

TOPP & CO.

GREAT BRITAIN

Specification for NEW WORK in Wrought Iron

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Specification

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Exquisite Architectural Metalwork

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QUALITY ASSURANCE

There is a wide disparity in cost between the cheapest of work, and the best. Without a sufficiently tight specification, work acquired on a competitive basis will tend towards the lower order. There is a need for a standard form of words which can be use to specify ironwork of the highest order.

Definition of the materials is a good start, for example 'puddled wrought iron' rather than just 'wrought iron', which is often misinterpreted as there is no current British Standard specific to either the material or to workmanship. Our view is that a proper specification is essential for this work, because without one, invariably the work is quoted by fabricators using mild steel and electric welding or, because blacksmiths know this is likely to happen they may quote for a lower standard of work to that which is really required. At least if a standard specification is used, everybody knows what to price for. If subsequently the customer cannot afford the cost, a proper judgement can then be made if the piece warrants the expenditure, whether additional monies can be found or if a delay for a year or two may be appropriate in order to get funds in place. Currently without proper guidelines wrought ironwork can be poorly made by default.

Mention of specific techniques is important, 'all welding to done in the fire' is often used, or less positively, 'no use of electric welding'. Assurance of quality, however, can only be guaranteed by examination of the track record of the contractor or from the submission of samples as explained in the specification below.

Whilst the overall specification is essential, it is also vital that works are properly priced and that any bill of quantity is accurate. Wrought iron is a specialist material and therefore requires specialist knowledge.

Material costs, the high level craft skills needed and the labour required to undertake such work is not widely understood and we frequently find that bids for the ironwork element for major refurbishments are severely underestimated and poorly specified. This often results in insufficient funds being allocated for the works.

SPECIFYING PURPOSE MADE FORGED WROUGHT IRON

Please also read – Restoration of Architectural Metalwork

It is strongly recommended that the following specification, or something very similar, is used by specifiers to ensure that there is no confusion over the term wrought iron which is often mistaken to mean mild steel by tenderers and results in numerous problems in respect of material usage, method of fabrication and cost. As far as we are aware, Topp & Company is the world's only supplier of wrought iron and therefore it is also suggested that we are put in specifications as nominated suppliers. If architects, smiths, etc. require advice on the use of wrought iron, working techniques and design considerations, we are always willing to offer assistance.

SPECIFICATION

It must be fully realised by all contractors before estimating that the employer and architect are expecting the work to be carried out to the best traditions and methods of the craft. The interest of the metal craftsmen in the execution of this work must be that of an artist taking

personal pride in his craft, and not merely a commercial undertaking. The architect will enforce the word and spirit of these specifications.

Samples

Samples of an executed piece of work done by the blacksmith may be required to accompany the tender. In all situations samples of appropriate details will be required prior to the work being carried out, specified shop drawings may also be required prior to manufacture.

Materials and Workmanship

All work included herein shall be executed of true puddled or charcoal wrought iron. No mild steel or other substitute materials will be allowed without the prior approval of the Architect and employer. All wrought iron shall be best quality forged iron, tough, ductile and fibrous in character, of even texture. All work shall be executed by craftsmen skilled in the trade.

All ornamental work shall be carefully forged, hand wrought and incised where and as required to produce the design and effect desired.

All work shall be substantially framed together and closely fitted. All joinings shall be neatly and strongly tenoned and riveted together, or forge welded. Heads of rivets and tenons are to be finished appropriately to the spirit of the piece, viz. normally they will be expressed proud of the surface unless countersinking is specifically asked for.

All spindles shall be forged; collars where required shall be forge welded onto the spindles. All leaves, rosettes or other free ornament shall be forged from substantial iron and forge welded where connected with stems or other ironwork. All welding shall be done at the forge and all shall be clean and perfect. No cast parts will be accepted without prior consent from the architect. All solid ornamental works shall be worked and incised as required by approved design.

Prior to assembling/reassembling ironwork, joints & meeting surfaces will be coated with a suitable protective coating such as red lead, zinc phosphate, mastic, bitumastic, as appropriate.

Installing railings into stonework

There are three ways to fit ironwork into stone as follows:

1. Hot poured and caulked or cold caulked lead. Advantages are that these are traditional methods, and that they are instant, requiring no setting time and it looks good. Disadvantages are that the lead does not stick to the iron, leaving the potential for water to enter the joint if the joint isn't sealed with paint. This seal needs to be re-made at intervals as a part of the maintenance of the ironwork. Looking to the future, lead is almost impossible to get out without damaging either the stone or the iron. Another consideration is that the hole in the stone must be water tight (lead tight), or a blind hole for hot pouring. If the caulking is too vigorous the stone can be fractured, especially if green.
2. Grout. A poured grout of white cement or similar lime based mortar. Advantages, also traditional, stress free, easy to extract later with hammer and chisel, sticks to iron so excludes moisture. Disadvantages are the setting time, which can necessitate propping of the railings etc overnight.

3. Resin. Advantages are convenience as applied usually by gun or cartridge, although this can result in incomplete filling of holes, and in this case a poured resin is better. Sticks very well to the iron to exclude moisture provided that the hole is properly filled. Resins will have a degree of flexibility which would serve to protect the stone against expansion/contraction stresses. Quick setting except in cold weather. Disadvantages are that resin is not guaranteed for ever and who knows how it will behave in the long term. Also it is not always easy to make a good appearance of the surface of the resin. Resin could prove difficult to remove without damage to stone or iron.

PROTECTION & FINISHING

Galvanising and zinc spraying have been mentioned and there are good reasons why these will not do. Galvanising depends upon dipping the work after cleaning in acid, in a bath of molten zinc, which leaves a rather thick layer of zinc on the surface. Drips frequently form which must be ground off. If you add to this that the small joints will remain full of acid after the treatment, it is easy to see why this process is not appropriate to delicate and complex wrought ironwork. Additionally, in certain circumstances, the galvanising process can deeply etch the surface of wrought iron causing irreversible damage to the piece.

Zinc spraying is a far less brutal process. It is a hand method, which consists of removal of all mill scale by grit blasting, and the immediate application of a zinc coating with a type of flame gun. The objections to grit blasting have been enumerated above. Further, it is not possible to clean very small joints by grit blasting, from the physical restrictions imposed by the size of a grain of grit, neither is it possible to clean nor spray material which is not accessible to line of sight. The water traps in wrought ironwork are just such small joints and out-of-the-way places.

Owing to the natural ability of wrought irons to resist corrosion, it is sufficient to protect ironwork by a good coating of paint. However, we cannot stress too strongly that, in common with other items placed out of doors, such as woodwork, wrought ironwork needs regular maintenance. Chips and developing problems should be dealt with at the earliest dry opportunity, and the work should be painted at least every five years.

Paint systems are evolving at such an incredible rate that our recommendations change often; you may phone us for advice on the current best system.

NOTE: All ironwork should be adequately protected during transport and installation with any grazes or chips to paintwork made good on site, using primer on any exposed steel prior to topcoat.

MAINTENANCE OF WROUGHT IRONWORK

Ironwork is commonly supposed to be nearly free of maintenance and as such is frequently left to rust undisturbed for long periods resulting in periodic major overhauls, at great expense. This could be avoided by insistence on annual inspection with immediate and usually trivial remedial work to arrest any developing problems.

Suggested establishment of a rolling programme of maintenance, of all items of ironwork, based upon the following schedule.

INITIALLY

1. Initial attention in the form of repair or restoration.

ANNUALLY

2. Thorough inspection of ironwork – Identify any areas of foliage, debris or moss build up and in particular any areas showing loose and damaged paintwork or signs of rust seeping from, or water lodging in, joints. Any chipping of paint in well-ventilated areas is not too significant.
3. Attend to identified problem areas at the earliest opportunity - Clean ironwork and immediate surrounding area of any build ups and ensure all ironwork is kept well ventilated. When the paintwork is dry remove dust, contaminants or loose coatings by sanding or wire brushing and then locally reseal all areas identified in the inspection by touch-up paintwork. Bare metal should be primed with suitable primer before applying topcoat. Run paint into any joints where water is known to lodge to make sure these areas are completely sealed. Note that this work can only be carried out in periods of warm and dry weather when the problem joints are thoroughly dried out.
4. Lubricate to ensure freedom of movement – Hinges; fill all grease nipples on bottom hinge sockets & lightly oil pin inside top strap hinges. Shoot Bolts; lubricate as necessary. Lock; lightly oil the top of the protruding locking bolt and then slide in and out a couple of times to disperse the oil.

EVERY FIVE YEARS

5. Thoroughly re-paint ironwork with original (or equivalent) high performance paint system as proposed under 'finishing'. Prior to painting the ironwork should be thoroughly cleaned with hot soapy water and a scrubbing brush then degreased. When the paintwork is dry remove dust, contaminants or loose coatings by sanding. Bare metal should be primed with suitable primer. Apply full topcoat as required.

EVERY 15 TO 20 YEARS

6. Inspect gate locks & determine if needs replacing.

LONG TERM

7. Decorative ironwork made of genuine wrought iron should be free of long-term damage if the maintenance regime outlined above is adhered to. However, should it be necessary to remove thick layers of paint the ironwork should be grit blasted only as a last resort as this removes the iron's own original protective layer of oxide. Instead all wrought ironwork should be striped by chemical means. Wrought iron should under no circumstances be galvanised or hot zinc sprayed as both cause irreversible damage to the natural corrosion resistant properties of wrought iron.

THEN BACK TO

1. Again et cetera ad infinitum.

NB – It is also possible to have the iron work made in mild steel using the traditional techniques mentioned above – See Specification for New Work Forged in MILD STEEL

Specifying Purpose Made Forged Wrought Iron

Please also read Workshop Techniques for the Restoration of Wrought & Cast Ironwork

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Specification

It must be fully realised by all contractors before estimating that the employer and architect are expecting the work to be carried out to the best traditions and methods of the blacksmith craft. The interest of the metal craftsmen in the execution of this work must be that of an artist taking personal pride in his craft, and not merely a commercial undertaking. The architect will enforce the word and spirit of these specifications.

Samples

Samples of an executed piece of work done by the blacksmith may be required to accompany the tender. In all situations samples of appropriate details will be required prior to the work being carried out, specified shop drawings may also be required prior to manufacture.

Materials and Workmanship

All work included herein shall be executed of true puddled or charcoal wrought iron. No mild steel or other substitute materials will be allowed without the prior approval of the Architect and employer. All wrought iron shall be best quality forged iron, tough, ductile and fibrous in character, of even texture. All work shall be executed by craftsmen skilled in the trade.

All ornamental work shall be carefully forged, hand wrought and incised where and as required to produce the design and effect desired. Under no circumstances in any part of this tender is ELECTRIC welding to be used.

All work shall be substantially framed together and closely fitted. All joinings shall be neatly and strongly tenoned and riveted together, or forge welded. Heads of rivets and tenons are to be finished appropriately to the spirit of the piece, viz. normally they will be expressed proud of the surface unless countersinking is specifically asked for.

All spindles shall be forged; collars where required shall be forge welded onto the spindles. All leaves, rosettes or other free ornament shall be forged from substantial iron and forge welded where connected with stems or other ironwork. All welding shall be done at the forge and all shall be clean and perfect. No cast parts will be accepted without prior consent from the architect. All solid ornamental works shall be worked and incised as required by approved design.

Prior to assembling/reassembling ironwork, joints & meeting surfaces will be coated with a suitable protective coating such as red lead, zinc phosphate, mastic, bitumastic, as appropriate.

Other:

Installing railings into stonework see page 16 of our Restoration of Architectural Iron Work

Wrought iron is sold in imperial sizes – where possible the drawings should include this or at least a reference to its metric equivalent – i.e. 25mm = 1 inch.

Check you are not contradicting yourself by leaving in the tender document references to zinc spraying and galvanising of the material. You do not do either to Wrought Iron. Remove all references to ELECTRIC WELDING (MIG & TIG).

Notes:

Ensure the companies you are asking to tender have the correct skilled craftsmen for the task – the theory and for the practical work

Build in the costs of visiting the company's workshop on a regular basis for inspection check and agreeing a way forward.

Terminology explained

TERM	Explanation
	<p>We are referring to the technique of working either mild steel or wrought iron. To the untrained eye it is difficult to tell the two materials apart.</p>
FORGED BARS	<p>We are not referring to the process of forged vs rolled bars - A forged bar is produced by taking an ingot or bloom and forging it down to size generally, between two opposing flat dies. With a rolled bar, the ingot or bloom is brought to size by passing it through two rolls, often several sets of rolls.</p>
FORGED COLLARS	<p>Collars are used to hold two or more pieces of metal together. They are often the easiest and most attractive way to attach curved surfaces together, as in scrolls.</p> <p>Collars can be simple bands or have fancy moulded profiles.</p>
FIRE / FORGE WELDING	<p>Forge Welding is a solid-state welding process that joins two pieces of metal by heating them to a high temperature and then hammering them together. The process is one of the simplest methods of joining metals and has been used since ancient times. It is one of the most fundamental techniques of blacksmithing, but one of the trickiest to master. It requires speed, precision, and</p>

practice.

GALVANISING AND ZINC SPRAYING

Offers a level of corrosion protection. Both processes coat the metal with a thin skin of metallic zinc which electrolytically protects the steel underneath. The choice depends on the on design of the metal work and the overall finish, zinc spraying gives a finer finished surface as long as there are no inaccessible crevices which the spray cannot reach.

Galvanising involves the chemical stripping of the metal in an acid bath, followed by immersion in a tank of molten zinc. The nature of the process ensures better penetration into crevices, the galvanised surface needs to be t-washed and an etch primer applied before painting. The galvanising process can leave the metal very 'rough' and time is needed to remove the roughness and the 'spots', this process removes some of the surface galvanised coating

Neither process should be used on wrought iron, neither is it necessary.

JOINTING:

Traditional methods include – collars, rivets,, tenons etc.

LAMINAR MATERIAL

Metal made by forge-welding different layers.

PLANISHING

Planishing is a technique that involves finishing the surface by finely shaping and smoothing the wrought iron.

REPOUSSE:

Repoussé is a metalworking technique in which a malleable metal is ornamented or shaped by hammering from the reverse side to create a design in low relief.

RIVETED JOINTS

Rivets have traditionally been used by blacksmiths to make strong and secure joint, they can also be used as a design feature in their own right.

Holes are first punched or drilled in the pieces of metal being joined. They are then clamped together and a rivet inserted through these holes. One end of the rivet is

supported by a heavy piece of metal called a bucking bar and the other end is then hammered flat, or domed over, to about one and a half times the width of the rivet body. The heads on both sides can be sharpened in dies. The rivet is usually inserted hot and the hammering causes it to swell up inside the holes which take up any play. Additionally, the rivet will shrink as it cools down and this causes it to pull together the pieces being joined. As a result a rivet makes a very strong and tight joint.

TIG and MIG:

As variants of electric welding, similar comments will apply. They are both applicable in certain situations but the use of mild steel as a filler wire should be avoided in favour of non-corrodible wires of nickel or bronze.

WROUGHT IRON BILLET:

Part of the process of forming the material, today this is normally 2 or 3 inch diameter lengths of bars, which can be used under a power hammer or heated and rolled down to bars.

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