

## Preliminary Report on Ross Sandstones

Ross was founded in 1821 by Governor Macquarie and was so named in honour of Captain H.M. Buchanan that being the name of his seat on the bank of Loch Lomond.

From the time of earliest settlement the value of the Ross sandstones has been fully recognised. The stones from the several beds are used in structures of various kinds of ornamental work, as abrasives, and for many other purposes. In the old burial ground is a headstone with the inscription easily decipherable dating from 1826 and many others of a little later date are in a remarkable state of preservation. Ross bridge over Macquarie River, built in 1836, is a very solid structure and as well the finest example of early ornamental stone work in Tasmania. The Municipal Council offices were built in the same year as were several other buildings, and from appearances might have been built a few years only so little has time stamped its impress on the exposed face of the stone, other local examples of stone work are the magnificent churches of the Methodist and Anglican demoninations and their internal ornamentation and the wonderful carvings in stone in the burial grounds.

### Situation and Access.

Ross is a small settlement of about 500 people on the main line of railway between Launceston and Hobart. Launceston is 48 miles distant, and Hobart is 74 miles by rail. The quarries are close to the township the centre being upwards of one mile distant.

Good roads connect the quarries and the railway station. Motor Lorry transport is the most efficient means of delivery to the station.

### Geologic Relations.

The sandstone beds of Ross belong to the basal member of the Trias-Jura formation which conformably succeeds without serious interruption the Permo-Carboniferous formation. These are the two more important coal measure periods, but in the case of the Trias-Jura with which this paper is concerned the coal-bearing strata (felspathic sandstone) overlies the Ross member. In this district the felspar coal-containing sandstones are not represented, the Ross member almost everywhere appearing at surface. In the wattle paddock the uppermost bed of this member is capped with a 6-foot layer of brown mudstone. This formation is intruded by diabase of mesozoic age in the forms of sills and irregular dykes, although in the area examined diabase does not appear, its near presence is indicated by the oxide of iron stain in the sandstones at many points. The impregnation of ferric oxide solutions is very marked in some places, the sandstone being a yellow to dark brown colour. Some stone is branded with ferric iron, other stone is clouded and wavey producing an effect and design similar to the growth markings in sawn pine.

The following varieties of stone are recognised :-

1. White sandstone, fairly soft, even texture, siliceous-used for grindstones;

2. Similar to 1 but stained with ferric oxide and slightly more felspathic also used for grindstones;
3. Grey sandstone, fine grain, even texture, felspathic, rather hard though easily chiselled - used largely for building and ornamental work;
4. Grey sandstone of coarser texture than 3 but similar in other respects and used for similar purposes
5. Brown sandstone streaked and clouded in many natural attractive designs, similar to 3 in other qualities and properties - largely used in ornamental work and sculpture;
6. Banded stone, brown and white alternating, similar to 4 in texture - used largely in ornamental work.

It is found that the better stone of each class always occurs under a considerable overburden.

### Production

During the past 40 years the quarrying of sandstone has been in the hands of two or three families, the greatest trade being in building stone and grindstone. No attempt has been made to extend the market and to compete with foreign producers, nevertheless Ross sandstones because of their natural superiority are known throughout Australia and New Zealand. During the long period of their operation no record of production has been kept, therefore, for comparative purposes an analysis of the trade cannot be made. At one time production was high and all local stone masons were fully engaged. Of late years the markets have been reduced by -

1. The importation of grindstones from England and other sources;
2. The displacement of stone by concrete in many kinds of structure;
3. The more general use of carborundum as an abrasive;
4. The inability of producers to enter into definite contracts; and
5. the production of stone from inferior beds.

The Quarries - Nichols and Banard, 5-acre lot, No. 1 Quarry.

This, generally known as Old Quarry, is 70 feet by 60 feet by 15 feet deep at face, and is situated near the northeast corner of the plot. Here the strike of the beds is  $284^{\circ}$  and the dip east of north at  $16^{\circ}$ . The cleavage trend is northwest and the dip southwest at  $75^{\circ}$ . This relation between the bedding and cleavage planes is taken advantage of in working out large blocks of the thickly bedded stone. In this quarry the stone is generally white with occasional yellowish-brown bands and consists almost wholly of angular quartz with a little felspathic cementing material and in places films of iron oxide. Although thin bedded in part the separation planes are so light that material of more than 12 inches in thickness may be procured. From this quarry came the 6-foot grindstone sent to Wembley, and many years ago exhibits were sent to Philadelphia

**Exhibition.** The upper beds are used for scythe stone manufacture and the lower wholly for grindstone. Sandstone below the white beds are mostly banded stone in brown, salmon, and white, the impregnation of the colouring iron oxide having been greatest along planes of bedding not otherwise discernable. Irregular bedding is noticeable in the lowest of the exposed stone. The upper bed exposed in this quarry contains cavernous spaces (up to one inch in length) lined with soft white clay which easily disintegrating leaves a pitted surface. However, the most deeply pitted part is close to a particular bedding plane, consequently the value of the stone as a whole is not greatly affected. In some sections no clay inclusions mar the extraordinary evenness of grain of the rock components.

The overburden is light so that an unlimited amount of stone can be obtained without deep stripping. As might be expected the surface stone has softened and has broken under long exposure to the agents of disintegration and erosion.

The constituent grains are predominantly of quartz irregular in outline, glassy, and of even grain size, and the felspathic cementing material is augmented by a thin film of ferric oxide around each grain. The larger particles are about  $\frac{1}{2}$  mm. in diameter and are well and closely packed, and the pore spaces in the coloured stone are almost completely filled with iron oxide. Grindstones and scythe stones from this material are not of such good quality as the white stone because the extrinsic ferric oxide tends to produce a smoother cutting surface. The interspaces in the white stone are filled with soft felspathic material, cohesive enough to form a compact body and soft enough to produce a quick cutting free stone. From this white stone all the best grindstones are made. The preference for white stone is not a matter of colour but of physical properties.

#### No. 2 Quarry.

From this quarry the chain posts leading to Ross Bridge were obtained, and many of the large, hardy grindstones were cut from this rock. The stone is a felspathic sandstone, fine and even in texture, white in colour and harder than that of No. 1 Quarry.

#### No. 3 Quarry.

This stone is hard, fine and even in grain, white but stained with ferric oxide on joint planes, and consists almost wholly of quartz. From this quarry much ornamental and building stone has been obtained and shipped, some of it to Warrambool.

#### Tucker's 9 acre lot. No. 4 Quarry.

This quarry is opened to a depth of 25 feet and is 50 feet long and 30 feet wide. The upper 4 feet is cross bedded, broken and rather closely laminated for sandstone. The irregular bedding at surface is very conspicuous, but below that part of the section the beds are evenly disposed and are of heavy close grained stone which can be excavated in large unflawed blocks. Under the microscope the stone presents a mosaic of small glassy grains, seldom more than  $\frac{1}{2}$  mm. in diameter, closely apposed, and with a minimum of felspathic cement.

This stone is very strong, impermeable, and durable; it has a low porosity and is not noticeably affected by frost. The colour is light grey and shows little alteration after an exposure of 90 years.

Some of the finest building stone trained and shipped to other parts was obtained from this quarry, and the examples to be seen in the burial grounds of old mausoleums in a wonderful state of preservation are silent witnesses to the qualities of this material. The stone is so amenable to sculpture that advantage is taken of that quality in embellishing many of the structures built of this rock.

#### No. 5 Quarry.

About 100 yards west of No. 4 is another though smaller quarry, 30 feet lower. Here the sandstone dips S  $10^{\circ}$  E at  $12^{\circ}$ . It is the felspathic variety, white, thick bedded, and a little flawed. The upper layers are thin bedded but the stone is of value. The lower stone is of good quality, fairly hard, and contains few inclusions of clay.

#### No. 6 Quarry

Forty feet further north another quarry has been opened in the extension of the beds exposed in No. 5. This is a very good hard stone. Joint planes course N  $78^{\circ}$  and dip  $87^{\circ}$  southward.

Flatiron Block, H.I. Davies, owner

#### No. 7 Quarry

This quarry is an opening into a low hill about 100 feet higher than No. 1. Here the sandstones are highly coloured with the grain of the stone sharply outlined. The colour is greyish at a depth of 6 feet. It is a felspathic variety, fine and even in grain, and is thickly bedded. The yellow and brown stone is harder than the underlying white rock. This stone is largely used for building monumental and ornamental work. Wavy and streaky designs are common in this beautiful rock.

#### No. 8 Quarry

Irregular bedding is conspicuous in the uppermost layers, but this gives place to even bedded, loosely banded, white felspathic sandstone of good quality. The upper part is much harder and more "wooly" than the lower, and distinct lines of stratification are not discernible in them.

E. Ransley's 9 - acres lots

#### No. 9 Quarry

This is one of the older quarries from which much stone for buildings and for grindstones has been obtained. The strike of the strata is N  $67^{\circ}$  E, and the dip is  $5.23^{\circ}$  E at  $12^{\circ}$ . Joint planes course N  $68^{\circ}$  W and dip northerly at  $60^{\circ}$ .

The stone is of the felspathic variety, inclined to be soft near the surface, in some parts irregular in bedding, and contains occasional pebbles of clay but is generally free and holes are not prominent. It is fine and even in grain.

This stone is of yellowish brown colour with darker streaks and clouds of brown emphasising the lines of stratifications which otherwise are indistinguishable except under close scrutiny. It is less desirable for grindstones

that the white varieties from Nichols and Barnards lot because the reasons already given.

No. 10 Quarry

The mass of the stone exposed here is similar to No. 9 but is banded different tones of red clearly showing the planes of stratification. A much lighter coloured stone, normally white but with irregular bands of yellowish brown, underlies the reddish stone. The general durability of this stone as observed in different buildings shows that its weathering properties are very high.

Kendon Estate, W. Von Bibra, owner

On this property are a number of quarries in different beds of stone which have been lately worked by E. Rawnsley. These are about 20 chains south of No. 1 Quarry.

North Quarries

Here the sandstones are exposed in two shallow openings. They dip S 57° W at a low angle and are cleaned in a direction almost normal to the strike. The rock is of the regular even grain except for occasional small pebbles of clay which being very soft is easily removed on exposed surface leaving ellipthically shaped holes. The stones from these quarries are cut into grindstone and scythestones, the former to 5 feet in diameter and of good quality. The stones are cut parallel to the lines of stratification which are in places sharply marked. Advantage is taken of these lines of weakness in splitting the stone, but although splitting is not very difficult the stone is compact enough to allow of cutting parallel to these lines of comparative weakness without reduction in the strength of the finished grindstone.

South Quarry

The quarry is situated on the eastern aspect of a hill which stands 40 to 60 feet above the general level. The beds strike roughly with the hill and are remarkably thick - much thicker than is common throughout the formation. Despite the fact that fracturing is pronounced the thickness of the beds allows of excavation in large blocks. The quarry is about 40 feet long, 20 feet wide, and 15 feet deep, exposing a stone uniform, fairly hard, and with the felspathic material more prominent. The beds dip into the hill under cover of a 6 feet bed of brown shale, increasing in thickness. Stone from this quarry has been largely used for buildings. It was thought that a market might be found for the rubble in the manufacture of glass, but the analysis given hereunder shows that it is of little use for that purpose :-

Silica	88.20	per cent
Ferric oxide	3.71	" "
Alumina	4.49	" "
Titania	0.40	" "
Magnesia	0.14	" "
Ignition Loss	1.80	" "

From this quarry was obtained two years ago the stone for Geelong College. The greater part is of splendid

building material.

A typical section in descending order is as follows :-

- 6 feet - brown mudstone cover
- 6 feet - slightly felspathic, even and fine grain, almost flawless, thick bedded, lines of stratification not distinct, well bounded, slightly muddy with water owing to feldspar.
- 6 feet - siliceous, more loosely bounded, free with water, thick bedded.
- 3 feet - similar in texture and material but "wooly" and with occasional soft patches.

The dip of these beds is S 72°W at 15°.

#### Beaufront Estate. W. Von Bibra, owner

On the Beaufront estate are several quarries in white sandstone from one of which came the material used in the building of Wesleyan Church of Ross. Here, as in other parts of the district, the practice has been to remove the upper beds only, but there is no doubt that equally good white stone can be obtained to a depth of 60 feet at least and probably much deeper. This stone consists almost wholly of quartz grains, even as to size, angular in form, with very little feldspar cementing material. It closely resembles that from W. Martin's lot and like that is not very hard. The dip is SW at an average angle of 12°.

#### W. Martin's lot

This plot of land adjoins Kendon Estate on the west and lies on the railway side of the hill. It is only 20 chains from the railway and equi distant from the general cementary. As the dip of the strata is south-west the beds could be worked to the rise towards the wattle Paddock beds which appear identical with these. The stone is exposed in a small cut at the foot of the hill where it is found to be of good quality thickly bedded, unflawed, and essentially similar in other qualities and properties to the Kendon beds. This should prove a valuable property.

#### Johnson's Quarry

This is a large quarry opened on the railway side of the hill into yellowish grey and streaky brown "wooly" stone. Although the value of the quarry is considerably reduced by the proportion of "wooly" stone and its irregular bedding, the arrangement of the joints counterbalances these objections and makes the obtaining of large blocks an easy matter.

The dip is SW and the stone, therefore, is worked to the rise and is easily excavated.

#### Methods of Operation

The system of operation has been crude in the extreme. It appears that not one operator has attempted to open the beds in long working faces but each has endeavoured to get at the best beds with as little outlay as possible. In consequence the cost of production has been high and a number of shallow quarries only have been opened. Much valuable stone has been destroyed by allowing contractors and inexperienced men to quarry their own stone. In the old quarries the stone has been worked by a succession of

quarryman each having adopted a method to suit his particular purpose.

The stone is excavated and dressed with the tools ordinarily used in hand work, consisting of hammers, chisels, wedges and drills of various types to suit the particular purpose. Hand work is necessarily slower than machine work and generally more costly. It is reported that El Eley of Ross cut 500 grindstones in a year and that a 6 foot grindstone occupies two men for four days. That gives an indication of the rate and cost of production.

In all large plants the use of hand chisels has been greatly lessened owing to the introduction of the pneumatic tool. This instrument consists essentially of a steel cylinder provided with a piston to which a reciprocal motion is given by means of compressed air.

In addition to their other uses they are sometimes employed in the place of channelling machines where such cannot be employed to advantage.

Channelling machines are employed to cut lineally any desired length and of a depth varying from 1 to 15 feet. The machine consists essentially of a truck travelling on rails provided with a chopping engine capable of delivering powerful blows to the rock as the truck is moved slowly along the rails. By repeated trips back and forth the gash is reduced to the required depth. Gang Saws are used to cut the stone to any desired sizes. The actual saws are bands of soft steel three inches wide, and  $\frac{3}{8}$  of an inch thick. The saw is set in operation and a constant supply of sand and water is fed uniformly over the stone by special distribution. The cutting is affected by the sharp sand which gets into the cuts and is ground between the saw blades and the stone.

A Rubbing Bed is employed for smoothing the sawn blocks or slabs of the stones. This consists essentially of a round horizontal steel plate to which a rotary motion is given either by overhead or underhead gear. The block of stone is placed face down on the rubbing bed, sand and water are supplied and the stone is left in position until sufficiently reduced.

Those constitute the chief appliances used in excavating and cutting sandstone.

#### Marketing the Stone

The following are the main products of the sandstone beds: -

1. Grindstones
  2. Scythe Stones and Glass Bevellers Stone
  3. Building Stone
  4. Kerbstone and Tombstone
  5. Paving Stone
  6. Chippings and Sand for moulding in ironwork
  7. Manufacture of bottle glass.
1. Grindstones are made in three grades, namely, quick, medium, and fine, and of sizes up to six feet in diameter and up to 12 inches in thickness.
  2. Scythe Stones are sent to all parts of Australia and a market is found for stone for Glass bevelling at Campi and Co's works, Russell Street, Melbourne.

3. Building Stone is used largely in Melbourne and Geelong and in Tasmania.
4. Kerbstone is used locally.
5. Paving Stone is also used locally.
6. Chippings are sent to Launceston where they are ground and used for moulds in iron foundries.
7. A market may be found for the waste in the manufacture of bottle glass.

The following list indicates the prices obtained for the stone at Ross -

Grindstones	from £1 to £16	according to size
Scythe Stones	from 3/- to 6/-	per dozen
Kerbstones	from 5/- to 6/-	per running foot
Sills	" 5/- to 6/-	" " "
Lintels	" 5/- to 6/-	" " "
Building Stone	4/- to 5/-	per cubic foot
Tombstone	from 5/-	per square foot
Rubble	" 5/-	per ton

The freight of the stone to Launceston is given hereunder, the shipping freights are not known.

From Ross to Launceston (48 miles) the railway charges are :-

Grindstones 16/8 per ton in truck loads of 4 tons each:

Rough Stone 7/7 per ton in truck loads of 7 tons each;

Rubble 6/- per ton in truck loads.

The cost of delivery from the Quarries to the Railway Station at Ross is about 3/- per ton by motor truck.

#### Results of Preliminary Investigation.

The results show that there are very extensive beds of sandstone of the various grades suitable for structures of almost all kinds, so situated that the products can be marketed cheaply and regularly.

Materials of exceptionally high quality are available. The immediate requirements are the employment of machinery in the operations of cutting and manufacture and the arrangement of markets in the Commonwealth and New Zealand for the products. By the use of machinery the cost of production will be greatly reduced. An attempt should be made to market the waste perhaps in the manufacture of bottle glass.

DIRECTOR OF MINES.

*Accredited & Sother  
C. J. H. Reid*

HOBART,

27th August, 1926.