

**PILES AND PILE-DRIVING: BEING A
REPRINT OF SOME OF THE ARTICLES
WHICH HAVE APPEARED IN
ENGINEERING NEWS ON PILE DRIVING
AND THE SAFE LOAD OF PILES AND OF
THE PAMPHLET ON "BEARING PILES"**

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Piles and Pile-Driving: Being a Reprint of Some of the Articles Which Have Appeared in Engineering News on Pile Driving and the Safe Load of Piles and of the Pamphlet On "Bearing Piles" by Rudolph Hering & A. M. Wellington

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RUDOLPH HERING & A. M. WELLINGTON

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PREFACE.

The following work contains a reprint of some of the more important articles on the subject of "Bearing Piles," which have appeared from time to time in Engineering News, including especially those in which what has since become known as the "Engineering News Formula" for the safe load of piles was announced, explained and defended. It also includes a reprint of a valuable pamphlet on "Bearing Piles," by Rudolph Hering, M. Am. Soc. C. E., which was published some years ago by the Engineering News Publishing Co., but long since went out of print; and a full abstract of a paper by Mr. Foster Crowell before the American Society of Civil Engineers on "Uniform Practice in Pile Driving" with the discussions thereon.

It is believed that this little volume contains about all that can be required in any case for solving the most serious problem connected with pile-driving, what load can be placed on given piles with safety; but if it be desired to find fuller information as to specific records, the back files of Engineering News, of the Transactions of the American Society of Civil Engineers and of the Proceedings of the Institution of Civil Engineers should be consulted, as they all contain further information of value; though the more important information to be had from all these sources is given in substance in this volume.

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THE
SAFE LOAD FOR BEARING PILES.

CODE OF RULES FOR SAFE LOAD OF
PILES.

(The following article, reprinted from Engineering News of Nov. 17, 1892, was intended to give a codified summary of the net results of all the information which follows, so as to make it a trustworthy set of rules for good practice in pile driving, and it is believed to do so.)

In our issue of Dec. 29, 1888,* we published an article on the subject of "Formulas for the Safe Load of Bearing Piles," in which a simple formula for the safe load of piles was proposed which has since met with wide and increasing acceptance; so that we might fairly say, perhaps, that it is now one of the most generally approved for practical use, if not the most approved among those who know of it. We claimed for it then that it would be found more trustworthy than any one of 16 different formulas which were given in it, quoted from Mr. Hering's admirable monogram on "Bearing Piles."* The experience and opinions of others have since confirmed our belief that this claim was well founded, and especially a recent paper by Mr. J. Fos-

* Republished later in this volume.

ter Crowell* before the American Society of Civil Engineers and the valuable discussion which followed it.*

We do not propose now to enter upon any detailed discussion of this discussion; it would occupy too much space, and would only be repeating in other words what has been said with sufficient fulness, perhaps, in the discussions themselves. It will be obvious to every one who reads the discussions, however, that they have added certain facts to our knowledge of pile-driving, and suggested and collated still more facts or well founded opinions. What we now propose to do, therefore, is to combine and codify in the form of suggested "Rules of Practice for Pile Driving" all those facts which seem to us to be sufficiently well determined to be incorporated in such a code, adding in a following article certain explanatory notes and tabulations by way of comment. The following is our suggested code of

RULES OF PRACTICE FOR PILE-DRIVING AND SAFE LOAD OF PILES.

A: METHODS OF DRIVING PILES.

Six methods of driving piles are in established use, which in order of frequency of use are as follows:

1. By the ordinary pile driving, in which a hammer weighing 2,000 to 3,000 lbs. or more is dropped 20 to 30 ft. or more, falling free, with an interval of several seconds (5 to 20) between blows.

* This paper and the following discussions, which contain a great deal of interesting and valuable information about pile-driving, is republished in abstract later in this volume, but will be found in full in Trans. Am. Soc. C. E., Vol. XXVII (1892), p. 99-172 and p. 560.

2. The same as 1, with the important exceptions that (a) the hammer does not fall free, but is retarded by the rope and revolving drum, and (b) the blows succeed each other somewhat more quickly. (This method is an uncertain and often deliberately deceptive one, but properly used is legitimate as well as convenient.)

3. By the water jet, in which a stream of water under pressure is ejected at or near to the point of a pile and rises thence along its sides, removing most of the side and end resistance, so that the pile sinks rapidly by its own weight, with or without some extra pressure added. This method is suitable only for sandy or other fine soil, but in such soils is often very efficacious when no other is possible.

4. By direct pressure of an insistant weight. This method is applicable only to very wet soils (practically saturated with water) of a muddy or very fine silty nature, but in such soils is often the only effective way of driving.

5. By the Nasmyth or other like steam pile-driver, in which somewhat heavier hammers (usually 3,000 to 5,000 lbs.) falling through much shorter falls (usually about 3 ft.) strike very much quicker blows (usually more than 60 per minute), but otherwise the same in principle as Method 1.

6. By gunpowder pile drivers, in which each blow is a double one, the first caused by the fall of the hammer after the last explosion, and the second (following close upon the first, so that there is no intermission in the movement of the pile, but still distinct), by the reaction of the explosion which throws the hammer upward.