

1: Handbook of Mechanical Works Inspection: a Guide to Effective Practice - ¼Ø±Ù~Ù‡ Ù‡Ø§

Look also at the relative amounts of inspection done by the parties (the vertical scale): here we have the start of work-hour budgets Handbook of Mechanical Works Inspection Fig 2. This is very expensive. to help us keep our grip on the target of effectiveness.

Handbook of Mechanical Works Inspection Fig 2. The characteristic of the curve will undoubtedly be contract-specific but now we have a model for managing the situation. Look also at the relative amounts of inspection done by the parties the vertical scale: The point Z represents the most effective amount of inspection - the target. There are real risks to FFP either side of this point on the horizontal axis. Too little inspection will not find the problems. Too much inspection will cause too much discussion; issues will become clouded, politics will prevail and we will expend huge amounts of resources on generating our own problems and then having to find fine and persuasive solutions. This is very expensive. Give it only a halfchance and it will take your profit away. Remember point Z and please try to avoid too much inspection, it can be one of the major dangers to effectiveness. Develop a tactical approach It is important not to confuse the tactics of an inspection with strategy the larger picture. Tactics are the strategy in action, elements of practical Objectives and tactics 15 advice, comprising the series of rational steps that lie behind all inspection activities. It is helpful to look at four main tactical elements they are more or less sequential - that make up an inspection activity to see how they are used. If you want to manage the situation properly and plan to obtain the best solution then you need the right information. Almost inevitably it will be impossible to have access to all relevant technical information relating to the equipment or contract, but basically you need the following things: Notwithstanding the need for these three cornerstones of information, you also need to think about specific background knowledge that will be needed in order to help you handle the technical discussions - and sometimes conflicts - that will inevitably arise. A better term perhaps is qualifying information and it is frequently this that actually makes a solution possible to the general satisfaction of the parties present. It is not necessarily wrong to attend an inspection without all the information â€” the necessary qualification being that you know what to ask because some of the other parties may be able and willing to help you. However, they may not, so I would be very wary of arriving at an inspection without the information I have mentioned. You could undoubtedly survive it. You would probably still be welcomed 16 Handbook of Mechanical Works Inspection by all parties concerned, but it is undoubtedly the path of the also-rans. Keep on doing it and slowly but surely your credibility as an inspector will drain away. Focus Focus means keeping sight of priorities. I have made the statement earlier that the various parties present at a works inspection may each have a different focus on events, even though their technical objectives are broadly the same. I can now proceed one step further and say that it is highly likely that each party will have a different focus. This gives a real potential for time delays and extra costs, before a consensus agreement or solution can be found. Good inspection involves managing these different foci. Look at how it works in practice. These diversions start off slowly, but increase in number during the inspection as the situation builds. It is likely that, in the course of discussions, issues of material traceability, testing techniques, workmanship, painting and packing, weld specifications, and many others will develop as side issues of the main theme. Commercial issues and questions of interpretation also appear to further complicate the arguments. Under such conditions the side issues can become very effective at blocking your focus on FFP. Side issues are often more interesting, and easier to discuss, than FFP. They can be an easy way out. You must guard against this - fortunately the rule is simple: This is a loop, and it is a good idea to make it a ten-minute loop. This means that you can play a full part in side issue discussions but every ten minutes you need to bring the subject of the discussion back to your FFP focus. Any longer than ten minutes and the side issues may well grow in priority until you are seen as unreasonable in trying to change the subject. Less than ten minutes and you may miss an important point that the side discussions reveal, so ten minutes is about right. Objectives and tactics 17 Fig 2. All parties start out neither innocent nor guilty and will remain that way, whatever the outcome of the inspection. It is also a fact, however, that a works inspection is about questioning the actions and technical knowledge of competent

contractors and manufacturers and can therefore be a rather stressful activity for all parties. Perhaps the best general guidance I can offer a works inspector 18 Handbook of Mechanical Works Inspection is to try and project a modest attitude of searching for the truth, rather than attempting to appear too confident, or authoritative, or even apologetic - I have seen some inspectors who continually apologize for being in the works. Granted, there are many different ways to do it, but over time the honest truth-seeking approach, albeit hard to maintain, probably works best. Armed with this, you can start asking questions. A good technique to master, which will serve you in all kinds of inspection situations, is that of chain questioning. This is a very effective way of getting at the truth. The technique involves spending most of your time upwards of 80 percent of the time you spend speaking asking questions; not in a suspicious or confrontational manner although these may have their place, but asking, just the same. The precision of the questions is important - they need to have two main properties. Firstly they should be capable of being answered by manufacturers or contractors in a way that allows verification. That is, manufacturers must be able to prove to you that what they say is true, and provide supporting evidence. This means you must be accurate in what you ask. Note that it is essential you obtain verification of a previous answer before developing the next question in the chain, otherwise future questions and answers can get increasingly hypothetical and the integrity of the chain breaks down. In most situations, a mixture of closed and open-ended questions seems to work best. It is at this point that we can see one advantage of the duplication of inspectors. With several parties using knowingly or unknowingly this technique, you get the benefits of cross examination, a situation which is widely accepted in legal circles as providing the best method of getting at the truth. You should find that a well-chosen chain of four or five questions, with tenacious perusal of the verification of each answer, will strip the veneer off most works inspection situations. A final point on questioning. Remember that this is an inquiry. Once you have asked a question it is not wise to answer it yourself. Thoughtful silence will normally bring the answer. Making decisions Making decisions is one of the things that you will have to do frequently during works inspections. Inspection is by its nature an adjudication Objectives and tactics 19 process and even when working within large companies and complex projects the practicality of the situation is this: We are fortunate in that inspection decisions centre predominantly on technical matters, so a rational approach is possible, and more likely to be accepted, than in for instance more complex management situations. It is wrong to expect that all decisions will be simple accept-or-reject choices, many will involve deciding on rectification work that needs to be done, or the extent of actions required by the various parties present. The way in which you present your decisions is therefore of prime importance. Clarity is vital - make sure that you express decisions in full, but in simple terms, so everyone will know what you mean. One of the pitfalls of decision-making during a works inspection is to be drawn into making qualified decisions based on something that is intended to happen in the future: The problem is that as an inspector you really only have the powers of scrutiny when you are in the works; once you leave, you relinquish much of the potential you have of influencing FFP. It is much better to make decisions whilst you are there. Listen carefully, then you decide - there and then. You must communicate your decisions to the other parties present. The only real way to do this is to put them in writing see Chapter 15 for guidance on non-conformance reports. Verbal agreements, with the best intentions of all parties, can easily be misunderstood. Write it all down. At this point it is useful to consider the influence that contractual agreements and protocol have on the way that decisions are implemented during an inspection. I have proposed that you should make the relevant decisions but this does not necessarily mean that you alone have to implement them. Normally, the various contractual agreements that exist between contractor and manufacturer, or between manufacturer and third-party body, are the best vehicles for getting things done. Keep the implementation chain short - and let the contractual protocol work for you. The end game It is at the end of a works inspection when things really start to happen. At this point ideas and decisions that have been accumulated by the parties during the course of the inspection will start to be put forward and implemented, bringing into focus any outstanding actions that are necessary. Effective inspection means planning carefully for this end game, understanding the mechanisms that are available, and using them to best effect. The main mechanisms available to you are twofold, the non-conformance report NCR and the corrective action CA. In practice our objective is to link them closely together - this is a good way of making things happen.

Non-conformance reports NCRs The purpose of a non-conformance report is to make a statement on fitness for purpose of the equipment that you have inspected. This definition is important; note that the purpose of an NCR is not to reject equipment. It can be contractually very difficult to formally reject equipment - you are in effect saying that it does not comply with the purchase order, with all the consequent contractual and legal implications. This is dangerous ground. You may feel that there is a paradox here; an inspector can accept equipment but cannot reject it? We could investigate this hypothesis but we would have to discuss legal liabilities and organizational responsibilities, and submerge ourselves in specific case law. This is another subject. We can do it more easily by putting to one side the accept versus reject argument and just look at what you are in the works to do. You have seen the first part of this before: In essence, it is the content which is important. The layout will vary between companies and contracts but frankly this Objectives and tactics 21 Ten simple rules 1. The next step is to link the NCR to an agreed corrective action. In fact, they must come in pairs, it is not good practice to issue an NCR without an accompanying discussion and agreement on how the issue will be put right. Corrective actions CAs It is much easier to find faults with equipment than it is to put them right. You should not expect therefore, that implementing corrective actions is easy.

2: Handbook Of Mechanical Works Inspection | Download eBook PDF/EPUB

The Handbook of Mechanical Works Inspection provides the techniques, guidelines, and technical data needed to perform inspections on mechanical equipment found in power and process plant applications.

Get fast, accurate solutions to virtually any day-to-day mechanical engineering problem with the revised "Handbook of Mechanical Engineering Calculations, " Second Edition. The "Handbook" offers expert solutions to thousands of mechanical engineering problems, all logically organized under four headings: Ranging from power plant equipment, combustion, compressors, heat exchanges, and refrigeration The Second Edition features include: Cutting-edge calculation procedures for design engineering advances in shafts, bearings, springs, and brakes The latest automatic and digital control calculations Numerous worked-out examples in USCS and SI units Helpful numbered steps showing the exact procedure for computing desired results A wealth of information new to the Second Edition on alternative and renewable energy, gas turbine installations, plastics, pumps and piping, refrigerants, plumbing, hydraulic and pneumatic systems, space humidification systems, and much more Get Step-by-Step Procedures for Solving Problems in: Steam Condensing Systems and AuxiliariesSection 3: Steam Generation Equipment and AuxiliariesSection 5: Feedwater Heating MethodsSection 6: Plant and Facilities EngineeringSection 7: Pumps and Pumping SystemsSection 8: Piping and Fluid FlowSection 9: Heat Transfer and Heat ExchangeSection Wastewater Treatment and ControlSection Heating, Ventilating, and Air ConditioningSection Environmental Control and Energy ConservationPart 4: Gear Design and ApplicationSection Bearing Design and SelectionSection Spring Selection and AnalysisSection Mechanical and Electrical BrakesSection Hydraulic and Pneumatic Systems DesignSection He has worked in plant designing and operation in a variety of industries, taught at several engineering schools, and lectured both in the United States and abroad.

3: Handbook of Mechanical Engineering Calculations, Second Edition : Tyler Hicks :

Handbook of Mechanical Works Inspection will not make you a technical expert on individual pieces of plant or help you to write quality assurance manuals. It is a.

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explained. If you follow the techniques described and start to apply them to your works inspections then this can help you do things the right way. These are important principles. Chapters 4 to 14 are the technical chapters and cover the equipment items themselves. Each technical chapter is based on a common structure, as shown in Fig. In a few cases you will see the information presented in an abbreviated two- page tabular format for clarity. Chapter 15 is about inspection reports. To start, we must look at the most important factor in effective inspection. We will see in Chapter 2 that it is an elusive concept, carrying with it all kinds of legal and commercial implications. As engineers, we must for the moment try to see it more simply. FFP is the ability of a piece of equipment to do its job correctly - in the way that the user expects. Each technical chapter sets out clear FFP criteria for the equipment in question. These are basically a distillation of the principles and requirements of the relevant codes, standards, and detailed engineering specifications. Most of the fine detail, however, has been omitted. What we then get is a clear view of the FFP requirements. We can work with this. In following the methodology of the technical chapters, you should treat the FFP criteria as a practical level of requirements. Look carefully at them. Please do not treat them as if they are a full statement of the technical requirements of the equipment: They do, however, form a firm base from which to start, and then if there are any particular requirements of the relevant specification, you can apply these in the correct context and not lose sight of the main priorities. FFP criteria will feature prominently in the type of inspection reports that I will introduce in Chapter 15. If you stick to reporting about FFP your reports will be concise and tell your clients what they need to know. This is what we are aiming for. Basic technical information If you ask experienced inspection engineers whether they prefer to have too much detailed technical information or too little, they will probably tell you they prefer to have too little. This makes good sense. What can we learn from this? Simply a few points about information needs during a works inspection. The range of detailed technical information relevant to mechanical equipment is quite vast. The British Library lists dozens of identifiable standards and nearly textbooks and databooks relating to centrifugal pumps alone; if we discuss high pressure vessels, or special steels, the Handbook of Mechanical Works Inspection inventory gets bigger. So we must limit our information to only that which is needed to perform an effective works inspection. The range is still wide, but hopefully it will become clear as you read through the technical chapters that much of it is generic and divides relatively easily into well-defined categories. Each technical chapter of this book provides the basic level of information and data that you need to understand works inspections performed on the equipment. Look, for example, at the technical information provided in Chapter 11 related to centrifugal pump performance testing. You will see that it is ordered specifically towards clarification of the fitness-for-purpose criteria. It will not tell you why a centrifugal pump impeller is a certain shape and size. Design is difficult to check during an inspection because it involves looking into the past. In a few chapters you will see that the technical information section presents calculation methods, where these play an important part. Air compressors and other rotating equipment are the main areas where calculation is required. Happily, no specialist knowledge is assumed, so stick with it, work slowly through the equations shown, and most should lose their mystery. Information references are important, so each chapter provides a simplified list of references. You can use these where, as is inevitable in some cases, more detailed or expansive technical data are required. Use them as necessary, but be wary of trying to go too much further. Standards Technical standards and codes of practice are the tools of manufacturing industry. It is worth considering that without them, every programme of design and manufacture would have to start from scratch. Standards are useful to inspectors because they are objective. Each technical chapter makes reference therefore to relevant codes and standards. Use them where they are imposed by the contract or where more detailed information is required, but remember your FFP criteria. European and ISO International Organization for Standardization standards are used as the basic reference, with national equivalents shown where applicable. In many technical areas, well-established national standards used in works inspection have not yet been harmonized within the EN standards framework. Where this is the case I have referred to the accepted national standard - on the basis that it is the one which you will probably see being used during your inspection visits. The situation is changing rapidly - it is advisable to check that any technical standard you do use is the most recent issue. Equipment specifications tend to be project-specific, hence it is more difficult to talk objectively about them in

this book. Luckily, with good specifications and they are not all good there is a lot of commonality of requirements with the relevant standards and codes of practice, at least as far as FFP is concerned. Chapter 3 is devoted to discussion of equipment specifications and their nominees, the inspection and test plans ITPs. Looking back at Fig. I advise that you use these requirements as a basis for what you expect to see in an ITP - but beware of encouraging further over-complication. An important note You will see that we have now taken the brave step into the field of terminology: Discussions on nomenclature in this field are extensive, whole volumes being dedicated to defining quality assurance terms so that we can understand them better. Fine, but this is a book on the techniques of effective works inspection. I am going to suggest that we define the ITP simply, as the document used by the manufacturer and their clients to monitor the manufacture and testing activities. We can then conveniently leave other debates to one side.

4: Handbook of Mechanical Works Inspection - [PDF Document]

Handbook of Mechanical Works Inspection is wise to fit in with the way that this system works. It is easy, with only a small amount of knowledge, for an external inspector to intervene.

5: Handbook of Mechanical Works Inspection A guide to effective practice 1st Edition

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6: Handbook of Mechanical Works Inspection : Dr. Clifford Matthews :

The Handbook of Mechanical Works Inspection provides the techniques, guidelines, and technical data needed to perform inspections on mechanical equipment found in power and process plant applications. The Handbook concentrates on the core fitness for purpose issues that arise during the witnessing of material and.

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9: Books on Welding

There are often some peripheral activities that are an important part of works inspection. the consultant or designer (the engineer).6 Handbook of Mechanical Works Inspection follow if you are not overly familiar with the types of equipment or activities that are involved. the procedural activities that surround the core inspection or test.

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