The Heiwa Challenge
Thanks!

- Thanks to **David E. Thomas** and the **NMSR** inviting me tonight and allowing me to **challenge** you and your clever members.

- Euro 10 000:- is up for grabs to the first winner of the **Challenge**.

- Working in the shipping and off-shore industry for 40 years, I rarely visit inland cities. I am glad to be here to see how landlubbers promote **science and reason**.

- Hopefully a friendly, lively, critical, scientific and reason based discussion will follow this presentation.

- Please note the **yellow** and **red** cards!
Here we go!!
Heiwa Co – European Agency for Safety at Sea

- **Heiwa Co** assists ship owners, charterers, underwriters and administrations with ship safety projects and ship management audits.
- **Heiwa Co** tries to find the simplest and most economical solution, based on first principles, innovative thinking and actual conditions and what the client wants to achieve, which is then checked against rules and requirements. Using this method the result is that safety exceeds the minimum rule requirements and there are cost savings.
- **Heiwa Co** has developed the **Coulombi Egg Oil Tanker** 1990-1997-2010.
- **Heiwa Co** has investigated the **M/S Estonia incident** 1994-2010.
- **Heiwa Co** campaigns against **Fast Rescue Boats** on ferries since 1999.
- **Heiwa Co** has also issued a **Challenge – The Heiwa Challenge!**
- [http://heiwaco.tripod.com](http://heiwaco.tripod.com)
The Coulombi Egg Oil Tanker

- The COULOMBI EGG oil tanker design is the only alternative to Double Hull tankers approved by the United Nation’s IMO in accordance with Marpol I/13F(5) since 1997.
- The COULOMBI EGG tanker is more robust than single or double hull due to its two tiers mid-height deck structure and is much more easy to inspect and maintain. **Safety is increased at reduced cost.**
- The United Nation’s IMO approval was given by the MEPC 40th Session 18-25 September 1997 and is described in MEPC circular letter no. 336.
- USA does not allow the COULOMBI EGG tanker in US waters.
- The steel structure has been analyzed using FEM for all possible loadings.
The M/S Estonia Incident 1994

- **Heiwa Co** has investigated the M/S Estonia ferry incident 1994, when >850 persons drowned.

- One conclusion is that the official cause of accident - *bow visor lost, water loaded in superstructure above waterline, vessel capsizing, vessel floating upside down, vessel sinking* – is not possible.

- A vessel *floating* upside down after capsize cannot sink! The air inside the hull cannot escape.

- I am the writer of several popular books about the incident all available free of charge on the Internet.

Ferry floating after capsize - it cannot sink! Suggesting anything else, e.g. air leaking out, is fraud!
The IMO decided 1995 after the 'Estonia' accident 1994 that all roro-passenger ferries (but no other ships) should have a **Fast Rescue Boat** from 1 July 2000.

2001 the IMO stopped the use of **Fast Rescue Boats** aboard roro-passenger ships.

**Many seamen were killed or injured trying to use them!**

IMO then suggested that ‘**fast rescue boats should not be used as a means of rescue**’.

But IMO still suggests they MUST be carried!

**Heiwa Co** suggests since many years that the rules shall be changed.

Fast Rescue Boats on ships cannot safely be launched and retrieved in severe weather … and are not safe.
The Heiwa Challenge 2010

The Heiwa Challenge is very simple!

You are requested to describe and test a real structure, where a small top part C can crush the much bigger bottom part A from above, when top part C is dropped by gravity on bottom part A.

The real structure can look like the structure right, e.g. a square block (3-D of course) of any material/elements (e.g. floors and pillars) connected together plus plenty of air between the elements! It is stable and rests on ground.
The Heiwa Challenge 2010

- The **top part C** is the 1/10th top of the total structure! It has mass M kilograms!
- The drop height is max 3.7 meters!
- The **bottom part A** is the 9/10th bottom of the total structure, has mass 9M kilograms and rests on ground.
- When **top part C** impacts **bottom part A** from above after free fall drop of 3.7 meter by gravity ($g = 9.82 \text{ m/s}^2$), it applies 36.3M Joule energy to the (total) structure with mass 10M and to the ground.
- **Can bottom part A be crushed into rubble by top part C?**
- That's the Challenge! **The Heiwa Challenge!**
- According US authorities and universities this type of crushes happens all the time! **Top C crushes bottom A**, i.e. the one layer C part crushes, **POUFF, POUFF**, the nine layers of A, one after the other, into rubble!
The Heiwa Challenge 2010

- Or, to keep it very simple!
- Can one structural unit C, dropped 3.7 meter from above and only by gravity, crush A below that consists of nine Cs resting on ground?
- What structure C can crush nine times itself by gravity?
- A filing cabinet? A piano?
Professor Z. Bažant of Northwestern University, Chicago, says that a small top part C of a solid structure or building A can easily “crush down” the bigger A into soft rubble B by gravity as per figures right (from his papers 2002 and 2008). Top part C remains intact during Crush-Down.

A 350 meters tall, solid, undamaged structure A is crushed into rubble B in abt. 15 seconds by its 53 meters top part C.

Soft rubble B then crushes up solid top C into more rubble B! Only rubble remains!

Bažant has written 400+ scientific papers about all sorts of rubble.

Bažant has so far refused to face The Heiwa Challenge!

What holds solid structure A together? The paint on the walls?
The Heiwa Challenge contender #1 – Z. Bažant

From Why Did the World Trade Center Collapse?—Simple Analysis JOURNAL OF ENGINEERING MECHANICS / JANUARY 2002 (submitted 13 September 2001) by Zdeněk P. Bažant, F.ASCE, and Yong Zhou - Abstract: This paper presents a simplified approximate analysis of the overall collapse of the towers of World Trade Center in New York on September 11, 2001:

“The analysis shows that if prolonged heating caused the majority of columns of a single floor (up top) to lose their load carrying capacity, the whole tower was doomed”.

“The collapse of the World Trade Center (WTC) towers has been explained as a gravity-driven process triggered by the collapse of a critical story (up top) heated by fire”.


Bažant suggests (2010) that “the collapse of the first critical story is so smooth that no impact with the next stories can ever be seen”!

Just heat the top and POUFF; the whole tower below goes POUFF, POUFF in less than 20 seconds! Only rubble and dust remains!

Figures by Bažant.
Ross Corotis, editor of the ASCE Journal of Engineering Mechanics, has recently resigned after having been forced to publish the rubbles of Z. Bažant & Co!

Z. Bažant uses a simplified and approximate 1-D model (a line of rods!) of an idealized structure (???) to explain his idea: one rod breaks suddenly at overload (or fire), top C (a rod?) drops, impacts and break the next rod below, etc, etc, and “collapse” of part A (rods!) follows from top down – in 1-D!!

In a real 3-D structure no rod breaks suddenly but elements deform plastically and no collapse will ever take place from top down due to lack of energy.

Fraudulent research (sic) by Z. Bažant! Incorrect peer review by ASCE! Easy to reveal!

Figure by Bažant.
Lecturer **K.A. Seffen**, Ph.D, of Cambridge University, England, also says that a small top part C of a structure or building A can crush solid A into rubble B from above by gravity as per figures right (from his peer reviewed paper about the matter).

It also goes very quick!

But his model is also just 1-D and does not represent a real 3-D structure or reality.

Dr. Seffen has not written 400+ scientific papers about all sorts of rubble.

He is another fraud anyway!

Dr. Seffen has therefore also refused to face The Heiwa Challenge!

Dr. Seffen suggests that a solid building A is destroyed like a rubber balloon losing its air! Why not like a punctured tire?
POUFF, POUFF!!

It is not possible that a small top part C of a real structure/building can crush, POUFF, POUFF, from above the several times bigger and stronger, solid structure/building A below into soft rubble B. If you believe otherwise, enter THE HEIWA CHALLENGE with a suitable structure and demonstrate the destruction! But, please, do not enter a simplified and approximate balloon as your structure! And no fires up top! Just drop the top C on the bottom A!
Conditions

(1) The structure volume is supposed to have a certain uniform cross area (meter²) and height h (meter) and is fixed on the ground. The structure consists of an assembly of various elements inside the volume, e.g. columns (wall elements), beams (floor elements), brackets (to connect columns and beams), plates, etc, of any type or material joined together. It can be any size!

The structure volume contains mostly air, of course. It can but need not look like the structure right (developed by NASA engineer Ryan Mackey)! It is VERY simple; 111 units of a horizontal beam/platform with mass m supported by/connected to two (or four ?) pillars (total 3 or 5 elements per unit) stacked/joined on top of each other (+ a mast on top). It looks like WTC1!! It also looks like a house of cards but note that the horizontal and vertical elements are connected with solid joints, so use weak supporting, vertical elements of fragile, easy to break material (and more solid, heavy horizontal ones).
Conditions

Top of the *structure* may look as per figure right:

**Top part C** consists of 14 units each with mass $m$.

**Bottom part A** resting on ground consists of 97 units each with mass $m$.

According various ‘experts’ (already mentioned) **top part C** (14 units, 14m) can easily crush down **bottom part A** (97 units, 97 m) into rubble after a 3.7 meters drop.

**The Heiwa Challenge** is to describe the *structure* and crush it!
Conditions

(2) The *structure* should be more or less identical from height = 0 to height = H, e.g. uniform density, layout of internal elements, weights and joints, etc.

Horizontal elements in *structure* should be identical. **Vertical, load carrying elements should be similar and be uniformly stressed due to gravity, i.e. bottom vertical elements may be reinforced or made stronger, if required.**

Connections between similar elements should be similar throughout. In example right \( H = 111 \ h \), where \( h \) is height of one unit.

(3) It is recognized that the *structure* may be a little higher stressed at height=0 than height = H due to uniform density, elements, etc.

(4) **Before drop test (see (8)) the *structure* shall be stable, i.e. carry itself and withstand a small lateral impact at top without falling apart and to deflect elastically sideways less than \( H/100 \) at the top.** Connections or joints between elements cannot rely solely on friction.
Conditions

(5) Before drop test top 1/10th of the *structure* is disconnected at the top at height = 0.9 H without damaging the structure/elements/joints more than required for disconnection.

(6) The lower *structure*, 0.9 H high is then called *part A*. The top part, 0.1 H high, is called *part C*.

(7) Mass of *part C* should be <1/9th of mass of *part A*.

(8) Now drop *part C* on *part A* and crush bottom *part A* of *structure* into smaller pieces by top *part C* of the *structure* (if you can! That's the test). Film the test on video!

(9) Drop height of *part C* above part A is max 3.7 meters. Less drop height is permitted. Thus the *maximum energy* (Joule) applied at collision C/A to initiate the crush-down is mass of *part C* times gravity acceleration 9.82 m/sec² (i.e. the force acting on C) times height 3.7 meters (i.e. distance the force/weight is displaced).
Conditions

(10) Structure is only considered crushed, when >70% of the elements in part A are disconnected from each other at the joints or broken between joints after test, i.e. drop by part C on A from 3.7 meters.

Try to use elements not producing smoke/dust when failing due to energy applied, so we can see the crush down action and the breaking of elements/joints on video.

If all supporting, vertical elements are broken in part A of structure right, then 66.66-80.00% of all elements are broken, etc, etc.

Challenge conditions can be found at http://heiwaco.tripod.com/chall.htm
Win Euro 10 000:-

- Have a try! I look forward to your structures and videos!
- The first person describing any structure fulfilling conditions 1-10 above and doing a successful drop test wins Euro 10 000:-.
- Terrorists (and demolition companies) are also welcome to participate in order to confirm their actions/services!
- Send your entry (description of structure + verified result of test/video) to Anders Björkman, 6 rue Victor Hugo, F 06 240 Beausoleil, France.
- anders.bjorkman@wanadoo.fr
Tips

- *Designing a structure* is generally a **static** problem, where immobile, non-displacing *loads/weights/forces* (unit **Newton**) are transmitted to ground via **intact** elements.

- Describing the crushing of a structure by gravity is a **dynamic** problem, where displacing loads/weights/forces, i.e. **energy** (unit **Joule**) is applied (1) *elastically* and (2) *plastically* on **intact** elements and as (3) **ruptures** and (4) **friction** on **failed** elements.

- You cannot describe the crushing of a 3-D structure in 1-D!
Tips

- Crushing real structures have been studied by engineers since 1990’s in Japan and Europe.
- Examples are, e.g., colliding ships and cars.
- Objective is to design an impact resilient structure to protect human beings and the environment in collisions.
- There is no known example of an initially stable, solid structure that can crush itself by gravity from top down. (If there is, enter it in the Heiwa Challenge and win Euro 10 000:- )
Tips

- The US National Institute of Standards and Technology, NIST, has no standards describing the crushing of a structure and no technology, e.g. software, to describe the crushing of a structure (or building).

- NIST has therefore no staff capable of doing a proper analysis of the standard crushing of a structure.

- NIST has issued a report about a crushed structure where NIST suggests that, if the energy applied by a dropped top part on the bottom part by gravity exceeds what the structure can absorb, global collapse of the structure ensues.

- However, the NIST suggestion has neither been proven theoretically with, e.g. an energy balance, nor practically in a laboratory for any real, initially stable structure (and NIST refuses the Heiwa Challenge).

- The American Society of Civil Engineers, ASCE, has also no idea how to describe the crushing of a real structure (or building).

- By participating in The Heiwa Challenge you may assist the NIST and the ASCE to find out what happens in the real world.
Tips

- No big structure/building is designed to withstand small airplanes smashing into their tops X! The small plane will be destroyed and local failures to elements at the top and above of the big structure will take place.
- The top C elements above X are always affected first locally!
- The load previously carried by X is now transmitted to ground by intact members above and below.
- Any believer that buildings “collapse” from top ... down due local failures up top caused, e.g. by heat, should study real structural damage analysis!
- Structural “collapse” is always from bottom up starting with the element just above the first failed element X developing upwards. Only elements above the failure displace downwards!
More Tips

- Right is *structure* with 10 horizontal elements, each with mass $M$ (in spite of different length).
- The horizontal elements are supported by identical, vertical *springs* that carry $M$ with a Factor of Safety = 3.
- The top *element* (one $M$) is supported by 1 *spring* and the bottom *element* is supported by 10 *springs* (that carry 10 $M$) and intermediate *elements* are supported by 2, 3, 4, 5, 6, 7, 8 and 9 *springs* – total 55 *springs*!
- Each *spring* thus carries $M$ (and has to be arranged like a pyramid to do it). *Note that all springs are equally loaded.*
- *Note that the bottom is 10 times “stronger” than the top!* Skyscrapers are built like that. Bottom is always much stronger than the top!

What happens, if the top *spring* is removed and the top *element* drops down by gravity and hits the next *element* below that is supported by two *springs*? Will the two *springs* break, so that two *elements* can drop and hit the next *element* below supported by three *springs*, etc, etc, until all 54 *springs* are broken and 10 *elements* are stacked on top of each other? Or, will 54 intact *springs* dampen the first impact from the top *element*, so it bounces?
More Tips

- Imagine a Tower that consists of 100 masses \( M \) (kg), labeled from top \( i = 1 \) to bottom \( i = 100 \).
- Adjacent masses are separated by elastic springs.
- Mass \( # \ i \) is supported by \( i \) springs below it.
- A spring carries \( M \) with a factor of safety of 3. Each spring has height \( L \) (meter). Thus the tower is \( 100L \) tall.
- **Top mass \#1** is supported by 1 spring that carries 1 \( M \).
- **Bottom mass \#100** is supported by 100 springs that each also carries 1 \( M \).
- A 100 \( M \) tower thus consists of 100 masses \( M \) supported by 5 050 springs.
- The 10 springs below mass \( # \ i = 10 \) (connected to mass \#11) are removed and the top part (**10 \( M \) and 45 springs**) free falls distance \( L \) and impacts the bottom part (**90 \( M \) and 4 995 springs**).
- Do you really think that bottom 4 995 springs fail before the 45 top springs?
- Only fools … like terrorists … believe that! Solution? See the end!
- **The taller a skyscraper, the stronger is the bottom relative the top!** It is a matter of scale! Bigger, taller structures/ships are stronger and more difficult to destroy than smaller structures/ships!
Tips – the Funny m structural Unit

- Since the WTC towers at NY were destroyed on 9/11 2001, there is an ongoing discussion whether steel structures can one-way crush down from top to bottom by gravity due to some local failures up top initiating “collapse” with the result that the complete structure becomes rubble.

- According some experts and laymen, incl. religious, fanatic fundamentalists, top down “collapse” is a natural phenomenon that, however, cannot be modeled or explained by structural damage analysis, like, e.g. ship collisions.

- In order to clarify matters I have designed the Funny m structural unit/assembly that you can use to build a tower that you then can try to crush or “collapse” ... just for fun.

- Purpose is to establish what spring, if any, breaks first, when aFunny m assembly, unrealistically, is dropped, free falls and then contacts/collides with another Funny m assembly in a tower like structure or ground itself:
Tips – the Funny m structural Unit

- **Funny m** is a very simple structural 3-D assembly that consists of one, square horizontal element with a mass \( m \) (e.g. a floor) supported at corners via solid connections by four vertical elements \( s \) (e.g. columns) that can compress like *springs* before breaking. Each \( s \) carries \( m/4 \).

- The height of this structural assembly is \( h \).

- Due to mass \( m \) the *springs* \( s \) deform compress elastically \( d = 0.03h \).

- The structural **Funny m** assembly is really funny or at least the spring elements. They can deform and compress \( 0.09h \) elastically and \( 0.1h \) plastically before they break. It means you must put on 3 \( m \) for the *springs* to start deforming plastically!

- You can put **Funny m** assemblies on top of each other to get a bigger structure, e.g. a tower like structure with \( n \) **Funny ms** as shown on next slide. The *springs* then adjust themselves to the number of \( m \) carried! If you put a Funny m assembly on another Funny m assembly, the bottom springs become twice as strong, etc. Then you have to put on 6 \( m \) uniformly (3 \( m \) on each element) to start plastic deformation!

- A **Funny m** unit is quite easy to model mathematically.
Tips - The Funny m Tower!

Right we see a **Funny m structure/tower** on ground with **n = 22** Funny m units/assemblies. The total mass of this structure is **n m** (or 22 m). The potential energy of each m is its distance above ground times g, where g is gravity acceleration. The total Potential Energy, PE, stored in the structure, relative ground, is the sum of the PE of each m or **n * m * n * h * g /2** or **PE = (n²mhg)/2**

The spring elements adjust themselves to the number of m carried as explained above. Thus the spring elements below the top m can just carry one m. The bottom spring elements can carry **n m**, i.e. they are **n times "stronger"** than the top springs. **The bottom springs can absorb n times more strain energy than the top ones! WTC 1&2 were built like that! Bottom 1/10th structure was 10 times stronger than the top 1/10th structure.**

This means that all springs compress equal distance d in the funny tower under static load. **Compressive stress in springs is same throughout. It also means that, if you add extra m (or potential energy) on top without adjusting the springs, a spring above will always break before a spring below.**
The Funny m Tower

- Now – disconnect the top two Funny m units (top part C) and drop them on the bottom 20 Funny m units (bottom part A).
- If top part C crushes all springs in bottom part A below, you are a WINNER of the Heiwa Challenge!
- If top part C bounces on bottom part A you have probably done a correct job!
- In above structure a mass of 2 connected masses m (top C) drops 3.7 meters and applies 72.7m Joule energy to structural parts C and A at the impact. A and C evidently deform elastically at impact and, if A and C can absorb 72.7m Joule energy, nothing more happens - only elastic deformation (a bounce) takes place.
- As the 72.7m Joule energy is split and absorbed 50/50 between C and A at contact and, because C is much smaller and weaker than A and therefore can elastically absorb much less energy than A, the result is always that C cannot apply any energy on A without destroying itself first. Normally just a bounce takes place.
- The initial impact cannot release more energy to maintain the crush-down process, i.e. one-way crush-down is not possible!
Tips – do an Energy Balance!

- Do an energy balance, e.g. what happened during the first 3.00 seconds of the alleged part A gravity “collapse” of WTC 1 as per Bažant:
- **Upper part C**, undamaged and not deformed according Bažant (mass 53 000 000 kg) moves down 31.38 meters “crushing” part A below and accelerates to and gets final velocity 20.74 m/s.
- Uppermost 41.84 meters of part A (mass 41 840 000 kg) becomes 10.46 meters of compressed rubble B that moves down 15.69 meters and also accelerates to and gets velocity 20.74 m/s.
- **What are the energies involved?**
  - After 3.00 seconds of part A “collapsing” due to gravity top C and rubble B with combined mass 94 840 000 kg have velocity 20.74 m/s that corresponds to 20.4 GJ of kinetic energy.
  - The potential energy applied to the process is (1) top C moving down 31.38 meters and (2) 41.84 meters of part A crushed down 15.69 meters into rubble B (53 000 000 x 31.38 + 41 840 000 x 15.69) x 9.82 = **22.8 GJ**, which means that only 22.8 - 20.4 = **2.4 GJ of energy is used to compress** 41 840 000 kg of part A into rubble B or 2 400 000 000/41 840 000 = **57.4 J/kg** or 57 kJ/ton or 0.016 kWh/ton WTC 1 structure.
  - In fact - applying 0.016 kWh of energy on one ton of any steel/concrete structure during say 3 seconds would not produce much effect.
- You need say 32 kWh to scrap a one ton modern car in one hour, i.e. 2 000 times more!

A strange picture of the WTC 1 destruction by gravity. Have you ever dropped anything, e.g. upper part C by gravity on something else, i.e. Intact part A of same structure and THIS happens?
Final Tip – do not rely on TV!

This is not a real “one-way gravity crush down” of a skyscraper!
It is just a photo from a video of the destruction of WTC2 on 9-11 with plenty of smoke and dust added.
It cannot happen in the real world! No structure collapses by itself from top down producing smoke and dust as just explained.
A child can see that the destruction or “crush down” (??) is not real.
There is no rubble!
Just smoke and dust added to the video to hide what really happened.

Above was shown on “live TV” in USA on 9-11-2001 but what is shown is not real!
Conclusions

- A one-way crush-down of a real structure A by its top C and gravity is not possible under any circumstances!
- Gravity provides too little energy!
- Top C always bounces ... and then nothing more happens.
- Nobody will therefore ever win the Heiwa Challenge.
Top part C of WTC 1 one-way crushes-down bottom A from above into rubble on 9-11? Sorry, it cannot really happen!
Des questions ?
WARNUNG VOR SELBSTMORD

Diesen Rat will ich dir geben:
Wenn du zur Pistole greifst
und den Kopf hinhältst und kneifst,
kannst du was von mir erleben.

Weißt wohl wieder mal geläufig,
was die Professoren lehren?
Daß die Guten selten wären
und die Schweinehunde häufig?

Ist die Walze wieder dran,
daß es Arme gibt und Reiche?
Mensch, ich böte deiner Leiche
noch im Sarge Prügel an!

Laß doch deine Neuigkeiten!
Laß doch diesen alten Mist!
Daß die Welt zum Schießen ist,
wird kein Konfirmand bestreiten.

War dein Plan nicht: irgendwie
alle Menschen gut zu machen?
Morgen wirst du drüber lachen.
Aber besser kann man sie.

Ja, die Bösen und Beschränkten
sind die Meisten und die Stärker.
Aber spiel nicht den Gekränkten.
Bleib am Leben, sie zu ärgern!

Erich Kästner

Jedes Wort im Gesicht
weiß etwas vom Teufelskreis
und sagt es nicht

Herta Müller 7. Dezember 2009
How to analyze a 100 floors structure when top 10 floors impact bottom 90 floors.

- Each floor in the structure has a mass $m$! The floors are labeled from top, $i = 1$ to $i = 100$ at ground.
- The floors are supported by weightless springs with rest length L. Floor # $i$ is supported by $i$ springs.
- Each spring carries a mass $m$ in the gravity field with a factor of safety 3. A spring has cross area A.
- The bottom 100 springs are connected to ground (with infinite mass).
- Thus all 5050 springs (1 at top, 100 at bottom, etc) are equally compressed a little and a known amount of **elastic strain energy** $E_e$ is statically stored in each spring. A spring can absorb another $2E_e$ energy before plastic deformation starts.
- The height of the tower is slightly less than 100 L (all springs are compressed 1/3 of its capacity before plastic deformation starts).
The initiating drop (to try to crush the bottom)!

- The 10 springs below floor #10 suddenly fail (are removed) and 10 top floors interconnected by 45 springs drop down distance $h$ due gravity acceleration $g$ and impacts the 90 floors below interconnected by 4 995 springs.

- **What happens to the 5 040 springs?**

- Energy released $E_r$ and applied to the 5 040 springs of the structure in impact is $10m$ times height $h$ times $g$ (gravity acceleration = 9.82 m/s²) and is thus known. $E_r = 10mhg$.

- We also know how much energy $E_a$ the 5 040 springs can absorb elastically before plastic deformation starts. It is $E_a = 10\ 080\ E_e$!

- If $E_r < E_a$ only a bounce will take place!
A numerical example:

- $m = 3\,600\,000\,kg$ (like one floor of WTC 1), $A = 0.45\,m^2$
- Compressive stress in spring is $800\,kg/cm^2$ ($8000\,000\,kg/m^2$)
- Yield stress is $2400\,kg/cm^2$
- The spring is assumed to compress* $x = 0.33\%$ of its length $L$, when loaded with $m$ (or $1\%$ L when loaded with $3m$, *when plastic deformation starts*. *Spring is not a solid rod and compression is both vertical and sideways*).
- $L = 3.6\,meter$, $x = 0.012\,meter$
- The spring constant $k$ is $m/x = 300\,000\,000\,kg/meter$ and the strain energy absorbed $E_e = kx^2/2 = 21\,600\,kg\,meter$ for one spring.
- $E_a = 217\,728\,000\,kg\,meter$ for $10\,080$ springs.
- $E_r = 129\,600\,000\,kg\,meter$ (when $10m = 36\,000\,000\,kg$ displaces $h = 3.6\,meter$)
  (To get energy in Joule you have to multiply with $g = 9.82\,m/s^2$! Here ‘energy’ is in unit kg meter).
- **So in this case $E_a$ is 1.68 times greater than $E_r$ = a bounce will take place** (and stress in springs soon become $800\,kg/cm^2$ again after impact).
- **This is what always happens when ‘locally strong’ structures collide!**
Argument against above:

- You may suggest that the $E_r$ is not applied to all 5,040 springs at once but only to the 11 springs below and 9 springs above masses # 10 and 11 in contact and it may be true! Thus 20 springs will be subject to plastic deformation (absorbing energy) while remaining energy is absorbed elastically by the other 5,020 springs.

- The conclusion remains that a top part of 36,000,000 kg dropping 3.6 meter on a bottom part of 324,000,000 kg, total mass 360,000,000 kg held together by 5,050 springs (of which 10 are removed), cannot destroy all 5,040 springs.

- On the other hand, if a spring only compresses elastically 0.2% of its length, as a rod, we get: $L = 3.6$ meter, $x = 0.0024$ meter

- $k = 1,500,000,000$ kg/meter (i.e. 5 times greater)

- $E_e = 4,320$ kg meter (i.e. 5 times smaller)

- $E_a = 43,545,600$ kg meter, i.e. only 33.6 % of $E_r$!!

- It simply means that only 33.6% of the released energy is absorbed elastically and that the remainder will be absorbed plastically by the springs (or will simply disappear as a seismic (energy!) wave in the ground).

- This is what always happens when ‘locally weak’ structures collide!
The hard reality!!

No structure of any kind can destroy itself from top down!

- In reality top elements above/below collision interface will be plastically deformed at collision, deceleration takes place and the top mass will be tipped or bounced off sideways and bottom elements will never be impacted at all, etc, etc. That is what happens when you drop a top of any structure on its own bottom part in a laboratory (or kitchen).

- To suggest that top part – mass = 10m – held together by 45 elements after drop $h = 3.6$ meter breaks through and overload groups of 11, 12, 13, 14 … 98, 99, 100, total 4 995 elements and 90 m in 90 levels one after the other after further 90 drops of 3.6 meter has nothing to do with reality.