

# Pietra Serena



100 m

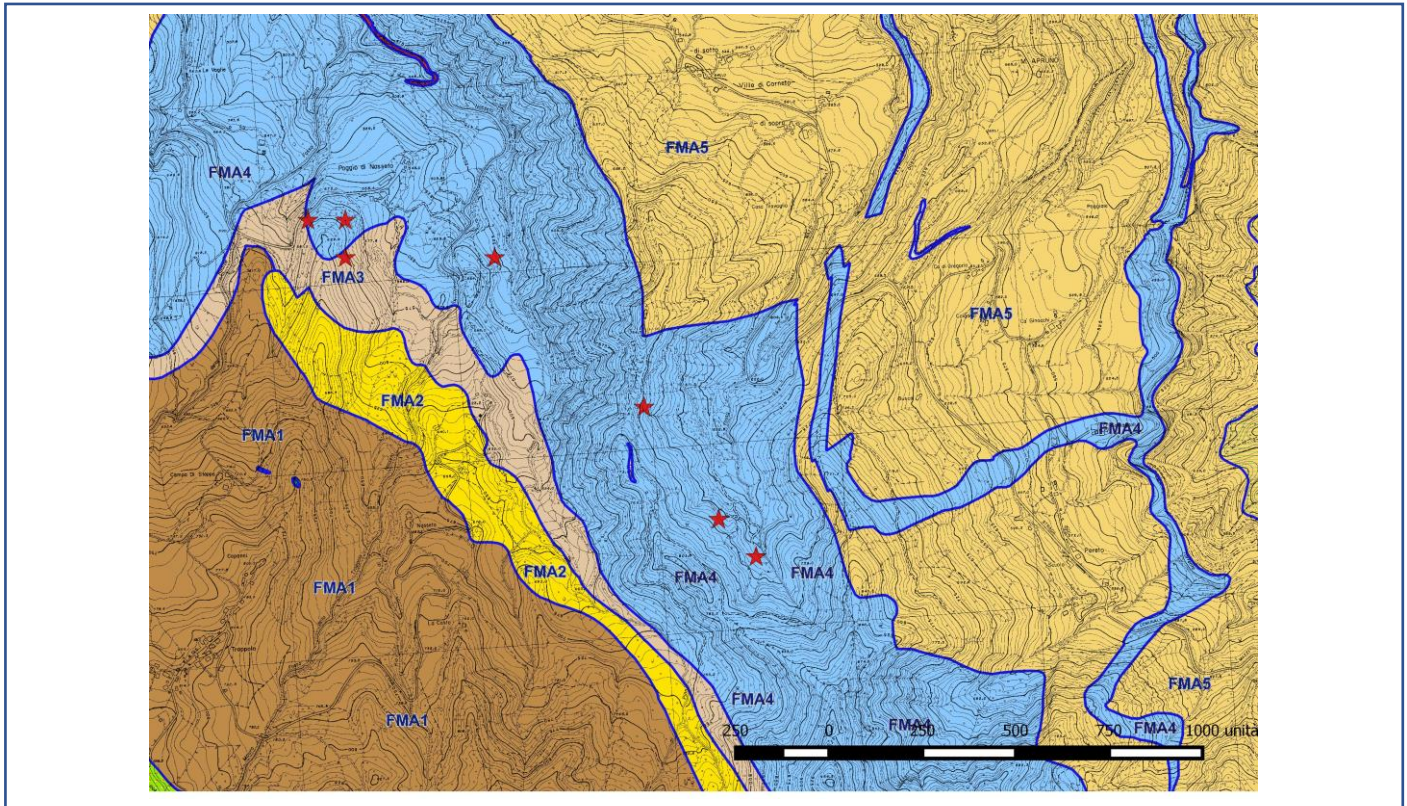
**Short description:**

“Pietra Serena” is a gray sandstone, notably and historically used in architecture and partly also in sculpture, typical of historical Tuscan architecture. The use of this term is quite widespread and commercially named “Pietra Serena” gray sandstones may derive from different geological units, mainly pertaining stratified silicoclastic turbidites of Oligocene to Miocene age, geologically pertaining the Tuscan and Umbro-Marchean-Romagna Sequences. In the eastern Romagna Apennines the “Pietra Serena” is quarried from the Formazione Marnoso-arenacea.

Photo: [https://www.eurocavesnc.com/foto/cave/canala/big/f\\_06.jpg](https://www.eurocavesnc.com/foto/cave/canala/big/f_06.jpg)

| Commodity (vocabulary) | Lithology (vocabulary) | Typical colour (code list) | Place of origin |                                       |                          |                      |
|------------------------|------------------------|----------------------------|-----------------|---------------------------------------|--------------------------|----------------------|
|                        |                        |                            | Country         | County / District / Province          | Municipality / Community | Place/town / Village |
| Sandstone              | Arenite                | Blue-grey                  | Italy           | Emilia-Romagna, Forli-Cesena province | Verghereto               | Corneto              |

# Geological setting



## Geology:

Stratified, tabular, medium to thick bedded marly-arenaceous turbidites; strata are made up by bottom layers of medium to fine-grained arenites, upgrading into marlstones. In the Romagna Apennines, the Pietra Serena derives from the Formazione Marnoso-arenacea, especially from the sub-unit Membro di Galeata (FMA4, in the map).

Derived from the Geological Map of the Emilia-Romagna Apennines, at the scale of 1:10.000 (simplified, i.e. slope, debris accumulations of Quaternary age are not represented).

In <https://ambiente.regione.emilia-romagna.it/it/geologia/cartografia/webgis-banchedati/webgis>, issued by the Servizio Geologico, Sismico e dei Suoli, Regione Emilia-Romagna.

**Production:** Quarries (centroids as red stars in the map) are mainly located in the Verghereto and Sarsina municipalities, in the Eastern Forlì-Cesena Apennines.

**Geological age:** Late Langhian-Early Serravallian

**Geological unit:** Membro di Galeata, Formazione Marnoso-arenacea

# Application, use and heritage



**Description:**

This stone is resistant and easy to work, frequently used in architecture, i.e. typically, in Tuscany during the Renaissance period.

Its pearly-gray, fine grained texture makes this stone simple and elegant. The stone texture is enriched with sparkling spots made of mica particles. The Pietra Serena is best suitable for ladders, flooring, columns, balconies, portals, fire places, covering, decorations, bathroom and kitchen tops. The particular beauty of this stone can be enhanced with a variety of finishings (after: [https://www.eurocavesnc.com/en/pietra\\_serena.php](https://www.eurocavesnc.com/en/pietra_serena.php))

In the photo (<https://www.eurocavesnc.com/en/realizzazione-en-port-channel-in-cesenatico>), an application of the Pietra Serena quarried in the Sarsina municipality: outdoor flooring for the restoration of the turistic Port Channel in Cesenatico, Forlì-Cesena province.

# Petrography



**Description:**

In the Easter Forlì-Cesena Apennines the Pietra Serena is made up of fine to very fine grained sandstones; the siliciclastic component (> 50%) is made up of quartz, feldspar, muscovite, biotite and predominantly phyllic lithic fragments. Among feldspars, plagioclase prevails over K-feldspar. The carbonate component is represented by terrigenous carbonate clasts, both micritic and spatitic, and by abundant cement.

**Source of information:**

<https://www.unionevallesavio.it/documents/1484590/5731062/2.+RELAZIONE+GEOLOGICO-MINERARIA-CON+ALLEGATO.pdf/225fb630-1890-4211-a26e-141a8269250b>

# Mineral composition

If no accurate number, use MM=main minerals, SM = Subordinate minerals, AM=accessory minerals

|               |               |               |               |               |               |               |
|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Mineral 1 (%) | Mineral 2 (%) | Mineral 3 (%) | Mineral 4 (%) | Mineral 5 (%) | Mineral 6 (%) | Mineral 7 (%) |
|               |               |               |               |               |               |               |
| Mineral 8 (%) | Mineral n (%) |               |               |               |               |               |
|               |               |               |               |               |               |               |

**Source of information:**

# Physical properties

|  |                                      |   |  |   |
|--|--------------------------------------|---|--|---|
| <b>Apparent density (EN 1936) kg/m<sup>3</sup></b> | <b>Open porosity (EN 1936) % vol</b> | <b>Water absorption at atmospheric pressure (EN 13755) % wt</b> | <b>Uniaxial Compressive strength (EN 1926) MPa</b> | <b>Flexural strength under concentrated load (EN 12372) MPa</b> |
|  |                                      |   |  |   |

|  |                                       |  |   |
|--|---------------------------------------|--|---|
| <b>Real density (EN 1936) kg/m<sup>3</sup></b> | <b>Total porosity (EN 1936) % vol</b> | <b>Water absorption coefficient by capillary (EN 1925) (g/m<sup>2</sup> x s<sup>0,5</sup>)</b> | <b>Flexural strength under constant moment (EN 13161) MPa</b> |
|  |                                       |  |   |

| <b>Frost resistance (EN 12371)</b>                          |                  |  |                  |   |
|---|------------------|--|------------------|---|
| <b>Technological Test (Test A)</b>                          |                  |  |                  | <b>Identification Test (Test B):</b><br>Number of cycles completed prior to stone failure |
| Flexural strength (EN 12372) after freeze-thaw cycling, MPa | Number of cycles | Uniaxial compressive strength (EN 1926) after freeze-thaw cycling, MPa | Number of cycles |   |
|   |                  |  |                  |   |

| <b>Resistance to ageing by thermal shock (EN 14066)</b>              |  |  |   |
|--|--|--|---|
| Change in dynamic modulus of elasticity (increase: +; decrease: -) % | Change in open porosity (increase: +; decrease: -) % | Change in ultrasound pulse velocity (increase: +; decrease: -) % | Change in flexural strength under conc. load (increase: +; decrease: -) % |
|  |  |  |   |

| <b>Abrasion resistance (EN 14157)</b>   |   |                                     | <b>Resistance to salt crystallisation (EN 12370)</b> | <b>Breaking load at dowel hole (EN 13364)</b> |                                     |
|---|---|-------------------------------------|--|---|-------------------------------------|
| Method A - Wide Wheel Abrasion Test, mm | Method B - Böhme Abrasion Test, cm <sup>3</sup> / 50cm <sup>2</sup> | Method C - Amsler Abrasion Test, mm | Change in mass (increase: +; decrease: -), %         | Breaking load, N                              | Thickness of the test specimens, mm |
|   |   |                                     |  |   |                                     |

| <b>Slip resistance by means of the pendulum tester (EN 14231 / CEN/TS 16165)</b> |                             |                    | <b>Rupture energy (EN 14158), Joule</b> | <b>Thermal Conductivity (EN 1745), W/m·K</b> |
|--|-----------------------------|--------------------|---|--|
| Tested surface finish  | Slip Resistance Value — SRV |                    |   |  |
|  | Dry test condition          | Wet test condition |   |  |
|  |                             |                    |   |  |

**Source of information:**

# Chemical properties

## Main elements

| SiO <sub>2</sub><br>(%) | Al <sub>2</sub> O <sub>3</sub><br>(%) | Fe <sub>2</sub> O <sub>3</sub><br>(%) | TiO <sub>2</sub><br>(%) | MgO<br>(%) | CaO<br>(%) | Na <sub>2</sub> O<br>(%) | K <sub>2</sub> O<br>(%) | MnO<br>(%) | P <sub>2</sub> O <sub>5</sub><br>(%) | SO <sub>3</sub><br>(%) | LOI<br>(%) |
|-------------------------|---------------------------------------|---------------------------------------|-------------------------|------------|------------|--------------------------|-------------------------|------------|--------------------------------------|------------------------|------------|
|                         |                                       |                                       |                         |            |            |                          |                         |            |                                      |                        |            |

## Trace elements

|          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|
| V (ppm)  | Cr (ppm) | Mn (ppm) | Co (ppm) | Ni (ppm) | Cu (ppm) | Zn (ppm) | As (ppm) |
|          |          |          |          |          |          |          |          |
| Sr (ppm) | Cd (ppm) | Ba (ppm) | Pb (ppm) | Be (ppm) | Rb (ppm) | Bi (ppm) | U (ppm)  |
|          |          |          |          |          |          |          |          |
| Sc (ppm) | Y (ppm)  | Th (ppm) | Sb (ppm) | Ta (ppm) | Nb (ppm) | Zr (ppm) | Sn (ppm) |
|          |          |          |          |          |          |          |          |
| Ag (ppm) | B (ppm)  | Mo (ppm) | W (ppm)  | Ga (ppm) | Ge (ppm) | Se (ppm) | Cs (ppm) |
|          |          |          |          |          |          |          |          |
| Tl (ppm) |          |          |          |          |          |          |          |
|          |          |          |          |          |          |          |          |


## REE

|          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|
| La (ppm) | Ce (ppm) | Pr (ppm) | Nd (ppm) | Sm (ppm) | Eu (ppm) | Gd (ppm) | Tb (ppm) |
|          |          |          |          |          |          |          |          |
| Dy (ppm) | Ho (ppm) | Er (ppm) | Tm (ppm) | Yb (ppm) | Lu (ppm) |          |          |
|          |          |          |          |          |          |          |          |

**Methods applied and source of information:**

## Sources of more information

| Type of information      | Name of provider  | URL |
|--------------------------|---|-----|
| This data sheet          | <p>Regione Emilia-Romagna, Servizio Geologico, Sismico e dei Suoli.</p> <p>Location of quarries: centroids of polygons derived from the Emilia-Romagna regional databases (in preparation), made available by the Servizio Difesa del Suolo, della Costa e Bonifica</p> |     |
| Non-commercial directory |   |     |
| Commercial directory     |   |     |
| Scientific publication   |   |     |
| Other publication        |   |     |

|                     |   |  |
|---------------------|---|--|
| <b>Compiled by:</b> | <p>Regione Emilia-Romagna, Servizio Geologico, Sismico e dei Suoli</p> <p><a href="https://ambiente.regione.emilia-romagna.it/it/geologia/servizio-geologico-sismico-e-dei-suoli">https://ambiente.regione.emilia-romagna.it/it/geologia/servizio-geologico-sismico-e-dei-suoli</a></p> |  <p><b>Regione Emilia-Romagna</b><br/>DIREZIONE GENERALE CURA DEL TERRITORIO E DELL'AMBIENTE</p> |
|---------------------|---|--|