כנס בטיחות במימן ה2

תכנון מבוסס הנחיות
לעומת
תכנון מבוסס ביצועים

רותם אנטמן

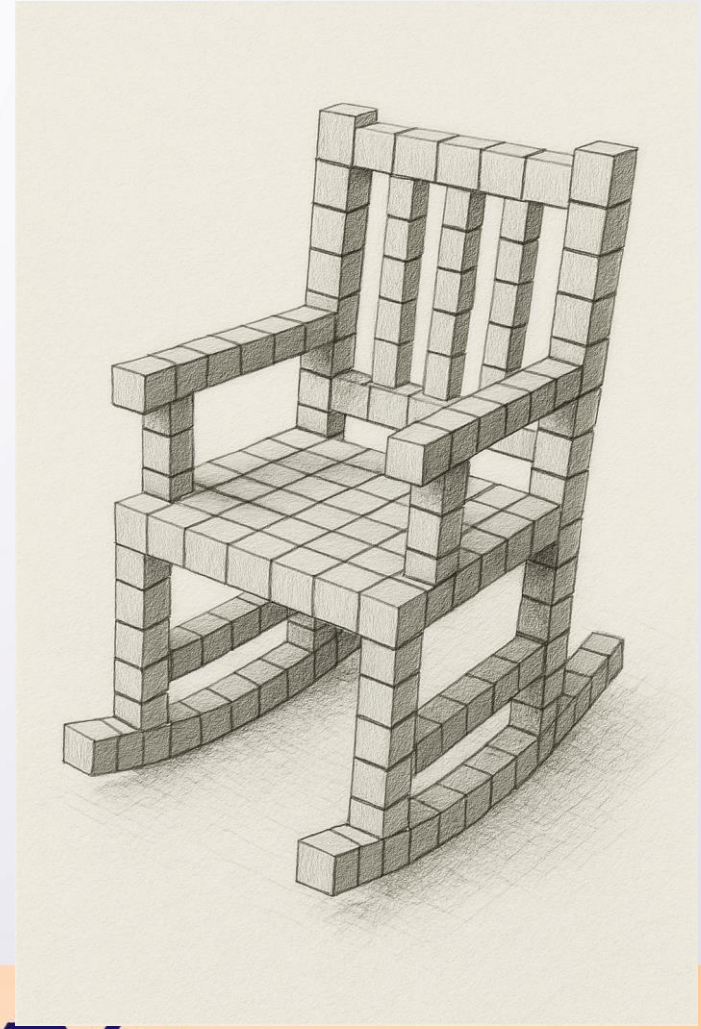
הנחיות לעומת ביצועים

היבט	תכנון מבוסס הנחיות Prescriptive-Based Design	תכנון מבוסס ביצועים Performance-Based Design
הגדרה	ממוקד **בדרך** - עמידה בהוראות מפורטות שנקבעו מראש.	ממוקד **ביעד** - מאפשר גמישות בשיטה שבה מושגות התוצאות.
גמישות	נמוכה	גבוהה
אימות	קל לבדיקה	קשה לבדיקה
תהליך התכנון	פשוט – צ'קליסט	תהליך ספירלי של הערכת תוצאות
חדשנות	מגביל	מעודד
סיכונים	אין התאמה מדויקת	בחירת התרחישים (מתוך אינסוף)

עדיף פשוט ממסובך

ברור שזה כיף
להיות כלוא

תבנה לי כסא נדנדה



2 או 12?

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האפשרות מובנית בתוך התקן

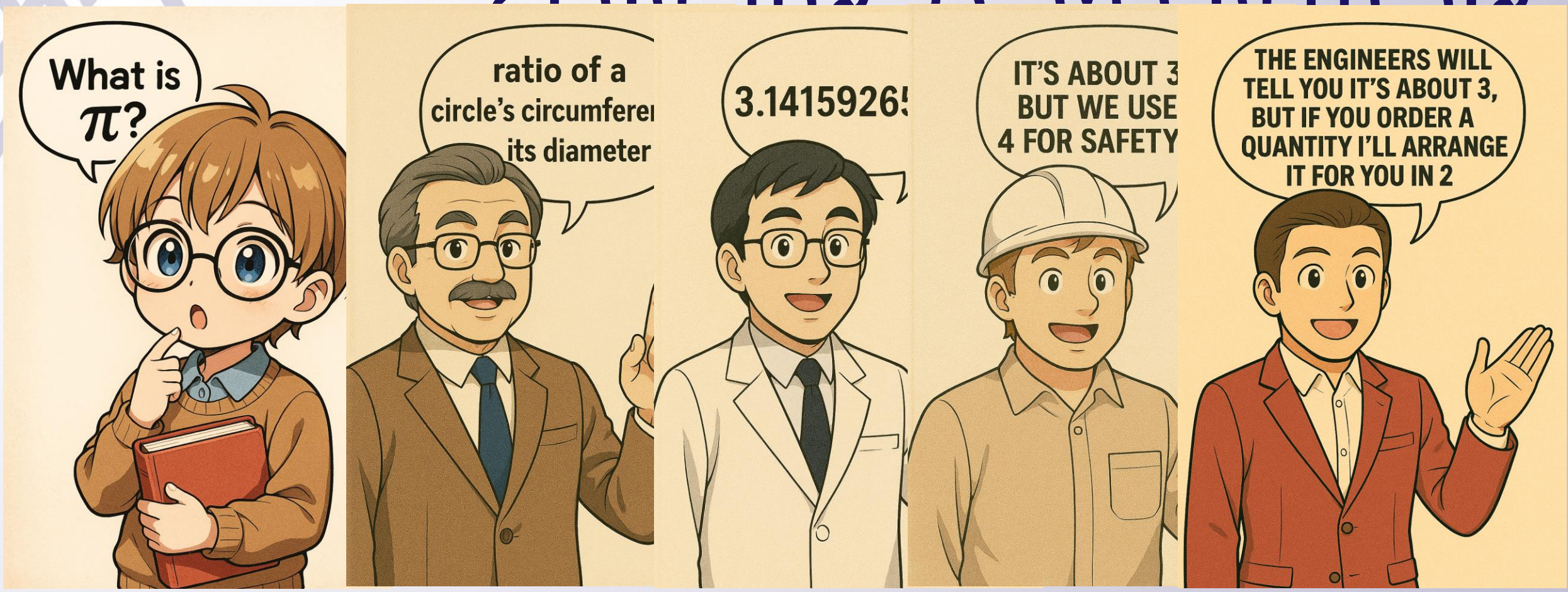
4.4.1 Prescriptive-Based Option.

> **4.4.1.1**
> A prescriptive-based option shall be in accordance with Chapters 1 through 4 and Chapters 6 through 18 of this code as applicable.

4.4.2 Performance-Based Option.

> **4.4.2.1**
> A performance-based option shall be in accordance with Chapter 1 through Chapter 5 of this *Code*. [**1**:4.3.2.1]
>
> **4.4.2.2**
> Prescriptive requirements shall be permitted to be used as part of the performance approach, if they, in conjunction with the performance features, meet the overall goals and objectives of this *Code*. [**1**:4.3.2.2]

איך מדוייק במה כל אחד עובד?



חשיבות פקטור הבטיחות

3.4.17 Safety Factor.
A factor applied to a predicted value to ensure that a sufficient safety margin is maintained. [***101***, 2021]

3.4.18 Safety Margin.
The difference between a predicted value and the actual value where a fault condition is expected. [***101***, 2021]

המודל מבוסס על הנחות.
ככל שהוודאות יורדת – פקטור הבטיחות יעלה.

- מה מספר התרחישים שנבחר?
- איך נבחרו התרחישים?

עדכון התקן ע"ב ביצועים

Pin Header

Table E.7 Updated Values to 2016 NFPA 2 and NFPA 55 Tables with 1.5 Safety Factor

Exposures		Separation Distance			
		>0.10 to 1.7 MPa (>15 to 250 psig)	>1.7 to 20.7 MPa (>250 to 3000 psig)	>20.7 to 51.7 MPa (>3000 to 7500 psig)	51.7 to 103.4 MPa (7500 to 15000 psig)
Group 1	2010 edition	12 m (40 ft)	14 m (46 ft)	9 m (29 ft)	10 m (34 ft)
	2019 edition	5 m (16 ft)	6 m (20 ft)	4 m (13 ft)	5 m (16 ft)
Group 2	2010 edition	6 m (20 ft)	7 m (24 ft)	4 m (13 ft)	5 m (16 ft)
	2019 edition	5 m (16 ft)	6 m (20 ft)	3 m (10 ft)	4 m (13 ft)
Group 3	2010 edition	5 m (17 ft)	6 m (19 ft)	4 m (12 ft)	4 m (14 ft)
	2019 edition	4 m (13 ft)	5 m (16 ft)	3 m (10 ft)	4 m (13 ft)

פתחים במבנים, גבול מגרש

אנשים שאינם עובדי המתקן

כל השאר

Notes:

(1) Group 1 Exposures include: lot lines, air intakes, operable openings in buildings and structures, and ignition sources. Group 1 separation distances are based on the higher value of radiation heat flux of 4.7 kW/m^2 or the unignited jet concentration decay distance of 8percent hydrogen volume fraction concentration. In this instance, the separation distance is higher for the concentration value than the heat flux value.

(2) Group 2 Exposures include parked cars, exposed persons other than those servicing the system. Group 2 separation distances are based on the higher value of the incident radiation heat flux of 4.7 kW/m^2 exposure to employees for a maximum of 3 minutes or the visible flame length.

(3) Group 3 Exposures include everything else (e.g., buildings of combustible construction, ordinary combustibles, openings in buildings and structures, etc.). Group 3 separation distances are based on the higher value of the radiant heat flux for noncombustible equipment of 25.2 kW/m^2 or the visible flame length.

הגדרת היעדים

5.2.2* Specific Performance Criteria.

5.2.2.1* Fire Conditions.
No occupant who is not intimate with ignition shall be exposed to instantaneous or cumulative untenable conditions. [**1:**5.2.2.1]

5.2.2.2* Explosion Conditions.
The facility design shall provide an acceptable level of safety for occupants and for individuals immediately adjacent to the property from the effects of unintentional detonation or deflagration. [**1:**5.2.2.2]

5.2.2.3* Hazardous Materials Exposure.
The facility design shall provide an acceptable level of safety for occupants and for individuals immediately adjacent to the property from the effects of an unauthorized release of hazardous materials or the unintentional reaction of hazardous materials. [**1:**5.2.2.3]

5.2.2.4* Property Protection.
The facility design shall limit the effects of all required design scenarios from causing an unacceptable level of property damage. [**1:**5.2.2.4]

5.2.2.5* Public Welfare.
For facilities that serve a public welfare role as defined in **4.2.5**, the facility design shall limit the effects of all required design scenarios from causing an unacceptable interruption of the facility's mission. [**1:**5.2.2.5]

5.2.2.6 Occupant Protection from Untenable Conditions.
Means shall be provided to evacuate, relocate, or defend in place occupants not intimate with ignition for sufficient time so that they are not exposed to instantaneous or cumulative untenable conditions from smoke, heat, or flames. [**1:**5.2.2.6]

5.2.2.7 Emergency Responder Protection.
Buildings shall be designed and constructed to reasonably prevent structural failure under fire conditions for sufficient time to enable fire fighters and emergency responders to conduct search and rescue operations. [**1:**5.2.2.7]

5.2.2.8* Occupant Protection from Structural Failure.
Buildings shall be designed and constructed to reasonably prevent structural failure under fire conditions for sufficient time to protect the occupants. [**1:**5.2.2.8]

לכל אתר הגדרה
שונה לנזק קביל

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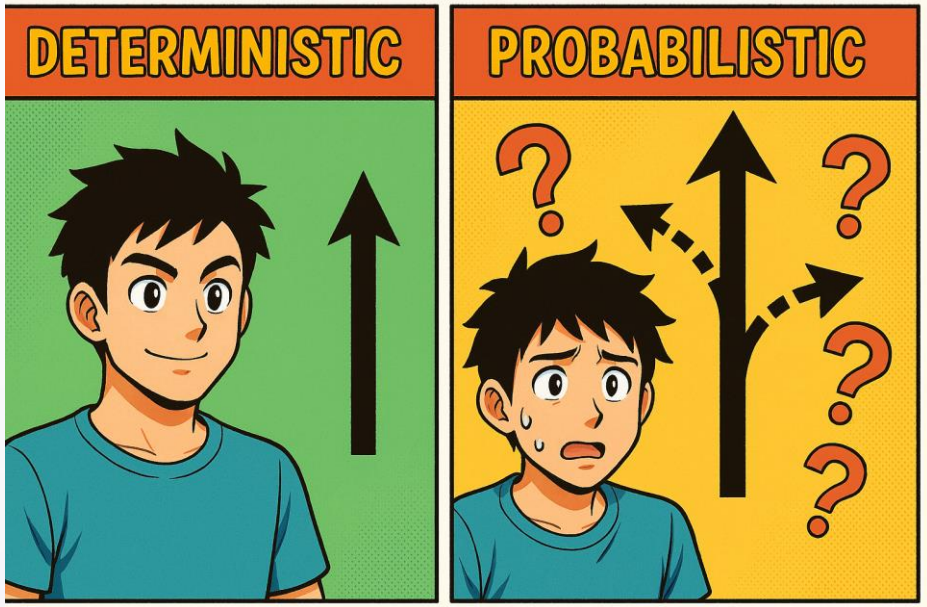
דטרמיניסטי?



Annex E — Explanation of Methodology Utilized to Develop Separation Distances

This annex is not part of the requirements of this NFPA document but is included for informational purposes only.

the task group, and comparisons were made to the existing requirements in the 2005 edition of NFPA 55.[3]

As the group evaluated the impact of the deterministic tables, it became apparent that the probability of occurrence of events should have a bearing on determining a reasonable level of safety.

The work of the task group integrated the efforts of Sandia's risk and reliability department, as part of the US Department of Energy Hydrogen, Fuel Cells & Infrastructure Technologies Program.

קרינה או הדף?

פיצוץ

- כליאה או צפיפות
- הצתה מאוחרת
- תכנון מבנים עמידים לפיצוץ
- QRA

Jet-Fire

- סבירות גבוהה
- הסיכון הקובע (Governing Hazard) בשטח פתוח כשמשלבים הסתברות