

TOPP & Co.

GREAT BRITAIN

Specification for NEW WORK forged in Mild Steel

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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 used 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' (see technical information five for new work in wrought iron) or Mild Steel but with qualification as to the techniques and methods of construction. Our view is that a proper specification is essential for all 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 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.

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 are severely underestimated and poorly specified. This often results in insufficient funds being allocated for the works.

SPECIFYING PURPOSE MADE FORGED MILD STEEL

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 'Forged' which is often mistaken by tenderers and results in numerous problems in respect of material usage, method of fabrication and cost.

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.

DIMENSIONS

It is expected that contractors conduct their own site survey for all construction dimensions. All drawings, dimensions and material stock sizes are for tender guide purposes only. Do not scale from drawings.

SAMPLES

Contractors are expected to be able to demonstrate their blacksmithing skills. Portfolio pictures of traditional scroll work previously executed by the blacksmith should accompany the tender and sample scrolls (or other parts of the project) may also be requested.

A sample of the proposed scroll design will be required prior to commencement of the project. It is proposed that this sample will be one of the (insert the section for your project).

WORKSHOP DRAWINGS

Full size workshop drawings of the project detailing, predominantly the scrollwork panels and newel post, are to be sent to the client for approval prior to manufacture.

Fully detailed workshop drawings of all the fixing for the balustrade, gates, piers and railing fixings (delete those not needed) are to be provided prior to manufacture for approval by the structural engineer.

NBS SPECIFICATION

Check you are not contradicting yourself, the standard Z11 refers to welded mild steel work, in our opinion this should not be included for new forge work. In other parts of the document you need to check all references to welded or welding (electric) does conflict with you specifying hand forged and traditional techniques work.

MATERIALS & WORKMANSHIP

Mild Steel - all scroll and frame work (list other parts if needed) included herein shall be executed in mild steel by craftsmen skilled in the blacksmiths trade.

All ornamental work shall be carefully forged & hand wrought as required to produce the design and effect desired. Forged fire welding should be used for all scroll work branch welds. All components are to be assembled together by mechanical methods, using the best traditions and methods of the blacksmiths craft, therefore arc welding must NOT be used to assemble components. No fillet welds. Watch the NBS specification for contradictions.

All work shall be substantially framed together and closely fitted. All joints shall be neatly and strongly riveted or screwed together. OR All joints 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. OR All visible fixings are to be finished flush with the surface. In the case of rivets and screws both are to be countersunk and filled as necessary prior to painting.

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 material 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.

IF NEEDED - Generally the detailing of the scrollwork is to follow the example shown in the drawings. That is to say scroll ends are generally solid snub, ribbon or fishtail as appropriate. Scrolls to be finely tapered by forging back as far as the first fixing.

SG Iron Casting –Cast in SG iron and screwed together in such a way as to leave minimal gaps between the castings. If a bespoke design please include for pattern making.

For outside work - 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: (delete the two you do not require)

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 of MILD STEEL – External Works.

Galvanising and zinc spraying: All mild steel components to be hot zinc or galvanised sprayed (delete one option) prior to final assembly.

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 ironwork.

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.

PAINTING

There are two systems we recommend: one for hand painting and the other for machine spray painting.

Hand painting:

Minimal paint system product specification for a '3 Coat Single Pack Alkyd System'

Stage 1 - Two coats of 'SigmaFast 20', an alkyd primer-undercoat

Stage 2 - One or two coats of 'SigmaFast 40', a high solids alkyd based protective topcoat. Colour/Ral No to be specified at time of order at time of order.

Note that the SigmaFast 40 is described as undercoat, in its own right most of the Sigma systems are based upon a gloss finish with either SigmaMarine 48 or 49 and you would use one coat of each (eg 20, 35, 40, 48) as a full system.

Spray painting:

Minimal paint system product specification for a '2 Coat Single Pack Alkyd System'

Stage 1 - One coat of Sigmacover 280 – undercoat-primer

Stage 2 - One or two coats of Sigmadur 520 – top coat.

If you cannot find these products from a local supplier then this paint system is available from;

Industrial Paint Supplies (Hull) Ltd, 51 Charles Street, Hull, HU2 8EH

T; 01482 321 154 E; sales@ipshull.co.uk

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 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 re-seal 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.

THEN BACK TO

7. Again et cetera ad infinitum.

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.
- 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 blacksmiths craft.
- The architect will enforce the word and spirit of these specifications.
- All drawings and dimensions given are approximate and for guide purposes only. It is expected that contractors will conduct their own site survey for all construction dimensions.
- This specification sets the style and quality of the intended ironwork and on accepting the order to construct and install the contractor will become fully responsible for all items relating to the design, build and installation.
- Mild Steel will not last as long as wrought iron even when galvanised or zinc sprayed. For longevity use wrought iron.
- EN1090 – is applicable for the manufacture of many handrails, staircases and balustrades where joins are electrically welded together. This should be born in mind if you opt for fabricated work.

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 practice.</p>
GALVANISING AND ZINC SPRAYING	<p>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.</p> <p>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</p>

'snots', this process removes some of the surface galvanised coating

JOINTING:

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

LAMINAR MATERIAL

Metal made by forge-welding different layers.

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, not to be used on traditional techniques ironwork

Updated January 2017