**SINGLE-SPAN GIRDER ( REACTIONS AND MOMENTS )**

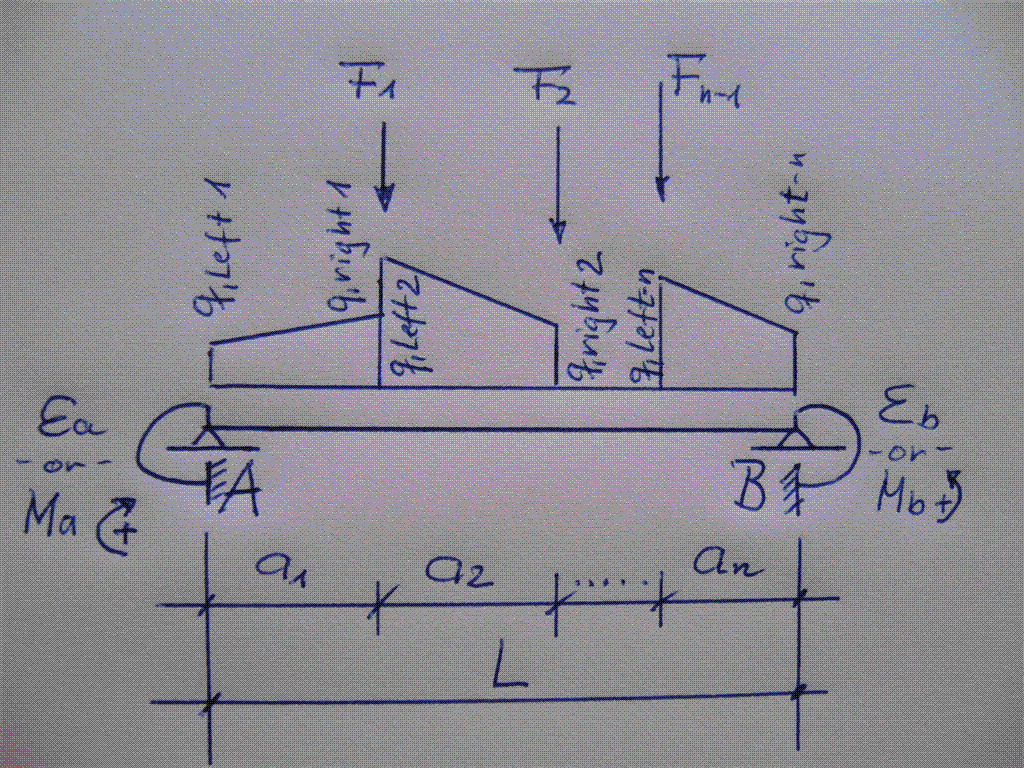
*Name:* **SingleSpan**v1.2

The program calculates for a beam with any number of sections the reaction forces and moments.

Each section i may have a trapezoidal load consisting of q,lefti and q,righti and one point load Fi

at the right end of the section. Both ends of the girder may have elastic restraints epsa and/or epsb, which may be in the range of ***0%*** *(no restraint, hinged) <= eps <=* ***100%*** *(rigid restraint, fixed)* (Fig. 1)*.*

If epsa(b) = 0 (no restraint), an external moment Ma(b) is optional instead at that support. Positive end moments cause tension at the bottom of the beam, cf fig. 1!

 fig. 1)

*Execution:*

Transfer the program to the Prime, select **SingleSpan()**  and complete the brackets by the quantity of the total length **L** to **SingleSpan(L)**. Then start the input for all sections from the left end of the beam ( support A ). Fill into the corresponding fields the section length ai, q,lefti, q,righti and Fi. Default values are Fi = 0 and ai+1 = L – sum(a1 to ai).

After the input of the last section you have to enter the degree of restraint epsa at end A in [%].

If epsa = 0, you may enter an external moment Ma acting in A instead. The same input has to be done for support B.

If you enter eps as a negative value ( eps < 0 ), this input is interpreted as the length **L,eps** of an adjacent field or column at that support having the consistent unit to L. It is assumed that the span and the adjoining field both have the **same** moment of inertia **I** and module of elasticity **E**, otherwise (–L,eps) has to be converted by:

**L,eps,convert = -k \* L,eps \* Ispan/Iadjoin**, where k = 1, if the distant support of the adjacent field (column) is hinged, otherwise ( if fixed ) k = 0.75 . In this case the appropriate eps is calculated by the formula: eps = 100 \* **L** / (**L**+**|L,eps|**) ).

E.g., for an adjoining field with **L,eps** = 4 m, **I,adjoin** = 1, **k** = 1, moment of inertia of the beam **I,span** = 2 and beam length **L** = 6 m you would have to enter:**L,eps,convert** = -1 \* 4 \* 2/1 = **-8**, which yields eps = 100 \* 6 / (6 + |-8|) = 42.9 % .

After that the results are displayed: support reaction at A and B, end moment at A, maximum field moment Mf with corresponding location xf ( from left support ) and right end moment Mb, as well.

After that you may input any location xi of the beam to calculate the shear force Qi and the moment Mi for this point. If xi coincides with a section end, both values Qi,left and Qi,right

are displayed to take into account a single load here. To leave this loop enter xi = 0.

Now you are asked to change any of the boundary conditions epsa, epsb, Ma, Mb ( yes = 1 ) or to

finish the calculation ( no = 0 ).

*EXAMPLE:*

Calculate the reaction forces and maximum field moment for the beam of fig. 2).

Start **SingleSpan()** and complete to **SingleSpan(6)**. Input for the first section:

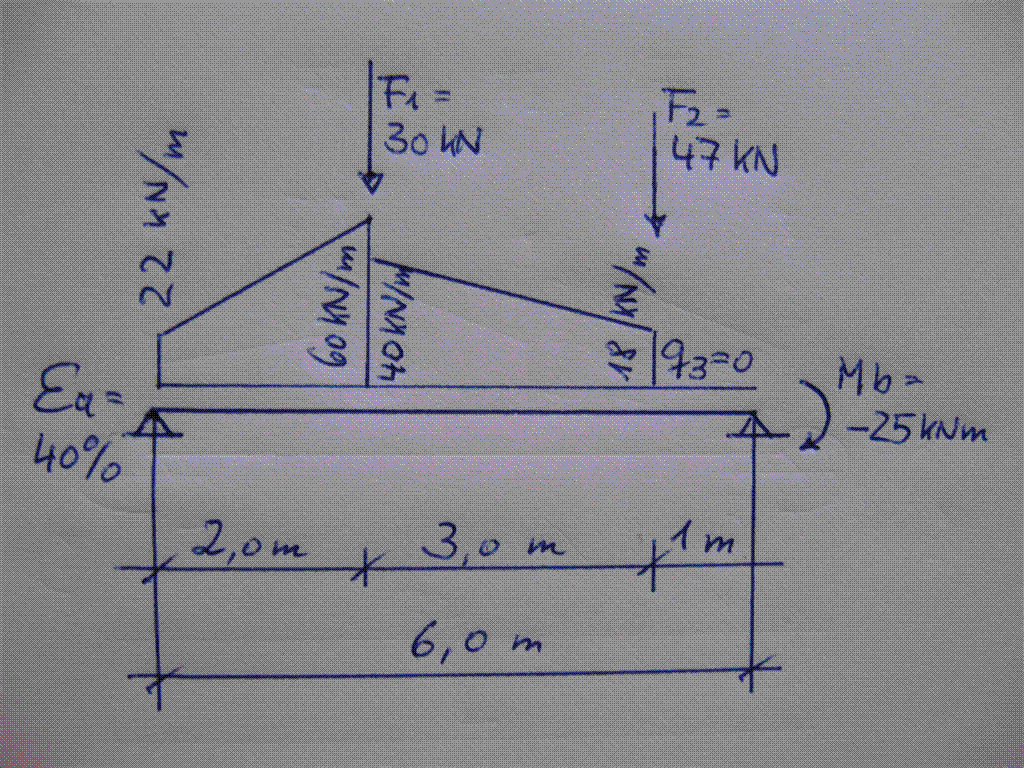
Length of section 1 = **2**, q,left-1 = **22**, q,right-1 = **60**, F-1 = **30** and press **Enter** and **OK**. Do so for section 2 **(** **3, 40, 18, 47)** and section 3 ( take over the value of the remaining length a**3** = **1** ),

then enter **0**, **0**, **0** and press **Enter OK**.

Now input: Restraint epsa [%] (neg.: L,eps,left) : **40 Enter OK**.

For support B enter: Restraint epsb [%] (neg.: L,eps,right) : **0** and continue:

M,b ( anticlockwise: + ) = **-25 Enter OK**.

 fig. 2)

The results are:

Ma = -77.723 Mb = -25.000 . Press “ENTER” to get the moments:

A = 141.843 B = 104.157 Mf = 148.329 at xf = 2.806 . Press **Enter.** To find Qi and Mi at point xi = 2 (end of section a1), input now:

xi = **2 Enter**:

xi = 2.000 Qi,left = 59.843 Qi,right = 29.843 Mi = 136.629. ( Qi,left - F1 = Qi,right ! )

If you enter a value xi > L a relevant hint is displayed.

Press “enter” and input Qi, Mi at xi = **0** to leave this loop.

To finish the program enter in the screen New epsa, epsb, Ma, Mb? yes/no = 1/0: **0**.

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*Claus Dachselt*