

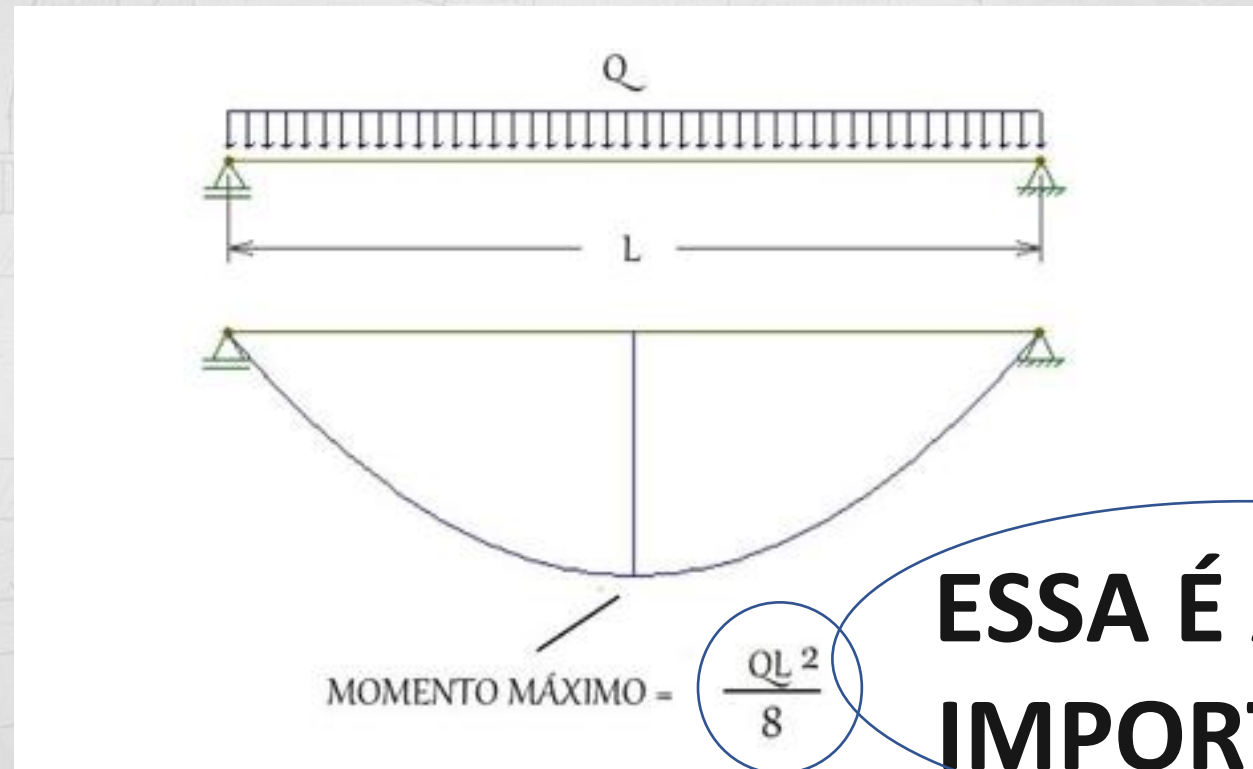
**“SER ENGENHEIRO ESTRUTURAL RAÍZ É
SABER CÁLCULO MANUAL”**

SIM!

Mas não é só isso...

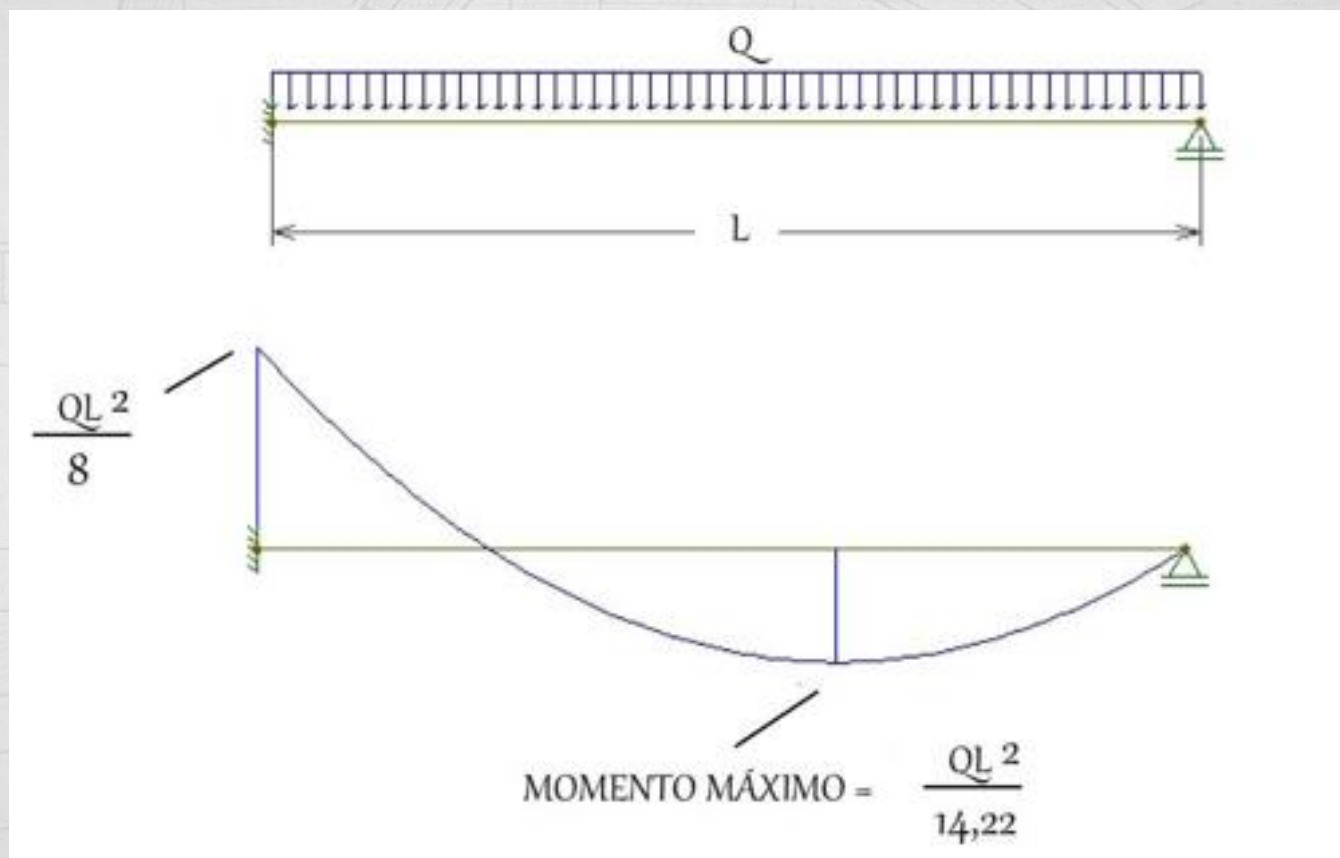
**“É TER NO SANGUE OS RESULTADOS DE SISTEMAS
ESTRUTURAIS TRIVIAIS”**

BIAPOIADA

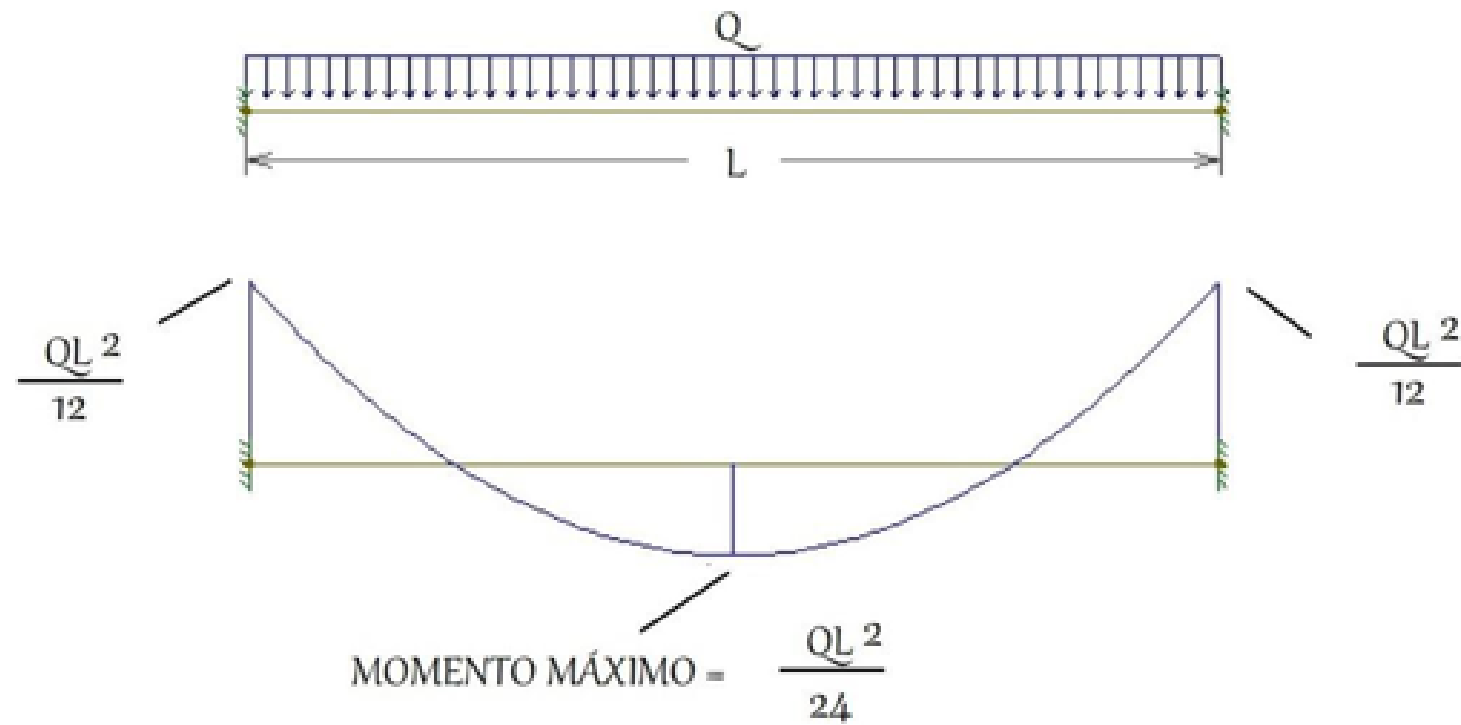


**ESSA É A MAIS
IMPORTANTE!**

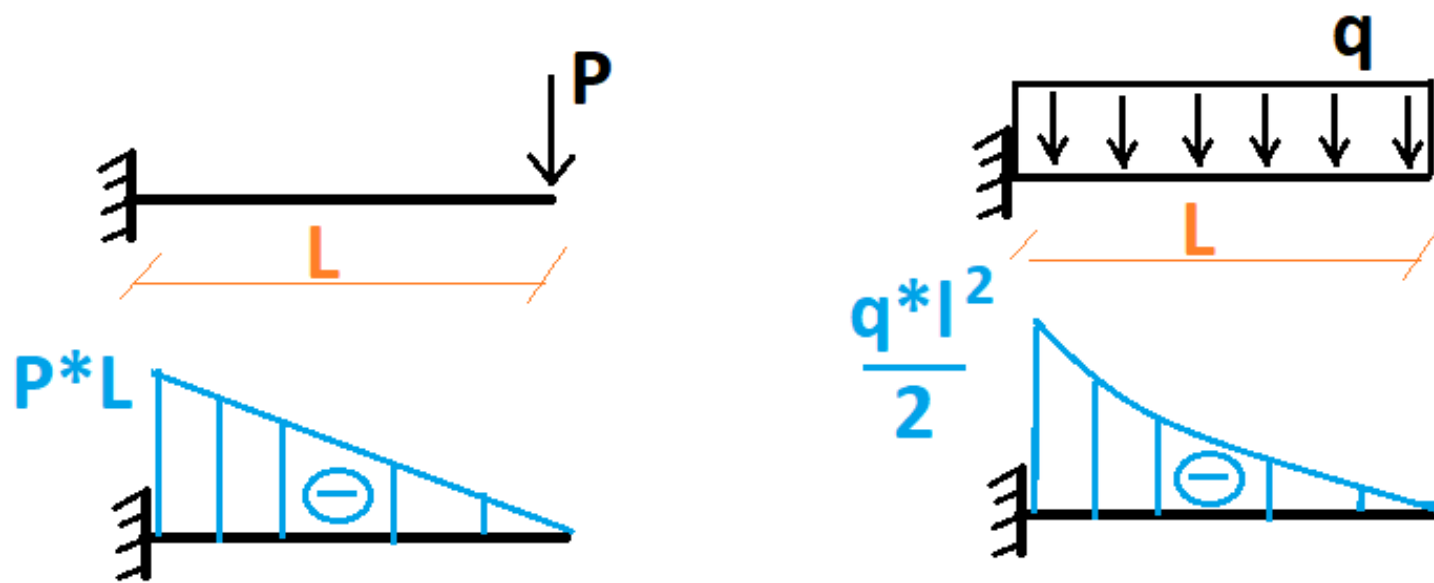
ENGASTADA E APOIADA



BI-ENGASTADA

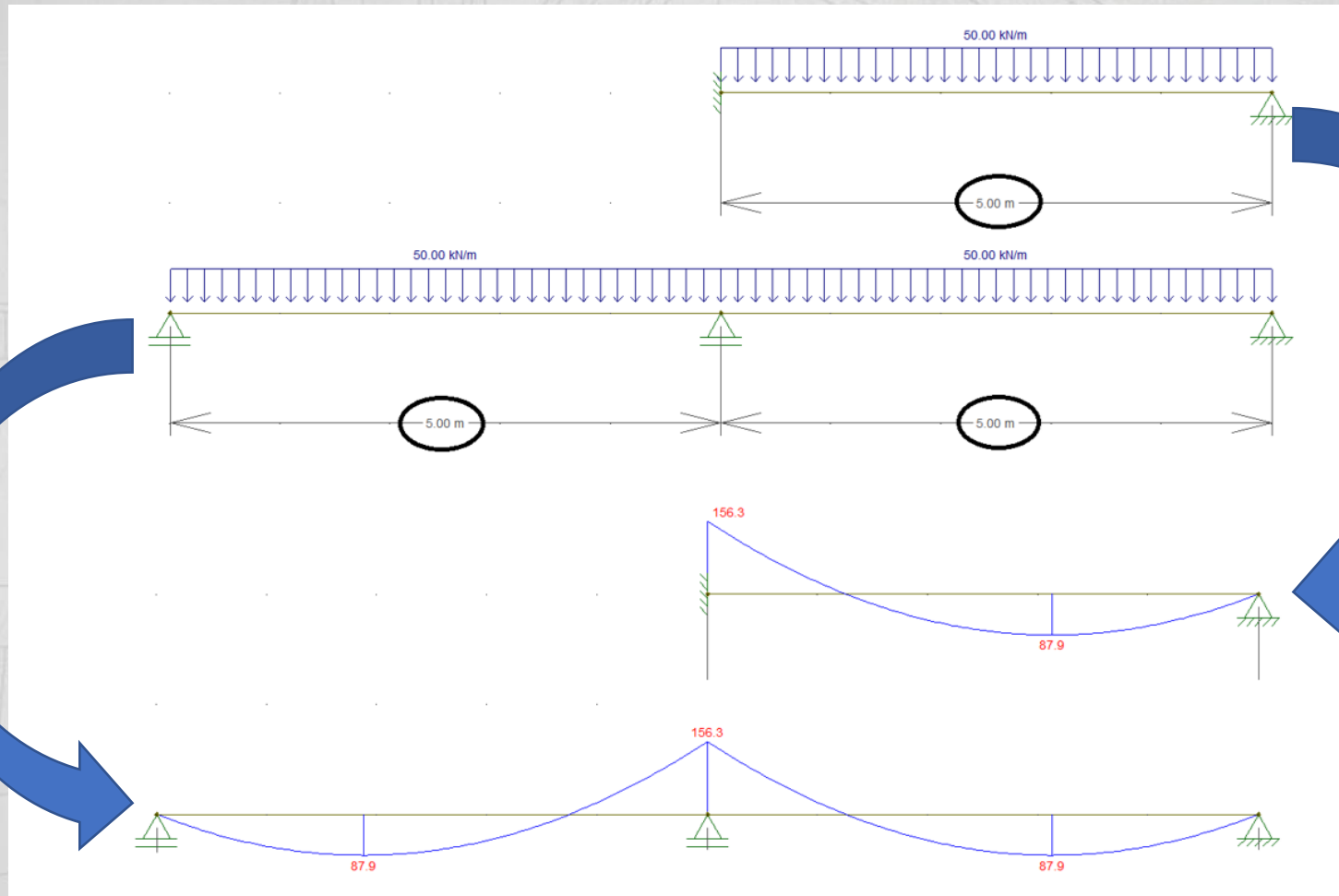


EM BALANÇO

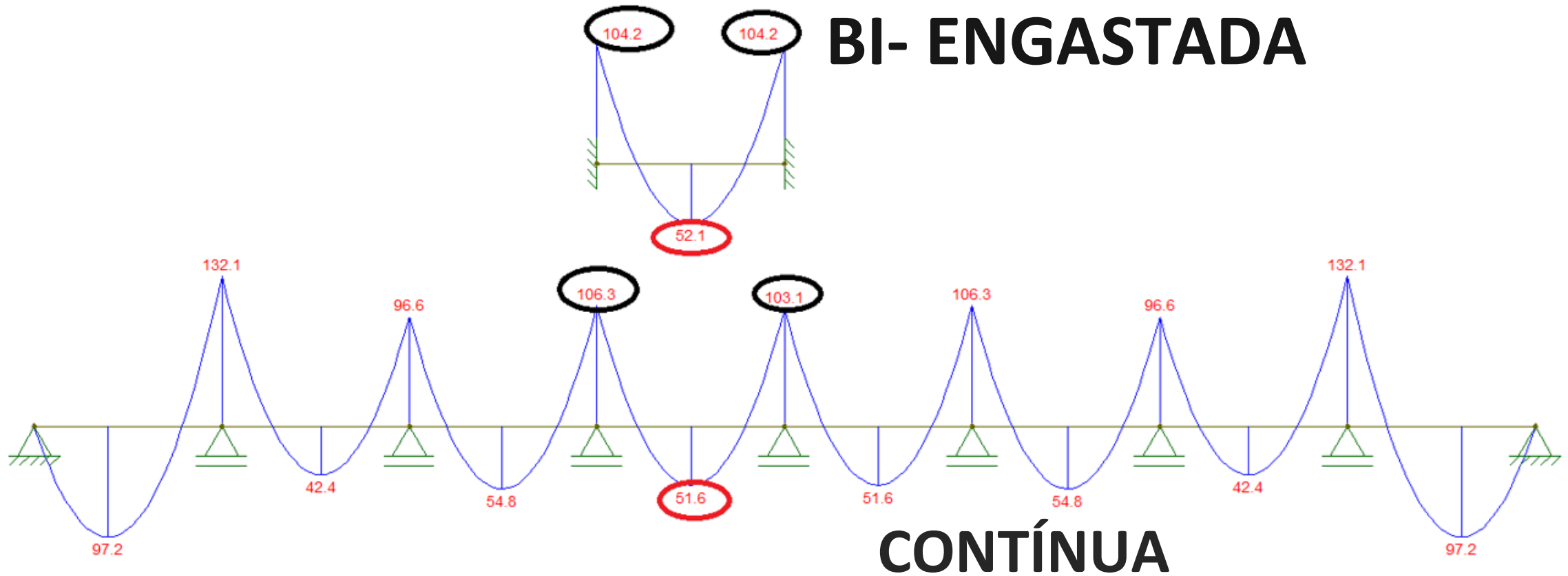


Diagramas de
Momento

“É SABER FAZER EQUIVALÊNCIAS ENTRE DIFERENTES SISTEMAS ESTRUTURAIS SIMPLES!”

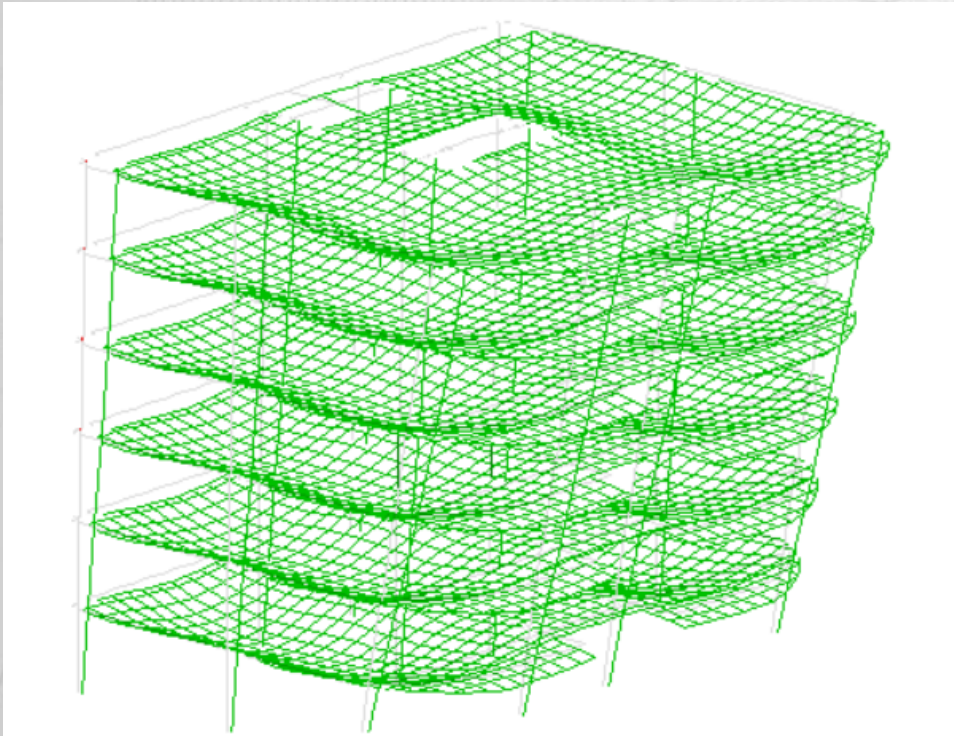


BI- ENGASTADA



ESTRUTURA TODA
DISCRETIZADA

MODELO REFINADO, COMPLETO,
COMPATIBILIZA DESLOCAMENTOS ENTRE
PILAR, VIGA E LAJE ETC..
PADRÃO NA ELABORAÇÃO DE PROJETOS



E PRECISAMOS
SABER ESSE?

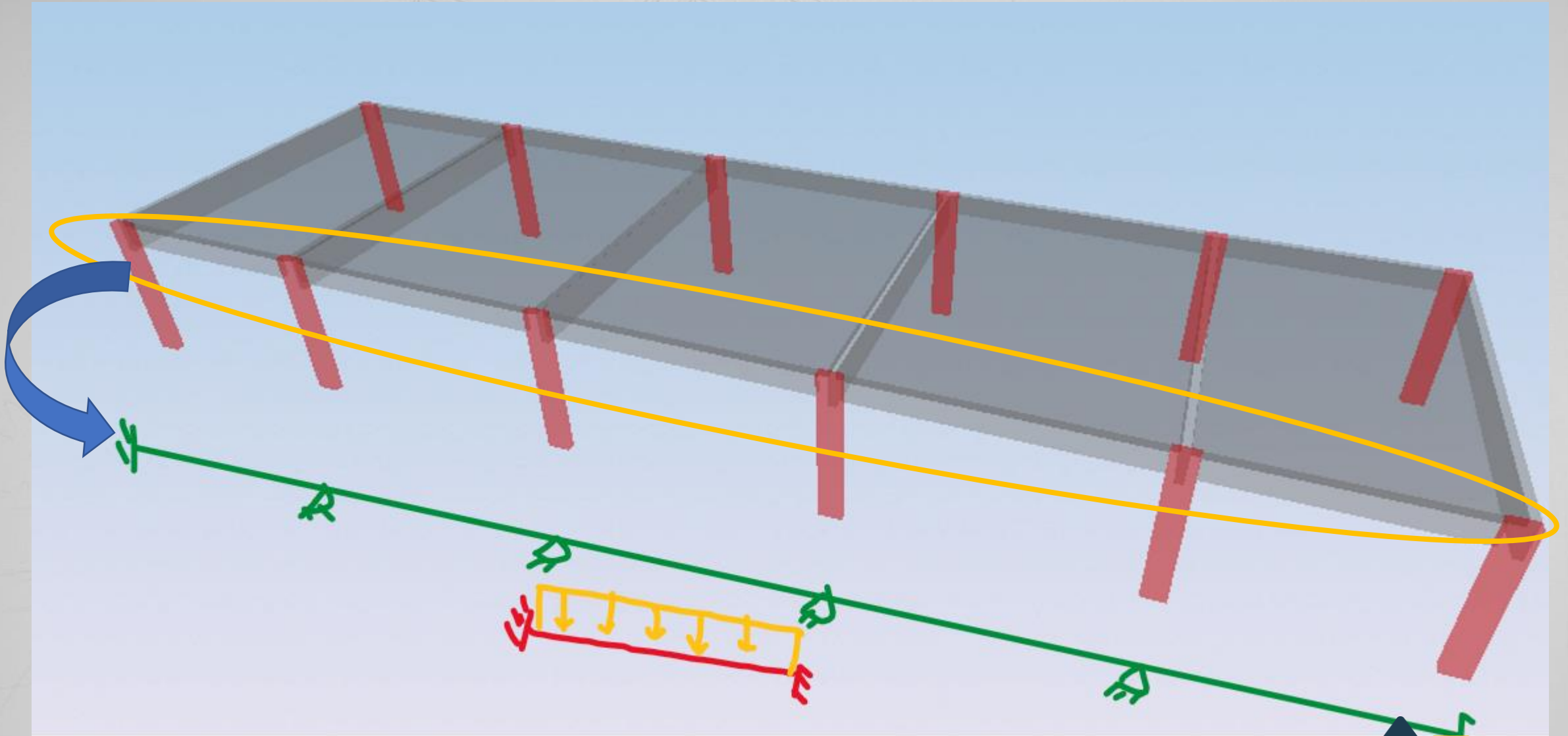


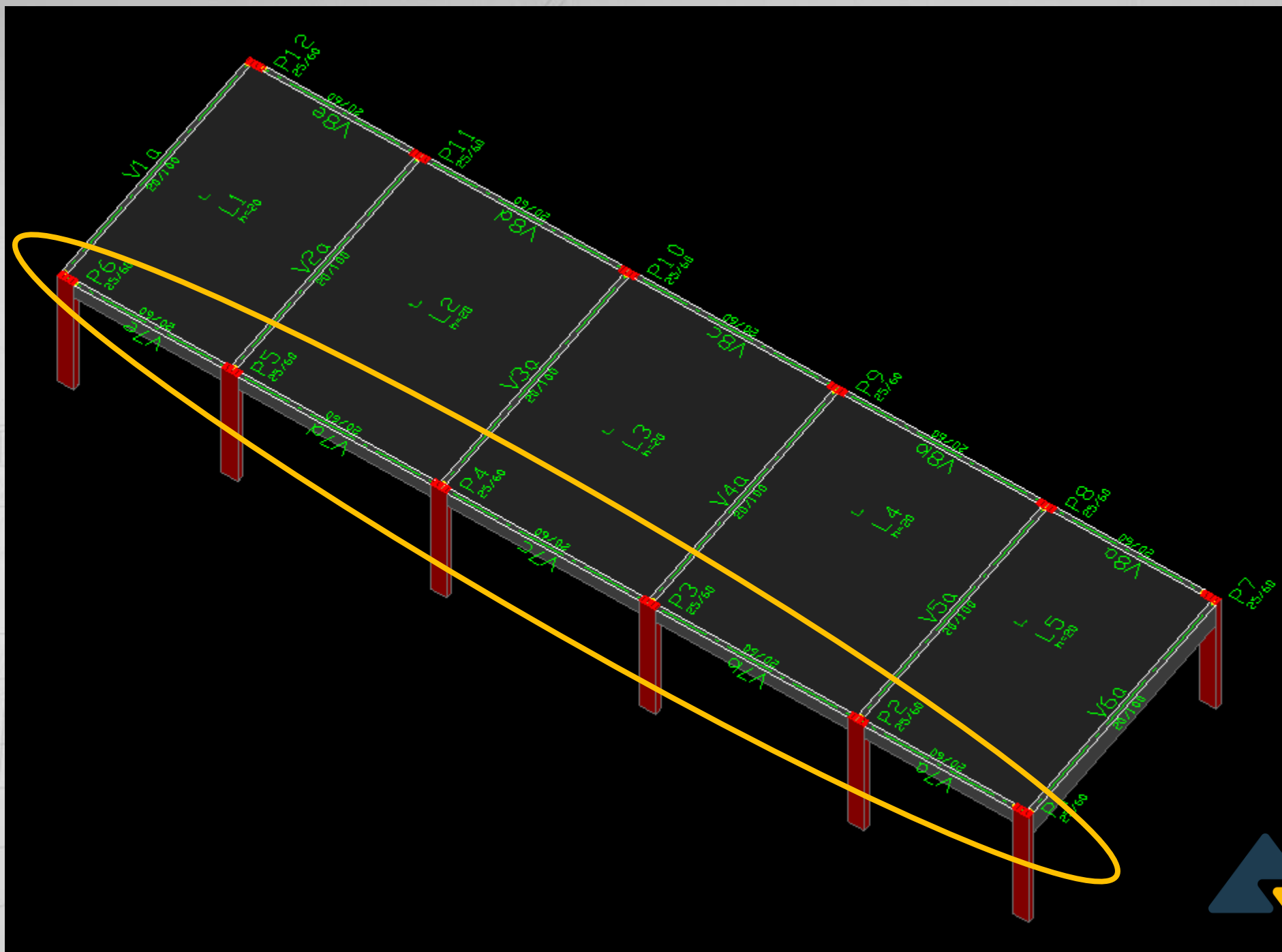
MODELO
SIMPLIFICADO

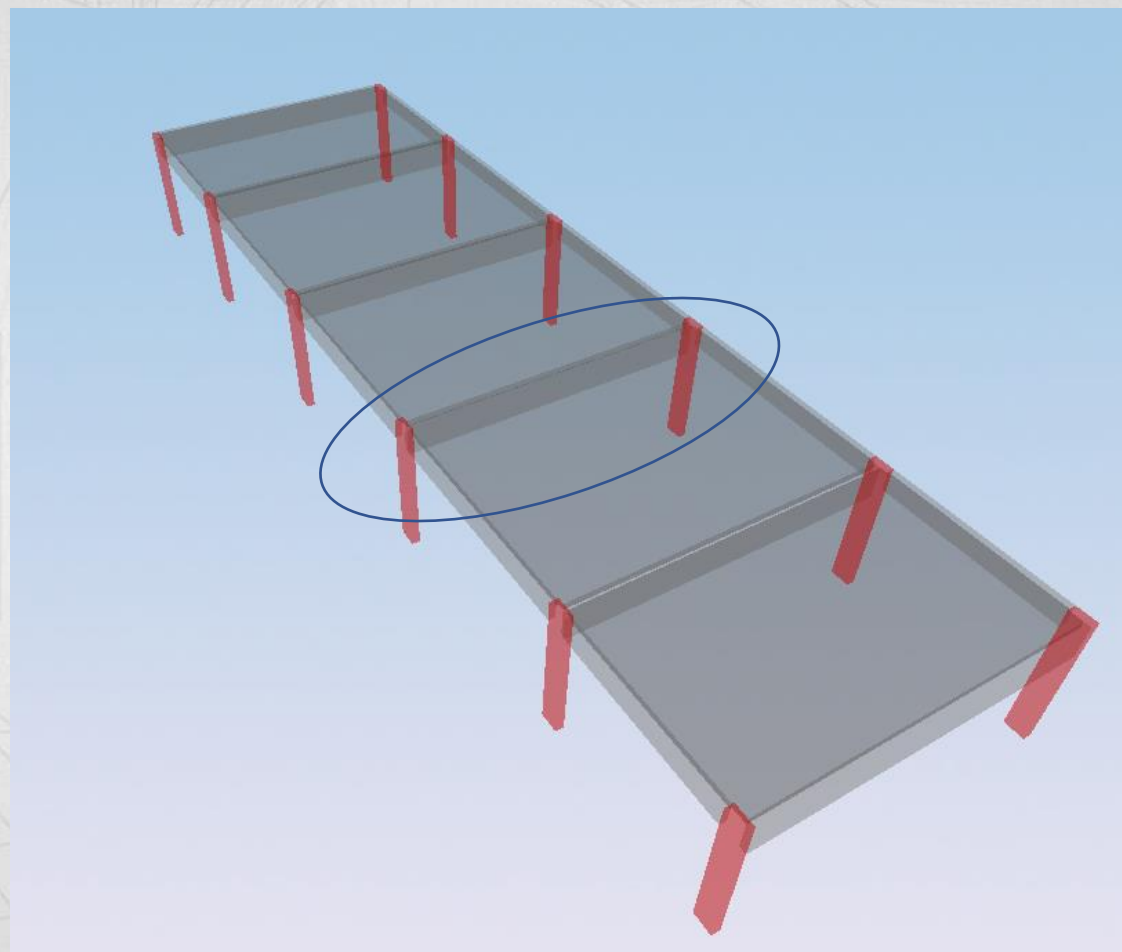
**O QUE MAIS O ENGENHEIRO DE ESTRUTURAS
PRECISA SABER...**

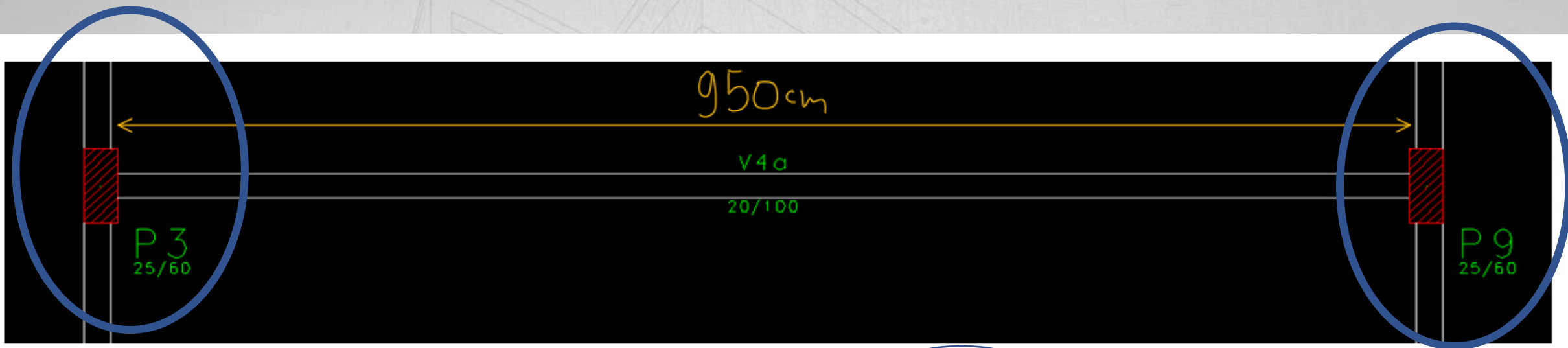
**E ASSOCIAR ESSES SISTEMAS
ESTRUTURAIS SIMPLES COM
PARTES DA ESTRUTURA REAL!**











$$l_{ef} = 950 + \begin{cases} 0,5 * 25 \text{ cm} = 12,5 \text{ cm} \\ 0,3 * 100 \text{ cm} = 30 \text{ cm} \end{cases}$$

(DIMENSÃO DO PILAR)

(ALTURA DA VIGA)

$L_{e, \text{PILAR}} = 400 \text{ cm}$

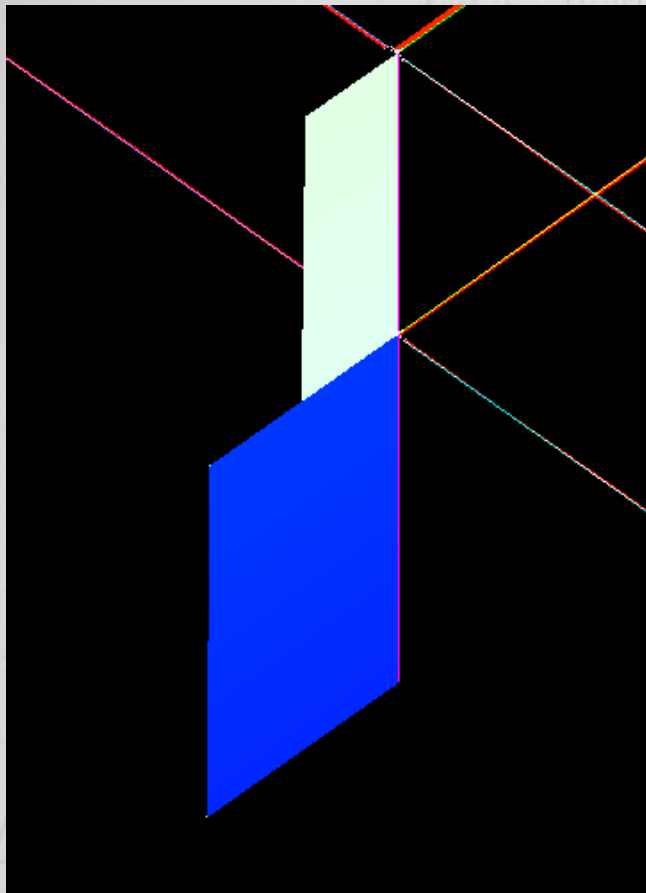
MENOR ENTRE
OS DOIS
VALORES

**TODO O ENGENHEIRO ESTRUTURAL PRECISA
SABER...**

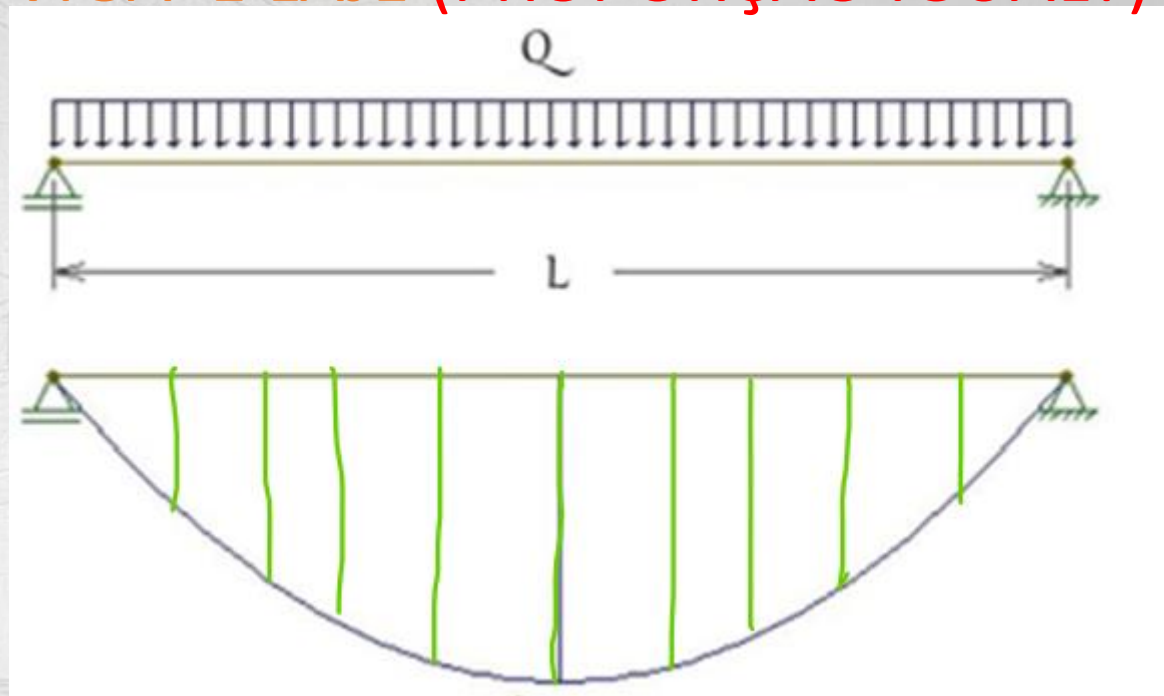
**A PROPORÇÃO ENTRE OS ESFORÇOS PARA CADA
CARREGAMENTO DA ESTRUTURA**



ESFORÇO NORMAL NO PILAR



MOMENTO FLETOR EM VIGA E LAJE (PROPORÇÃO IGUAL?)



% PESO PRÓPRIO

% DE MAIS PERMANENTES

% ACIDENTAIS

O ENGENHEIRO ESTRUTURAL RAÍZ PRECISA SABER...

- ✓ Fazer cálculo manual
- ✓ Ter “no sangue” os Sistemas Estruturais Triviais
- ✓ Saber as “contas de padaria”
- ✓ Fazer analogias Estrutura Completa X Sistemas Estruturais Simples

E TAMBÉM, NÃO MENOS IMPORTANTE...



SABER MUITO BEM COMO O PROGRAMA FUNCIONA!

**Diversas situações de não conformidade
são identificadas no seguinte âmbito:**

**NÃO SIMULAÇÃO DO
PROCESSO CONSTRUTIVO
PELO PROGRAMA**

Pavimento de transição

The diagram illustrates a transition pavement layout with the following components:

- Points of Origin (NASCE):** P1 (70/20), P2 (22/60), and P3 (22/60).
- Structural Layers and Dimensions:**
 - 100/100 (multiple locations)
 - 70/100 (multiple locations)
 - 14/50 (multiple locations)
 - 14/85 (multiple locations)
 - 14/40 (multiple locations)
 - 30/90 (multiple locations)
 - 25/60 (multiple locations)
- Points of Interest:** P108 (110/25), P109 (120/25), and P110 (120/25).
- Other Labels:** P9 (80/22), h=13, h=15, and h=13 (multiple locations).

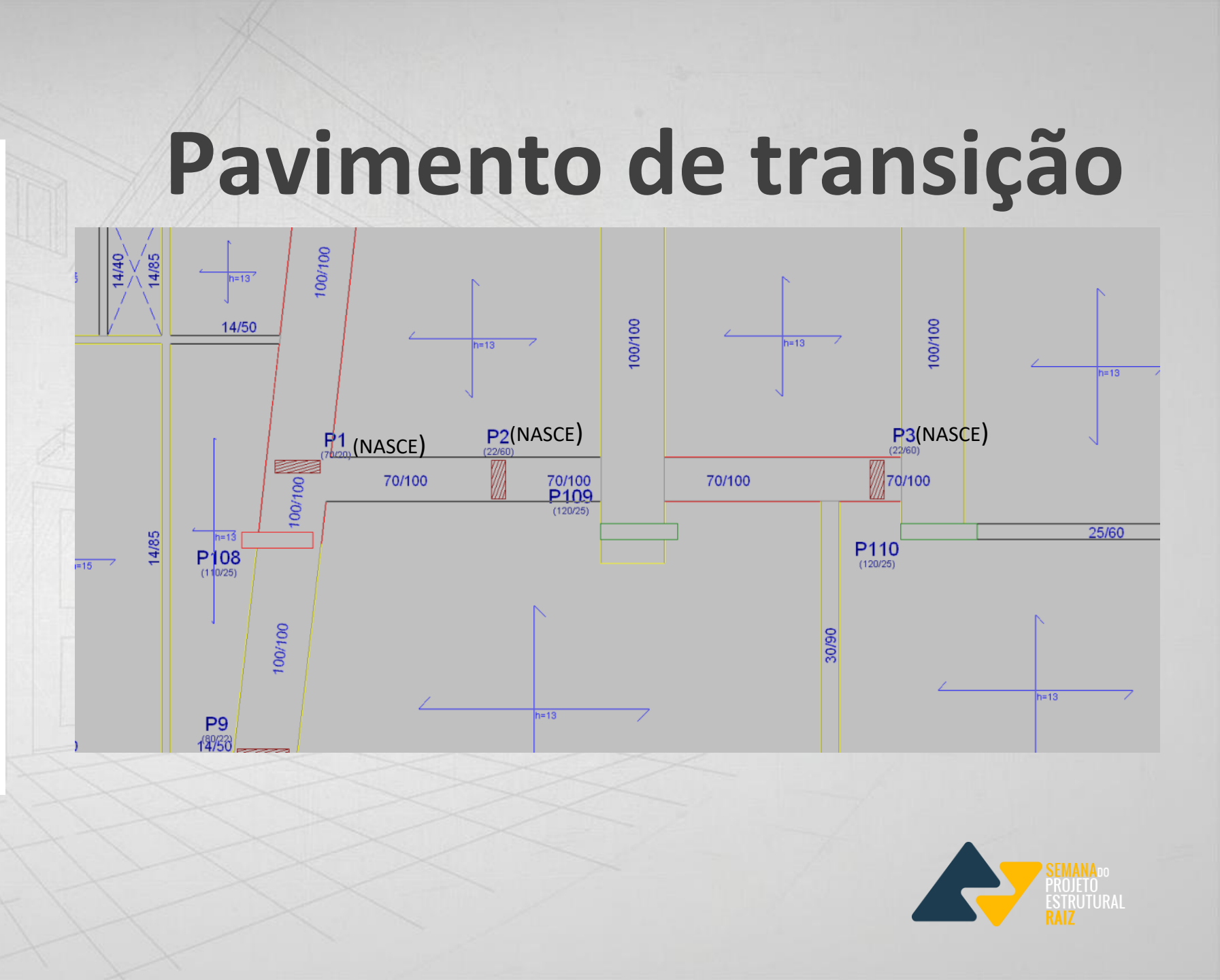
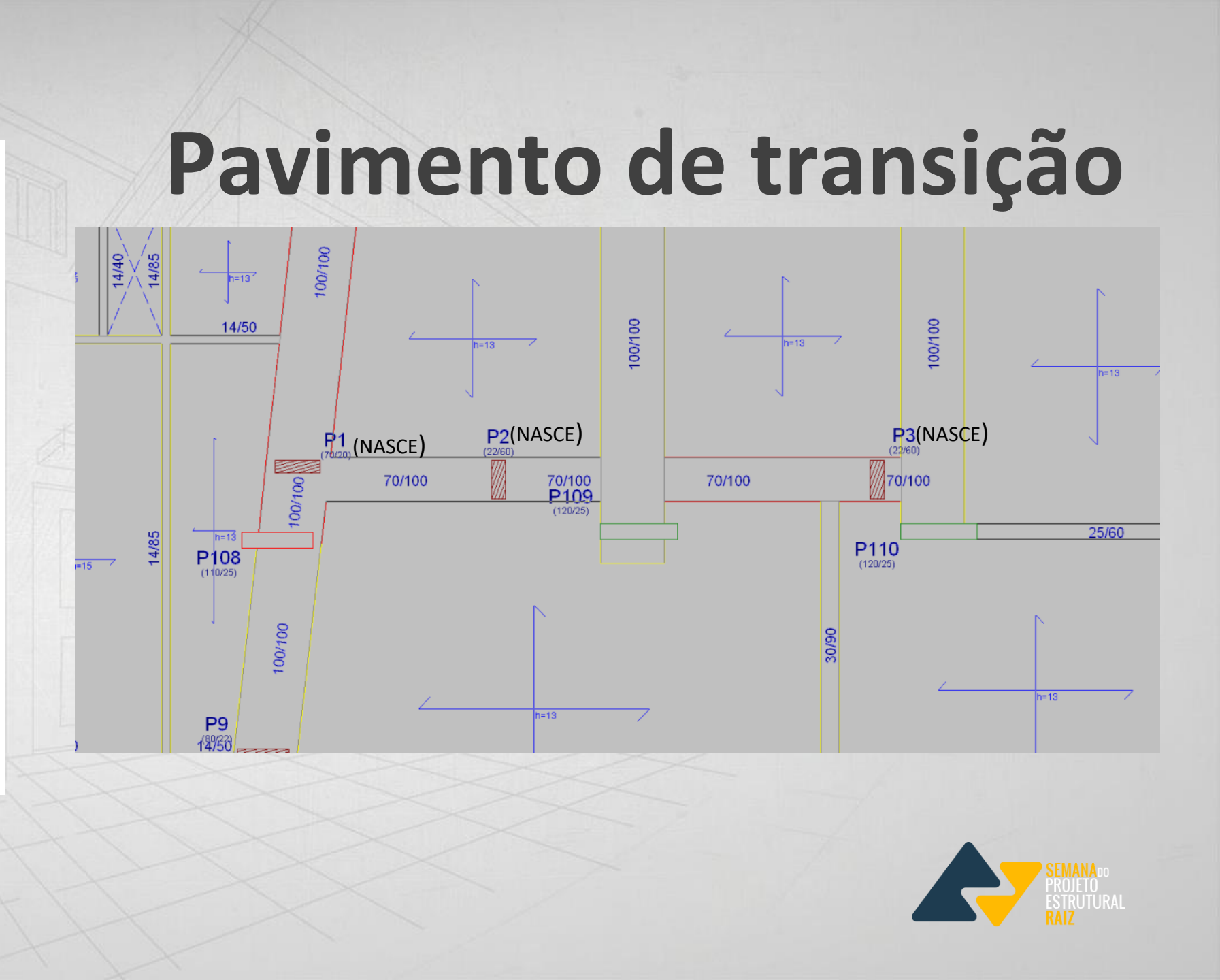
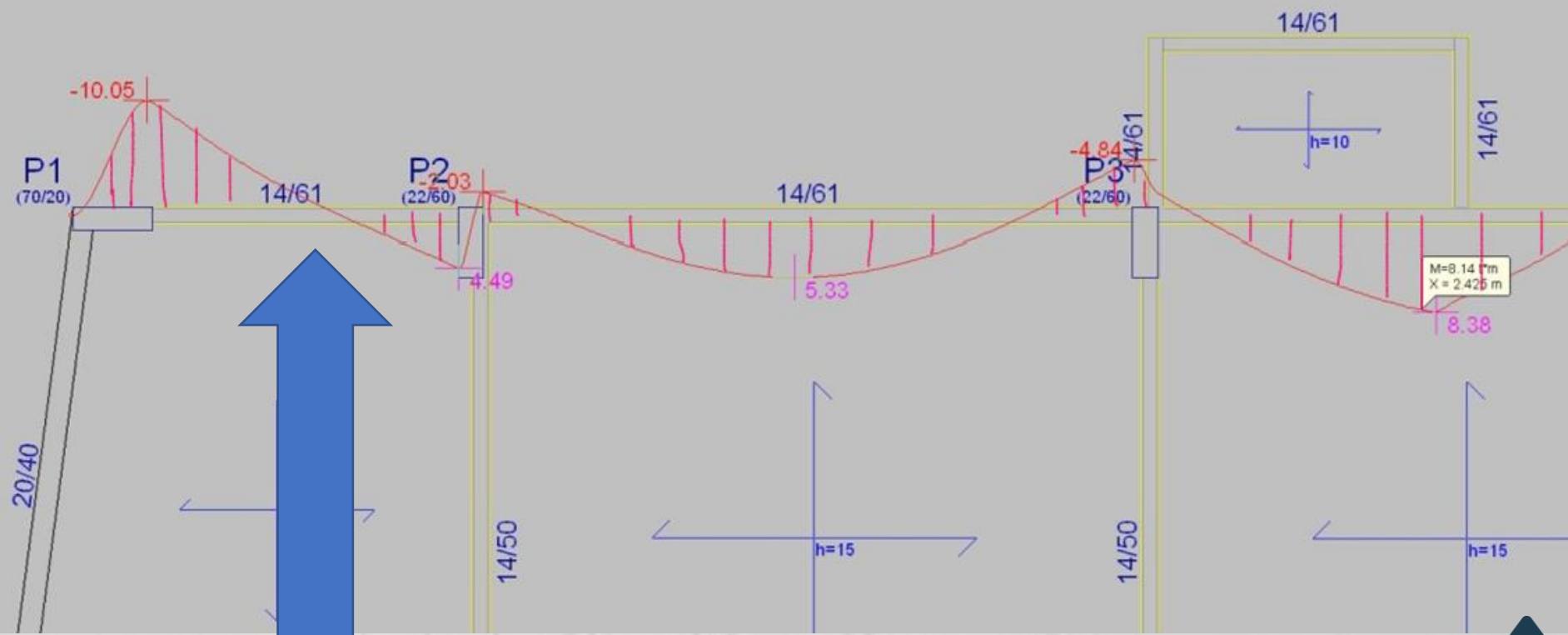


DIAGRAMA DE MOMENTOS: VIGA DO 10o PAVIMENTO

SÓ CARGAS GRAVITACIONAIS



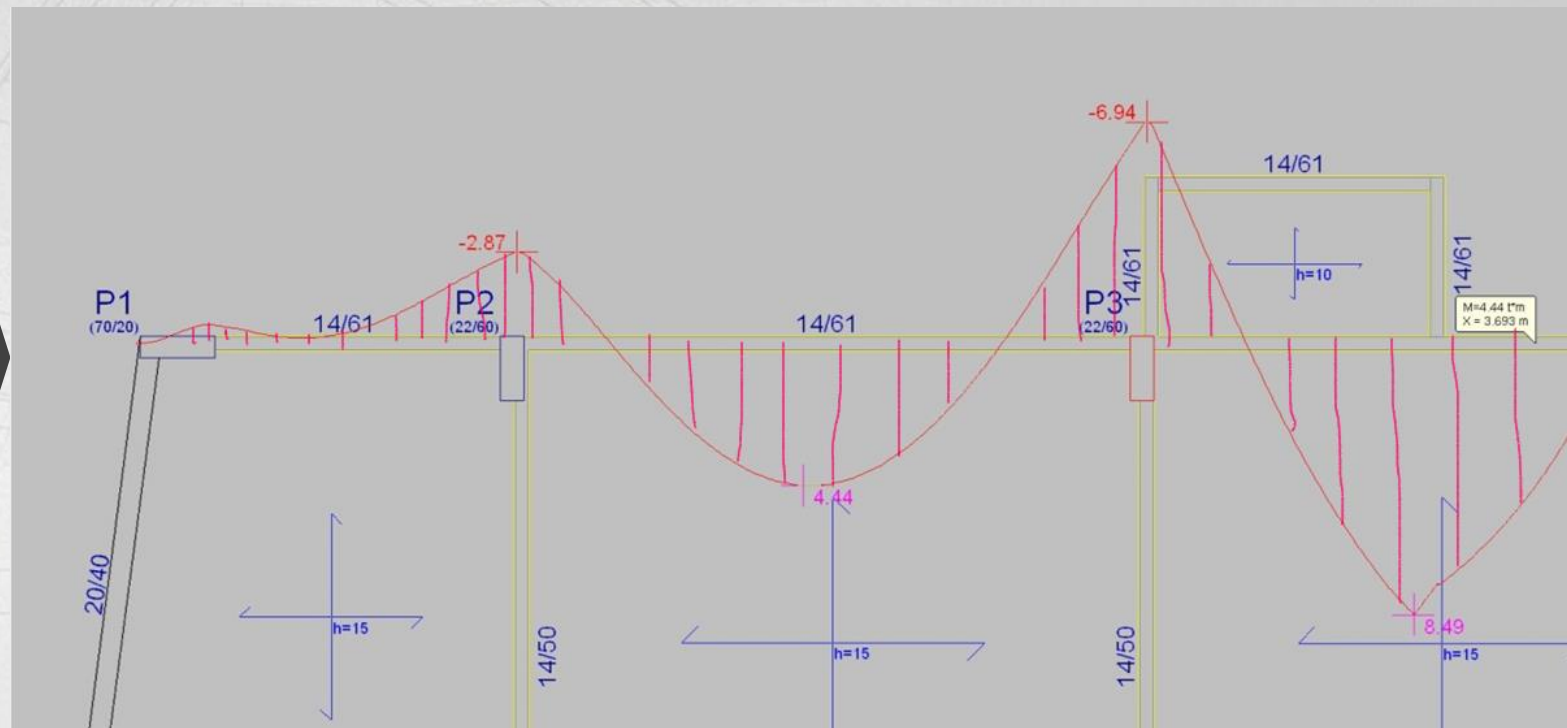
TÁ "SERTO"?

O ENGENHEIRO ESTRUTURAL RAÍZ PRECISA SABER...

- ✓ Fazer cálculo manual
- ✓ Ter “no sangue” os Sistemas Estruturais Triviais
- ✓ Saber as “contas de padaria”
- ✓ Fazer analogias Estrutura Completa X Sistemas Estruturais Simples

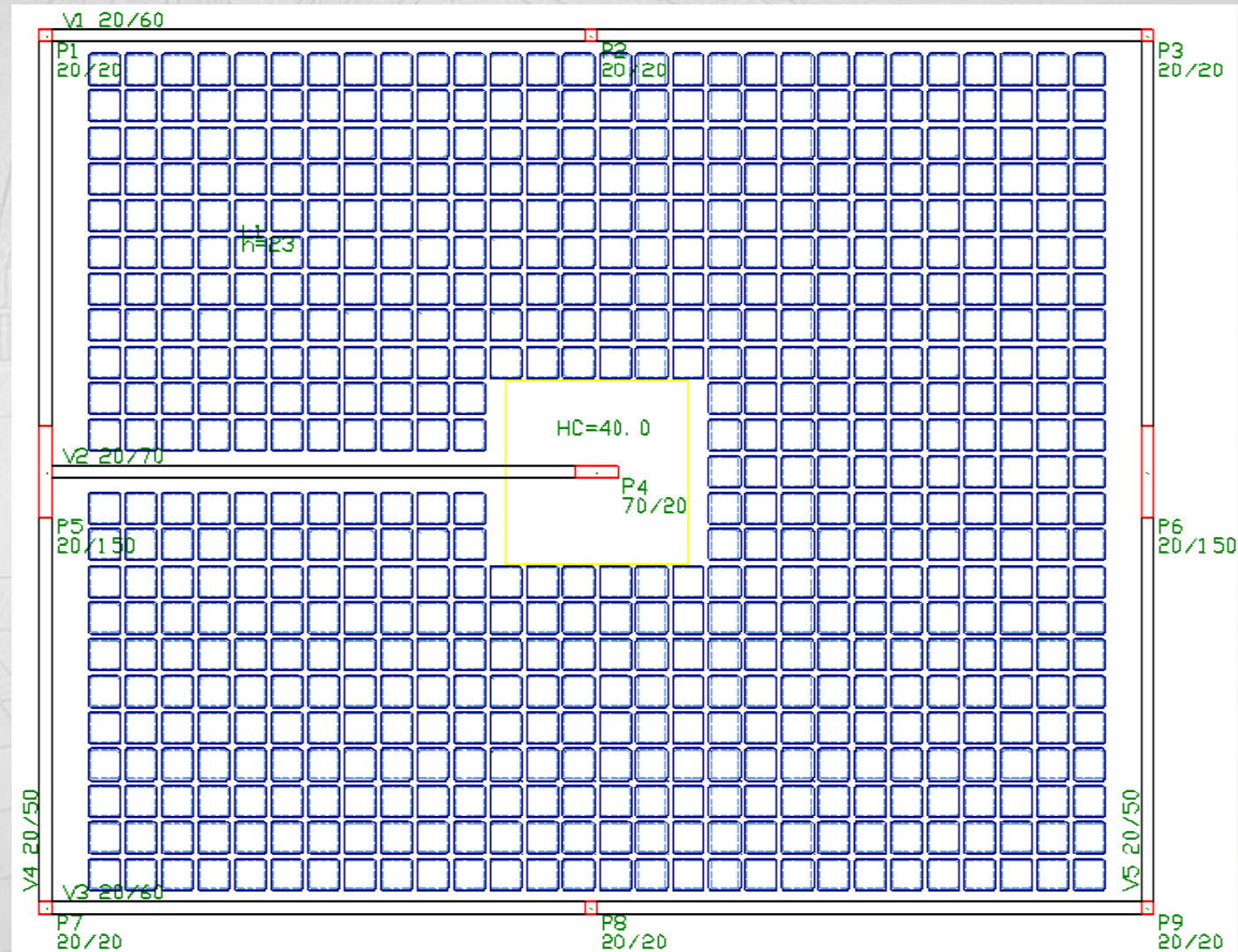
MAS O QUE HOUE???

**Resolvendo
com o próprio
programa
(sabendo
como ele
funciona!!!)**

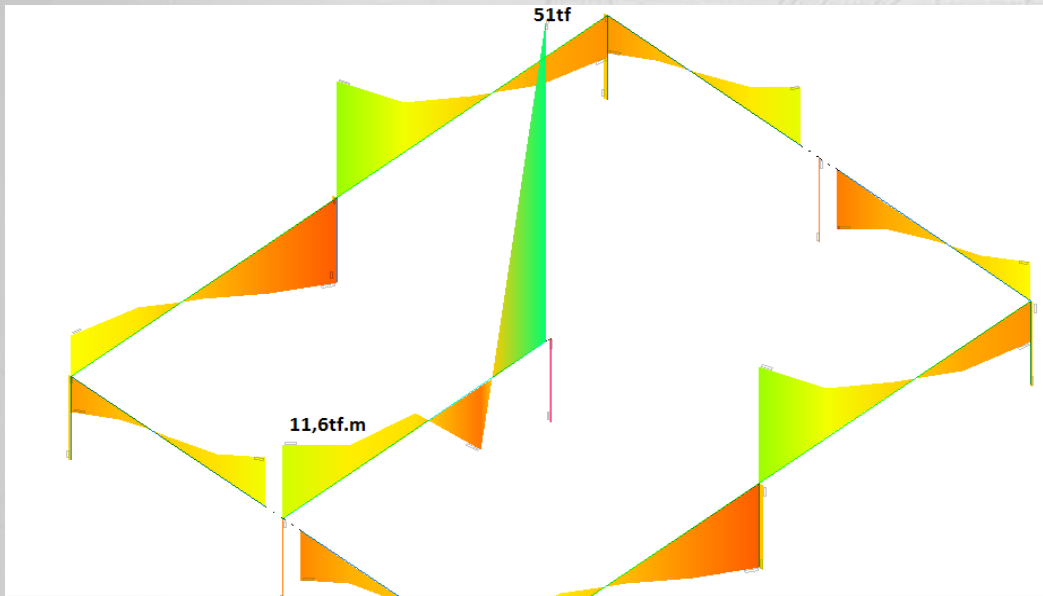


OK!!!

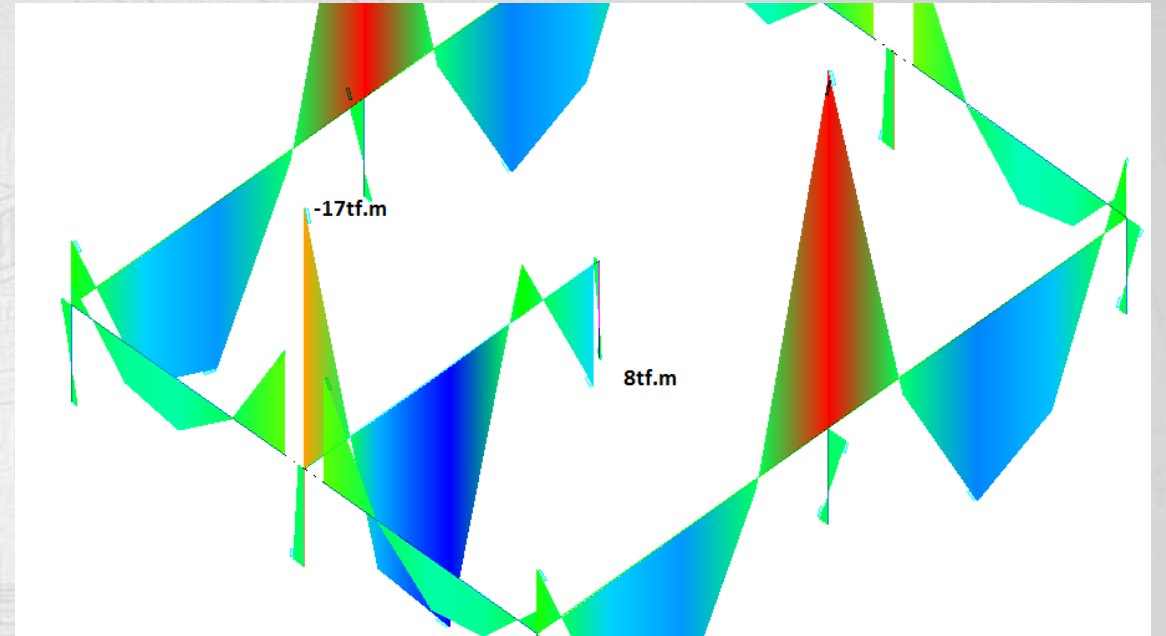
Viga V2



GERAÇÃO AUTOMÁTICA

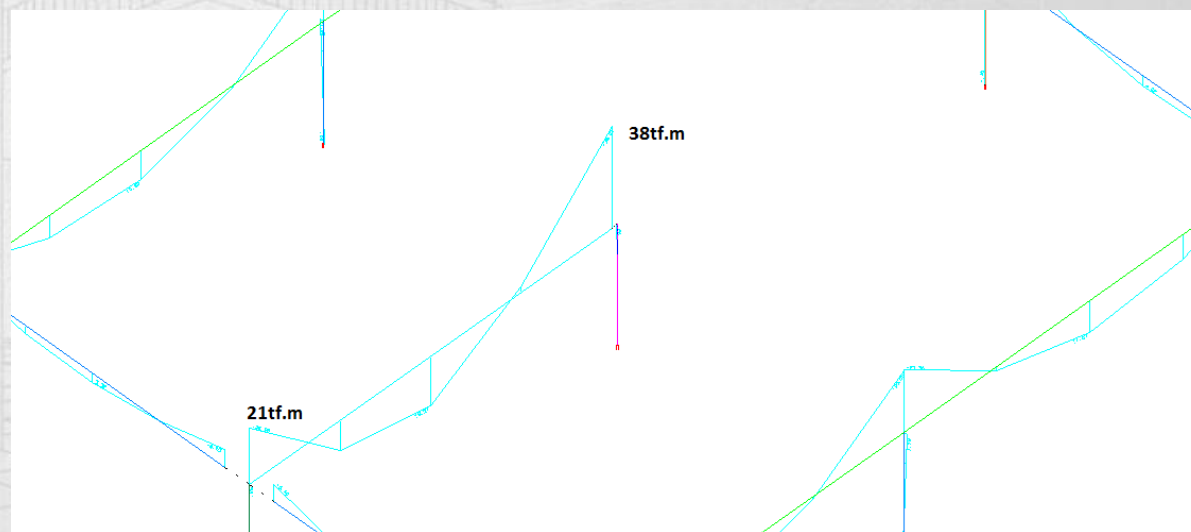
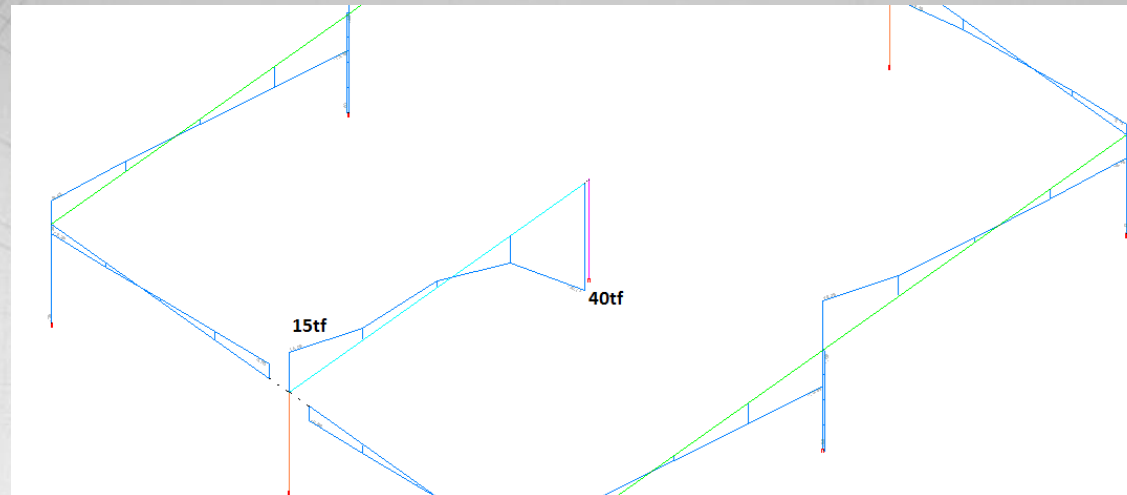


CORTANTE



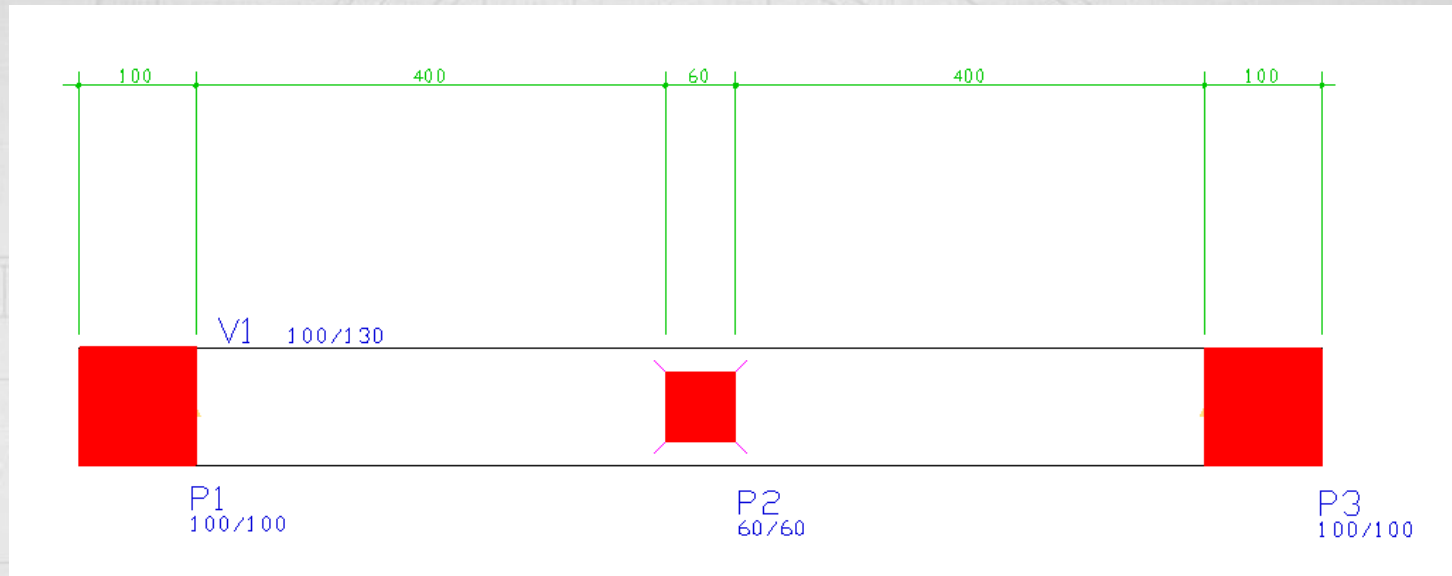
MOMENTO

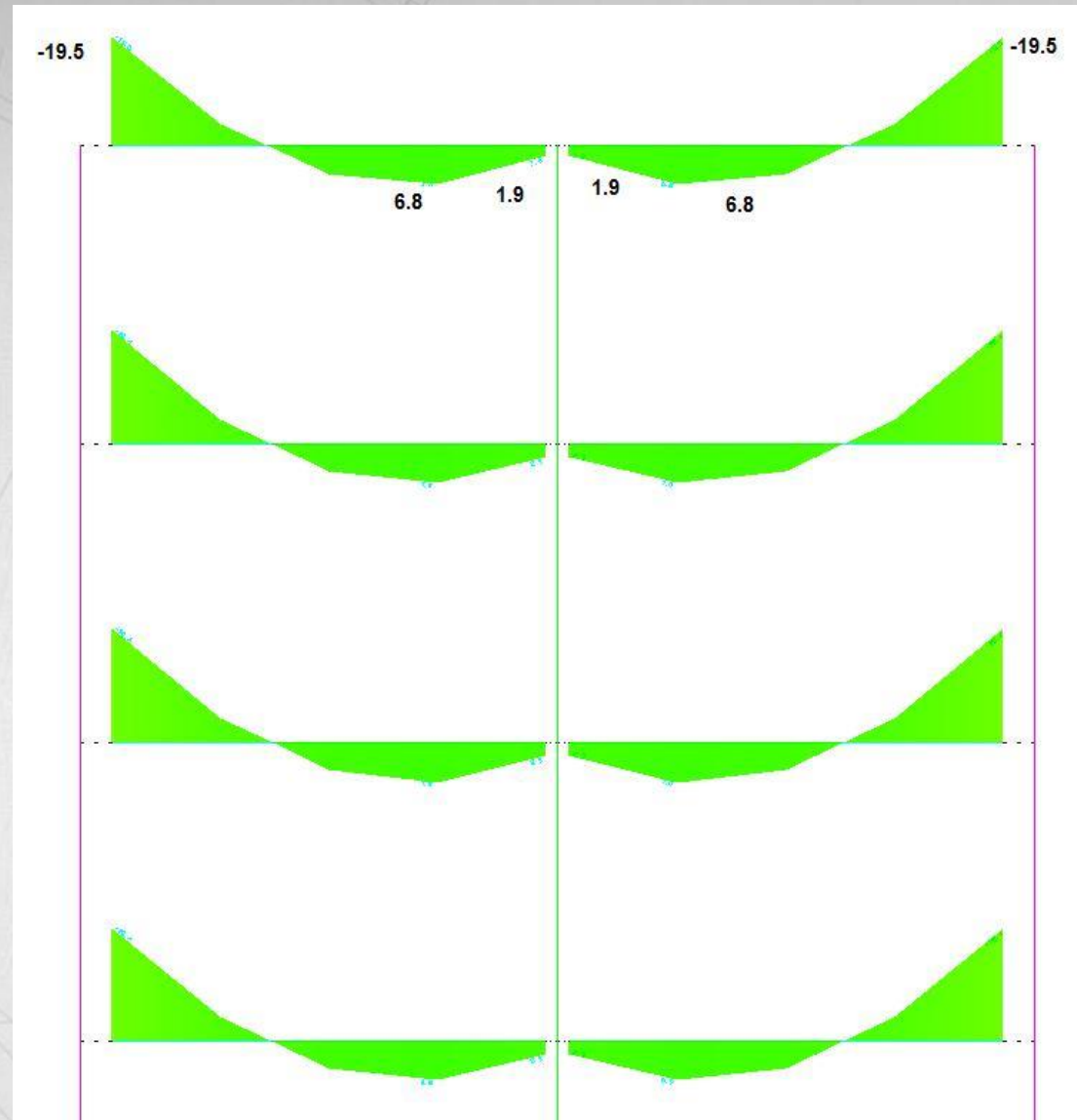
**Resolvendo
com o próprio
programa
(sabendo
como ele
funciona!!!)**



OK!!!

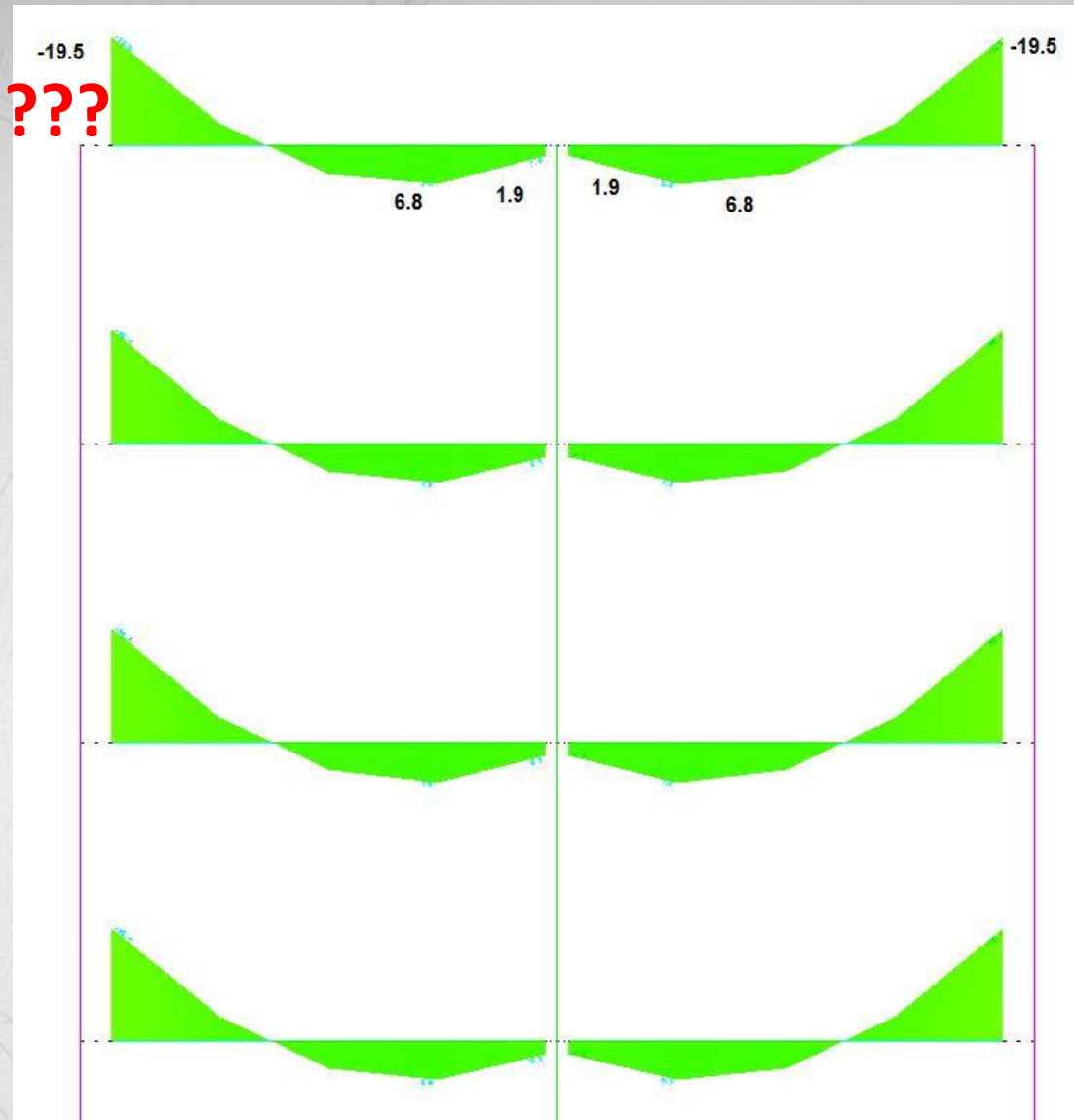
TRANSIÇÃO



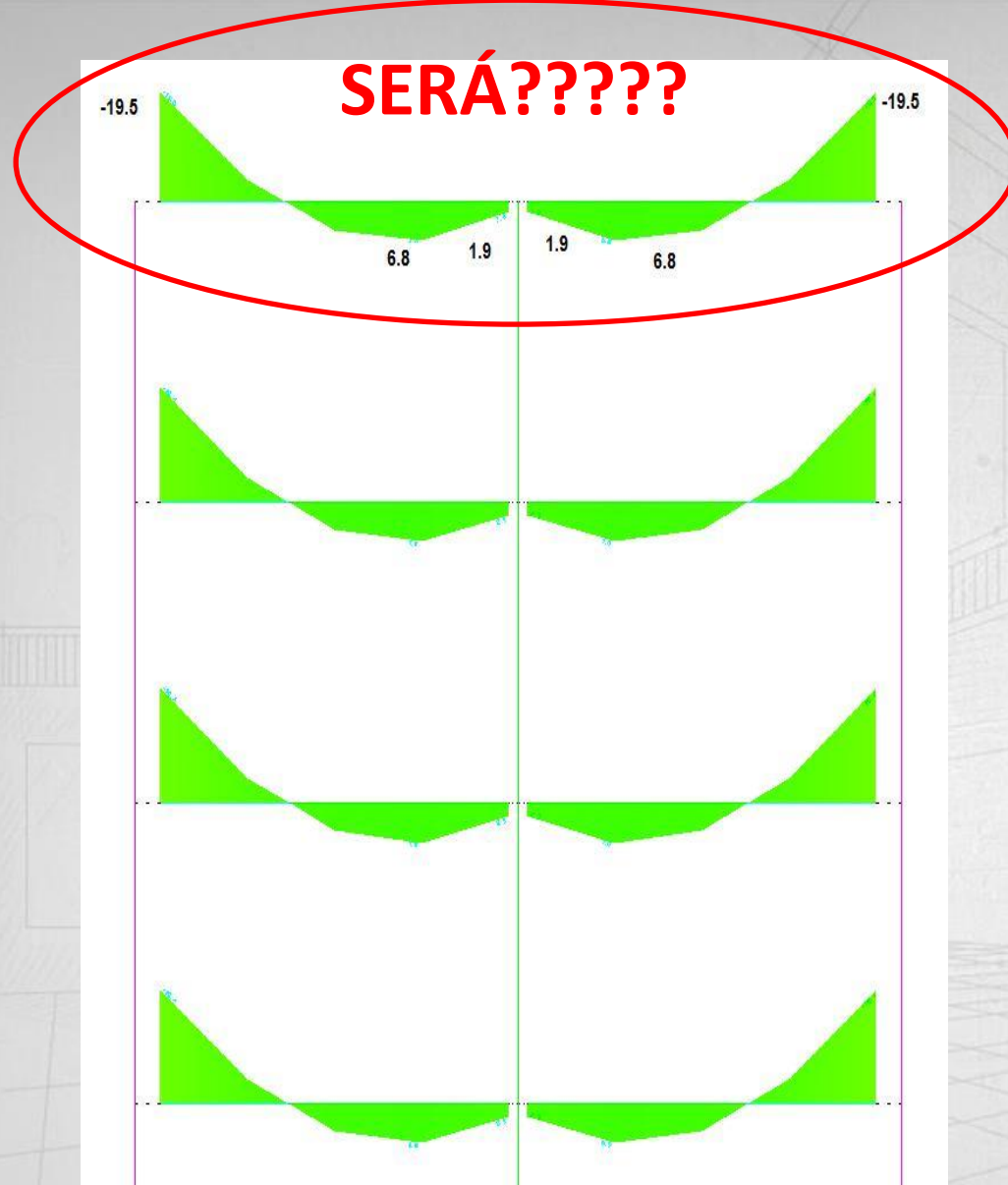


Momentos: Pavimentos Superiores

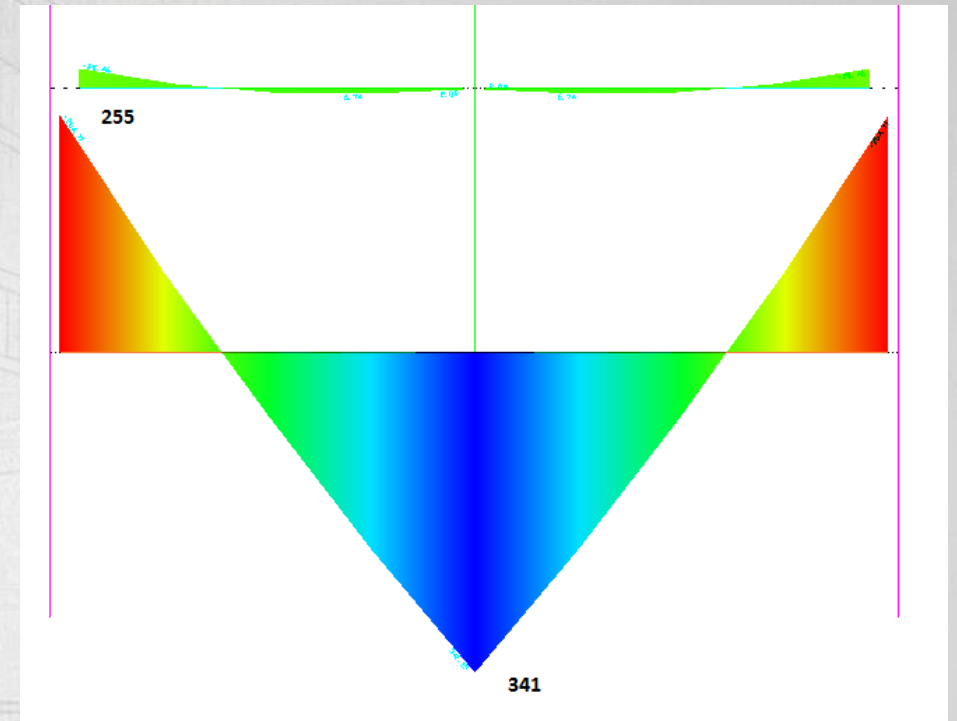
SERÁ?????



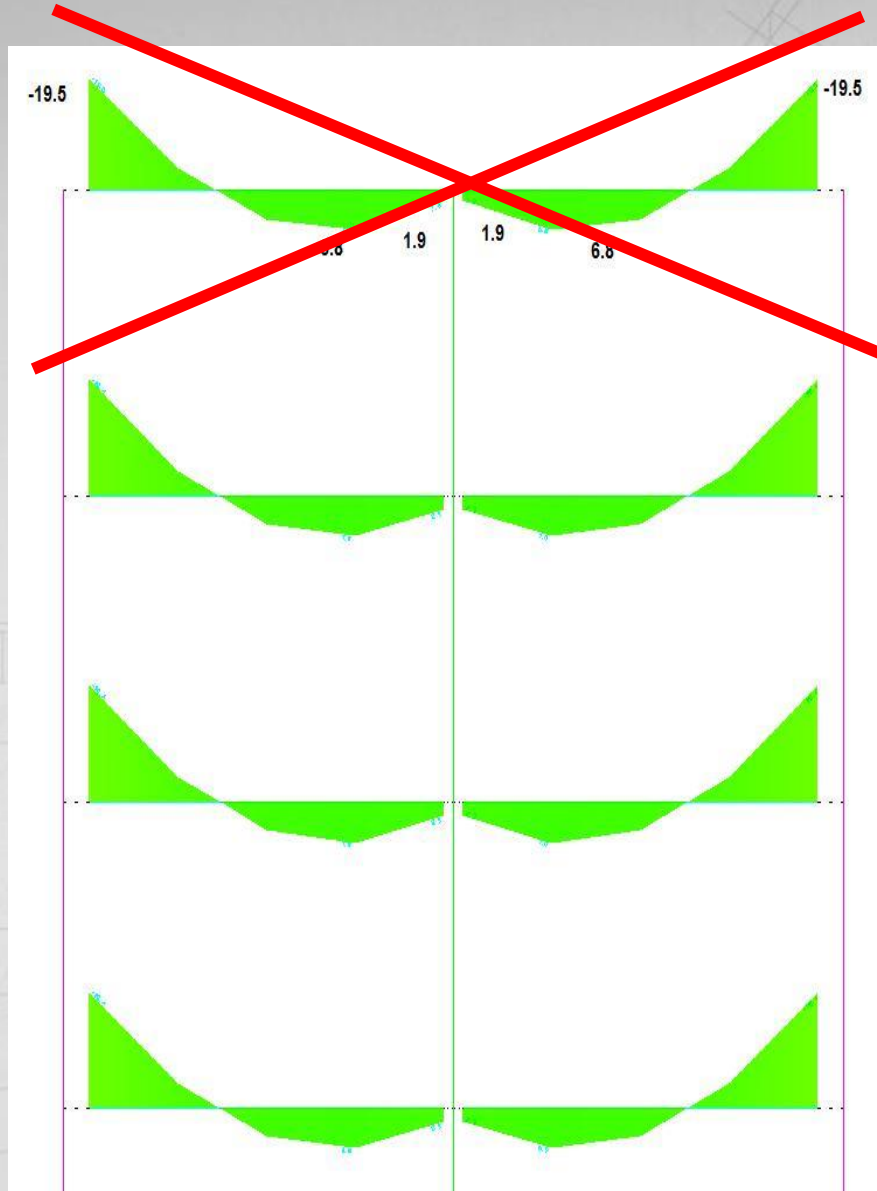
Momentos: Pavimentos Superiores



Momentos:
Pavimentos Superiores



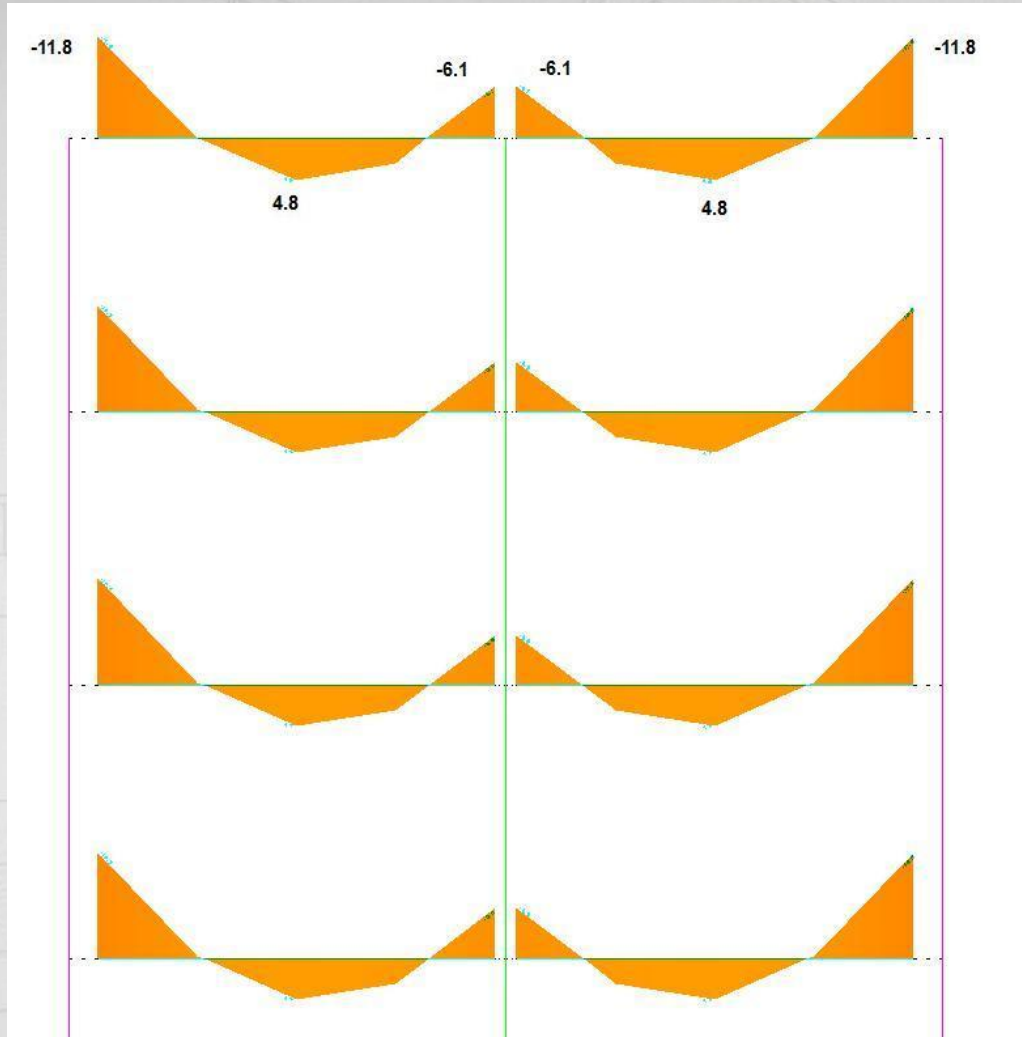
Momentos:
VIGA DE TRANSIÇÃO



A ESTRUTURA NÃO É FEITA E
CARREGADA DE UMA SÓ VEZ
COMO O PÓRTICO A PRINCÍPIO
SIMULA

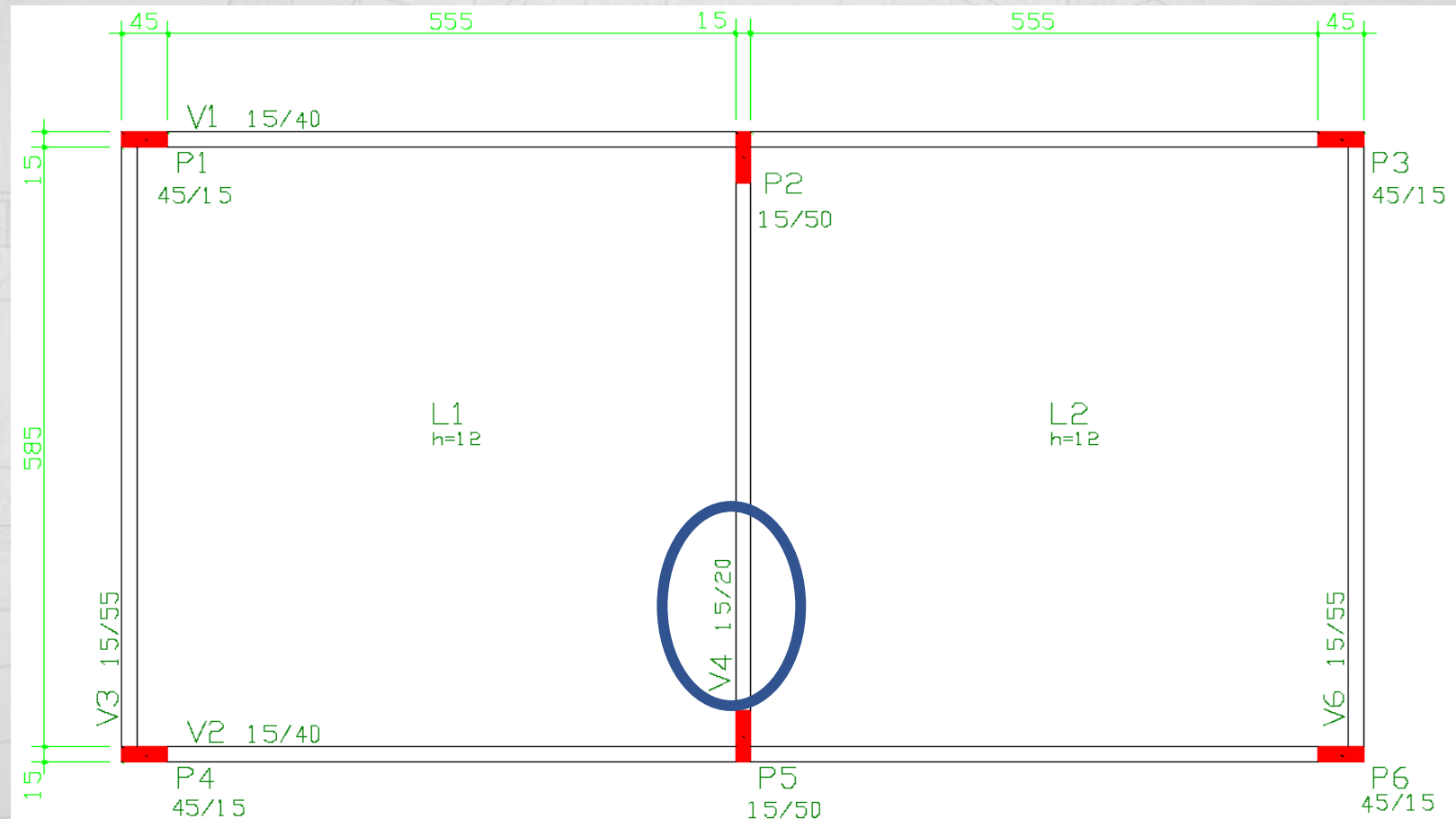
Momentos:
Pavimentos Superiores

AÍ SIM!!!!



Momentos:
Pavimentos Superiores

QUANDO O CÁLCULO MANUAL PODE NÃO DAR CERTO...



PROCESSO SIMPLIFICADO

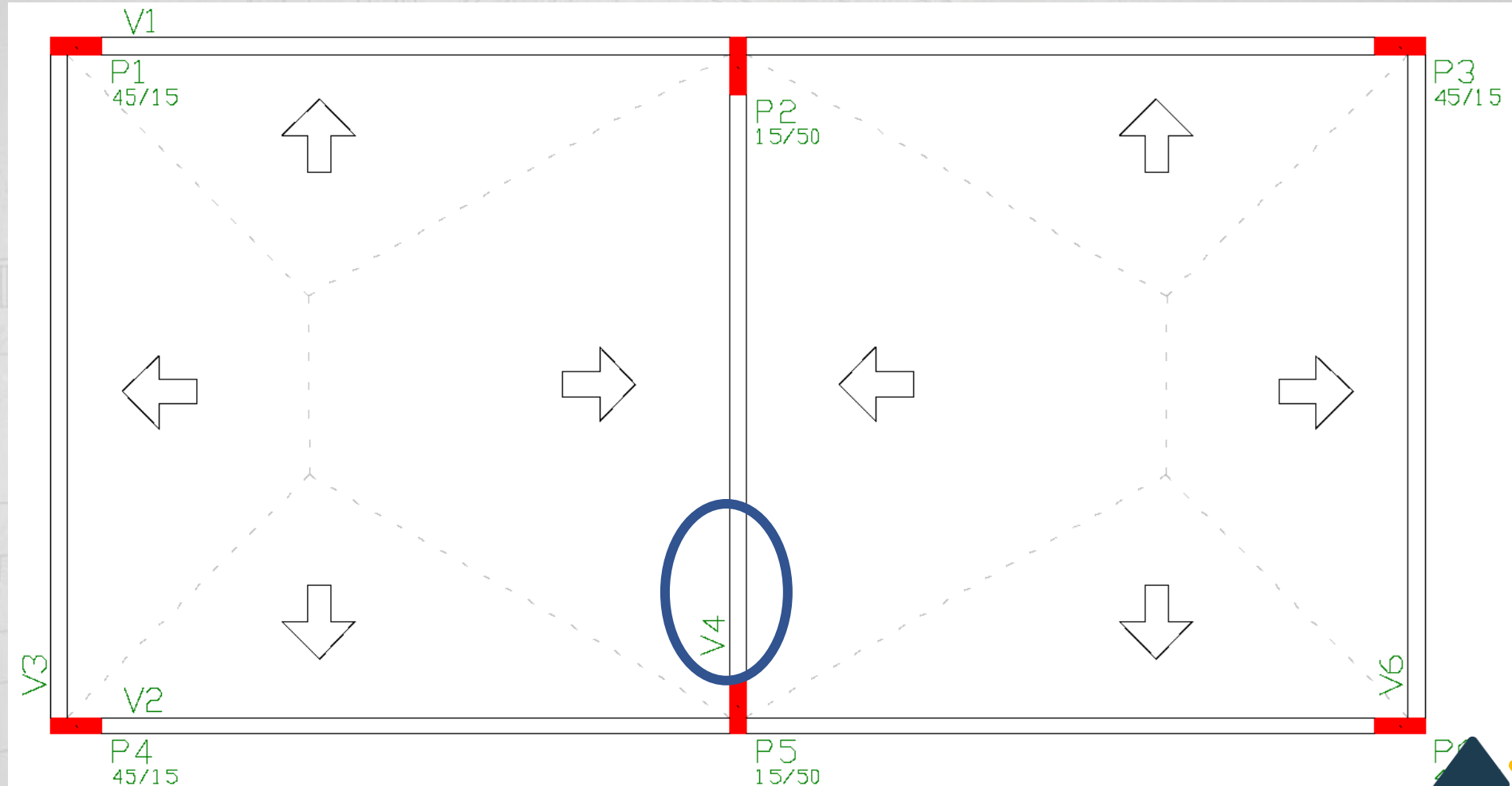
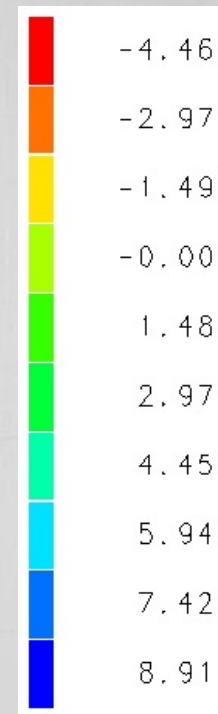
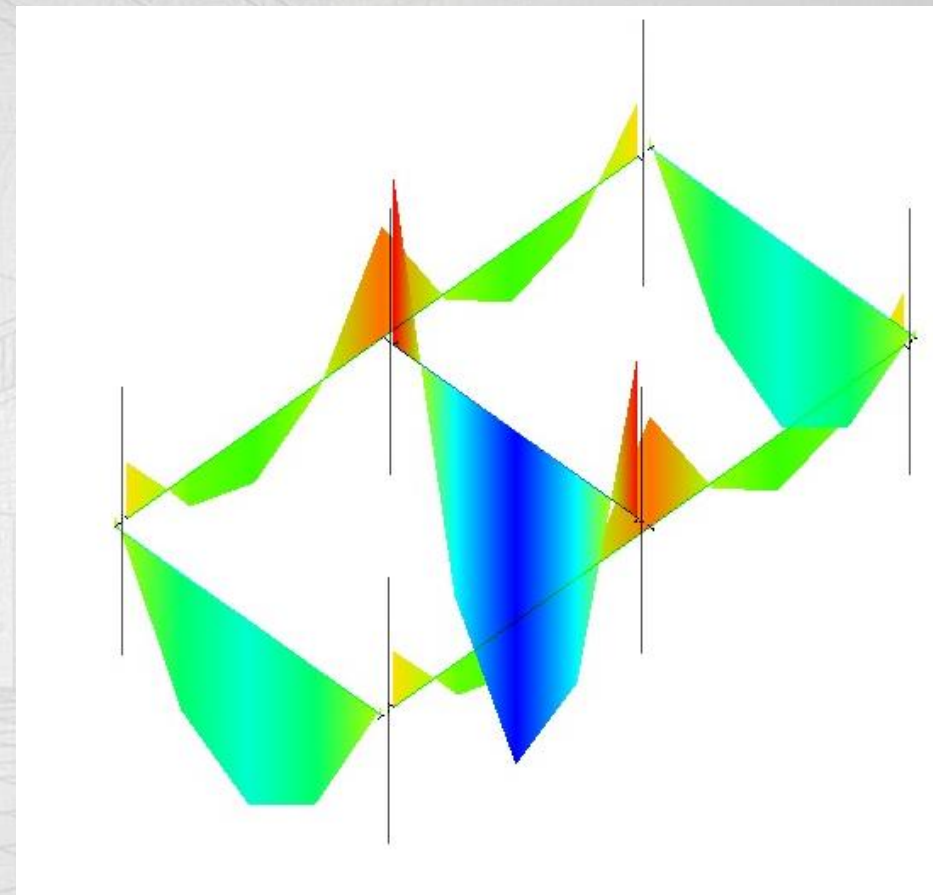
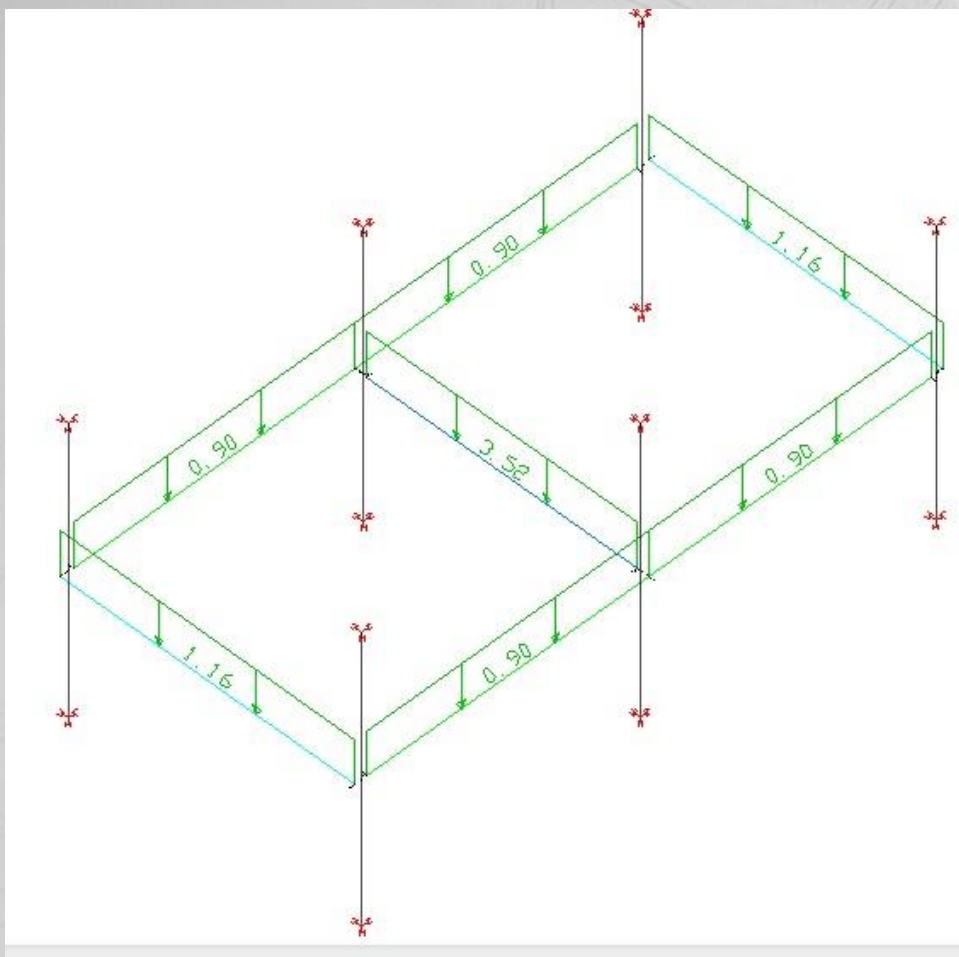
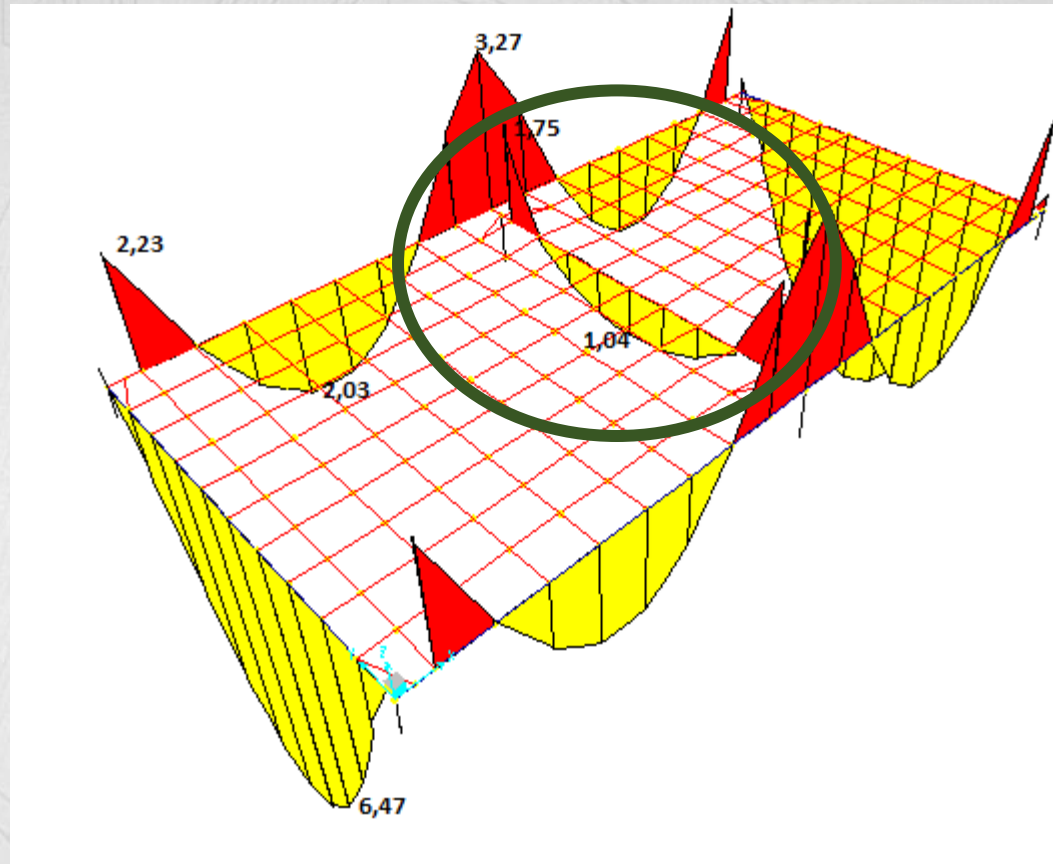


DIAGRAMA DE MOMENTOS



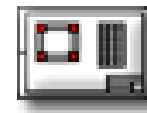
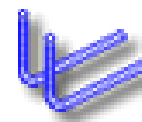
SERÁ????!!!!

MÉTODO DOS ELEMENTOS FINITOS



AGORA SIM!!!

AS ETAPAS DO PROJETO E O CALCULISTA RAIZ



Concepção
Estrutural

Análise
Estrutural

Dimensionamento e
Detalhamento

Desenhos
e Plantas