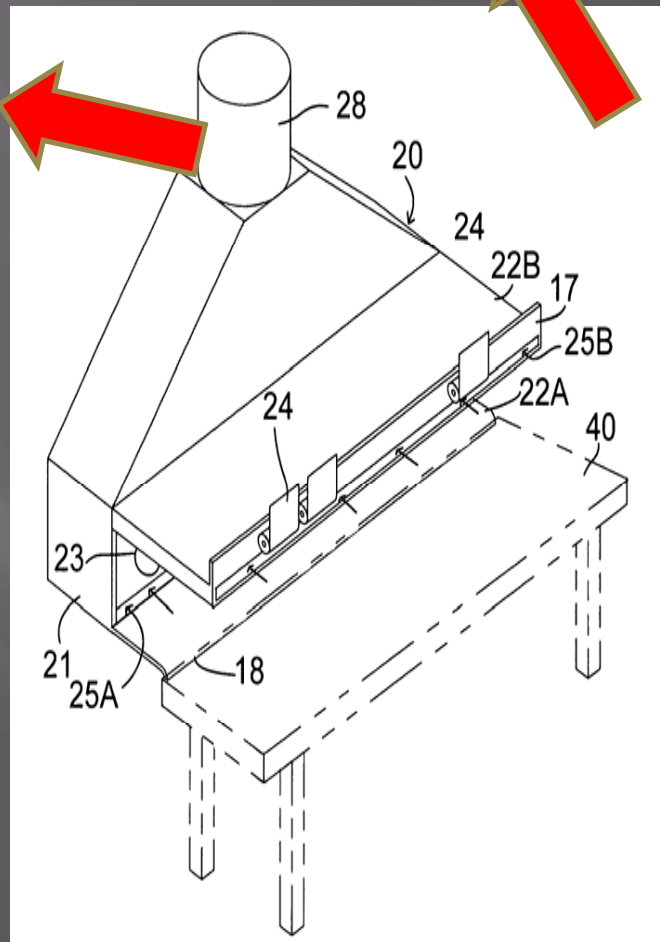
The Past

e 1980, IH Engineers
ten designed controls,
g. coke oven emission
ntrols, plating shop
ntilation, welding
ntilation and so forth.

Hs were expected to be able to:

ake engineering control
ommendations; assist engineers

view P&Ss and make
ommendations to designers



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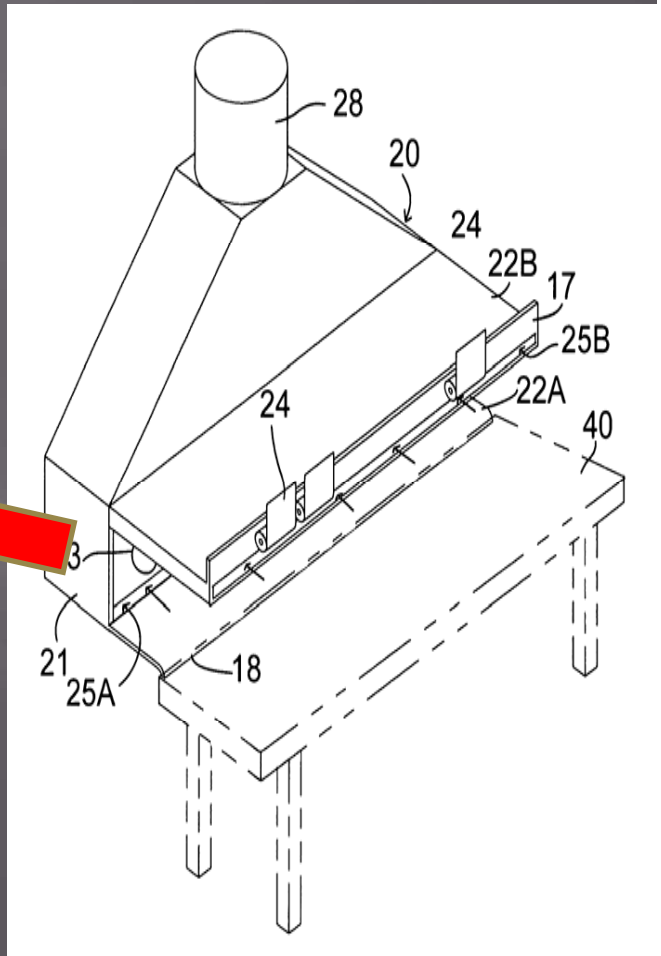
The Past

1980, IH Engineers often designed controls, coke oven emission controls, plating shop lation, welding ventilation and so forth.

IHs were expected be able to:

Make engineering control commendations; assist gineers

view P&Ss and make recommendations to gners



hat did IH Engineers Do? IHs?

The Past

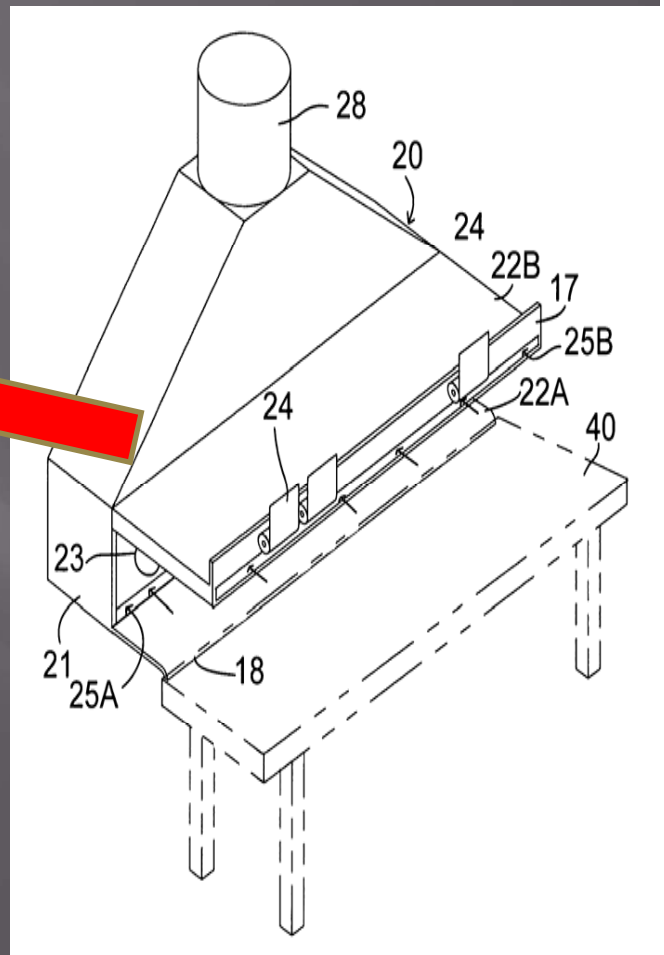
IHs were expected to be le to:

ke engineering control recommendations; st engineers

Review P&Ss and make commendations to signers

aluate and troubleshoot existing engineered rol systems

derstand engineered control systems and they work



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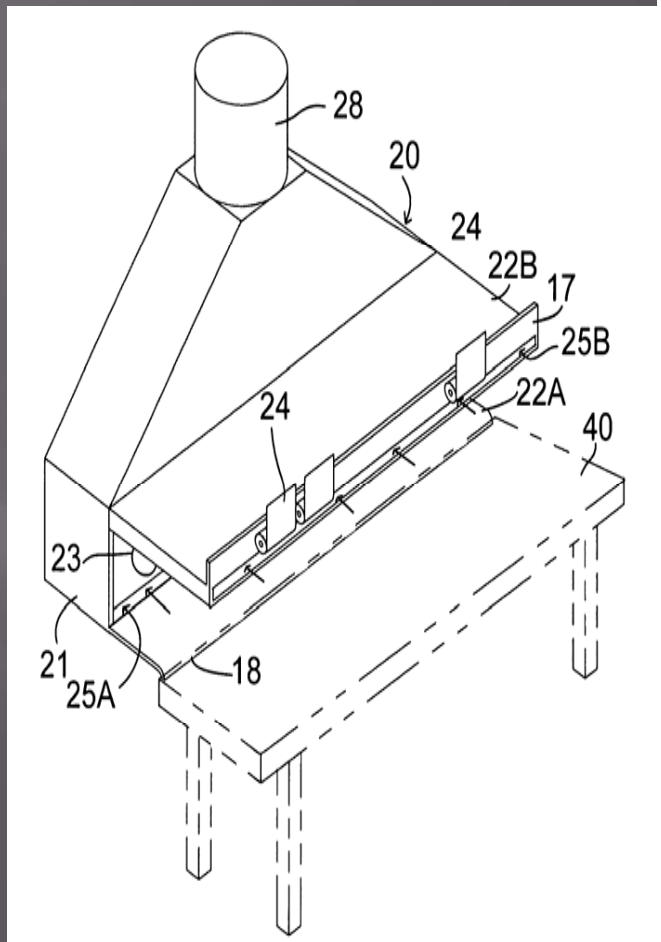
derstand engineered control systems and
they work



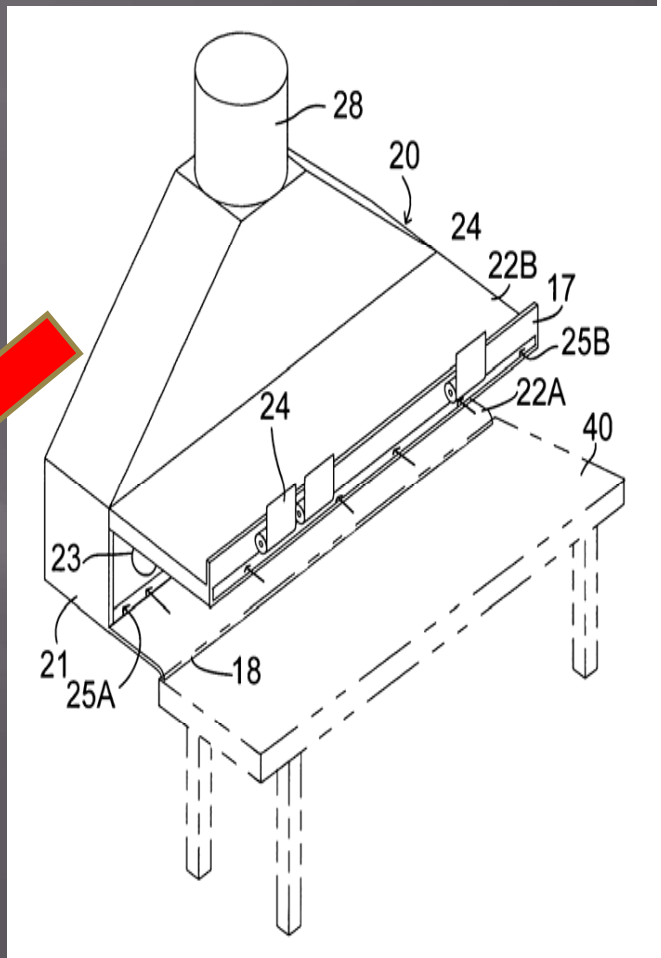
hat did IH Engineers Do? IHs?

The Past

Hs were expected to be able to:

- ke engineering control recommendations; st engineers
- view P&Ss and make recommendations to gners
- aluate and troubleshoot existing engineered rol systems

Understand engineered ntrol systems and how ey work



Vhat do Engineers in IH Do Today?

The Present

gineers in IH do very
tle actual design-to-
ild work.

are still expected to be able to:

ake engineering control
ommendations

eview P&Ss and make
ommendations to designers.

aluate existing engineered control
ems

ommunicate effectively with
neers

at do IHs do, re: engineering now?

The Present

gineers in IH do very little actual sign-to-build work.

s are still expected be able to:

Make engineering ntrol recommendations

eview P&Ss and make recommendations esigners.

valuate existing engineered control ems

ommunicate effectively with engineers

at do IHs do, re: engineering now?

The Present

s are still expected to
able to:

ke engineering control recommendations

Review P&Ss and make
commendations to
signers.

aluate existing engineered control
ems

mmunicate effectively with engineers

at do IHs do, re: engineering now?

s are still expected to able to:

ke engineering control recommendations

eview P&Ss and make recommendations esigners.

Evaluate existing gineered control stems

mmunicate effectively with engineers

The Present

at do IHs do, re: engineering now?

The Present

gineers in IH do very little
ual design-to-build work.

s are still expected to
able to:

- ke engineering control recommendations
- eview P&Ss and make recommendations
esigners.
- aluate existing engineered control
ems

Communicate effectively
th engineers

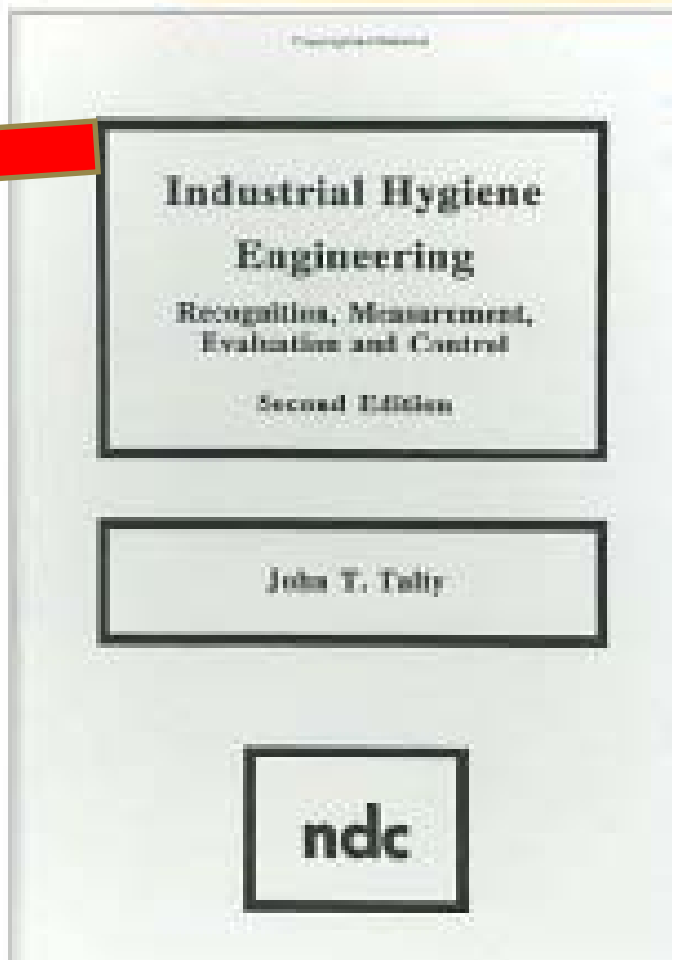
he Past and Present

e Primary Text:
Engineering: Recognition,
asurement, Evaluation and
ntrol.

Edition: late 60's – early 70s?
onsor: NIOSH (Byers,
Clintock, Vernon, et al)

Edition: 1988 (25 yrs ago)
onsor: NIOSH and NDC (John
ty) [Needs Updating]

Ed. available on Amazon,
ed. $40 "New" $140

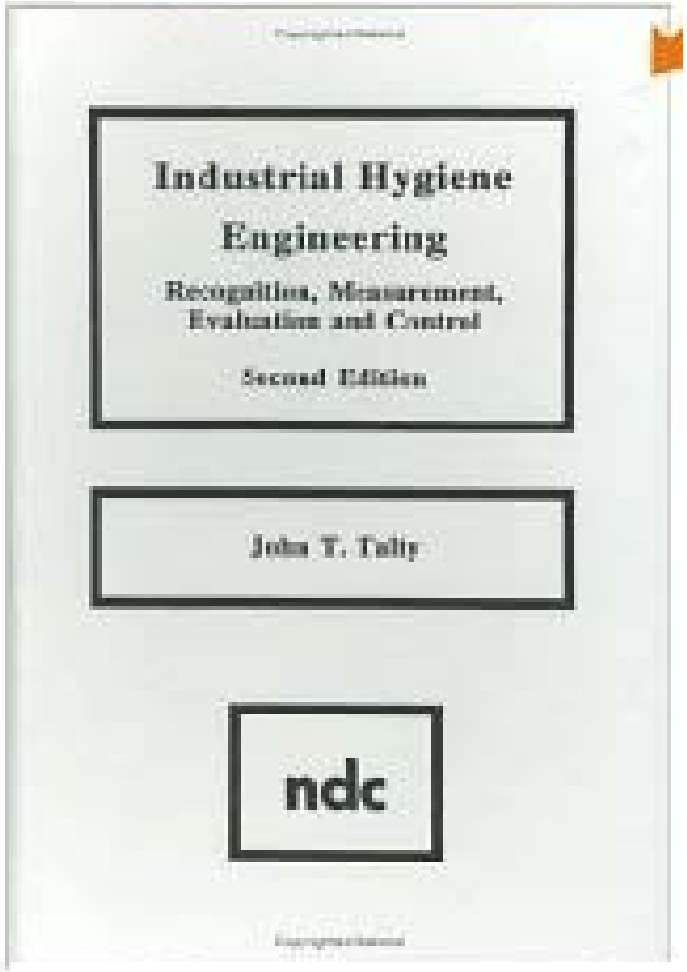


kindle edition

HE Contents

pic	Pages	
erview of IH	85	
ntilation	240	(1)
ermal Stress	40	(2)
und/noise	120	(3)
mination	70	(2)
diation	130	(3)
onomics	60	(2)
ner	60	

- Only topic with detailed "design" instructions
- Very little design, if any
- About 20 pages on "controls"



ast and Present

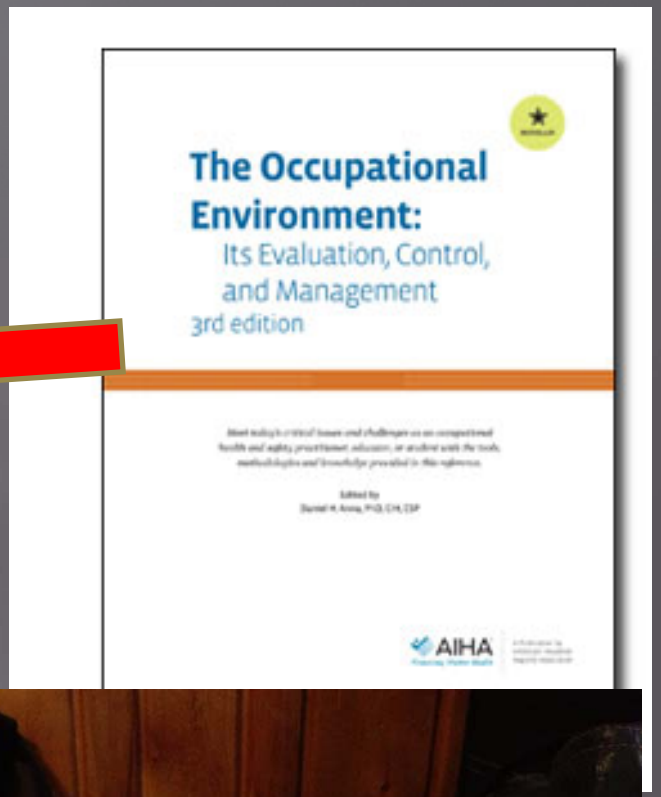
er Primary EC Texts:

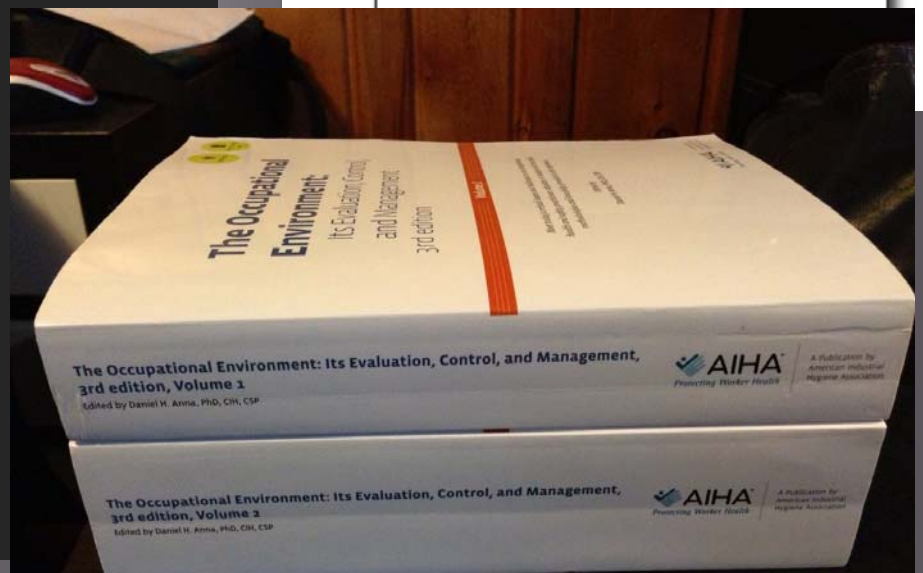
A “White Book” (Derived
m NIOSH “White Book.”)

tiple Chapters on
gineering” topics:

tilation
se
rmal Stress

Edition Current
ce: $50 - $300





he Past and Present

ores of EC
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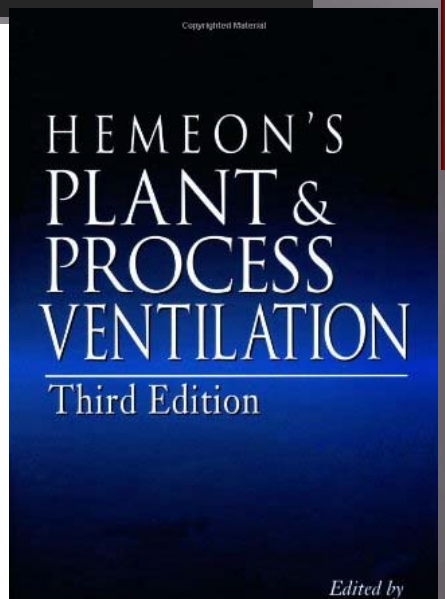
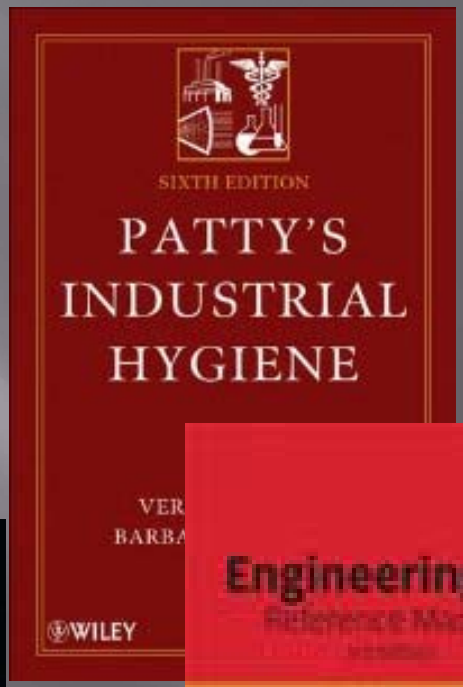
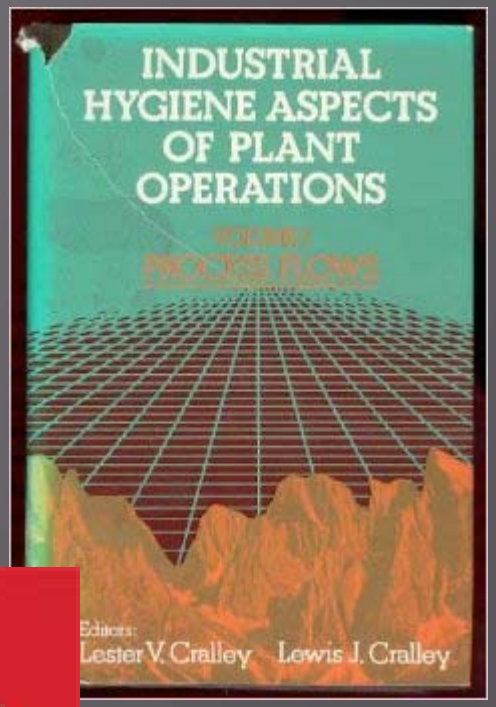
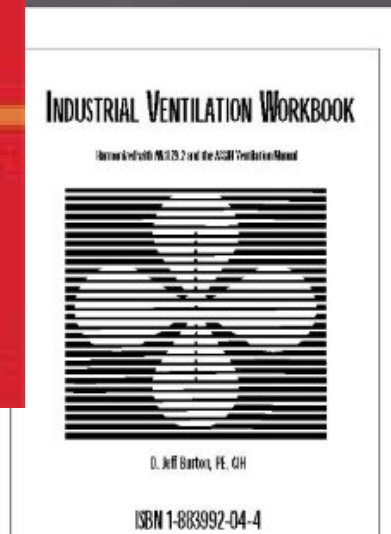
d new





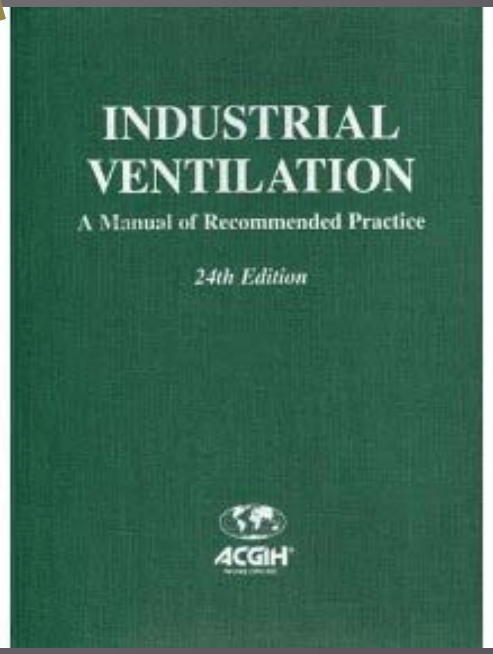


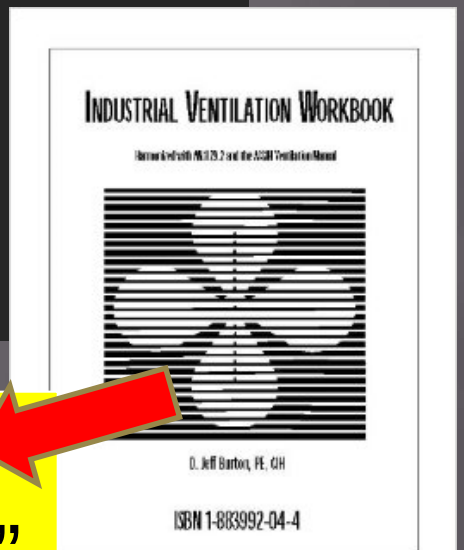


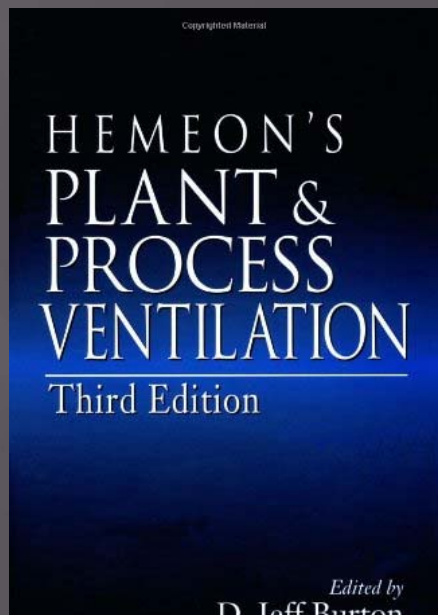
dustrial Ventilation:
imary focus of
Engineering:
st and Present

Design
Operation
Maintenance
Testing
Troubleshooting

ll occupancies
quire ventilation."



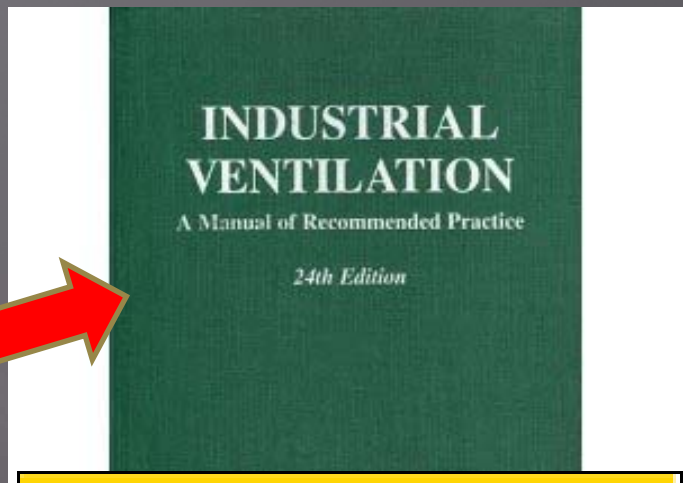


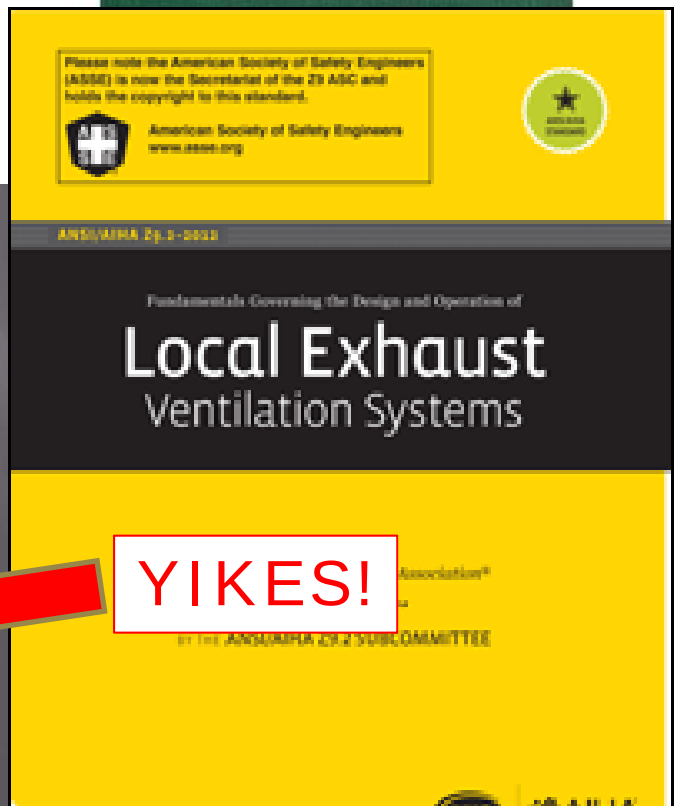


tandards of Practice
E: Ind. Ventilation

mary “SGP” since 1951:
GIH IV Manual
ow in 28th Edition)
Not a Standard.” – ACGIH]

SI Z9 (Ind. Ventilation)
ce 1960s
HA: Secretariat to 2012
SE: Secretariat now!!



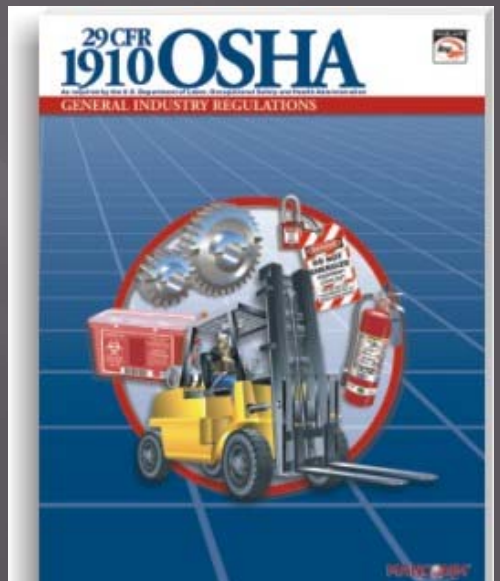


tandards of Practice,
ther EC

SHRAE Standards 52, 55,
2 plus others
IVAC)

OSH Guidelines, various,
g., Recirculation

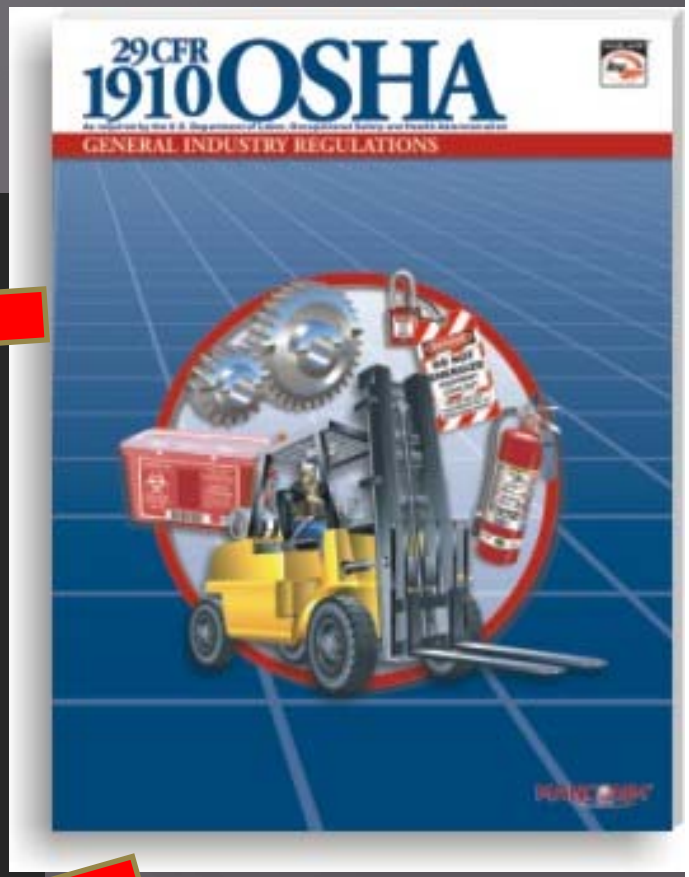
SHA Regs, various (85
lated to engineering
ontrols) but old



pact of OSHA and her traditions

HA (and all IH traditions) ll for engineering and ministrative controls to applied first, where chnically and financially asible.

This alone drives the quired retention of an ngineering" component



LUS

ABIH

e **ABIH has defined three IH *domains*):**

- **Risk Assessment (sciences, hazards, health effects)**
- ***Hazard Control (ventilation, biomechanics*)**
- **Program Management (standards; laws, codes, programs)**

ngineering *skills* have a major role to play in all of these "domains"

Education and its impact on Engineering in IH

n the past we hired ngineers and trained em to be industrial ygienists. Today we hire ls and give them some ngineering training." –

rica Jones, Chair, PECC, AIHA, 2014, ersonal communication.

ducation and its impact on ngineering in IH -- Present

here are 140+ programs that offer A, BS MS programs in OH, IH, IS, EH by US cademic institutions.

5+ offer BS or MS degrees in IH-related ducation.

---

ustrial Ventilation (as a surrogate for “IH Engineering”) is a quirement for “most IH BS and MS programs.”

nt students average “less than 10 or less per program” = out 550 students enrolled each year.

ources: Cresente Figueroa, UNA; ASSE

College & University Directory

Map displays number of schools listed per state

OEH&S programs

ducation and its impact on ngineering in IH -- Present

ere are 140+ programs that offer A, BS or MS programs in , IH, IS, EH by US academic institutions.
+ offer BS or MS degrees in IH-related education.

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ducation and its impact on ngineering in IH -- Present

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5 this year at the RMCOEH]

ends in IV course content in “last 5 years” :
nerging IV into general controls classes
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urces: Cresente Figueroa, UNA; ASSE

uggested Conclusions -1

H Engineering" is *not* currently
cognizable as a profession.

Safety Engineering" is still a
cognized profession (@PE
atus.)

s this necessary or desirable?)

job listings on Google for "IH Engineer." There are
listings for "Safety Engineer."

ere are no BS or MS degree programs awarding "IH
gineering" degrees.

uggested Conclusions -2

Engineering" is not currently recognizable as
rofession. "Safety Engineering" is still a
ognized profession (@PE status.)

this necessary or desirable?)

o job listings on Google
r "IH Engineer." There
e job listings for "Safety
ngineers."

re are no BS or MS degree programs
arding "IH Engineering" degrees.

uggested Conclusions - 3

Engineering" is not currently recognizable as
rofession. "Safety Engineering" is still a
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this necessary or desirable?)

job listings on Google for "IH Engineer."
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here are no BS or MS
egree programs awarding
H Engineering" degrees.

No PE track for IH or Safety?)

uggested Conclusions - 4

st IH BS and MS programs
clude “engineering controls” in
urse materials at varying levels
technical complexity.

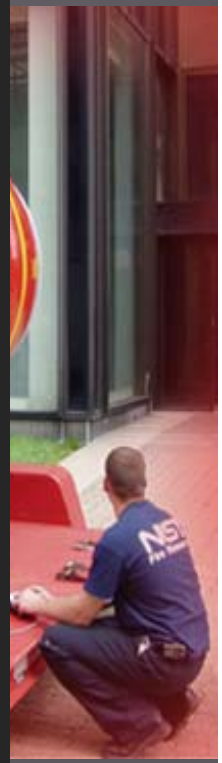
(Are they adequate??)

BS-level engineers enroll in MS IH programs. (Personal
rience.)

we need to attract more?)

e is no PE status for “IH Engineers” There (was) for “Safety
eers.”

arely design engineering controls and only occasionally review



uggested Conclusions - 5

t IH BS and MS programs include “engineering controls” in rse materials at varying levels of technical complexity.

Are these programs adequate??)

ew BS-level engineers enroll in S IH programs. (Personal xperience.)

(Do we need to attract more?)

re is no PE status for “IH Engineers” There (was) for “Safety ineers.”

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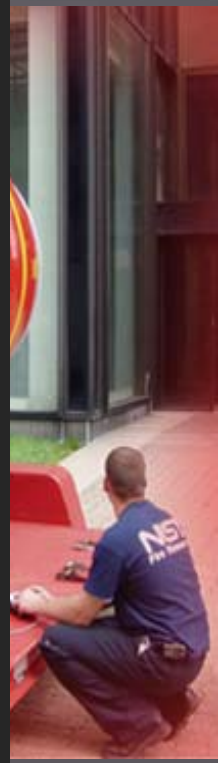
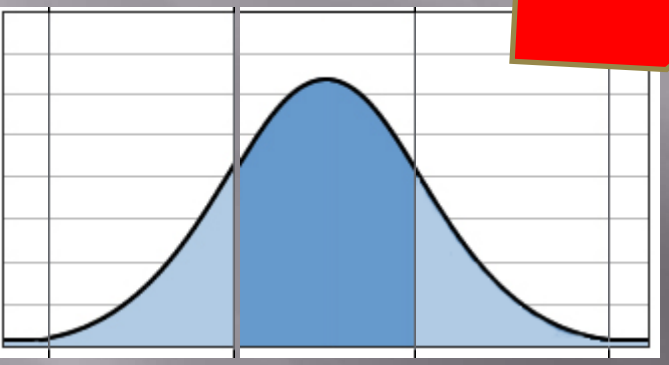


he starting salary for IHs is about $56,000."

he median salary for an IH in the US is
7,857." – 2013 BLS Data (Degree unspecified)



What about salary competition?

The Present

he starting salary for MEs is about $60,500
S) and $75,700 (MS)"

he median salary for a typical ME in the US is
0,600." – 2012 and 2013 BLS Data

uggested Conclusions - 6

t IH BS and MS programs include “engineering controls” in course erials at varying levels of technical complexity.

Are these programs adequate??)

BS-level engineers enroll in MS IH programs. (Personal experience.)

o we need to attract more?)

e is no PE status for “IH Engineers” re (was) for “Safety Engineers.”

s rarely design engineering ontrols and only occasionally view design P&Ss.

he Future? Recommendations:

Recognize that engineering is still a great base for being an industrial hygienist.

nd ways of attracting more BS graduate engineers into our MS IH programs.

e sure BS and MS IH programs cover engineering control (EC) topics sufficient to meet today's IH eeds, especially ventilation.

rovide diverse EC PDCs and DL courses to help IHs do their jobs and specific EC tasks.

pdate and write new IHE / EC manuals and textbooks.

upport/sponsor technical / engineering standards-setting activities when standards effect the IH rofession.

he Future? Recommendations:

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Update and write new IHE / EC manuals, handbooks and textbooks.

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he Future? Recommendations:

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pdate write new IHE / EC manuals and textbooks.

Support/sponsor technical and engineering *standards-setting* activities when those standards effect/impact the IH profession.

he Future? Recommendations:

ecognize that engineering is still a great base for being an industrial hygienist; ttract engineers into the profession.

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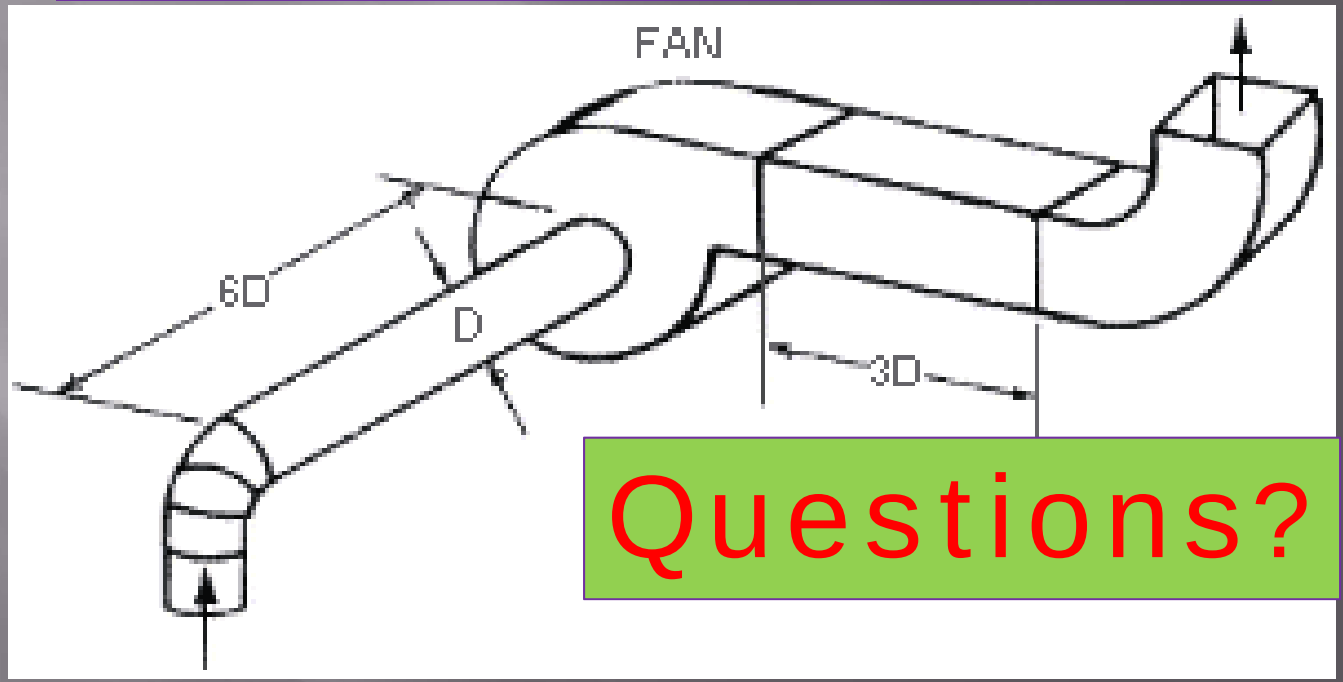
upport/sponsor tech[illegible] and engineering *standards-setting* activities hen those standar[illegible]ffect/impact the IH profession.

Partner with ASSE to rebuild the engineering base of OH&S.

IH Engineering

D. Jeff Burton, PE

YPSW Conference, January 2014



Questions?