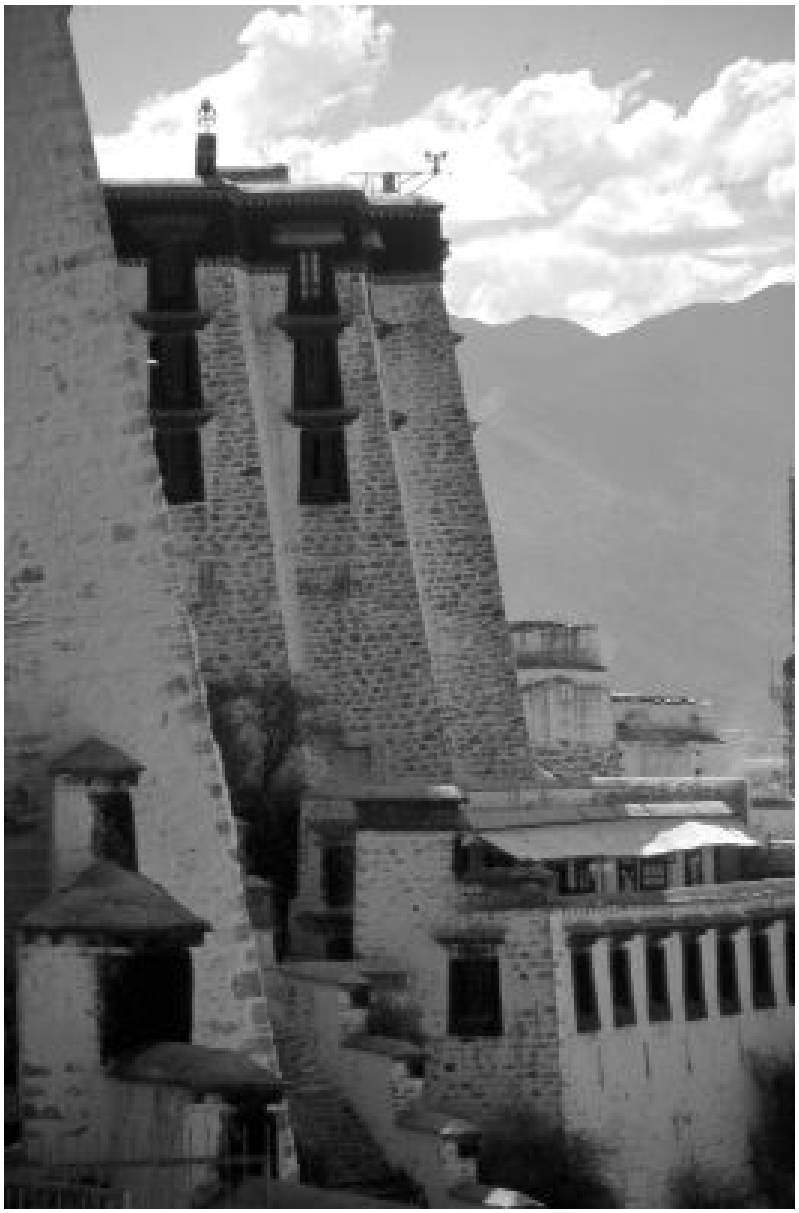


The Potala, seat of religious and political power of old Tibet

TIBETAN STONE JOURNEY

Jim Underwood

Most visitors to Tibet enter through the capitol city Lhasa and on their journey from the airport are treated to the range of building methods common through the region: the same adobe block of our American southwest, the rammed earth that is becoming more common in the US, and finally the extensive use of stone in the city itself. Most people don't notice the extensive quarries as they cross the edge of Lhasa Valley; and most leave with the impression that in this land of the earth's highest mountains stone (and, increasingly, concrete) is the dominant building material. My work in Tibet is entirely with rammed earth structures; but my love is for the stonework, particularly the work done more than 50 years ago.

The stonework of Lhasa and a scattering of Buddhist monasteries through Tibet are in fact exceptional in a region where the use of earth for building overwhelmingly dominates; but the monasteries and old Lhasa structures are readily accessible and beautiful exceptions. The monasteries were often built with rock because historically they enjoyed wealth and a vast social support system to haul rock - and they were often built in rockier, less accessible sites. Lhasa had these wealth and social support factors in abundance, along with a readily available source of fine grained gray granite surrounding half the Valley.

High quality dry-stone work was also used in buttressing roads and building bridges in the river gorges and lesser quality work was (and still is) used to terrace fields. With easier transport of rock these days, houses and enclosing walls are often built of rock laid carelessly or well a foot or so up, and then rammed earth or adobe is used above.

Historical & Social Context

There seem to have been two early phases of stone work in Tibet determined by what rock was readily available and what tools were on hand to shape it. The early phases show great similarity with each other; the current, or modern phase is a dramatic departure from the early work.

Very old buildings in Lhasa show the extensive use of un-quarried stone, picked up from streams, gulleys and hillsides, and usually sorted more or less for size and flat face before use. However, the rocks you see on the face of an early wall are quite variable in size and shape; there is extensive use of small, flat chinking stones that create a pattern common across Tibet but especially in Lhasa - larger rock framed in a matrix of small chinking stone. Two and three story walls

are common especially in the old monasteries with the exterior walls thickly built at the base and sloping strongly inward to the top. These walls were laid up with mud mortar in the beautiful horizontal chinked pattern on the outside and inside faces, and random rubble rock was used between, again with a packing of mud mortar. This construction can be seen clearly in ruins. The use of non-uniform stone can be dated reliably in one sacred building (the base of the Jokhang Monastery) to about the 7th century AD, where it is difficult to photograph because of the extensive layering of whitewash. A nearby monastery, Shideh, now in ruins, shows the same stonework in the extensive first story and is easily photographed. The stone work immediately above the first level shows the complimentary but distinctly different, later second phase work.

In Lhasa Valley, a growing national religious / economic/political center, the easy supply of loose stone must have soon been used up. What I refer to as Phase two stonework is much more even in appearance, using stone that appears to have been roughly squared to a general size - stone broken out of boulders as I was watching done recently. The main stones of a phase two wall are distinctly square or rectilinear, laid in long horizontal lines that may run 50 meters in an unbroken back wall. The small flat chinking stones familiar in phase one work remain a clear and distinctive feature of this later work. I have not yet been able to date the transition from one approach to the other except that Phase two was in use by the 1600's; but the lack of intermediate stonework between the two phases indicates a sudden change. This probably happened in conjunction with the introduction of iron tools along the vast continental trade routes many centuries ago. Remote as it was Tibet was an ancient continental crossroads for trade.

All traditional stone work, both in buildings and enclosure walls, was capped with an eaves of slate sloping outward, weighted with a domed ridge of small stone or gravel

Walls of Tayepa Monastery, one of the oldest in Tibet

down the center, and the whole covered with a special crushed soft rock which was tamped into place in the manner of rammed earth. The affect was to shed water from the core of the wall and lend unusual beauty to it.

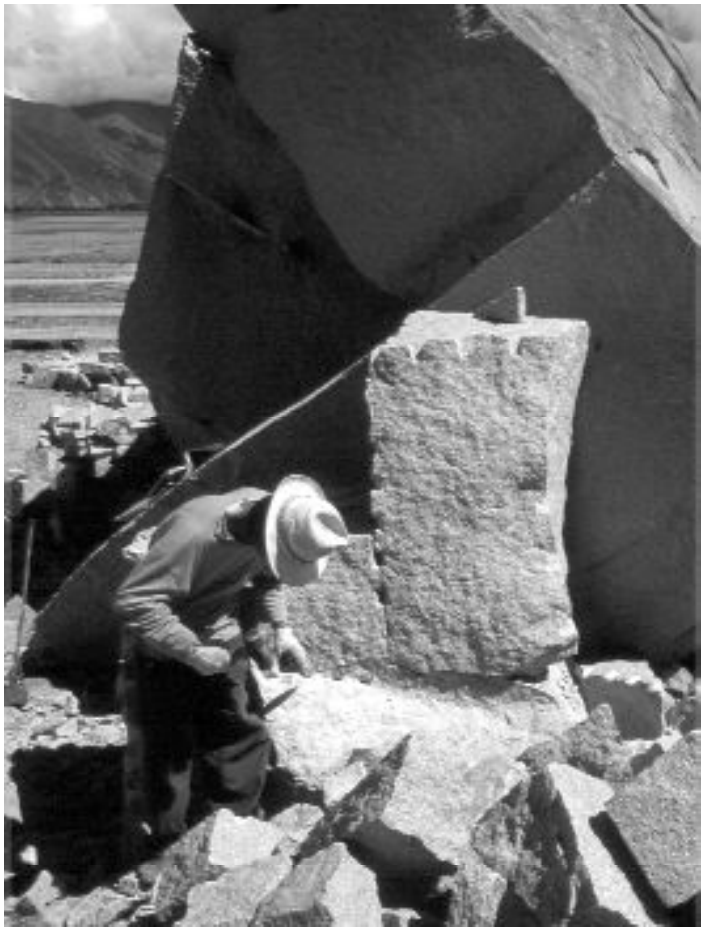
With two exceptions (noted under Potala and Rural) I have not observed many examples of these first two 'classical' phases of stone work being done in Tibet today. I keep looking and hoping; but much as in our own country, technology pushes out handwork until there is enough surplus capital to underwrite a resurgence. The current era represents a nearly complete break from the past, especially in Lhasa Valley

Stonework in the modern era (since the 1950's) employs carbide tipped hand tools which give us well dressed, often carefully finished grey granite in many shapes - blocks, steps, rounds, railings, detailed statuary and so forth. Hand tools have not just been the norm in Tibet, they have been nearly universal in stonework in the current era until very recently. In all my early 1990's visits to quarries, finishing yards and building sites around Lhasa, nearly all work was being done with hand tools with the exception of transport by shofu, the ubiquitous two wheeled Asian diesel tractor pulling a wagon. Most quarrying was done as small hillside operations much like early New England quarrying. During the 1990's, with the dramatic expansion of Lhasa, the demand for building stone fostered the large scale introduction of industrial quarrying on the north and northeast flanks of the valley. Nearly every day you can hear the sound of dynamite breaking up the faces.

The new hotels of Lhasa sport polished slabs of marble, pink granite and other rock in the lobbies, but these typically have all been manufactured in mainland China and shipped in at great expense. Now we are starting to see extensive stone working yards with large diamond saws cutting the local grey granite into thin slabs which are ground to not-quite a polish. This is stone veneering, not really artistic stone work; and while the granite used for

wall building these days is highly worked and mortar laid, the hand quarries are interesting.

Given Tibetan wage labor rates vs the cost of power production tools, the hand tools will likely persist and perhaps dominate for some time. A good hand craftsman can be hired for about $3/day and rough quarry folks, though often paid at piecework rates, cost less. Power tools are special order items and usually of very poor quality, prone to frequent breakdown according to the construction company owners I interviewed. People keep on producing, even if at a slow rate.



The Hand Worked Quarries

The Himalayan Range is almost all sedimentary with limestone, sandstone, shale and lots of fossils in with some associated metamorphic rock. The steep igneous ridges of granite surrounding the east, north and west sides of Lhasa Valley (a river defines the south side of the city) are a bit unusual in the region. The quarries and associated stone camps lie about 5 to 20 Km out from Lhasa's center at the bases of all these ridges and many are readily seen from the main roads servicing the city. The individual quarries are shallow cuts into the steep granite faces that often blend one into the next to form continuous white scars at the base of dun colored natural rock.

Hand quarrying works in response to natural fractures and seams in the rock, as you'd expect. The modern difference is that since the easy and obvious seams have long since been worked, the quarrymen have to work seams higher on the granite faces with the consequent dangers involved. Quarrymen climb on pegs driven into holes drilled into the rock faces by hand; at some chosen point they hand drill a series of holes which are then feather and wedged to split out a rock section which will be worked up below where it lands. The industrial quarrying on the valley's north side blasts out large sections into random rubble piles below, end loaders sort it out a bit, and the quarry workers scramble over the debris trying to make sense of it with hand and light power tools. OSHA doesn't exist in Tibet.

Quarry produce is mainly rough rectangular block of standard sizes, larger block for special carving purposes, and debris used for road work, foundations and fill. I have not seen rock dressed at a quarry, though it may be in some cases. Rock transport historically was certainly by yak or on somebody's back, as it is today around the work site. Wheeled carts powered formerly by humans and animals, now by the shofu, dominate transport from quarry to construction site; trucks are increasingly used.

Tibetans traditionally avoid mining as a religiously unsuitable activity and large scale quarrying seems to come a bit close to that. In any case, nearly all quarrying and finishing is done by immigrants from Sechuan, basically the gateway province to the east and the source of most of the immigrant workforce in Tibet. This workforce brings skills and tools unknown to the Tibetans and there is little mixing or sharing. Some ethnic Tibetan construction firms have sprung up and there are a few that are increasingly capable in working stone. Keep in mind that most of Tibet does not build with stone, but with earth.

Dressing Stone

Stone was carved and dressed in Tibet in the per-modern times (before about 1950) primarily for monastery steps, some statuary such as stone lions, at alters and a few support pillars at entrances. Dressing stone was not common until the widespread introduction of carbide tipped tools, primarily with the immigrant workers mentioned earlier. By the 1990's the local Lhasa granite was being worked into all manner of objects - railing assemblies, bird baths on pedestals, round tables with barrel seats, and of course more stone lions - all by hand, a chip at a time mainly at special yards.

The most common output, however, was (and still is) carefully dressed building stone used in the rebuilding and growth of Lhasa. Rough quarry stock of a general size is

delivered to building sites where squared blocks are made to the mason's size instructions. The blocks are faced five sides, excluding the inward face, and laid in concrete mortar (there is only one version of cement common in Tibet). Debris is used for chink and fill on the inside surfaces, which are usually plastered to cover the rough work. Excess debris may be used as fill, in concrete, or sold. For me these buildings are not nearly up to the aesthetic standard of the early stone work in Tibet, but they are good looking and beat the concrete and tile favored by central planners. Some argue that they are stronger and they probably are; but the old structures held fine for many centuries - 14 centuries so far in the case of the Jokhang.

The Potala

The Potala is an overwhelming presence floating perhaps 500 feet above all Lhasa, a huge monastic castle built on a rock island in the valley center. Historically it represented the overwhelming religious and political center of Tibetan Buddhism. From a mason's viewpoint it is one of the larger stone structures in the world, and it presents some exceptions to the building characteristics I noted above for phases one and two stonework.

The main structure is surrounded on the valley floor by a high wall (about 30 feet high) which is rammed earth on the inside (suggesting that earth is the main component of the wall) and faced with fresh granite on the outside. This facing granite was quarried and roughly dressed to size and then laid up according to phase two pattern - sized for height but not so much for length and chinked with small, flat flakes of the same granite. Everything was laid up in concrete and very sloppily struck and pointed, indicating all in all a fairly recent and poorly done repair job. This high wall intersects a main entrance building and "guard" buildings at the corners, all nice two story Phase one work in contrast to the wall.

The main Potala building was built in stages from the 1600's onward of squared stone throughout (excepting Phase one in the walls enclosing the massive staircases), giving us some indication that Phase two capability was in place by then. During the 1998/99 restoration work the chief architect took me into the eastern bowels of the Potala to where the main rampart walls join the bedrock of the hill. Looking out the vertical ventilating slits you could see a dozen feet of laid rock, and inside was a catacomb of pillars supporting the many floors and walls above. I later heard that all the base rock of the Potala was set in molten lead, but I have not been able to confirm this.

Rural Work

There are perhaps a half dozen areas of Tibet where rock and some level of population density combine; and then there are quite a few sparsely populated areas where rock is used extensively ñ mainly at the southern edge along the Himalayan backbone and in river gorges. Increasingly, also, rock is trucked to places where it was never used traditionally.

The rural work is a hodge-podge of quality, from recent thrown-up terrace and enclosure walls which collapse frequently to some very nice old road buttressing and arch bridge work along the steep gorge walls (modern road work utilizes a lot of stone, all concrete laid). Here and there an old well-laid wall appears, usually in ruin. The main difference in the well-laid old rural walls from those of Lhasa Valley is in the chinking, which is done randomly without so much emphasis on the little horizontal flat stones.

Mentioned at the beginning, currently built quality walls of any kind (building or enclosure) are started with rock as the foundation, the rock going above ground a foot or more. The remaining wall is either adobe or rammed earth (un-stabilized, rammed in forms); the rock prevents moisture from wicking upward and destroying the earthen parts. The rock foundations are sometimes well laid and frequently are not; but at least some sense of quality dry stone work does remain in Tibet.

Tourists will come. Tourism in Tibet, as it is in most places, is both a blessing and a curse. Tourists change the culture they come to enjoy by sparking a vast support infrastructure and a change in local attitudes and aspirations. More positively tourists to Tibet have shown their huge interest in the traditional culture and consequently their support for rehabilitation of the monasteries and traditional culture. The various crafts, including decent stone work, stand to benefit.

Jim Underwood started climbing rocks in his teens and has loved them ever since; he takes on special construction projects in eastern West Virginia and works in small business development (rural construction sector) abroad, mostly Tibet at the moment.