

Units of construction

Medieval building records are in many currencies and are extremely difficult to translate into modern equivalents. To circumvent these difficulties I have employed an arbitrary unit of work based on bulk billing techniques used by quantity surveyors. This is widely employed today as an extremely effective method for making initial cost estimates with minimal errors. As some churches were built in small increments over many decades, while others were completed with great rapidity, I needed a unit that would be small enough to provide realistic figures in the former without becoming too huge in the latter. I settled on using a unit, six of which would pay for one small vaulted bay in the aisle, or a small first-floor gallery. Such a bay would consist of an external wall with a small window, half of two columns about 2.5 meters tall, the floor and footings under them and the vault and roof overhead.

The number of units was increased proportionately in larger or taller bays. Additional units were added for the end walls, for towers and crypts and for greater complexity. In multi-story work I took account of the additional cost of building upper stories in scaffolding, cranes and the slower movement of men and materials. A fairly complex spreadsheet was used to make the calculations and maintain consistency. The difference between rubble and ashlar construction did not have a great impact on the work-rate, for though rubble is a cheaper construction in walls it makes little difference in vaults or piers. Sculpture and glass are not included in these figures. I have assumed that costs did not change from region to region and have taken no account of the distance of the site from the quarry, though in some cases this would have been a significant factor.

In this way the rebuilding of Chartres cathedral after the fire of 1194 cost 5645 units, and the earlier western bay with its two towers cost 700. In September 1972 Ken Green and I costed the post-1194 rebuilding at \$38 million Australian dollars, excluding stained glass. Between then and 2018 the Building Price Index has risen from 16 to almost 300, an increase of almost 20 times. The Index applies to standardized large-scale and repetitive structures like warehouses and shopping malls. Yet over these forty-five years cost increases have been minimized with new materials, better fabrication methods and site management, and the mechanization of the trades so that work could be done by relatively unskilled labour. In discussion with professional quantity surveyors we decided to compensate for these technological improvements and for the disappearance of hand-crafting by increasing the current index by 70 percent. The cost of Chartres today would therefore be about \$1.25 billion. Considering there are no mechanical, lift nor electrical services, no communication gear nor hydraulics, this seems a fair price for a shell of this size and complexity. I therefore estimate that one unit is worth, in 2018 Australian dollars, about \$22,000, and that our one small vaulted bay would cost today somewhat more than \$130,000.

The costing has usually been restricted to those buildings that still stand. The extent of work in the Paris cathedral nave in the 1150s can never be known, nor the original form of Notre-Dame de l'Epine. Though rough estimates might be made of the 1150s ambulatory at Laon or the pre-1918 Mont-Notre-Dame or pre-Revolutionary Royaumont, there would be no end to these guesses and approximations once begun. However, partial ruins such as Longpont that have enough remains to show their size and dates have been costed as if they were still standing. Total ruins such as Mont-Notre-Dame, Vaucelles, Saint-Vincent in Laon, and Vaux-de-Cernay have had only the remaining stones costed as we don't have enough information to make a reasonably accurate estimate of either size or dates of the missing parts. Heavily renovated buildings such as Poissy have been costed in full.

The total number of units expended in the 800 more interesting churches and ruins built between 1130 and 1240 comes to about 150,000 units. This is almost 200 units (or 4.5 million dollars) per church. Expenditure ranged from 77 at Cerseuil, a small parish church with four arms and a crossing, to 5,645 on the cathedral of Chartres. Perhaps twenty construction campaigns were required to complete Cerseuil costing an average of \$85,000 each, while Chartres required forty-six to the completion of the high vaults averaging a bit less than three million each. Rarely would a campaign at Cerseuil cost more than four units, while one at Chartres would have been enough to build the whole of Cerseuil twice.

Our period is marked by a sudden and many-fold surge in construction that lasted eighty years. It is flanked by much more modest levels of spending that throw the enormity of this period's activity into relief. Though there is a slight dip in the middle, this extraordinary flowering of stone left northern France crowned with some of the most precious and inspiring architectural creations in all human history.