

Engineering Report: Beam Analysis

Generated Using Python & PyLaTeX

February 1, 2026

Contents

0.1 Introduction

This report presents an analysis of a simply supported beam subjected to given loading conditions.

0.1.1 Beam Description

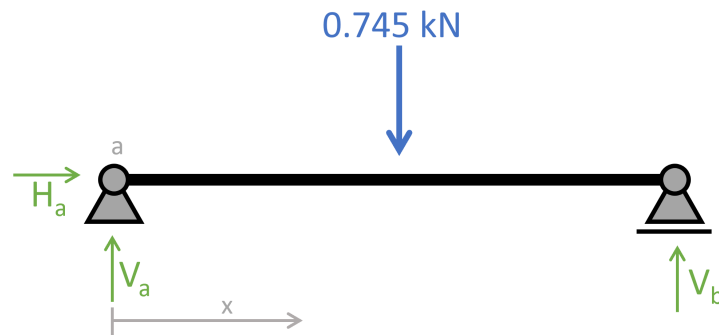


Figure 1: Simply Supported Beam

0.1.2 Data Source

The loading data was read from the provided Excel file using pandas.

0.2 Input Data: Force Table

Position (m)	Force (kN)
2	10
5	20
8	15

0.3 Analysis

0.3.1 Shear Force Diagram

[width=14cm, height=6cm, grid=both, xlabel=Position (m), ylabel=Shear Force (kN), thick,] [smooth, blue] coordinates (0.0,15.0) (0.02,15.0) (0.04,15.0) (0.06,15.0) (0.08,15.0) (0.1,15.0) (0.12,15.0) (0.14,15.0) (0.16,15.0) (0.18,15.0) (0.201,15.0) (0.221,15.0) (0.241,15.0) (0.261,15.0) (0.281,15.0) (0.301,15.0) (0.321,15.0) (0.341,15.0) (0.361,15.0) (0.381,15.0) (0.401,15.0) (0.421,15.0) (0.441,15.0) (0.461,15.0) (0.481,15.0) (0.501,15.0) (0.521,15.0) (0.541,15.0) (0.561,15.0) (0.581,15.0) (0.602,15.0) (0.622,15.0) (0.642,15.0) (0.662,15.0) (0.682,15.0) (0.702,15.0) (0.722,15.0) (0.742,15.0) (0.762,15.0) (0.782,15.0) (0.802,15.0) (0.822,15.0) (0.842,15.0) (0.862,15.0) (0.882,15.0) (0.902,15.0) (0.922,15.0) (0.942,15.0) (0.962,15.0) (0.982,15.0) (1.003,15.0) (1.023,15.0) (1.043,15.0) (1.063,15.0) (1.083,15.0) (1.103,15.0) (1.123,15.0) (1.143,15.0) (1.163,15.0) (1.183,15.0) (1.203,15.0) (1.223,15.0) (1.243,15.0) (1.263,15.0) (1.283,15.0) (1.303,15.0) (1.323,15.0) (1.343,15.0) (1.363,15.0) (1.383,15.0) (1.404,15.0) (1.424,15.0) (1.444,15.0) (1.464,15.0) (1.484,15.0) (1.504,15.0) (1.524,15.0) (1.544,15.0) (1.564,15.0) (1.584,15.0) (1.604,15.0) (1.624,15.0) (1.644,15.0) (1.664,15.0) (1.684,15.0) (1.704,15.0) (1.724,15.0) (1.744,15.0) (1.764,15.0) (1.784,15.0) (1.805,15.0) (1.825,15.0) (1.845,15.0) (1.865,15.0) (1.885,15.0) (1.905,15.0) (1.925,15.0) (1.945,15.0) (1.965,15.0) (1.985,15.0) (2.005,5.0) (2.025,5.0) (2.045,5.0) (2.065,5.0) (2.085,5.0) (2.105,5.0) (2.125,5.0) (2.145,5.0) (2.165,5.0) (2.185,5.0) (2.206,5.0) (2.226,5.0) (2.246,5.0) (2.266,5.0) (2.286,5.0) (2.306,5.0) (2.326,5.0) (2.346,5.0) (2.366,5.0) (2.386,5.0) (2.406,5.0) (2.426,5.0) (2.446,5.0) (2.466,5.0) (2.486,5.0) (2.506,5.0) (2.526,5.0) (2.546,5.0) (2.566,5.0) (2.586,5.0) (2.607,5.0) (2.627,5.0) (2.647,5.0) (2.667,5.0) (2.687,5.0) (2.707,5.0) (2.727,5.0) (2.747,5.0) (2.767,5.0) (2.787,5.0) (2.807,5.0) (2.827,5.0) (2.847,5.0) (2.867,5.0) (2.887,5.0) (2.907,5.0) (2.927,5.0) (2.947,5.0) (2.967,5.0) (2.987,5.0) (3.008,5.0) (3.028,5.0) (3.048,5.0) (3.068,5.0) (3.088,5.0) (3.108,5.0) (3.128,5.0) (3.148,5.0) (3.168,5.0) (3.188,5.0) (3.208,5.0) (3.228,5.0) (3.248,5.0) (3.268,5.0) (3.288,5.0) (3.308,5.0) (3.328,5.0) (3.348,5.0) (3.368,5.0) (3.388,5.0) (3.409,5.0) (3.429,5.0) (3.449,5.0) (3.469,5.0) (3.489,5.0) (3.509,5.0) (3.529,5.0) (3.549,5.0) (3.569,5.0) (3.589,5.0) (3.609,5.0) (3.629,5.0) (3.649,5.0) (3.669,5.0) (3.689,5.0) (3.709,5.0) (3.729,5.0) (3.749,5.0) (3.769,5.0) (3.789,5.0) (3.81,5.0) (3.83,5.0) (3.85,5.0) (3.87,5.0) (3.89,5.0) (3.91,5.0) (3.93,5.0) (3.95,5.0) (3.97,5.0) (3.99,5.0) (4.01,5.0) (4.03,5.0) (4.05,5.0) (4.07,5.0) (4.09,5.0) (4.11,5.0) (4.13,5.0) (4.15,5.0) (4.17,5.0) (4.19,5.0) (4.211,5.0) (4.231,5.0) (4.251,5.0) (4.271,5.0) (4.291,5.0) (4.311,5.0) (4.331,5.0) (4.351,5.0) (4.371,5.0) (4.391,5.0) (4.411,5.0) (4.431,5.0) (4.451,5.0) (4.471,5.0) (4.491,5.0) (4.511,5.0) (4.531,5.0) (4.551,5.0) (4.571,5.0) (4.591,5.0) (4.612,5.0) (4.632,5.0) (4.652,5.0) (4.672,5.0) (4.692,5.0) (4.712,5.0) (4.732,5.0) (4.752,5.0) (4.772,5.0) (4.792,5.0) (4.812,5.0) (4.832,5.0) (4.852,5.0) (4.872,5.0) (4.892,5.0) (4.912,5.0) (4.932,5.0) (4.952,5.0) (4.972,5.0) (4.992,5.0) (5.013,-15.0) (5.033,-15.0) (5.053,-15.0) (5.073,-15.0) (5.093,-15.0) (5.113,-15.0) (5.133,-15.0) (5.153,-15.0) (5.173,-15.0) (5.193,-15.0) (5.213,-15.0) (5.233,-15.0) (5.253,-15.0) (5.273,-15.0) (5.293,-15.0) (5.313,-15.0) (5.333,-15.0) (5.353,-15.0) (5.373,-15.0) (5.393,-15.0) (5.414,-15.0) (5.434,-15.0) (5.454,-15.0) (5.474,-15.0) (5.494,-15.0) (5.514,-15.0) (5.534,-15.0) (5.554,-15.0) (5.574,-15.0) (5.594,-15.0)

(5.614,-15.0) (5.634,-15.0) (5.654,-15.0) (5.674,-15.0) (5.694,-15.0) (5.714,-15.0)
(5.734,-15.0) (5.754,-15.0) (5.774,-15.0) (5.794,-15.0) (5.815,-15.0) (5.835,-15.0)
(5.855,-15.0) (5.875,-15.0) (5.895,-15.0) (5.915,-15.0) (5.935,-15.0) (5.955,-15.0)
(5.975,-15.0) (5.995,-15.0) (6.015,-15.0) (6.035,-15.0) (6.055,-15.0) (6.075,-15.0)
(6.095,-15.0) (6.115,-15.0) (6.135,-15.0) (6.155,-15.0) (6.175,-15.0) (6.195,-15.0)
(6.216,-15.0) (6.236,-15.0) (6.256,-15.0) (6.276,-15.0) (6.296,-15.0) (6.316,-15.0)
(6.336,-15.0) (6.356,-15.0) (6.376,-15.0) (6.396,-15.0) (6.416,-15.0) (6.436,-15.0)
(6.456,-15.0) (6.476,-15.0) (6.496,-15.0) (6.516,-15.0) (6.536,-15.0) (6.556,-15.0)
(6.576,-15.0) (6.596,-15.0) (6.617,-15.0) (6.637,-15.0) (6.657,-15.0) (6.677,-15.0)
(6.697,-15.0) (6.717,-15.0) (6.737,-15.0) (6.757,-15.0) (6.777,-15.0) (6.797,-15.0)
(6.817,-15.0) (6.837,-15.0) (6.857,-15.0) (6.877,-15.0) (6.897,-15.0) (6.917,-15.0)
(6.937,-15.0) (6.957,-15.0) (6.977,-15.0) (6.997,-15.0) (7.018,-15.0) (7.038,-15.0)
(7.058,-15.0) (7.078,-15.0) (7.098,-15.0) (7.118,-15.0) (7.138,-15.0) (7.158,-15.0)
(7.178,-15.0) (7.198,-15.0) (7.218,-15.0) (7.238,-15.0) (7.258,-15.0) (7.278,-15.0)
(7.298,-15.0) (7.318,-15.0) (7.338,-15.0) (7.358,-15.0) (7.378,-15.0) (7.398,-15.0)
(7.419,-15.0) (7.439,-15.0) (7.459,-15.0) (7.479,-15.0) (7.499,-15.0) (7.519,-15.0)
(7.539,-15.0) (7.559,-15.0) (7.579,-15.0) (7.599,-15.0) (7.619,-15.0) (7.639,-15.0)
(7.659,-15.0) (7.679,-15.0) (7.699,-15.0) (7.719,-15.0) (7.739,-15.0) (7.759,-15.0)
(7.779,-15.0) (7.799,-15.0) (7.82,-15.0) (7.84,-15.0) (7.86,-15.0) (7.88,-15.0) (7.9,-
15.0) (7.92,-15.0) (7.94,-15.0) (7.96,-15.0) (7.98,-15.0) (8.0,-30.0) ;

0.3.2 Bending Moment Diagram

[width=14cm, height=6cm, grid=both, xlabel=Position (m), ylabel=Bending
Moment (kNm), thick,] [smooth, red] coordinates (0.0,0.0) (0.02,0.301) (0.04,0.602)
(0.06,0.902) (0.08,1.203) (0.1,1.504) (0.12,1.805) (0.14,2.105) (0.16,2.406) (0.18,2.707)
(0.201,3.008) (0.221,3.308) (0.241,3.609) (0.261,3.91) (0.281,4.211) (0.301,4.511)
(0.321,4.812) (0.341,5.113) (0.361,5.414) (0.381,5.714) (0.401,6.015) (0.421,6.316)
(0.441,6.617) (0.461,6.917) (0.481,7.218) (0.501,7.519) (0.521,7.82) (0.541,8.12)
(0.561,8.421) (0.581,8.722) (0.602,9.023) (0.622,9.323) (0.642,9.624) (0.662,9.925)
(0.682,10.226) (0.702,10.526) (0.722,10.827) (0.742,11.128) (0.762,11.429) (0.782,11.729)
(0.802,12.03) (0.822,12.331) (0.842,12.632) (0.862,12.932) (0.882,13.233) (0.902,13.534)
(0.922,13.835) (0.942,14.135) (0.962,14.436) (0.982,14.737) (1.003,15.038) (1.023,15.338)
(1.043,15.639) (1.063,15.94) (1.083,16.241) (1.103,16.541) (1.123,16.842) (1.143,17.143)
(1.163,17.444) (1.183,17.744) (1.203,18.045) (1.223,18.346) (1.243,18.647) (1.263,18.947)
(1.283,19.248) (1.303,19.549) (1.323,19.85) (1.343,20.15) (1.363,20.451) (1.383,20.752)
(1.404,21.053) (1.424,21.353) (1.444,21.654) (1.464,21.955) (1.484,22.256) (1.504,22.556)
(1.524,22.857) (1.544,23.158) (1.564,23.459) (1.584,23.759) (1.604,24.06) (1.624,24.361)
(1.644,24.662) (1.664,24.962) (1.684,25.263) (1.704,25.564) (1.724,25.865) (1.744,26.165)
(1.764,26.466) (1.784,26.767) (1.805,27.068) (1.825,27.368) (1.845,27.669) (1.865,27.97)
(1.885,28.271) (1.905,28.571) (1.925,28.872) (1.945,29.173) (1.965,29.474) (1.985,29.774)
(2.005,30.025) (2.025,30.125) (2.045,30.226) (2.065,30.326) (2.085,30.426) (2.105,30.526)
(2.125,30.627) (2.145,30.727) (2.165,30.827) (2.185,30.927) (2.206,31.028) (2.226,31.128)
(2.246,31.228) (2.266,31.328) (2.286,31.429) (2.306,31.529) (2.326,31.629) (2.346,31.729)
(2.366,31.83) (2.386,31.93) (2.406,32.03) (2.426,32.13) (2.446,32.231) (2.466,32.331)
(2.486,32.431) (2.506,32.531) (2.526,32.632) (2.546,32.732) (2.566,32.832) (2.586,32.932)

(2.607,33.033) (2.627,33.133) (2.647,33.233) (2.667,33.333) (2.687,33.434) (2.707,33.534)
 (2.727,33.634) (2.747,33.734) (2.767,33.835) (2.787,33.935) (2.807,34.035) (2.827,34.135)
 (2.847,34.236) (2.867,34.336) (2.887,34.436) (2.907,34.536) (2.927,34.637) (2.947,34.737)
 (2.967,34.837) (2.987,34.937) (3.008,35.038) (3.028,35.138) (3.048,35.238) (3.068,35.338)
 (3.088,35.439) (3.108,35.539) (3.128,35.639) (3.148,35.739) (3.168,35.84) (3.188,35.94)
 (3.208,36.04) (3.228,36.14) (3.248,36.241) (3.268,36.341) (3.288,36.441) (3.308,36.541)
 (3.328,36.642) (3.348,36.742) (3.368,36.842) (3.388,36.942) (3.409,37.043) (3.429,37.143)
 (3.449,37.243) (3.469,37.343) (3.489,37.444) (3.509,37.544) (3.529,37.644) (3.549,37.744)
 (3.569,37.845) (3.589,37.945) (3.609,38.045) (3.629,38.145) (3.649,38.246) (3.669,38.346)
 (3.689,38.446) (3.709,38.546) (3.729,38.647) (3.749,38.747) (3.769,38.847) (3.789,38.947)
 (3.81,39.048) (3.83,39.148) (3.85,39.248) (3.87,39.348) (3.89,39.449) (3.91,39.549)
 (3.93,39.649) (3.95,39.749) (3.97,39.85) (3.99,39.95) (4.01,40.05) (4.03,40.15) (4.05,40.251)
 (4.07,40.351) (4.09,40.451) (4.11,40.551) (4.13,40.652) (4.15,40.752) (4.17,40.852)
 (4.19,40.952) (4.211,41.053) (4.231,41.153) (4.251,41.253) (4.271,41.353) (4.291,41.454)
 (4.311,41.554) (4.331,41.654) (4.351,41.754) (4.371,41.855) (4.391,41.955) (4.411,42.055)
 (4.431,42.155) (4.451,42.256) (4.471,42.356) (4.491,42.456) (4.511,42.556) (4.531,42.657)
 (4.551,42.757) (4.571,42.857) (4.591,42.957) (4.612,43.058) (4.632,43.158) (4.652,43.258)
 (4.672,43.358) (4.692,43.459) (4.712,43.559) (4.732,43.659) (4.752,43.759) (4.772,43.86)
 (4.792,43.96) (4.812,44.06) (4.832,44.16) (4.852,44.261) (4.872,44.361) (4.892,44.461)
 (4.912,44.561) (4.932,44.662) (4.952,44.762) (4.972,44.862) (4.992,44.962) (5.013,44.812)
 (5.033,44.511) (5.053,44.211) (5.073,43.91) (5.093,43.609) (5.113,43.308) (5.133,43.008)
 (5.153,42.707) (5.173,42.406) (5.193,42.105) (5.213,41.805) (5.233,41.504) (5.253,41.203)
 (5.273,40.902) (5.293,40.602) (5.313,40.301) (5.333,40.0) (5.353,39.699) (5.373,39.398)
 (5.393,39.098) (5.414,38.797) (5.434,38.496) (5.454,38.195) (5.474,37.895) (5.494,37.594)
 (5.514,37.293) (5.534,36.992) (5.554,36.692) (5.574,36.391) (5.594,36.09) (5.614,35.789)
 (5.634,35.489) (5.654,35.188) (5.674,34.887) (5.694,34.586) (5.714,34.286) (5.734,33.985)
 (5.754,33.684) (5.774,33.383) (5.794,33.083) (5.815,32.782) (5.835,32.481) (5.855,32.18)
 (5.875,31.88) (5.895,31.579) (5.915,31.278) (5.935,30.977) (5.955,30.677) (5.975,30.376)
 (5.995,30.075) (6.015,29.774) (6.035,29.474) (6.055,29.173) (6.075,28.872) (6.095,28.571)
 (6.115,28.271) (6.135,27.97) (6.155,27.669) (6.175,27.368) (6.195,27.068) (6.216,26.767)
 (6.236,26.466) (6.256,26.165) (6.276,25.865) (6.296,25.564) (6.316,25.263) (6.336,24.962)
 (6.356,24.662) (6.376,24.361) (6.396,24.06) (6.416,23.759) (6.436,23.459) (6.456,23.158)
 (6.476,22.857) (6.496,22.556) (6.516,22.256) (6.536,21.955) (6.556,21.654) (6.576,21.353)
 (6.596,21.053) (6.617,20.752) (6.637,20.451) (6.657,20.15) (6.677,19.85) (6.697,19.549)
 (6.717,19.248) (6.737,18.947) (6.757,18.647) (6.777,18.346) (6.797,18.045) (6.817,17.744)
 (6.837,17.444) (6.857,17.143) (6.877,16.842) (6.897,16.541) (6.917,16.241) (6.937,15.94)
 (6.957,15.639) (6.977,15.338) (6.997,15.038) (7.018,14.737) (7.038,14.436) (7.058,14.135)
 (7.078,13.835) (7.098,13.534) (7.118,13.233) (7.138,12.932) (7.158,12.632) (7.178,12.331)
 (7.198,12.03) (7.218,11.729) (7.238,11.429) (7.258,11.128) (7.278,10.827) (7.298,10.526)
 (7.318,10.226) (7.338,9.925) (7.358,9.624) (7.378,9.323) (7.398,9.023) (7.419,8.722)
 (7.439,8.421) (7.459,8.12) (7.479,7.82) (7.499,7.519) (7.519,7.218) (7.539,6.917)
 (7.559,6.617) (7.579,6.316) (7.599,6.015) (7.619,5.714) (7.639,5.414) (7.659,5.113)
 (7.679,4.812) (7.699,4.511) (7.719,4.211) (7.739,3.91) (7.759,3.609) (7.779,3.308)
 (7.799,3.008) (7.82,2.707) (7.84,2.406) (7.86,2.105) (7.88,1.805) (7.9,1.504) (7.92,1.203)
 (7.94,0.902) (7.96,0.602) (7.98,0.301) (8.0,0.0) ;

0.4 Summary

A Shear Force Diagram (SFD) shows how internal shear force varies along the beam.

A Bending Moment Diagram (BMD) shows how internal bending varies along the beam.