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British Horological Institute

The Servicing of Clocks and Watches

The Servicing of Clocks and Watches

A guide produced by the Examinations Board of the British Horological Institute to assist students preparing for the EAL / BHI Certificate in the Repair, Restoration and Conservation of Clocks / Watches.

Two Units, Unit 8, The Restoration and Conservation of Clocks, and Unit 13, The Restoration and Conservation of Watches, require students to consider carefully their approach towards “repair”, “restoration” and “conservation”. It is expected that candidates will refer to the various approaches presented in this handbook when providing supporting comment for the nature of the work that has been undertaken. The information presented represents the views of a number of experienced horologists and will also prove useful for those working within the profession.

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1. Introduction

This booklet has been prepared by Members of the Examinations Board with the intention of providing guidance to students. It should, nevertheless, also be useful to professional horologists seeking advice in this area. In its preparation the opinions of a variety of experienced horologists have been sought to provide an overall picture which will inform the student of various measures that can be adopted when servicing clocks and watches.

Candidates submitting a Portfolio for Unit 8 or Unit 13 are required to include, for five clocks or five watches according to the pathway selected, evidence of the work that they have completed. The Portfolio may also include supplementary information relating to the restoration / conservation measures that have been adopted; during assessment the approach to restoration / conservation is carefully considered by the Examiners.

In order to understand the need for and to apply good practice, when servicing clocks and watches, students have generally been directed to seek guidance from fully qualified members of the BHI and from the textbook 'Conservation of Clocks and Watches' edited by Peter B. Wills. This booklet aims to provide a summary of information from this textbook and includes material from other sources. It is often suggested that horologists should consider each item on its merits; this may be satisfactory for the experienced professional who has handled a very wide range of items of different age and type but it is of little benefit to the student or less experienced professional.

Horological items suffer from continuous change and deterioration due to wear and tear and, sometimes, as a result of servicing. If such work does not respect the integrity of the item then the originality of the piece becomes lost. The purpose of this document is to provide a summary of current thinking concerning the servicing of clocks and watches and, in Appendices 1 and 3, to give clear guidelines for students on appropriate approaches for various types of clocks and watches. These notes should be considered by all candidates intending to submit a Portfolio for Unit 8 or Unit 13 as they will form the basis for assessment of the "approach" applied by the candidate.

2. Servicing Activities

Servicing can be defined as "the periodic activity to maintain the function and / or condition of a clock or watch". It encompasses a range of different approaches which can be followed according to the nature of the clock or watch and the views of the horologist and the client. Important decisions are required to determine the nature and extent of the work to be undertaken, whether to repair, to restore or to conserve.

Unfortunately these terms, repair, restoration and conservation can have different interpretations by horologists. (Repair, for example, is a very broad term; for some it refers to the attention given to just a portion of the mechanism to ensure further service but for others it would include dismantling, cleaning and bushing etc.)

It is important therefore to have a clear understanding of the meaning of the various terms as they are used in this document; they cover a very wide spectrum of activities, each of which differs considerably in the degree of intervention. At one end of the spectrum the item may be protected against change or subsequent deterioration, in the middle it is returned to functional order but at the other end it is permanently changed by returning it to its 'original' condition.

3. Generally Accepted Definitions of Processes described in 'The Conservation of Clocks and Watches' edited by P B Wills

3.1 Repair

The mending, that is, the putting into functional order of a clock or watch.

This can include work on a part or the whole of the mechanism. It may involve fully dismantling, cleaning, re-assembling, lubricating and adjusting a clock or watch. The outcome of the work will be that the item is fit for further use without risk of damage or rapid deterioration.

3.2 Restoration

The reinstatement of a clock or watch to its conjectured former state and function.

The item would be restored to the condition that it is believed the maker intended. It is likely that research will be necessary to determine the design and finish of damaged or missing components. The degree of intervention will depend upon the type of item and its un-restored condition:-

- a. Inappropriate components can be removed.
- b. Missing components can be replaced.
- c. New parts may be purchased or made, or similar parts adapted to suit.
- d. Previous changes from its original state can be reversed.
- e. Surface finish can be returned to the style of original.
- f. It is not acceptable to alter or modify existing original components of the clock or watch to accommodate new components.

3.3 Conservation

The stabilisation of a clock or watch so that it is preserved in its existing state.

The conservation of a working clock or watch will necessitate periodic cleaning and lubrication; any further work should be, as far as possible, reversible and be limited to the necessary minimum intervention:-

- a. The clock will be cleaned to remove surface dirt, congealed oil etc.
- b. The patina present on plates, etc. should remain.
- c. Restoration of component/s is only considered appropriate to safeguard against future damage which would result from breakage of a part or accelerated wear because of worn or unsuitable components.
- d. Design faults that seriously affect the operation of the piece should only be modified to ensure reliable working or to prevent future damage or accelerated wear. Caution must be exercised because any decision to make alterations may be based on incorrect knowledge or understanding.
- e. Corrosion should be treated to prevent further deterioration, but there is no attempt to refinish areas to remove signs of corrosion.
- f. All aspects of its 'life' up to the present are considered to be part of the history of the clock or watch and should be retained, bearing in mind their merit and appropriateness

4. An Extended View of the Servicing of Clocks and Watches

Since the book, 'The Conservation of Clocks and Watches' edited by P B Wills, was first published in 1995, there has been further consideration concerning the conservation and restoration of clocks and watches.

There is now an organisation known as the Institute of Conservation which developed the PACR (Professional Accreditation of Conservator Restorers) process to accredit conservators of all disciplines for entry to the Conservation Register. The BHI is a PACR participating body; BHI professional members who become Accredited Conservator- Restorers (ACR) will follow the "Guidelines for Prospective PACR Candidates" (Appendix 4). These guidelines refer to the European Confederation of Conservator-Restorers' Organisations' (ECCO) "CODE OF ETHICS". This code is included as Appendix 5. Whilst it is recognized that few horologists working outside the museum service will undertake pure conservation, the accredited conservator-restorer is bound by the same code when undertaking repair or restoration work.

To ensure an overall understanding of conservation / restoration issues it is important for the student to possess knowledge of the PACR Guidelines and the ECCO Code of Ethics, as well as the material in the book by P B Wills. It may be appropriate to apply some aspects of the ECCO Code of Ethics when undertaking repair /restoration work.

Key points of this approach which must be considered are:-

- a. The primary aim of the conservator is to preserve an object to enable its historical, aesthetic and technical features to be appreciated and understood.
- b. Except for the demands of preservation no permanent alteration of the object's structure or aesthetic appearance is acceptable – the principle of reversibility.
- c. Where a movement is to be returned to working order, it must be done with the minimum effect on the existing structure.

The accredited conservator-restorer is required to apply these principles rigorously to all their work regardless of age or condition. Conservation, as defined in 3.3, should not therefore be considered just as a distinct approach but embracing "repair" and "restoration".

The definitions of "repair" "restoration" and "conservation" given in Section 3 are relevant but an in-depth consideration of approaches for the servicing of clocks and watches is incomplete without:-

- a. the inclusion of two additional terms based on the previous definitions:-
 - i. 'conservative repair' (PACR - Remedial Conservation)
 - ii. 'conservative restoration' (PACR - Conservation Restoration)
- b. 'preventive conservation' relating to non-working items for display or storage.

4.1 Conservative Repair

The mending, that is, putting into functional order of a clock or watch ***with the minimum of necessary intervention and ensuring, where possible, all work is reversible.***

The term is more appropriately applied to older clocks and watches as distinct from modern pieces.

4.2 Conservative Restoration

The reinstatement of a clock or watch to its conjectured former state and function *whilst retaining, as fully as possible, the historical integrity of the piece.*

4.3 Preventive Conservation

The removal of all sources of deterioration and the application of inert preserving materials to ensure long term integrity.

The environmental control of temperature, humidity, light levels / storage structures / handling / transport issues are all important parts of the process of preventive conservation.

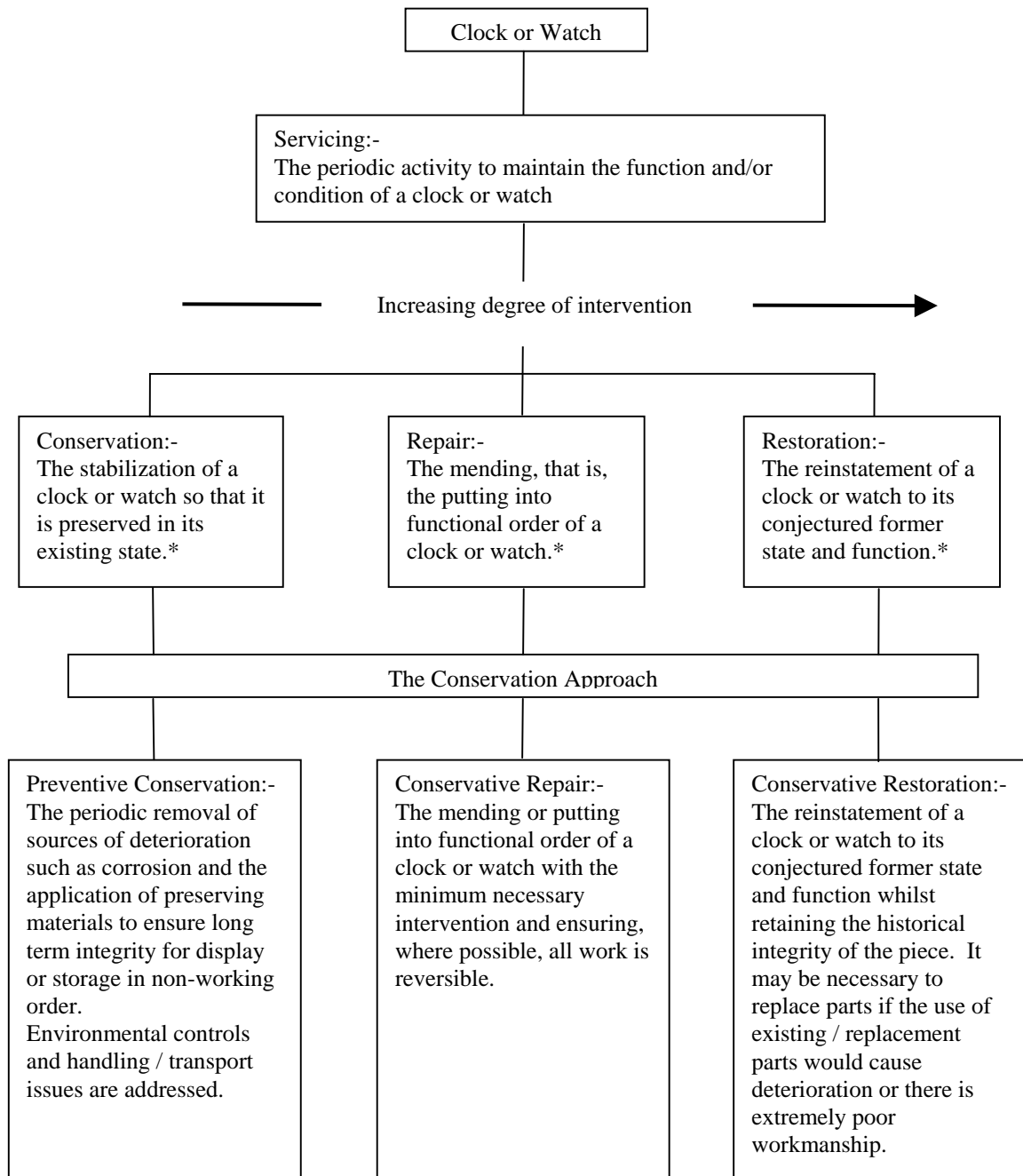
The preventive conservation of a clock or watch requires periodic evaluation of its condition and the environment for storage or display:-

- a. Generally, clocks or watches for display / storage in non working order.
- b. Corrosion should be treated rather than removed in order to prevent damage to surrounding areas.
- c. The clock or watch would be assembled without lubricant if it is not intended to be run.

Items requiring Preventive Conservation are not suitable for use as portfolio items. Examples of Preventive Conservation are therefore not included in Appendix 1.

5. A Summary of Approaches for the Servicing of Clocks and Watches

The overall position can be shown diagrammatically:-



*Based on definitions given in Conservation of Clocks and Watches edited by Peter B Wills

6. Making New Parts for Clocks and Watches

Summary of key differences between the various Servicing options

<p style="text-align: center;"><u>Repair</u></p> <p>(Putting into functional order)</p> <ul style="list-style-type: none"> • Any new parts, which are required or desirable, can be made and fitted. • Disused components may be modified to suit. • May alter structure of piece if required. • Desirable but not essential that parts are similar in style and finish to original. • Work must be consistent with good workmanship. 	<p style="text-align: center;"><u>Restoration</u></p> <p>(Re-instatement to conjectured former state and function)</p> <ul style="list-style-type: none"> • Parts made in same style and finish as conjectured former state. • Research, as required, to determine style, material and finish. • Similar parts may be adapted to suit. • Full records made of work done. • Parts removed to be retained. • New parts identifiable.
<p style="text-align: center;"><u>Conservative Repair</u></p> <p>(Putting into functional order with minimum intervention)</p> <ul style="list-style-type: none"> • New parts, only if essential to running or to prevent damage or wear, may be made and fitted. • Replacement parts wholly in accordance with original detail. • No changes to the structure. • All work reversible, if possible. 	<p style="text-align: center;"><u>Conservative Restoration</u></p> <p>(Re-instatement to conjectured former state and function whilst retaining historical integrity)</p> <ul style="list-style-type: none"> • New parts made and fitted only if essential to functioning, to prevent damage or repair, to rectify very poor workmanship. • Parts made appropriate in every detail. • No changes to the existing structure. • Re-conversion to former state not acceptable. • Full records made of work done. • If parts removed then retained. • New parts identifiable

7. The Portfolio

The contents of this paper on the servicing of clocks and watches will influence, to a varying degree, the decisions and actions of a candidate when undertaking the actual work and when preparing the Portfolio. The guidance for the preparation of Portfolios, which has been circulated by the Institute, has been slightly modified so that candidates are now required to prepare supplementary material for each item using the four following headings clearly:-

1. Appraisal
2. The Conservation / Restoration Process
3. A Justification of the Conservation / Restoration Approach
4. Research

The expression “Conservation / Restoration” is used to encompass the range of approaches described in Appendix 1. Further guidance to define the required content of the Portfolio is given in the Syllabus Handbook and presented below:-

1. Appraisal:-

You are required to demonstrate that you can evaluate the condition of the items that receive your attention and can appraise the work of others by giving:-

- initial condition of the clock / watch movement and its case

INCLUDE

- if appropriate, an evaluation of previous repairs, their quality, effectiveness and whether they are appropriate

2. The Conservation / Restoration Process:-

You are expected to describe the design / making of the two new components for each Portfolio item together with other work undertaken. If there are more than two components please select the more complex items.

Describe:-

- the design and making of the two missing / replacement components with, where appropriate, calculations (include any minor research required and steps taken to ensure accurate geometry for correct operation).

AND

- the other work undertaken to the clock / watch

3. A Justification of the Conservation / Restoration Approach:-

You are required to show that you are familiar with the alternative approaches available. You are expected to refer to the Examinations Board Paper on The Servicing of Clocks and Watches when providing:-

- a comparative evaluation of the selected approach with alternatives

INCLUDE

- steps taken to maintain originality including the reasons for selecting the materials **and** the design for replacing broken or missing components

AND

- an evaluation of the work undertaken to the clock / watch

4. Research:-

You must show that you are able to carry out horological research and present your findings by describing:-

- research to discover information about the historical background of the maker of the clock / watch.
- research to determine the design of a replacement component (unless included in The Conservation Restoration Process).
- research to learn about a manufacturing process required to produce a replacement component.
- research to consider the performance of the piece that has been restored.
- other research directly relevant to the piece.

Appendix 1 - Approaches for the Servicing of Clocks and Watches

When presented with a particular type of clock or watch the student will need to make a decision on which approach to adopt.

1. Scope

The information provided in this document relates directly to clock and watch movements these being the main area of activity for the horologist. It must however be remembered that the same principles apply to ancillary items such as dials and cases. Work on such items will often be undertaken by specialists in their respective fields. It is therefore advisable to discuss and, where necessary, influence the nature of work to be completed by others in order to maintain an overall integrity of approach to the piece.

It is not possible to draw rigid boundaries between different types of items in order to provide prescriptive information; for many pieces there will be no doubt about the approach which should be taken but for others it will be less clear. Reference to Appendix 3 reveals a number of categories which show more than one approach to be appropriate; a decision must be reached bearing in mind the wishes of the client, the views of the clock / watchmaker regarding “conservation – restoration” issues and the nature of the item itself. If there is still uncertainty, the piece should be treated in accordance with the more conservative approach. An assessment of its likely rarity, advice and / or research will always assist when considering the degree of intervention.

2. The Customer

The owner of a horological item may set down certain requirements to be followed when carrying out the required work. This may be based on their understanding of the piece, its originality, condition, financial value, etc. Before undertaking any work it is the duty of a professional horologist to advise the owner on current good practice. This document can be used as a part of that advice to the owner. An owner may ask for a particular course of action, even if this represents bad practice. Such conflicts should be resolved, where possible, by discussion with the client in order to achieve a decision acceptable to both parties. Where the owner insists on work which you believe is bad practice the British Horological Institute Code of Practice requires all members, whether qualified or not, “to refuse the work politely but firmly, advising the customer of your reasons for doing so” (Appendix 2).

3. Examples

There are large differences in the degree of intervention and the reversibility between the approaches; examples of current good practice are presented on the following pages to complement the definitions and add clarity for the candidate. The intention is not to provide an exhaustive list of techniques and practices but to give sufficient examples to enable the reader to identify the differences between the different approaches. Conservative repair and conservative restoration are included by overlaying the PACR guidelines and ECCO Code of Ethics (PACR, Appendix 4 and ECCO, Appendix 5) on the sections relating to repair and restoration. It is inevitable therefore that some repetition is present in order to provide a full and clear picture.

4. Record Keeping

It is important that records are maintained of all work but in the case of conservative repair, restoration and conservative restoration there is an obligation to produce complete written and photographic records giving details of the object and its initial condition, dismantling, cleaning, conservation / restoration activity, assembly and testing. A copy should be retained and a copy provided for the client.

1. Repair

Examples of suitable practice:-

- a. Chemical cleaning approaches are acceptable using proprietary clock and watch cleaning fluids and methods. It is important, however, to ensure that no damage occurs as a result of cleaning fluids used at higher concentrations than recommended by the manufacturer or due to unsuitable use. (e.g. ammonia based clock cleaners used for prolonged periods or in an ultrasonic tank)
- b. The surfaces of plates, wheels etc. may be re-finished.
- c. Pivots, striking levers, pallet faces, etc. may be re-finished to remove indications of wear.
- d. Where pivot holes are worn, commercially manufactured bushes can be fitted, if they are appropriate, and finished flush to the plate. It may, however, be preferable to manufacture bushes as required to ensure suitable material and dimensions.
- e. New mainsprings may be fitted to replace 'set' springs to ensure the full working duration of the clock / watch. This should not present difficulty in modern items where replacement mainsprings are likely to be of similar strength; caution should be exercised with older pieces as the power output of the replacement could be significantly different to the original.
- f. Manufacturer's genuine replacement parts should be used when available (this is only likely to apply to 20th and 21st Century mass-produced watches and clocks).
- g. Whenever genuine parts are not available:-
 - i. The use of generic parts should be considered - they may require modification / finishing. The customer should be aware if generic parts are being used, particularly for watches because of warranty and factory servicing implications.
 - ii. It may be necessary to fit components from a disused clock or watch movement; these may require modification to ensure reliable operation and should be re-finished where necessary.
 - iii. It may be necessary to manufacture the required components in the style of the original with regard to design and finish.
- h. Replace 'consumable' components, e.g. watch batteries, seals.*
- m. Watch crowns should be replaced.*
- i. Watch glasses should be replaced.*
- j. Watch cases should be refinished.*

*A watch service department will often use the term watch "servicing" to describe a complete overhaul to include routinely replacing parts as required, refinishing the case, replacing glass and crown etc.

2. Conservative Repair (PACR - Remedial Conservation)

Examples of suitable practice:-

- a. The purpose of cleaning is to only remove substances detrimental to the preservation of the object – the soaking of movement parts in ammonia solutions is not acceptable. It is permissible to wash visible movement parts in such solutions to remove excessive tarnishing.
- b. Action should be taken to arrest and or remove corrosion.
- c. The re-polishing / graining of surfaces for aesthetic purposes is generally not acceptable.
- d. Care must be taken to ensure that evidence of original finishes, such as gilding, is not destroyed during the repair process.
- e. The surfaces of pivots, striking levers, pallet faces, etc. may be re-finished but it is not necessary to remove all signs of wear; this is not usually required to ensure the continued reliable functioning of the item.
- f. Bushes should be carefully selected / made for the piece to ensure fitting with the minimum loss of structural material and driven flush to the inside of the plate thus avoiding filing and refinishing. New oil sinks should not be formed if it requires metal to be removed from the plate.
- g. Whenever possible replacement parts should be wholly in accordance with the original detail. E.g. rubbed in jewels should be replaced with similar jewels.
- h. Any replacement parts, essential for the safe operation of the item, must be made so that changes to the ‘structure’ of the piece are not required.
- i. An existing mainspring may be retained even though it results in a reduced duration.
- j. New parts would be fitted as given in ‘Repair’ (f and g) but only if essential to the functioning of the clock or watch or to prevent damage or increased wear in the future. The removed parts would be retained and, where possible, new parts made clearly identifiable by marking.
- k. Appropriate records, both written and photographic, should indicate which parts were replaced and when.
- l. Laser welding techniques should be considered to overcome worn components, e.g. clock pinions, but there must be a careful consideration of the possible result. E.g. a “refurbished” pinion could increase wear on the adjacent driving wheel.
- m. Dials, watch and clock, should only be sympathetically restored after very significant deterioration and no longer serviceable.
- n. Replace ‘consumable’ components, e.g. watch batteries, seals.
- o. Existing watch crowns should be retained if they are still serviceable.*
- p. Watch glasses, even if they are scratched, should be retained.*
- q. Watch straps or bracelets may have been previously replaced; existing or original straps should be retained if they are safe for further use.*

*A watch service department will often use the term watch “servicing” to describe a complete overhaul to include routinely replacing parts as required, refinishing the case, replacing glass and crown etc. However, with older watches, the client may request parts marked * to remain, thus ensuring the watch retains a “mellow” appearance in keeping with its age and style. Some companies may not issue a full service guarantee, for example the waterproofing of the case, if old parts are retained at the client’s request. Watch owners need to be made aware of this *before* any work is started on the timepiece.

3. Restoration

Examples of suitable practice:-

The term ‘restoration’ may be used to describe a ‘full restoration’ as well as the restoration of components to restore function. A ‘full restoration’ may require the replacement of missing components or, as in the case of a verge re-conversion, the removal of a number of components and their replacement with parts conjectured to be like the original. The ‘functional restoration’ of components would include the restoration of worn pivots, the making of, for example, a replacement striking lever which has been broken and the re-facing of pallets. The overall objective of full restoration is to ensure that the piece looks the same, and operates in the manner, as intended by the maker. The degree of intervention will depend upon the type of item and its un-restored condition.

- a. Chemical cleaning approaches are acceptable using proprietary clock and watch cleaning fluids and methods. It is important, however, to ensure that no damage occurs as a result of cleaning fluids used at higher concentrations than recommended by the manufacturer or due to unsuitable use. (e.g. ammonia based clock cleaners used for prolonged periods or in an ultrasonic tank)
- b. Restoration of existing components should maintain as much of the original as possible but, for example:-
 - i. Lightly worn pivots can be re-finished to remove all evidence of wear.
 - ii. The worn surfaces of striking levers can be refinished to remove all signs of wear.
 - iii. Clock escapement pallets can be refaced maintaining the original geometry of the escapement. Pallets should not be bent or the back cock position changed to compensate for wear.
 - iv. Damaged teeth in wheels should be replaced instead of producing a new wheel.
 - v. When many teeth are worn or damaged it may be possible to retain the “wheel centre” by fitting a new ring of teeth.
 - vi. Re-pivoting should be adopted instead of making and fitting a new arbor.
- c. When it is necessary to replace components the design and finish should match the original; research is likely to be required to determine the design and finish of missing components:-
 - vii. The design should use the evidence available from the remaining portion of the clock /watch and knowledge of / reference to similar pieces.
 - viii. Original locations of pivot holes should be used instead of creating new pivot holes.
 - ix. Materials that closely match the original should be used.
 - x. Replacement parts should be identified by marking to prevent future confusion.
 - xi. Original parts that are replaced should, where possible, be retained with the movement to contribute to the “history” of the movement.
 - xii. Records, including photographs, should be maintained to ensure a complete provenance.

Restoration, continued:-

- d. The re-finishing of components may be necessary because of damage or to remove corrosion / discolouration.
 - xiii. the original finish should be determined and components re-finished to the same standard.
- e. Brass Dials
 - xiv. The chapter ring, if the silvering has deteriorated, should be lightly re-finished with fine abrasive prior to re-silvering.
 - xv. The engraving wax should be restored with black wax where missing or damaged.
 - xvi. The dial plate, if no original gilding remains, should be polished and lacquered.
- f. Worn watch crowns should be replaced.
- g. Scratched watch glasses should be replaced.
- h. Watch straps should be replaced, with the manufacturer's strap if available.
- i. Dials, watch and clock, should be restored where necessary.
- j. Replace 'consumable' components, e.g. watch batteries, seals.

4. Conservative Restoration (PACR – Conservation Restoration)

Examples of suitable practice:-

- a. The purpose of cleaning is to only remove substances detrimental to the preservation of the object – the soaking of movement parts in ammonia solutions is not acceptable. It is permissible to wash visible movement parts in such solutions to remove excessive tarnishing.
- b. Action should be taken to arrest and or remove corrosion.
- c. The re-polishing / graining of surfaces for aesthetic purposes is generally not acceptable.
- d. Care must be taken to ensure that evidence of original finishes, such as gilding, is not destroyed during the repair process.
- e. The surfaces of pivots, striking levers, pallet faces, etc. may be re-finished but it is not necessary to remove all signs of wear; this is not usually required to ensure the continued reliable functioning of the item.
- f. Bushes should be fitted with the minimum loss of structural material and driven flush to the inside of the plate to avoid filing and refinishing. New oilsinks should not be formed if it requires metal to be removed from the plate.
- g. Whenever possible replacement parts should be wholly in accordance with the original detail. E.g. rubbed in jewels should be replaced with similar jewels.
- h. Any replacement parts, essential for the safe operation of the item, must be made so that changes to the ‘structure’ of the piece are not required.
- i. An existing mainspring may be retained resulting in a reduced duration.
- j. New parts would only be fitted to replace existing components if essential to the functioning of the clock or watch or to prevent damage or increased wear in the future. The removed parts would be retained and, where possible, new parts made clearly identifiable. The conversion of an anchor escapement back to a former verge escapement would be inappropriate.
- k. Missing components, such as a striking train, can be produced but they should be appropriate for the movement in every detail; each part should be identifiable and clear records must be maintained. There should be no alteration to the existing structure.
- l. Laser welding techniques should be considered to overcome worn components, e.g. clock pinions, but there must be a careful consideration of the possible result. E.g. a “refurbished” pinion could increase wear on the adjacent driving wheel.
- m. Brass Dials
 - i. The chapter ring should be restored without removal of material; cleaning with solvents may remove dirt and discoloured lacquer; a paste of salt, cream of tartar and water can remove old lacquer and brighten the old silvering; it may be necessary to use silvering paste if the silvering is in very poor condition.
 - ii. Silvered dials should be protected with microcrystalline wax (e.g. Renaissance Wax) rather than lacquer which may be incompatible with the engraving wax.
 - iii. The dial plate, should be washed with soap and warm water to remove dirt and protected with microcrystalline wax.

Conservative Restoration, continued:-

- n. Appropriate records with photographs should indicate which parts were replaced and when.
- o. Existing watch crowns should be retained if they are still serviceable.
- p. Watch glasses, even if they are scratched, should be retained.
- q. Watch straps or bracelets may have previously been replaced; existing or original straps should be retained if they are safe for further use.
- r. Dials, watch and clock, should only be sympathetically restored after very significant deterioration and absolutely no longer serviceable.
- s. Replace 'consumable' components, e.g. watch batteries, seals.

Appendix 2 - British Horological Institute Code of Practice

British Horological Institute



Code of Practice

This code applies to the repair, restoration and conservation of clocks, watches and other horological items.

All members of the Institute, qualified and unqualified, are bound by this code.

1. Give your customer a receipt for any item you take in, whether for assessment or repair. Note on this receipt and in your records the condition of the item before accepting it for work, drawing your customer's attention to any obvious defects or aspects that concern you. Consider photographing all items as you receive them as part of your normal practice. If the item will require dismantling before you can indicate your price, obtain and record the customer's consent for this, and for any charge this may incur.
2. Provide your customer with a written price for all work as soon as possible after receiving it, except very minor or "while-you-wait" tasks, and an indication of how long the work is likely to take. Make sure your customer knows whether you have provided a quotation (i.e. firm and fixed price) or an estimate (i.e. indicative price $\pm 15\%$), and record your customer's acceptance of your price. State whether any applicable taxes are included. If extra work becomes necessary, obtain and record the customer's consent for the extent, cost and delay of the extra work.
3. Take care of your customer's property: identify it using a job card, tag or similar, and keep records of the work you carry out: parts fitted, test records, customer instructions or authorisations etc, with dates. Keep appropriate customer records. Submit a detailed invoice to your customer, and include relevant test results.
4. Consider the need to insure yourself against risk: especially public liability and employer's liability where appropriate, and objects left for repair. If your insurance does not cover objects left for repair, obtain and record your customer's acknowledgement that insurance of the clock or watch is his/her responsibility.
5. Always work to a professional and responsible standard.
6. Consider the original character and property of artifacts of historic, rarity or quality value, and advise the customer accordingly. If your customer requests work that, in your opinion, will unduly jeopardise this character, refuse the work politely but firmly, advising the customer of your reasons for doing so.
7. Never undertake work beyond your level of competence. If you send a job or part of a job to a specialist, advise the customer in advance and note this in your records.
8. When repairing modern high-quality watches, fit only genuine and exact replacement parts whenever possible. If you can't do this, obtain and record the customer's approval before proceeding, and record the non-genuine components on your invoice.
9. Do not use letters of qualification to which you are not entitled. If you are unsure, check your entitlement with the Membership Team at the Institute's Headquarters.
10. Conduct yourself with courtesy and consideration towards all customers and do not bring the Institute into disrepute.
11. Observe the public interest in matters of Health and Safety.
12. Observe all laws and regulations within the country in which you operate your business.

If your customer is dissatisfied for any reason, first try to resolve the issue politely and objectively. If you are a UK based MBHI, FBHI, LBHI, GradBHI or Trade Associate, and your customer is still dissatisfied with your response, advise that the BHI's conciliation service is available, and offer contact details.

(Issued by the BHI Board July 2005. This version supersedes all previous versions.)

Appendix 3 - Determining a suitable approach

It is recognized that students may not be able to gain advice from the experienced professional when considering the appropriate approach for servicing clocks and watches. Any guidance offered can appear prescriptive when, in reality, there are many more factors that should be considered. Students may feel, however, some concern that the result of the assessment of their Portfolio will be influenced by the opinion of the Examiner concerned and, for this reason; the following table gives broad guidance which will form the basis for the evaluation of Portfolios.

Example:- A Mass produced 20th Century watch where genuine spare parts are available (W4) requires servicing and a new stem, setting lever spring and setting lever. It would be inappropriate for the student to make the components or use generic parts.

Clocks

	Category	Repair / Conservative Repair	Restoration / Conservative Restoration	Preventive Conservation
C1	Clocks of extreme age e.g. 17 th Century clocks.	Conservative Repair	Conservative Restoration	For items to be retained in store or on display
C2	Rare clocks of any age, clocks with historical connections, or those with original features or modifications of particular horological interest	Conservative Repair	Conservative Restoration	For items to be retained in store or on display
C3	18 th and 19 th Century clocks.	Repair or Conservative Repair	Restoration or Conservative Restoration	For items to be retained in store or used for display
C4	Marine chronometers, deck watches, regulators or clocks of exceptional quality	Repair or Conservative Repair Use genuine parts if available or purchase / make / modify parts in full sympathy with the original	Restoration or Conservative Restoration Use genuine parts if available or purchase / make / modify parts in full sympathy with the original	For items to be used for display
C5	Mass produced 20 th century mechanical, electrical, electronic or quartz clocks.	Repair or Conservative Repair Use genuine parts if available or purchase / make / modify parts in full sympathy with the original	Restoration or Conservative Restoration Use genuine parts if available or purchase / make / modify parts in full sympathy with the original	Not normally applicable
C6	20 th century individually designed clocks.	Repair or Conservative Repair Purchase / make / modify parts in full sympathy with the original	Not normally applicable	Not normally applicable

Watches

	Category	Repair / Conservative Repair	Restoration / Conservative Restoration	Preventive Conservation
W1	Watches of extreme age e.g. 17 th Century watches.	Conservative Repair	Conservative Restoration	For items to be retained in store or on display
W2	Rare watches of any age, watches with historical connections, or those with original features or modifications of particular horological interest.	Conservative Repair	Conservative Restoration	For items to be retained in store or on display
W3	18 th and 19 th Century watches.	Repair or Conservative Repair	Restoration or Conservative Restoration	For items to be retained in store or used for display
W4	Mass produced 20 th and 21 st Century watches where genuine spare parts are available.	Repair or Conservative Repair Use genuine parts	Restoration or Conservative Restoration Use genuine parts	For items to be retained in store or on display
W5	Mass produced 20 th and 21 st Century watches where genuine spare parts are not available.	Repair or Conservative Repair Use generic parts / make / modify parts in full sympathy with the original	Restoration or Conservative Restoration Use generic parts / make / modify parts in full sympathy with the original	For items to be retained in store or on display
W6	20 th and 21 st Century individually designed watches or 20 th century watches of very high quality.	Repair or Conservative Repair Use genuine spares if available / make / modify parts in full sympathy with the original.	Restoration or Conservative Restoration Use genuine spares if available / make / modify parts in full sympathy with the original.	Not normally applicable

Appendix 4 - Professional Accreditation of Conservator-Restorers

The following document is provided for applicants who wish to apply to become conservator-restorers accredited by PACR (Professional Accreditation of Conservator-Restorers).

After graduating, the candidate may decide to become an accredited conservator-restorer. This is the qualification required for work on behalf of museums or the National Trust. Accredited professionals have to ensure that all of the work they undertake, irrespective of the type of item, is carried out with full regard for the PACR Guidelines (below) and the ECCO Code of Ethics (Appendix 5). These are set out below; their inclusion here does not imply that the Examinations Board or the BHI fully endorses its contents.

GUIDELINES FOR PROSPECTIVE PACR CANDIDATES

Introduction

1. These notes are provided as guidance for the BHI professional member who is considering becoming an Accredited Conservator-Restorer (ACR). They should be read in conjunction with all the information relating to Professional Accreditation of Conservator-Restorer (PACR) and the European Confederation of Conservator-Restorers Organisations (ECCO) to be found by following the links from the BHI website (www.bhi.co.uk). The ECCO Professional Guidelines is an extensive and comprehensive document with which PACR candidates should be fully familiar.
2. The BHI, as a PACR participating body, administers the PACR scheme in conjunction with the Institute of Conservation (ICON) for all horological applicants. It is important to appreciate that the assessment process presumes that, having achieved MBHI or FBHI grade, applicants are technically proficient. The PACR assessment process therefore focuses solely on the applicant's conservation competency.

Code of Ethics

3. The ECCO Code of Ethics has been designed to apply to all accredited conservators, irrespective of their conservation specialism. These do not replace the BHI's Code of Practice but are in addition to it. Successful candidates will therefore be expected to adhere to both the codes in their work.

Horological Conservation

4. The primary aim of the conservator is to preserve an object to enable its historical, aesthetic and technical features to be appreciated and understood.
5. Horological conservators must consider the object as a whole which includes, in addition to the dial and movement, the case and the environment in which it is to be used or stored. Conservation, therefore, consists of three principle elements:
 - a. Direct actions to arrest or treat deterioration and ensure mechanical function. (Remedial Conservation)
 - b. Restoration to facilitate the object's appreciation and understanding (Conservation-Restoration)
 - c. Preventive conservation measures (Preventive Conservation).

Remedial Conservation

6. Remedial conservation consists of direct actions carried out to stabilise and retard further deterioration. It covers not only the treatments to arrest and or remove corrosion, dirt etc. but also the attention required to ensure the efficient mechanical functioning of clocks and watches, if they are to be used. Essentially this covers cleaning, attention to treat sources of corrosion or potential corrosion and minor mechanical attention. The methods used must always be proportional and the minimum necessary to allow the nature and history of the clock or watch to be appreciated and understood. Dials and cases would also be included, however where the material of these objects is outside the conservator's field of expertise they would have to be referred to the appropriate conservation specialist for attention.

Conservation-Restoration

7. It is often the case that objects are presented to the horological conservator in a damaged, broken, altered condition or with missing elements. In these circumstances, some level of restoration may be necessary if the object is to be appreciated and understood. It is perfectly legitimate for such attention to be undertaken while respecting, as far as possible, the object's aesthetic, historical and physical properties. Existing escapement conversions, for example, would normally be retained but poor or potentially damaging alterations such as the use of too heavy weights, the inappropriate use of solders, glues and coatings would be removed. If an object is to be kept working, then damaged or potentially damaging parts such as mainsprings, weight lines etc. have to be replaced, but parts removed must be recorded and retained with the object. Completely missing parts may be replaced in such a way as to match the style, function, material and aesthetic appearance of the object, but must be identifiable and recorded in such a way as to ensure that they can easily be recognised as such.

Preventive Conservation

8. Preventive conservation is concerned with the control of indirect factors that have or may have an adverse effect upon objects. This covers a wide range of factors from correct handling, moving and use of objects, to advising upon or creating the optimal environmental conditions in which to use or store objects. It may also involve the direct application of protective coverings or frequency of assessment and conservation schedules in circumstances where objects are at particular risk.

Note Although the three principle elements of conservation have been outlined separately above, in practice there is often considerable overlap between them. Nevertheless, it is possible to treat remedial and preventive conservation as two distinct specialisms.

Documentation and Record Keeping

9. The horological conservator has an obligation to record the treatment carried out on objects they work upon. Photographic as well as written records are usually expected.

Continuous Professional Development (CPD)

10. As part of the accreditation process, candidates will be required to complete a CPD assessment. This will form the basis of a reassessment after two years with the purpose of helping conservators to self-assess their conservation skills and identify any areas where practice needs to be updated in line with new conservation developments.

Further Information

11. BHI accredited PACR assessors are available to provide further information and informal advice. They can be contacted by getting in touch with Upton Hall.

Appendix 5 European Confederation of Conservator-Restorers' Organisations

The ECCO (European Confederation of Conservator-Restorers' Organisations) Professional Guidelines that apply to Conservator Restorers working in any field are reproduced below. More information can be obtained from the ECCO website www.ecco-eu.info

E.C.C.O. PROFESSIONAL GUIDELINES (II): CODE OF ETHICS

Promoted by the European Confederation of Conservator-Restorers' Organisations and adopted by its General Assembly, Brussels 7 March 2003

I GENERAL PRINCIPLES FOR THE APPLICATION OF THE CODE

Article 1: The Code of Ethics embodies the principles, obligations and behaviour which every Conservator-Restorer belonging to a member organisation of E.C.C.O. should strive for in the practice of the profession.

Article 2: The profession of Conservator-Restorer constitutes an activity of public interest and must be practised in observance of all pertinent national and European laws and agreements, particularly those concerning stolen property.

Article 3: The Conservator-Restorer works directly on cultural heritage and is personally responsible to the owner, to the heritage and to society. The Conservator-Restorer is entitled to practise without hindrance to her/his liberty and independence.

The Conservator-Restorer has the right in all circumstances to refuse any request which s/he believes is contrary to the terms or spirit of this Code.

The Conservator-Restorer has a right to expect that all relevant information regarding a conservation-restoration project (of any size) is given to her/him by the owner or custodian.

Article 4: Failure to observe the principles, obligations and prohibitions of the Code constitutes unprofessional practice and will bring the profession into disrepute. It is the responsibility of each national professional body to ensure that its members comply with the spirit and letter of the Code, and to take action in the case of proven non-compliance.

II OBLIGATIONS TOWARDS CULTURAL HERITAGE

Article 5: The Conservator-Restorer shall respect the aesthetic, historic and spiritual significance and the physical integrity of the cultural heritage entrusted to her/his care.

Article 6: The Conservator-Restorer, in collaboration with other professional colleagues involved with cultural heritage, shall take into account the requirements of its social use while preserving the cultural heritage.

Article 7: The Conservator-Restorer must work to the highest standards regardless of any opinion of the market value of the cultural heritage. Although circumstances may limit the extent of a Conservator-Restorer's action, respect for the Code should not be compromised.

Article 8: The Conservator-Restorer should take into account all aspects of preventive conservation before carrying out physical work on the cultural heritage and should limit the treatment to only that which is necessary.

Article 9: The Conservator-Restorer shall strive to use only products, materials and procedures which, according to the current level of knowledge, will not harm the cultural heritage, the environment or people. The action itself and the materials used should not interfere, if at all possible, with any future examination, treatment or analysis. They should also be compatible with the materials of the cultural heritage and be as easily and completely reversible as possible.

Article 10: The conservation-restoration treatment of cultural heritage should be documented in written and pictorial records of the diagnostic examination, any conservation / restoration intervention and other relevant information. The report should also include the names of all those who have carried out the work. A copy of the report must be submitted to the owner or custodian of the cultural heritage and must remain accessible. The record remains the intellectual property of the Conservator-Restorer and shall be retained for future reference.

Article 11: The Conservator-Restorer must undertake only such work as s/he is competent to carry out. The Conservator-Restorer must neither begin nor continue a treatment which is not in the best interest of the cultural heritage.

Article 12: The Conservator-Restorer must strive to enrich her/his knowledge and skills with the constant aim of improving the quality of her/his professional work.

Article 13: Where necessary or appropriate, the Conservator-Restorer shall collaborate with other professionals and shall participate with them in a full exchange of information.

Article 14: In any emergency where cultural heritage is in immediate danger, the Conservator-Restorer - regardless of her/his field of specialisation - shall render all assistance possible.

Article 15: The Conservator-Restorer shall not remove material from cultural heritage unless this is indispensable for its preservation or it substantially interferes with the historic and aesthetic value of the cultural heritage. Materials which are removed should be conserved, if possible, and the procedure fully documented.

Article 16: When the social use of cultural heritage is incompatible with its preservation, the Conservator-Restorer shall discuss with the owner or legal custodian, whether making a reproduction of the object would be an appropriate intermediate solution. The Conservator-Restorer shall recommend proper reproduction procedures in order not to damage the original.

III OBLIGATIONS TO THE OWNER OR LEGAL CUSTODIAN

Article 17: The Conservator-Restorer should inform the owner fully of any action required and specify the most appropriate means of continued care.

Article 18: The Conservator-Restorer is bound by professional confidentiality. In order to make a reference to an identifiable part of the cultural heritage s/he should obtain the consent of its owner or legal custodian.

Article 19: The Conservator-Restorer should never support the illicit trade in cultural heritage, and must work actively to oppose it. Where legal ownership is in doubt, the Conservator-Restorer must check all the available sources of information before any work is undertaken.

IV Obligations to Colleagues and the Profession

Article 20: The Conservator-Restorer must maintain a spirit of respect for the integrity and dignity of colleagues, the Conservation-Restoration profession, and related professions and professionals

Article 21: The Conservator-Restorer should, within the limits of her/his knowledge, competence, time and technical means, participate in the training of interns and assistants.

The Conservator-Restorer is responsible for supervising the work entrusted to her/his assistants and interns and has ultimate responsibility for the work undertaken under her/his supervision S/he must maintain a spirit of respect and integrity towards such colleagues.

Article 22: Where work is (in whole or in part) sub-contracted to another Conservator-Restorer, for whatever reason, the owner or custodian must be kept informed. The original Conservator-Restorer is ultimately responsible for the work, unless prior arrangements are made to the contrary.

Article 23: The Conservator-Restorer must contribute to the development of the profession by sharing experience and information.

Article 24 : The Conservator-Restorer shall strive to promote a deeper understanding of the profession and a greater awareness of conservation-restoration among other professions and the public.

Article 25: Records concerning conservation-restoration for which the Conservator-Restorer is responsible are her/his intellectual property (subject to the terms of her/his contract of employment). S/he has the right to be acknowledged as the author of the work.

Article 26: Involvement in the commerce of cultural property is not compatible with the activities of the Conservator-Restorer.

Article 27: When a professional Conservator-Restorer undertakes work that is outside the scope of Conservation-Restoration, s/he must ensure that it does not conflict with this Code.

Article 28: To maintain the dignity and credibility of the profession, the Conservator-Restorer should employ only appropriate and informative forms of publicity in relation to her/his work. Particular care should be exercised in relation to Information Technology (IT) in order to avoid the dissemination of inappropriate, misleading, illegal or unauthorised information.