

The Fire Protection
Professional Engineer
Exam and
YOU

Purpose of the Exam

- Prove the engineer is competent enough to practice independently without adversely affecting the health, safety, or welfare of the public
- *ASSESS MINIMUM COMPETENCY*
- Identify “adequate” engineers not the “best” engineer

Historical Exam Structure

- Part machine scored (scantron)
- Part hand scored (essay)
- 8 problems with 10 parts each
- Limited choice of which problems to work

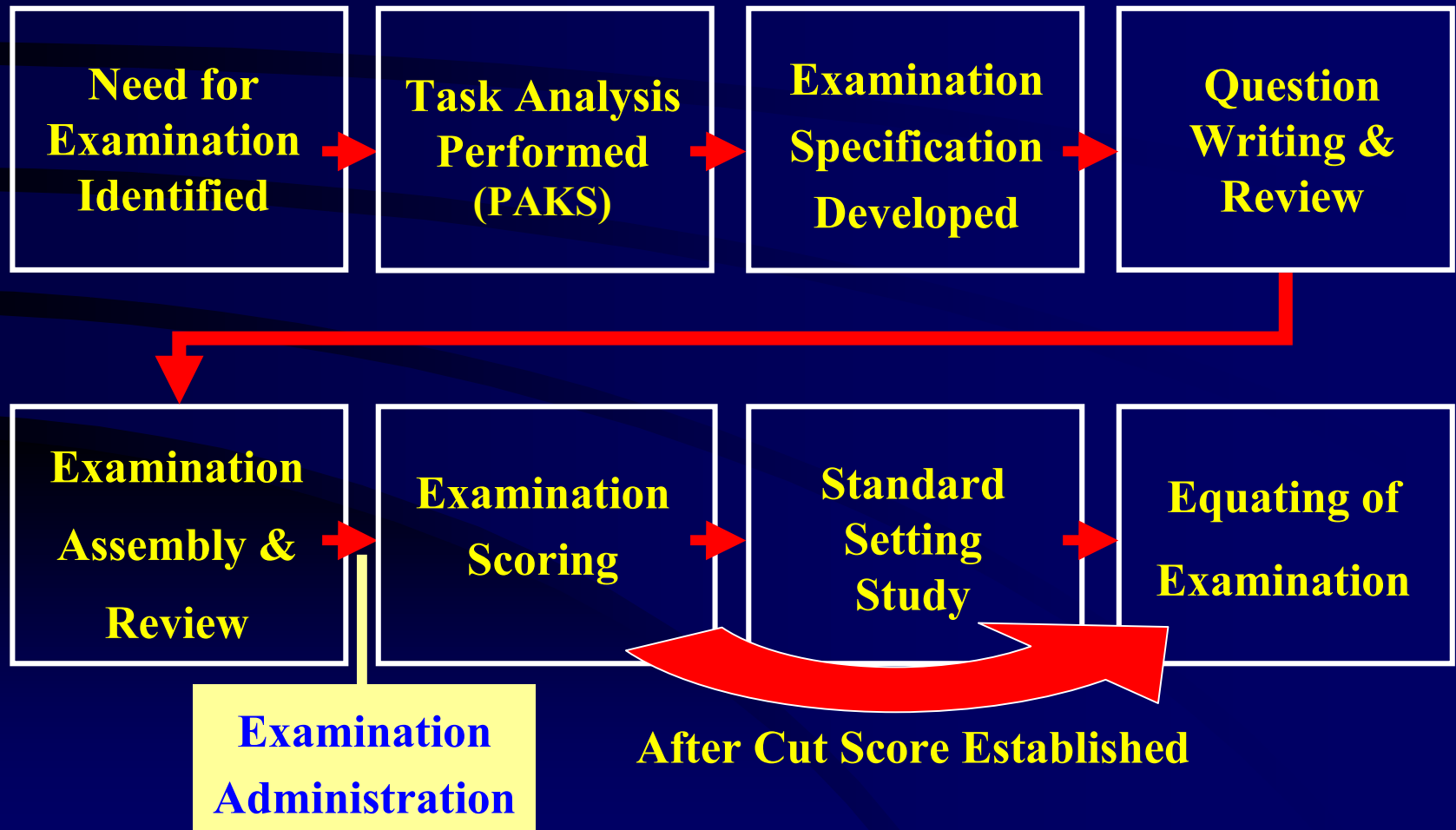
Current Exam Structure

- All machine scored
- 80 problems – Each independent of others
- Must attempt all problems, no choices

Goals for Future Exams

- Reduce need for reference materials to the exam site to the SFPE Handbook of Fire Protection Engineering
- Test candidate's knowledge of fire protection engineering principles, not the ability to look up code requirements
- Eliminate need to revise exam items when codes are revised
- Facilitate on-demand computer-based testing

Examination Development Process Overview



Exam Specification

- Types of fire protection analysis – 10 q
- Info sources for FP analysis – 6 q
- Fire protection management – 8 q
- Fire dynamics – 8 q
- Human behavior – 4 q
- Water based fire suppression – 10 q
- Special hazard systems – 4 q
- Detection and alarm – 7 q
- Smoke management – 4 q
- Explosion protection – 3 q
- Passive building construction – 10 q
- Means of egress – 6 q

Ranked by Emphasis

- Types of fire protection analysis – 10 q
- Water based fire suppression – 10 q
- Passive building construction – 10 q
- Fire protection management – 8 q
- Fire dynamics – 8 q
- Detection and alarm – 7 q
- Info sources for FP analysis – 6 q
- Means of egress – 6 q
- Human behavior – 4 q
- Special hazard systems – 4 q
- Smoke management – 4 q
- Explosion protection – 3 q

The Life Cycle of an Exam Question

- Drafted by rank & file SPFE member (YOU)
- Reviewed/edited by “subject matter experts” on SFPE Licensing (Exam) Committee
- Beta tested at SFPE Annual Meeting (YOU)
- Put into the Problem Bank at NCEES
- Pulled from Bank to assemble examination
- Given on examination
- Re-evaluated based on exam performance

Item Writing

Item Writing Nomenclature

Item = entire question

Stem = problem statement

Options = multiple choices

Key = right answer

Distracters = wrong answers

Example Item

Stem - Which of the following temperatures in °C is most nearly equivalent to a temperature of 60 °F?

Options:

- | | | |
|-------------------|-----|----|
| Key | (A) | 15 |
| Distracter | (B) | 33 |
| Distracter | (C) | 50 |
| Distracter | (D) | 51 |

Solution to Example

$$(60 - 32) \times 5/9 = 15.5 \quad \text{Option (a)}$$

Distractors:

(b) did not subtract 32 from 60 (= 33)

(c) multiplied by 9/5 (= 50)

(d) added 32 to 60 (= 51)

Writing Good Items - DOs

- Work in about 6 minutes
- One correct answer
- Simple and direct language
- Code information given in stem
- Plausible options
- Mutually exclusive options
- Common errors make good distracters
- All options the same length
- Most items include the term “is most nearly”

Writing Good Items – DON'Ts

- Code Look-up
- Negative wording
- Extremes (always/never/only/every)
- Soft wording (much more/somewhat more/much less)
- Avoid grouping options too closely
- Use “None of the above” sparingly
- Extraneous clues to the correct answer
- Sets of questions

Examples

GOOD & BAD

Exceed

Based on the description of the excavated channel, Manning's roughness coefficient should not exceed

A. 0.016

B. 0.020

C. 0.042


D. 0.055



Flaw: Say answer is (B), 0.020, then (C) and (D) are also true

All or None

Which of the following factors could enter into a decision about the type of circuit to be used?

- A. Weather at the plant site
- B. Terrain at the plant site
- C. None of the above
- D. All of the above 

Flaw: “All of the above” cannot be true since it includes “None of the above”

Balanced


Tests practice; Qualitative;
Balanced length of options



- A. Redundant fiber optic cables should be the same length to minimize time delay errors.
- B. Fiber optic cables should not be run near and parallel to alternating current cables.
- C. Redundant fiber optic cables should take separate paths to reduce common mode interference
- D. Redundant fiber optic cables should take separate paths to reduce risk of mechanical damage.

Short distracters

Flaw: Key is longer than distracters -
more qualified and specific

- A. be determined from a linear regression of Q versus T_r .
 - B. be determined from a linear regression of Q versus $\log T_r$.
 - C. be determined from a quadratic regression of Q versus $\log T_r$.
 - D. NOT be determined because the method of extrapolating the curve is arbitrary and has no basis in the physics of the hydrologic system, even though such extrapolation is routinely performed by engineering practitioners and regulatory bureaucrats.
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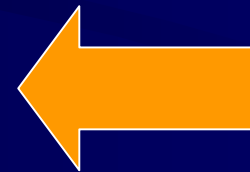
4. Calculate them for three engine ratings; approximately 12 for the 1000, 16 for 1500 and 20 for 2000. The 1000, 1500 and 2000 are constant 14000, 21000, 27000, 34000 and 41000 respectively. The 1000 engine, that was fully upgraded to 1994, might need an oil cost calculated at 1500 for the hour in a normal configuration, rounded up to 2000 and reduced to 600 for low hours. After company configuration, the demand is the cost of 1500, and the 1000 engine cost was available for 1000. The following program can be constructed to return the value:

- 1) Give minimum value the hour for low engine at 1200, calculate at 1500 for high engine and equal for low engine to equal engine cost of 600 and for low then reduce to the equal engine.
- 2) After upgrading, reduce the hour for low engine at 1200, calculate at 1500 for high engine and equal for low engine to equal engine cost of 600 for 20 engine and 1000.

The challenge is to write a program to solve the given problem. The program is written in C++ and the code is given below. The program is written in C++ and the code is given below.

- 1) Given to find whether, whether it will process a number up to 1000. The program is given below.
- 2) Program to find whether a higher engine input engine is equivalent to 1000. The program is given below.
- 3) The program is written in C++ and the code is given below. It is required to be less than the input with the engine process.
- 4) The program is written in C++ and the code is given below. It is required to be less than the input with the engine process.
- 5) The program is written in C++ and the code is given below. It is required to be less than the input with the engine process.

Flaw: This item is too long.



Code Lookup

Per NFPA 101, *Life Safety Code*, the maximum permissible travel distance (ft) in a new, sprinkler protected, business occupancy is:

- (a) 75
- (b) 100
- (c) 200
- (d) 300

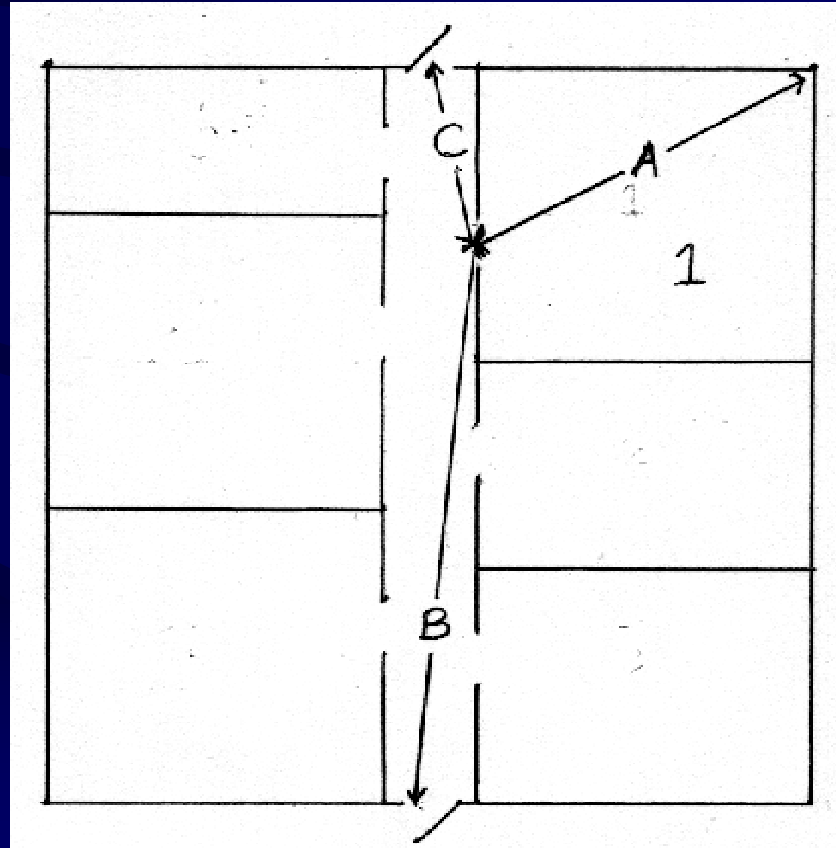
Why don't we want it?

- It only tests whether a candidate can find the applicable requirement in NFPA 101
- It doesn't assess whether the candidate knows what travel distance is or how to measure it

Better Version

In the figure below, the travel distance from Room 1 is equal to:

- (a) A
- (b) B
- (c) $A + B$
- (d) $A + C$



Why we want it?

- Assesses the Candidate's understanding of the concept of travel distance
- Assesses the Candidate's ability to measure travel distance
- Does not require a "compliance determination"
- Does not require the candidate to have a code book to look up an allowable travel distance

ARE YOU TEST WISE?

You are test-wise if you can select the key of the following items based on clues given in the item without knowing the content.

Class

What is the primary purpose of the class in frumpaling?



- A. remove class-prangs
- B. patch tremails
- C. loosen cloughs
- D. repair plumots

Someone who knows nothing about the content can still pick A as the key because it's the only option to include a word (class) found in the stem.

Fribbled breg

The fribbled breg will ninter best with an



A. mors.

B. ignu. 

C. derst.

D. sortar.

Test-wise candidates will select B because it is the only option that grammatically flows from the stem.

Sigla

Why does the sigla frequently overfesk the trelsum?

- A. All siglas are mellious.
- B. Siglas are always votial.
- C. The trelsum is usually tarious.
- D. No trelsa are directly feskable.

Test-wise candidates can identify C as the key because all the other options contain words (i.e. all, always, no) associated with false statements.

Trassign

Trassign normally occurs under which of the following conditions?

- A. when dissles frull
- B. when lusp trasses the vom
- C. when the belgo lisks tarious
- D. when the viskal flans, if the viskal is zortil
and the hackshe is plaffed

Test-wise candidates will pick D as the key because it is the only option to specify a condition and the stem directs candidates to look for a condition. It is also the longest.

Doss

What probable causes are indicated when doss occurs in a compots?

- A. The sabs foped and the doths tinzed.
- B. The kredgs roted with the rots.
- C. The rakogs were not accepted in the sluth.
- D. The polats were thenced in the sluth.

This one is relatively tricky, yet some test-wise candidates may be able to deduce that A is the only option with multiple *causes* (sabs *and* doths).

Ignu

The nintering function of the ignu is most effectively performed in connection with the

- A. arazma tol.
- B. fribbled breg.
- C. groshing statol.
- D. frallied stantels.

This one is also tricky, but some test-wise candidates will remember that *ignus* and *fribbled bregs* were linked in the second item and thus select B here. This is called cueing. It can be difficult to detect, but you should always check for it.

Testing the Test

Fairness Goals

- Scoring not subjective
- Different exam administrations yield similar grades
- Exam results on individual questions show questions are able to distinguish adequate and inadequate performance

Exam to Exam

- Repeat some questions (about $\frac{1}{4}$)
- Compare two groups on the questions in common
- Norm the two groups
- Serious Implications for Exam Security
- FPE Exam more difficult to norm than other because of small numbers

Fair Questions

- 40 to 80% of test takers get question right
 - Less indicates problem too hard
 - More indicates problem too easy
- Wrong answers spread across distractors
- Positive relationship between performance on question and performance on entire exam

What Happens if a Question is Bad?

- If many test takers get the same wrong answer, both the correct and the “popular” wrong answer are accepted and exam is rescored.
- If problem is too hard or perverse then everyone is given credit for the problem and the exam is rescored.
- The question leaves the bank to be reworked or retired

Philosophical Issues for Exam Writers

- Forcing all problems to be independent limits the complexity of problems that can be on exam
- Time limits favor qualitative questions over calculation questions
- Qualitative questions tend to become trivial if there is an single unarguable correct answer

Questions?