Earth Pressure & Retaining Wall Design

By

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Types of Earth Retaining Walls

I- Permanent Walls

II- Temporary Walls ......

I- Permanent Walls

1- Gravity Wall

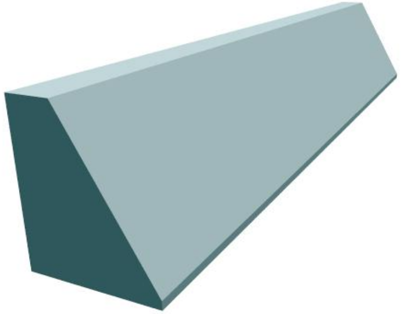
2- Semi-gravity wall

3- Cantilever wall

4- Counterfort wall

5- Sheet pile wall & Braced cuts

1



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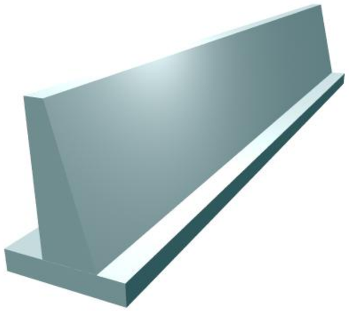

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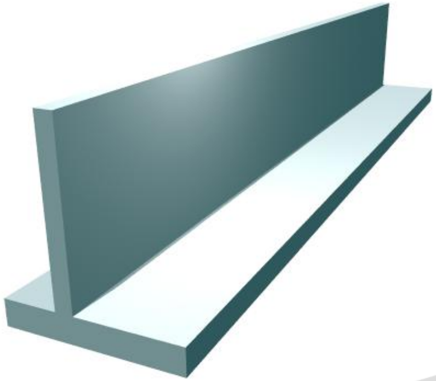

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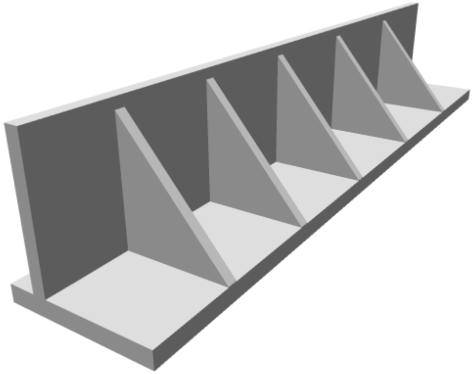

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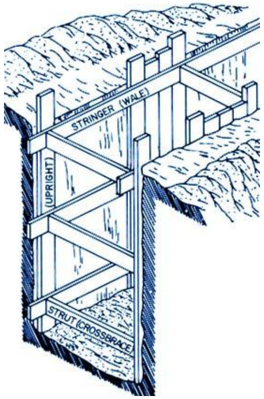

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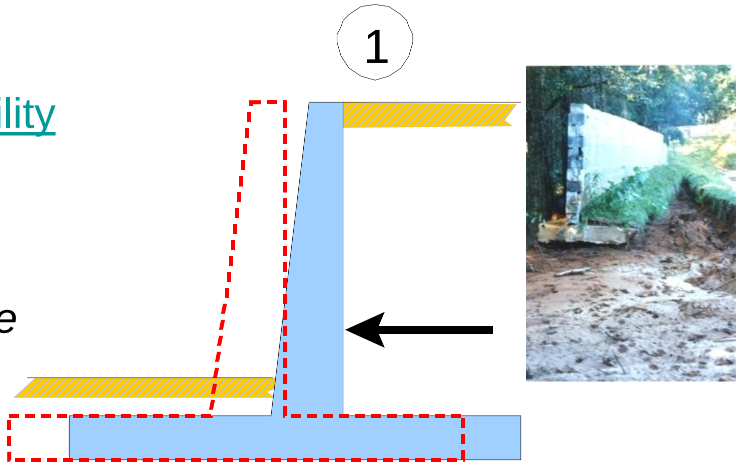
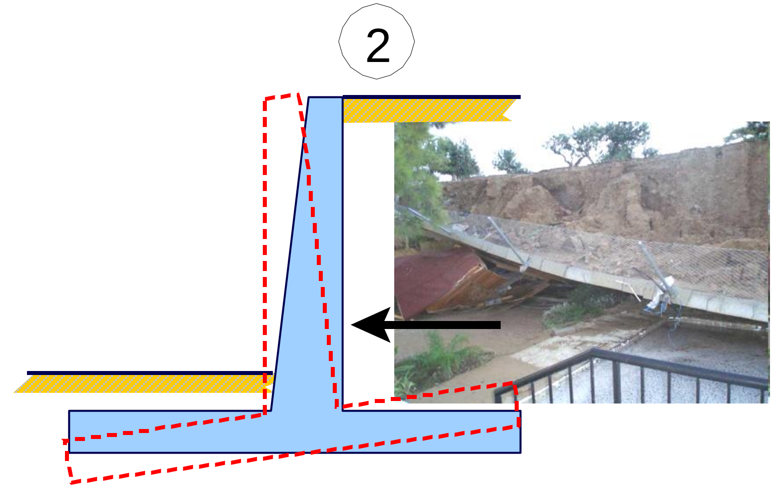
Design of Retaining Wall

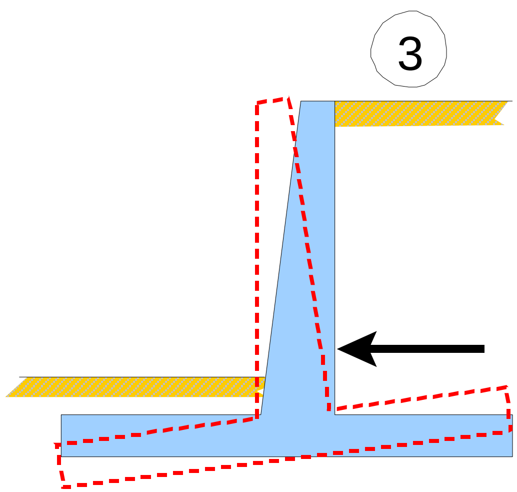
1- External Stability
2- Internal Stability

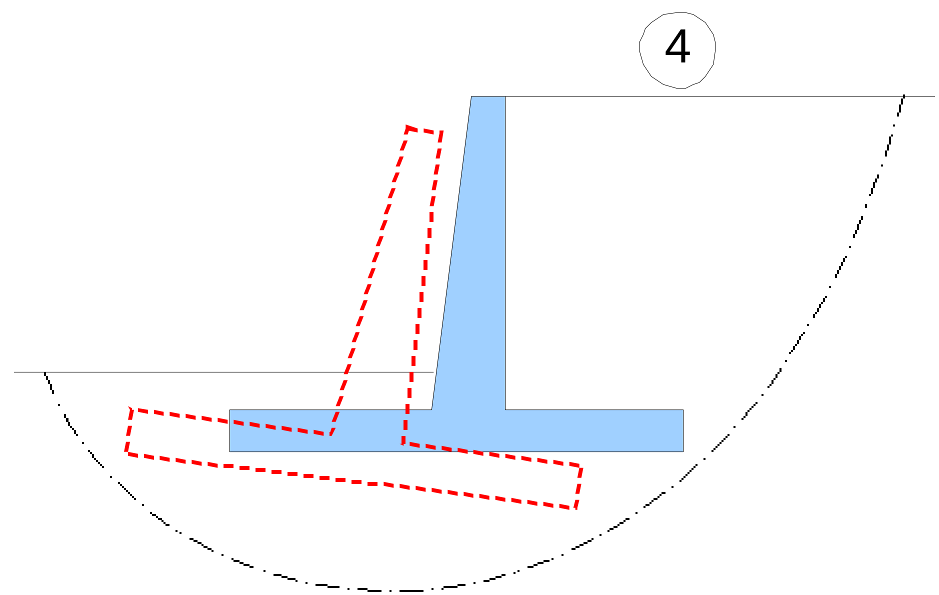




1. External Stability

1- Sliding
2- Overturning
3- Settlement
4- Overall Failure





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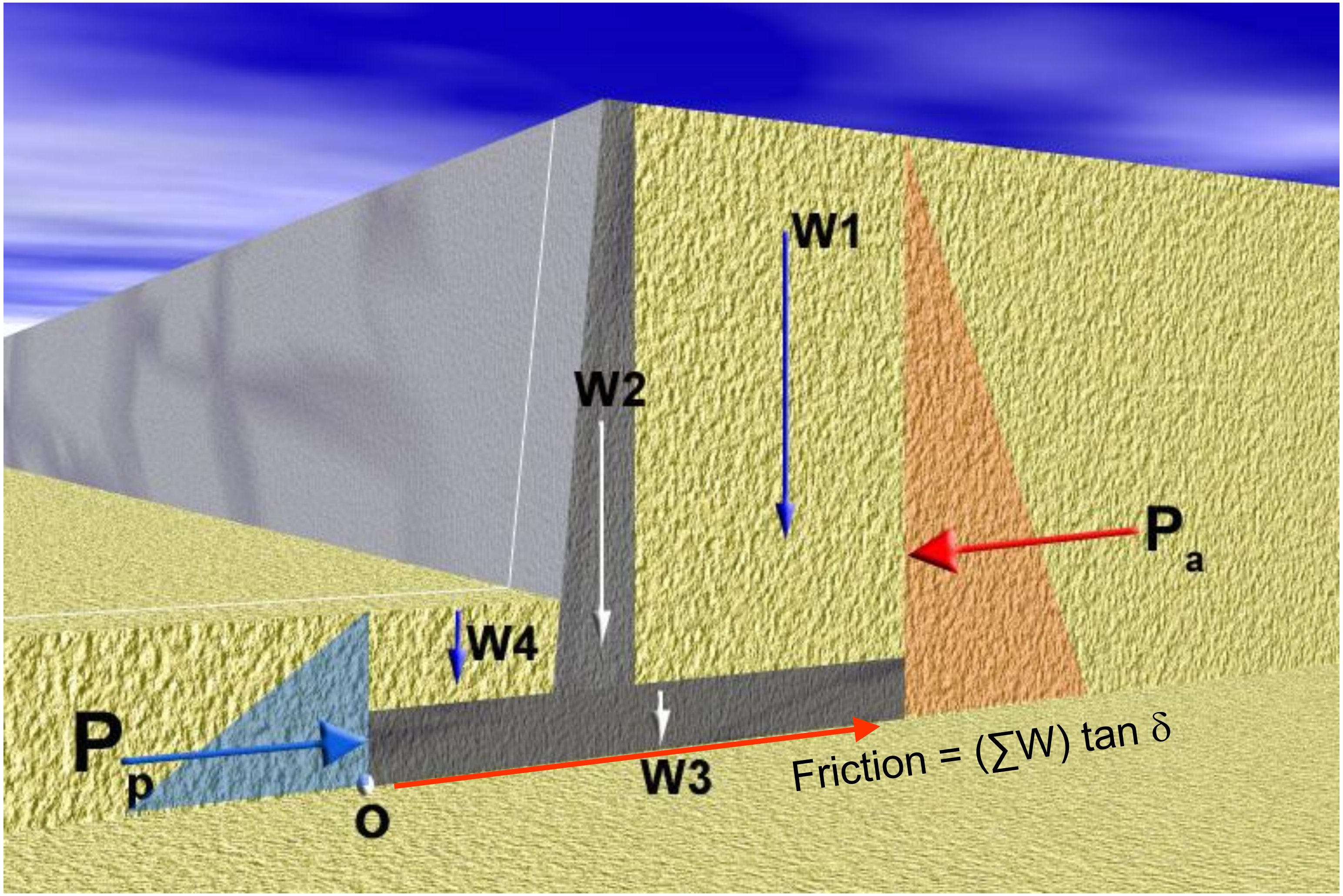
I. External Stability

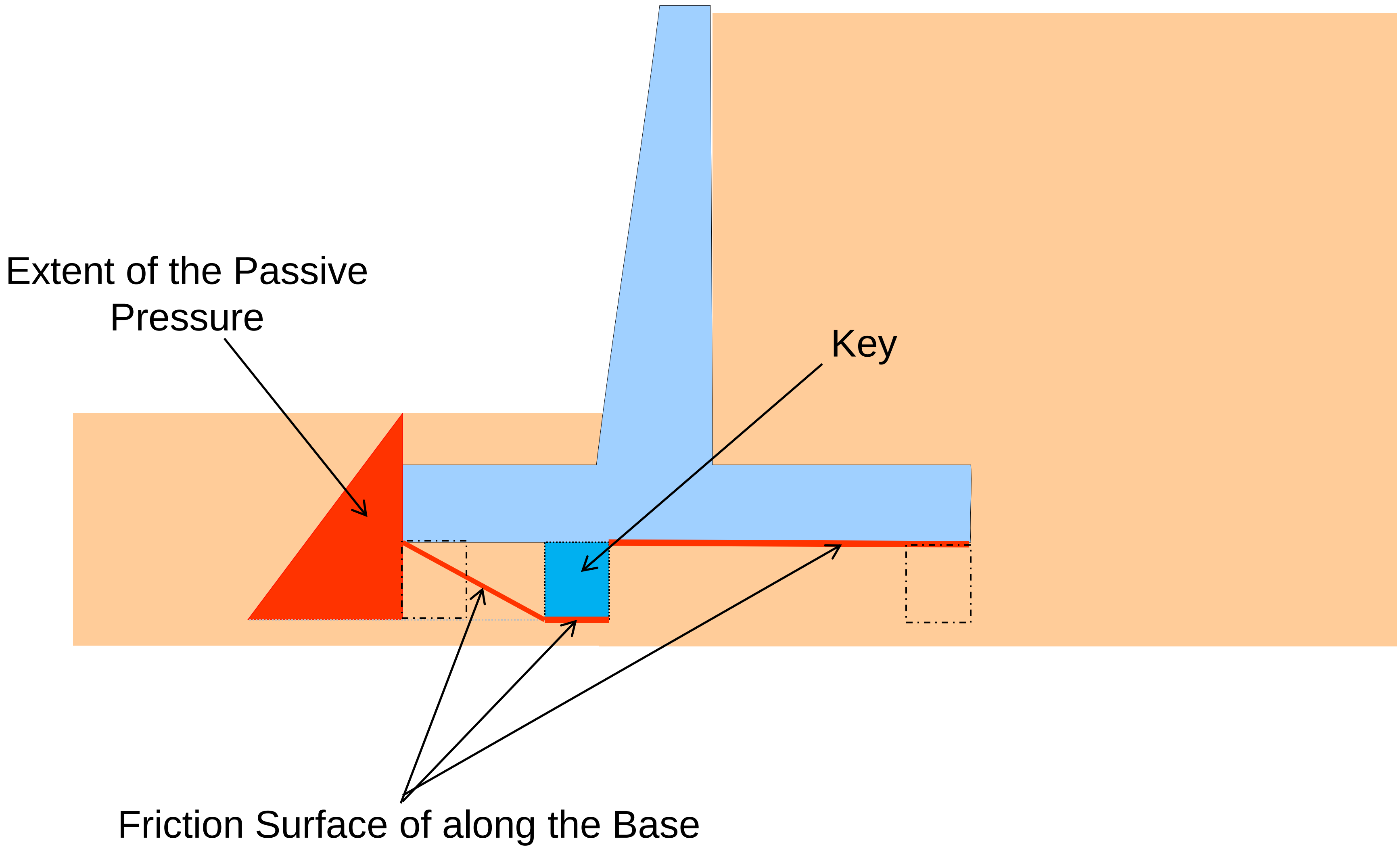
1- Sliding

$$\text{Factor of Safety Against Sliding} = \frac{\text{Resisting Force}}{\text{Driving Force}} = \frac{F_R}{F_D}$$



$$F_D = P_a \qquad\qquad F_R = P_p + \text{Friction}$$

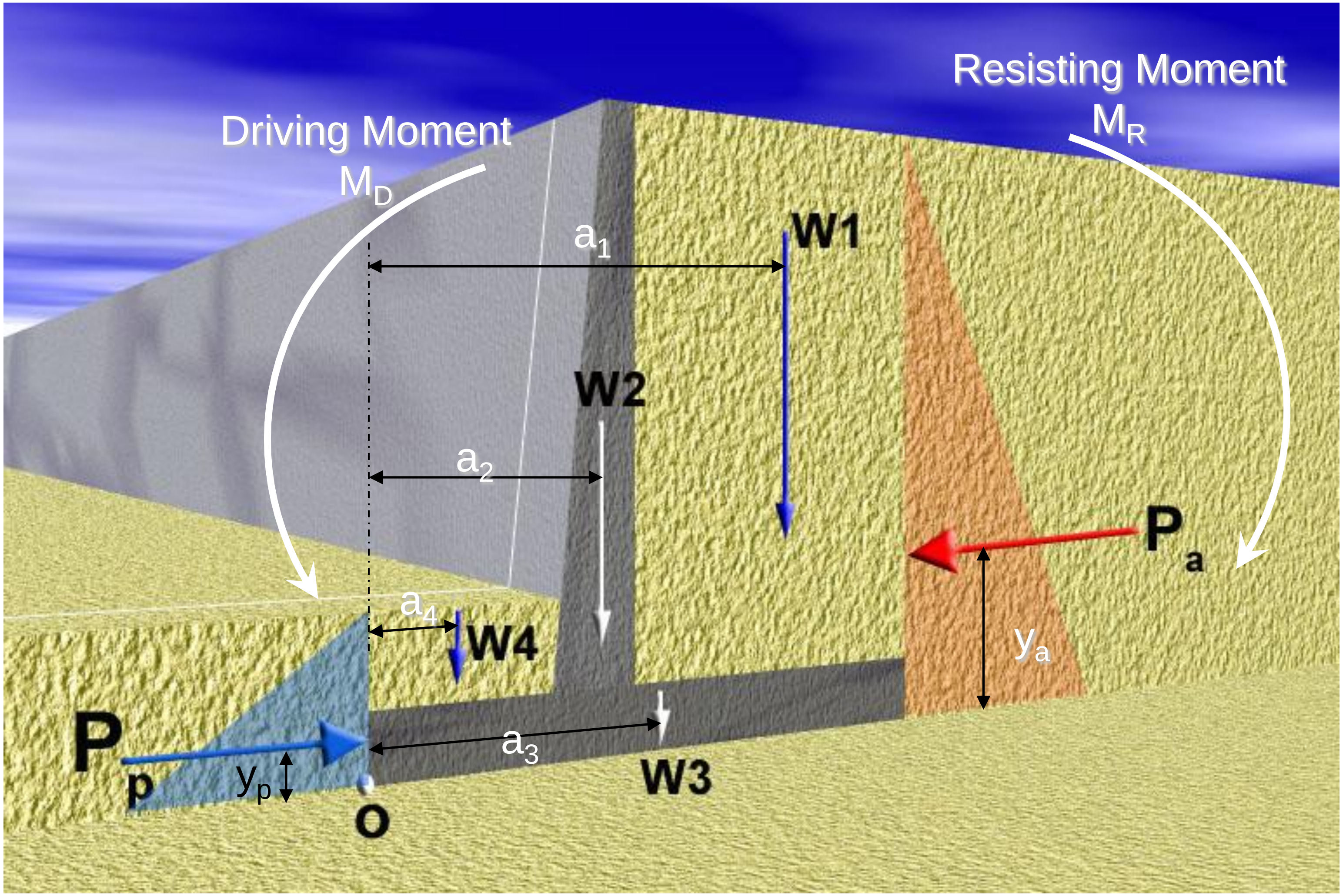
Using Key at the Base to Improve Sliding Resistance



I. External Stability

2- Overturning

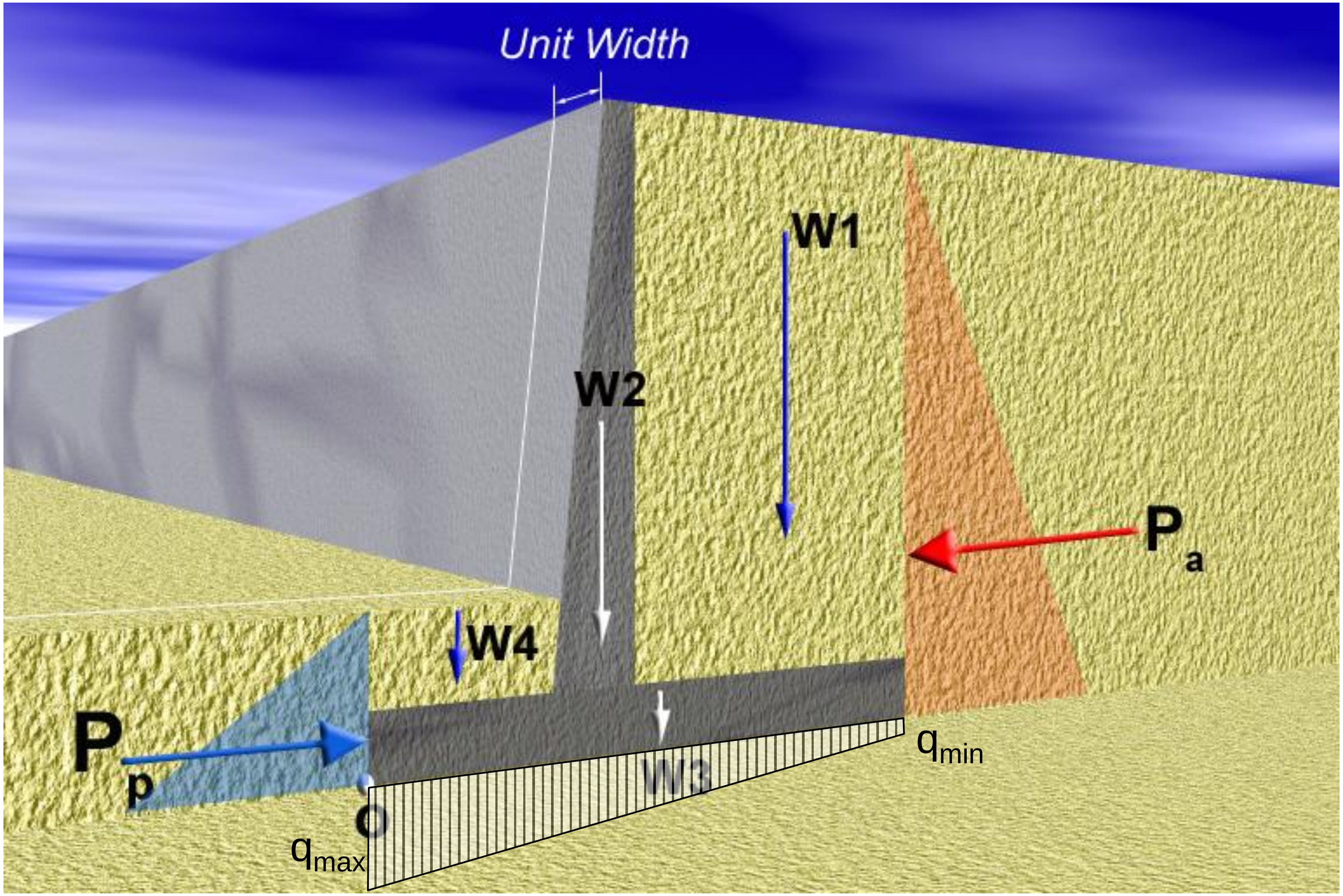
Factor of Safety Against Sliding = $\frac{\text{Resisting Moment}}{\text{Driving Moment}} = \frac{M_R}{M_D}$



Moment About o $M_D = P_a \cdot y_a$ $M_R = P_p . y_p + W_1 a_1 + W_2 a_2 + W_3 a_3 + W_4 a_4$

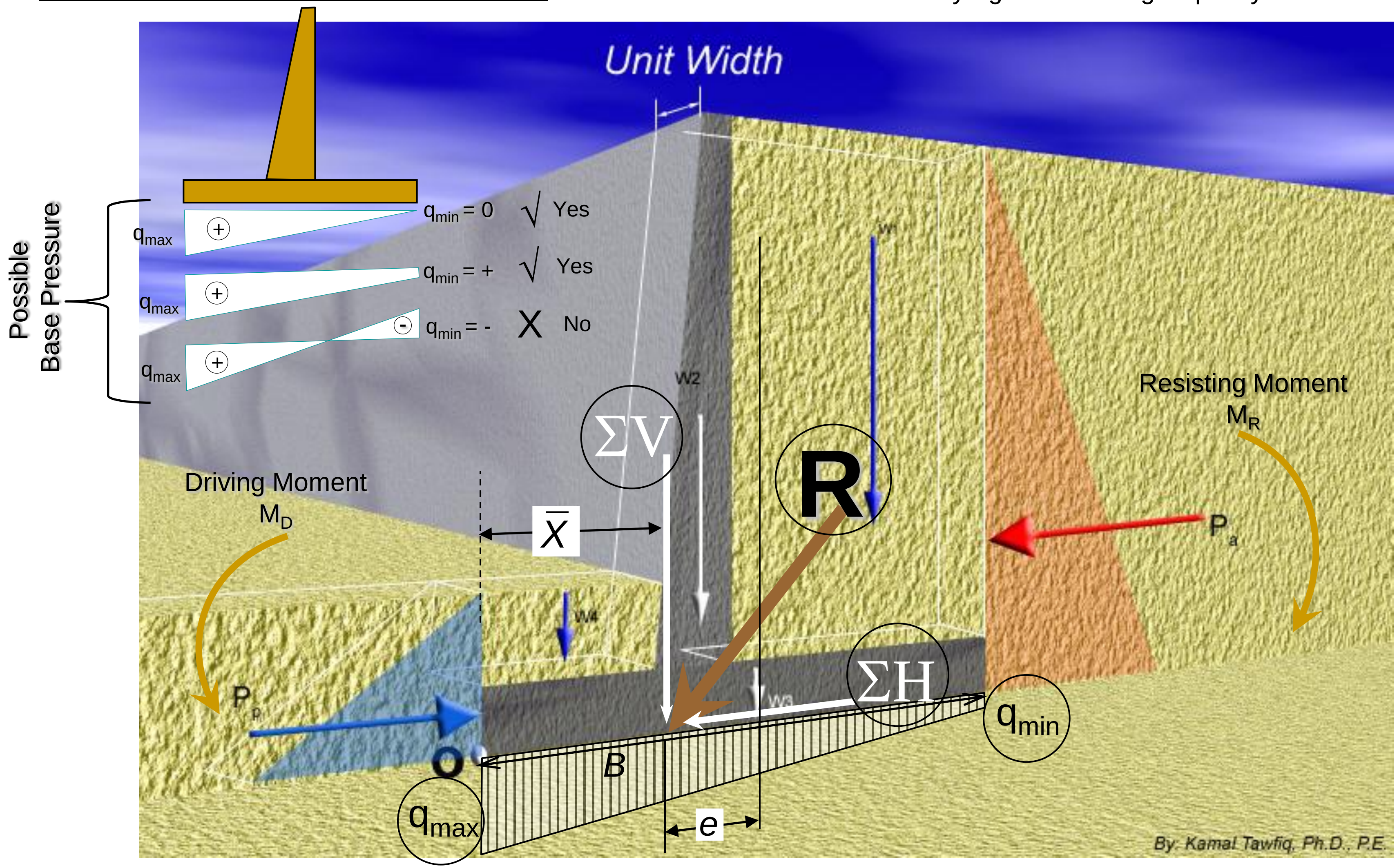
I. External Stability

3- Check for Base Pressure



3- Check for Base Pressure

$$\text{Factor of Safety Against Bearing Capacity Failure} = \frac{q_{all}}{q_{max}}$$



ΣV = sum of all vertical loads

ΣH = sum of all horizontal loads

$$R = \sqrt{(\Sigma V)^2 + (\Sigma H)^2}$$

$$M_{net} = \Sigma M_R - \Sigma M_D$$

$$\bar{X} = \frac{M_{net}}{\Sigma V}$$

$$e = \frac{B}{2} - \bar{X}$$

$$q = \frac{\Sigma V}{A} \pm \frac{M_{net}\, y}{I}$$

$$q_{\substack{max \\ min}} = \frac{\Sigma V}{B}\left(1 \pm \frac{6e}{B}\right)$$

Retaining Wall Design

Internal Stability

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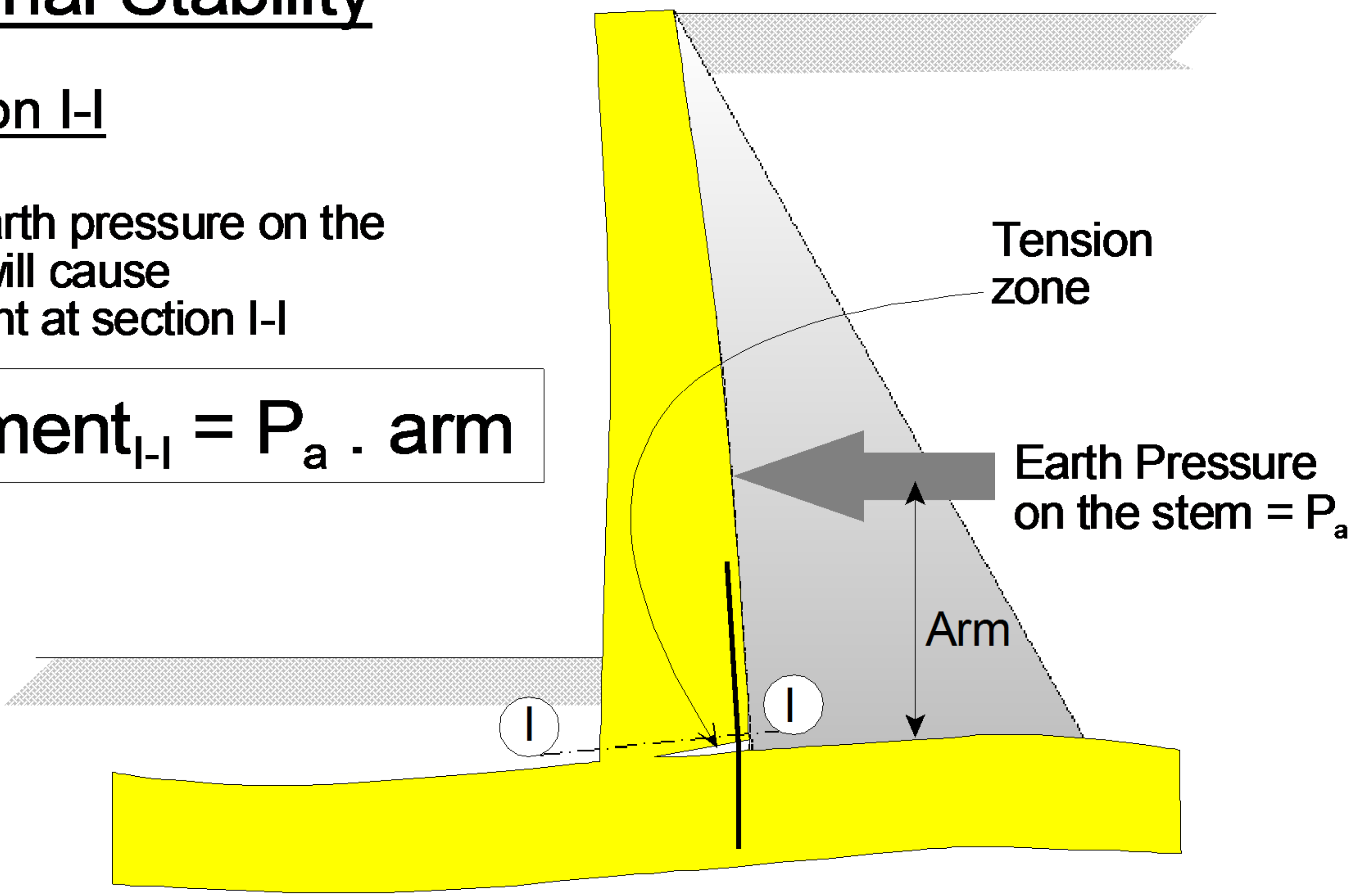
Internal Stability

Section I-I

The earth pressure on the stem will cause moment at section I-I

$$\text{Moment}_{I\text{-}I} = P_a \cdot \text{arm}$$

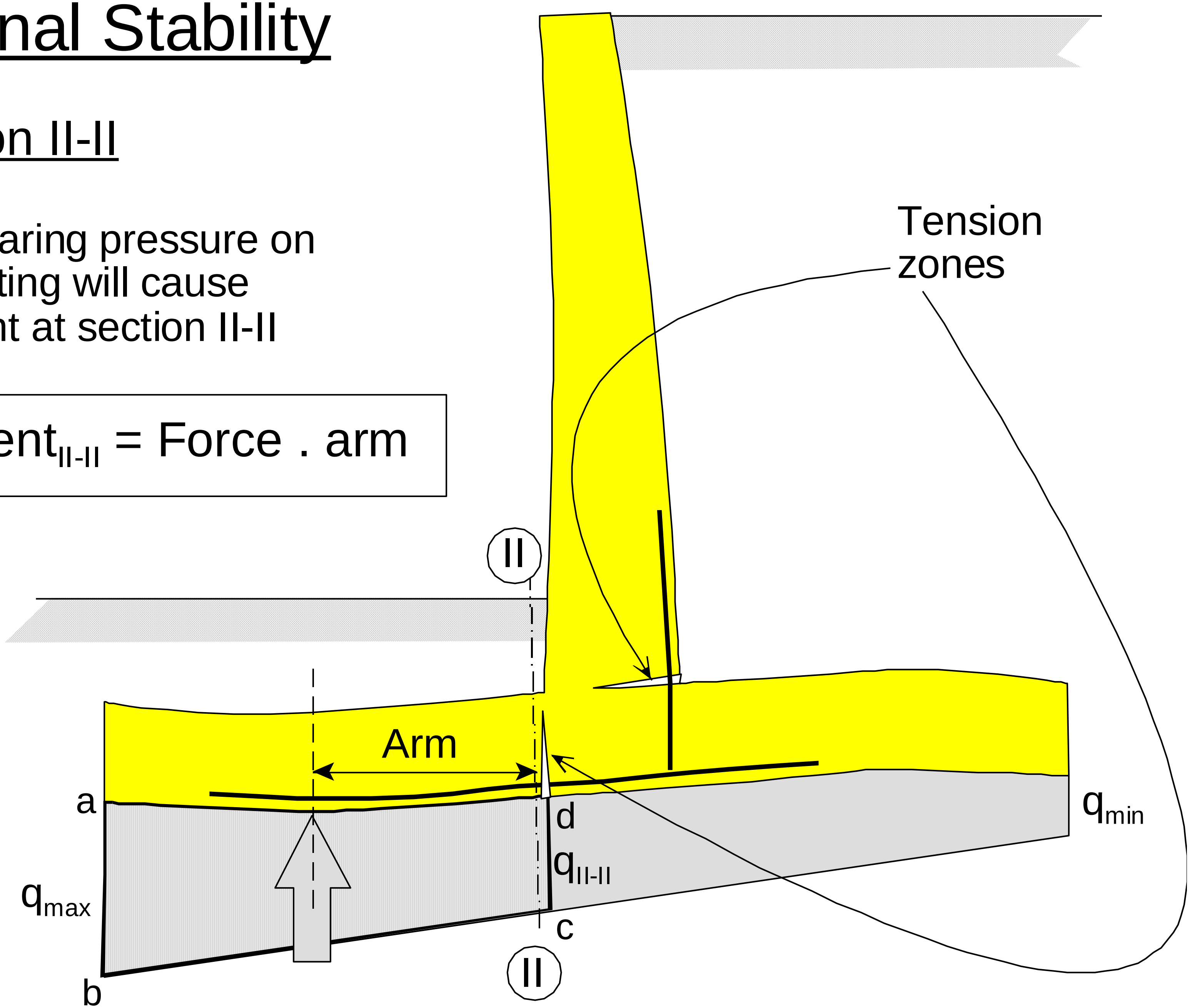


Internal Stability

Section II-II

The bearing pressure on the footing will cause moment at section II-II

$$\text{Moment}_{II\text{-}II} = \text{Force} \cdot \text{arm}$$



Force =Area *abcd*

Internal Stability

Section III-III

The bearing eressure on the stem will cause moment at section III - III

$$\text{Moment}_{II-II} = \text{Net Force . arm}$$