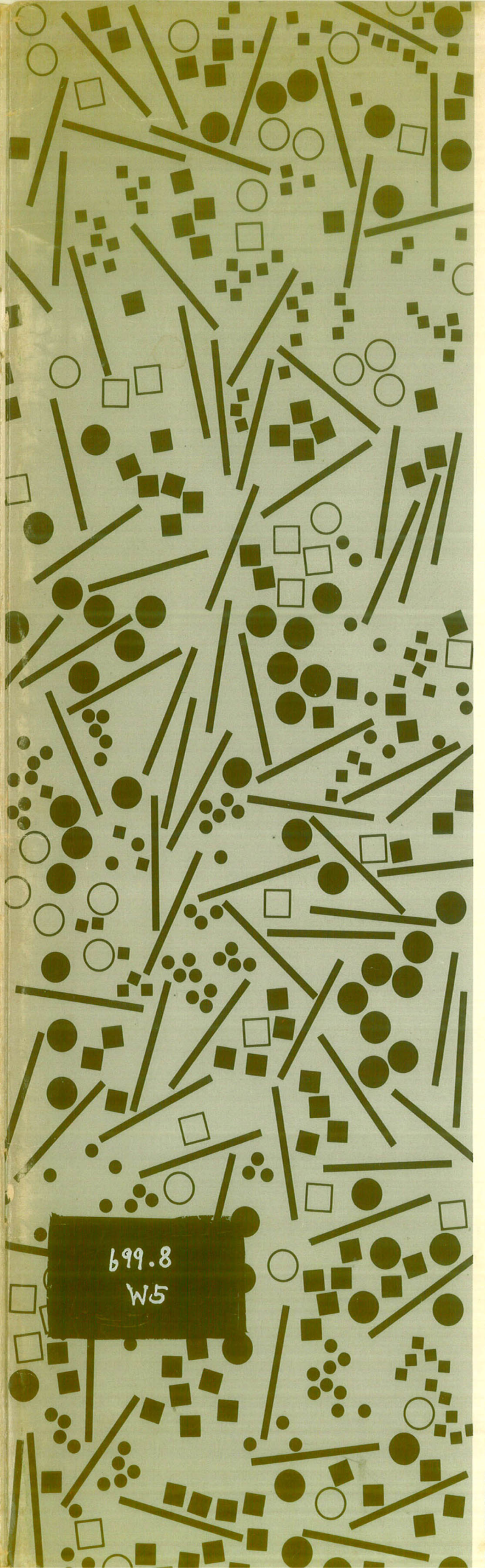
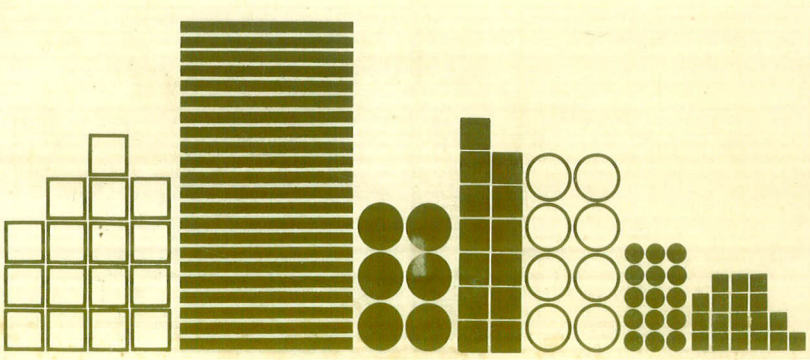


Conservation and protection of building materials

G. T. B. WINSTANLEY, CGIA, AIOB, FIBICC

Cement and Concrete Association



Conservation and protection of building materials

G. T. B. Winstanley, CGIA, AIOB, FIBICC

CEMENT AND CONCRETE ASSOCIATION

Designed and published by the Cement and Concrete Association, 52 Grosvenor Gardens, London SW1W 0AQ

Printed in Great Britain
by William Clowes & Sons, Limited, London, Beccles, and Colchester

12.055 First published 1973

SBN 7210 0885 2

Price: £2.25

DEDICATION

This book is dedicated to all those who taught me
everything I know about civil engineering and building.

G. T. B. W.

PUBLISHER'S FOREWORD

There is nothing in this book that is not common sense, that rare commodity everyone claims to have. However, the proper meaning of common sense is 'practical wisdom' and since this book was written against a background of years of experience and observation on site—of actually *doing* the right thing and preventing the wrong—we think you will find a great deal of help and guidance in these pages. After all, even if you pick up just one single tip—which perhaps saves a sheet of ply or a wash basin or a repainting job or a wasted day—the effort will have been worth while.

CONTENTS

General introduction and hazards

Waste is inevitable but it must be controlled. Seldom can anything be fitted or fixed without the off-cut, because the module of a size differs from the module of the space to be filled.

Certain guidelines and directions are required and it is the aim of this book to supply them. But it must be realized that efficiency can be achieved only by trying to follow these guidelines, and by organizing a feedback of information on better methods.

The control of waste can be considered under four general headings:

(1) Ordering
(2) Handling and storing
(3) Fixing
(4) Protection.

The detailed implications of these activities will vary from trade to trade. Very seldom does one man or trade complete the operation. In nearly every case, someone goes before to prepare and someone follows to complete. We must check what the first man did, and leave the way clear for the last man to finish, the aim being always to give the client a new job, not a second-hand one.

Ordering

Procedures are initiated by those in authority, and issued to those who do the work, with a view to making the organization operate smoothly, efficiently and economically.

One of the most important factors in ordering materials is to learn what the accepted waste factors will be on your particular type of contract. Certain percentages of waste are known, and used by the estimators, but these are only broad outlines which make sure that the extra expense will be covered in a tender. One must try to find out the true facts by intelligent observation. Quantities for the contract which are not covered by nominated suppliers will have to be taken off the drawings by the agent or surveyor, and this calls for the cancellation and the safe disposal of all superseded drawings, due notice being taken of variations and omissions, so as to avoid over- or under-ordering. The material quantities should not be taken from the Bill of Quantities, but the quantities in the Bill are a good guide to see that no blatant errors are arising.

Consideration must be given to the time requirements of arrival of material, fixtures, etc. Three streams of supply can usually be distinguished:

(1) Correctly ascertained long-term deliveries
(2) Short-term deliveries
(3) The 'when required' materials, such as cement, lime and sand.

Handling

Give thought to racking, coverings, skids, etc.

Storage buildings are seldom big enough for the job. Compounds are always too small.

Make up your mind who is going to do the ordering on the contract; the agent must give guidance and direction to his foremen about 'taking off' the materials required, and check that they know what they are doing. Do something constructive about surplus materials, and so obtain the credit for it—this applies to almost everything surplus. Do not waste anything. The handling of the materials is one of the biggest causes of damage. (There are others, of course, particularly the protection of fixed and unfixed material, which will be dealt with later.)

Materials should be placed in proper racks and stacked to prevent distortion and bending. A single object might be quite safe on its own, but a stack of them may result in damage to the lowest half dozen. Do not forget that damp rises fast in porous materials; protect them from the bottom as well as the top.

Learn how to off-load and stack a load of drainpipes so that they do not run. See that someone on your job knows how it should be done, and see that they do it. Difficulties often arise with the delivery of pre-bent mild-steel bar reinforcement, as this is often sent in full loads. It is hard to find a place for it—it seems that too much comes in at one time—and it is in the very nature of the contract that it arrives when the site is torn up by machinery. Lorries coming in and out will always pose a problem but it is no use saying nothing can be done about it; something *must* be done about it. If the site is restricted, arrangements must be made for the deliveries to be phased. Co-operation with the planner is here essential, as reference to the proposed stage programme will indicate suitable dates for delivery. Time will be gained by preparing clean stacking places: do not throw the coil of tying wire off a lorry into the mud; packaged

and banded bricks cost money, so do not tip them off the lorry.

Provide nail bins in your stores and keep storage space on the floor for the heavier items. So much damage is done by dropping because the floor space was cluttered up, and the chap could not get a firm grip on what he was moving. It may not be at once realized that many of our safety problems are connected with careless and indifferent handling of materials.

Efficient temporary roads play a great part in the proper handling of materials. Where you see material has been dumped in the mud or in the wrong place, you will find a poor road is often the cause.

Give some consideration to a thin concrete hardstanding beneath the sand and ballast bins, adjacent to the mixer, and of course use the calibration marks on the lorries to check you are getting what you are paying for.

Fixing of materials

Basically there are two ways of fixing: the right and the wrong. It is up to you and your team to learn the right way; the right way is always better, cheaper and quicker. The right way makes a sure job, it saves money on future maintenance, and it is quicker because some thought has been put into the operation and it becomes routine.

Use the correct type of nails for the job, and a suitable size nail-punch to sink them. Do not use a broken rule to measure; it never works. Make sure you have the right mortar mix for the bricks, tiles, etc.

Use up all the bats in the brickwork. The bricks were not delivered as bats; they got broken on your site. Was it carelessness that caused this expense? If so, eliminate it. Do not use facing bricks or concrete blocks to fill holes in your roadway; use the bats by all means, but not new material.

Prefabrication is by no means a new art; it has been practised for hundreds of years; so wherever possible use a workshop on the site to do this prefabrication. Cut the architraves to lengths, bundle them for sections of your job and deliver them where and when required. The collected off-cuts will do for shelf cleats, plugs, and a host of other uses. Where there is repetition of formwork, mark it plainly for re-use. Knock back or flatten the nails in discarded timber, and clear the mess away from new work as it arises. Invest in a few cheap dustbins and put the waste in them. Eliminate the dust being kicked about on sections where painting is being carried out.

Protection

Protection is vital at all times and in every phase of the contract; during off-loading and handling; when materials are waiting to be fixed; during fixing; and when fixed. Protect your materials and workmanship from the following hazards.

Against the sun

Materials that can suffer from the sun, such as timber, should be stored under covered racks, or opaque coverings, properly laid on skids or boards. Timber should be knotted and primed either before delivery or as soon as possible after delivery. It is often beneficial to have this done by your own men, as a painting subcontractor will not be on the site in the early stages to do it.

Against rain and snow

Again see that the materials requiring protection from rain and snow are raised on skids or hardstandings off the ground. Coverings should be free from holes and be properly tied to prevent the wind from blowing them away. Do not stack sanitary ware so that rainwater gathers inside—it may burst if there is a frost. Make some effort to get it properly under cover. This raises the question of having large enough stores in which to put the material.

Against wind

Strut the work properly, both for compression and tension. See that covering sheets are not lifted bodily and cast down elsewhere as, apart from damage, accidents can occur.

Against traffic

Erect barriers, time the arrivals, and prevent vehicular and foot traffic passing over wet concrete or new work. Protect door jambs from damage by barrows, cover up floors, and provide level running surfaces by using proper runways and by packing up runs above fixed steelwork.

Against collapse

Provide correct and adequate strutting to concrete slabs; do not interfere with timber strutting, or with supports to excavations, unless under expert supervision; do not strike or load too early. Inadequate bolting, nailing or screwing should also be avoided, and provision made against insecure and loose basework.

Against fire

Never leave lamps, torches, jets or other flame adjacent to work. Use metal or asbestos shields when using such burners. Also eliminate excessive friction. Do not let anything bearing a flame get out of control, such as oil, oily rags or bonfires. Always keep sand and water available and comply with the fire prevention regulations.

Against oils and acids

Fit proper taps to all oil and fuel drums, mount them on stands and supply wastage or drip trays. Provide proper measuring containers and funnels for moving oils and acids. Always store acids on the floor, never at high level, and out of the way of foot or mechanical traffic. Exhibit a printed notice with instructions on how to neutralize the acid in case of accident, and ensure that prompt action is always taken. Keep oils off all floors and fixtures and take immediate action if oil or acid is causing damage. Dilute as instructed, and use gloves and

barrier creams. Never carry petrol in open buckets. Obey all rules and regulations for storage.

Against burst pipes
Repair bursts immediately and try to see the fault is not repeated. Discard faulty and worn pipes and fittings. Erect proper and secure stand-pipes. Prevent lorries from running over hoses by putting planks or boards on each side on the pipe. Sink pipes into the ground where possible.

Against theft
Prevent theft by more than the usual application of common sense. Find out, and check where the materials are required. Prevent men from leaving materials lying about during tea and meal breaks. Issue materials in the cardboard packing boxes that the materials came in; do not throw them away. Issue nails by weight and screws by the number, and record to whom issued. See that craftsmen have nail boxes. Provide lock-ups and site tool boxes. Take firm action when theft is discovered. Some damaged or worn material is inevitable on all contracts, but never let a man take this off the site unless you have given him permission in the form of a signed and dated docket. Employ competent watchmen, or engage one of the recognized security organizations for periods when the job is closed. Always be suspicious and watchful with regard to the security of materials on your site. Do not fix materials out of a sensible time sequence just to give someone something to do.

Against undue waste
Prevent unnecessary waste by eliminating haphazard methods and by having some control of thought and action. Do not let foot traffic pass over timber or sheets of material. Stack materials out of the way. Watch carefully for the cumulative weight of materials on those at the bottom. Avoid scratching and scarring of sanitary ware. Do not over-issue from the stores. Specify, where possible, how much material is wanted for a particular job and, if too much has been taken, make arrangements for its return to the stores.

Against dirt and mud
Keep dirt, sand, etc. away from polished and good surfaces. Do not allow lorries to splash materials such as mild-steel bar, timber or bricks. Use plenty of skids and hardstandings to keep cement, lime, etc. off the ground.

Against damage
Prevent damage by adequate protection. Get the confidence of your men so that they will admit that they have had an accident or spoiled some work. This will give you a chance to re-order in plenty of time, so saving worry and delay later in the contract. Detailed matters of protection in each trade are given later in the text.

Against dropping and falling
See that proper slings are used, and teach men how to tie the correct knots and timber hitches. See that falling objects do not further damage men or articles below. Use toe boards. Make sure that things are not knocked off window cills or platforms. If material is dropped or falls, clean up the mess at once. But try to prevent the damage occurring.

Against bad workmanship
Prevent bad workmanship by making pride of craft dominate everything that happens on your site. See that the supervisors know what they are supposed to be supervising. Always be on the lookout for better ways to do a job; give instructions whenever you see they are required. Try to prevent men experimenting when they do not know. Change their tasks if they are not adaptable to them. See that bad workmanship is not occasioned by rushing a job. You should be in contact with your men at least every two hours. The agent should see or run across his foreman many times during the day. Prevent the weather damaging materials so that inferior material is not built into the work.

Against being buried
This can be prevented by keeping the site clean and stopping excavators and other machinery spreading spoil where it should not go. This applies most particularly to scaffold base-plates and scaffold fittings being dropped and not cleared away. Gather up company small tools when finished with, return them to the stores and tell the storekeeper you have returned them.

Against rats and other vermin
Eliminate this hazard by cleanliness. Provide dustbins in mess rooms and see they are used. See that canteens are cleaned out daily. Check that waste food is not thrown about the building when the canteen is not used. Exhibit suitable notices requesting co-operation from the men. (Notices containing threats of instant dismissal are useless when men are unobtainable !!!)

Against unsanitary behaviour
Unsanitary behaviour can be prevented by installing on the site, in the very early stages, proper lavatory facilities. Keep them clean so they are not objectionable to use. Provide 'sentry-box' lavatories on high levels and see they also are fit to use. Take stringent and prompt action against anyone using dark rooms or out-of-the-way places for this behaviour.

If it is difficult to find personnel to keep the lavatories in good order because of abuse and ridicule, arrange for them to attend *before or after* site hours.

Against explosions
Obey every regulation when using explosives or shot-firing fixing guns. Specialist explosive operators must be licensed and registered. They must keep proper records, which are reconciled periodically against their own explosive magazine. They must be allowed to have the explosive-carrying vehicle placed where they dictate, and you must arrange to have one operator with the vehicle.

The loss or theft of explosives on a site can prove to be serious; police proceedings will be taken if any irregularities have been permitted. Crime can be reduced if stringent precautions are taken.

Keep guns and cartridges under tight stores control and prevent unauthorized persons using the equipment.

Finally, carefully imitate all good practice you may observe, and amend or eliminate all bad practices you may see.

Appendix A on pages 19–20 summarizes the preceding hazards. A good plan would be to reproduce it and display it on your office wall.

PART TWO

Sequence of general trades and skills

The following list enumerates the sequence of trades and skills as generally outlined in a Bill of Quantities, and the text gives methods of conservation and protection of materials during the construction of the work. (The more specialized trades and skills are dealt with in Part Three.)

(1) Setting out
(2) Excavator
(3) Formwork erection
(4) Steel-fixing
(5) Concreting
(6) Steel erection
(7) Brickwork
(8) Metal window fixing
(9) Carpenter and joiner
(10) Plasterer
(11) Wall and floor tiler
(12) Plumber
(13) Glazier
(14) Decorator
(15) Drainlayer

Setting out

The erection of level and square profiles immediately gives the impression of orderliness. Irregular profiles made of odd bits of timber will make operatives think that it is only a rough job and that anything will do. Fix the profile pegs inside the profile, as otherwise the board will be pulled off when the line is strained, and material and time will be wasted fixing it up again. Use saw-cuts in the profile for the trench excavation widths; these will take the thick glacé or nylon setting-out cord which will indicate that it is not the face of the brickwork but of the concrete. Use a nail to indicate the face of the work, as a bricklayer's cotton line which is much thinner than the cord can be fixed to this.

Use proper site rails, and proper 'travellers' marked in different colours so as to maintain the correct gradient for each pipe run. Take great care that the boning rods are of a set; colour each set a different colour and check diagonal measurements as often as possible. Do not rely solely on the square; it may be out a couple of degrees from a right-angle, and this error can cause buildings to be out of square. Do not use running measurements, as errors increase very quickly. See that all the measurements do in fact add up to the total measurement given on the drawings. On a sloping site, it is most important that setting out be done on a level plane. Be exact whenever possible. Remember that what the architect has put on the drawing you have to put on the ground. Become efficient in the use of the instruments and treat them with great care. Obtain the bench-mark positions and readings from the local Council Office. Fix a solid immovable bench-mark on the site by concreting a brick on end in some position where it is safe. Always have a second or secret bench-mark so that it can be used if the original one is moved, or has to come out. Remember it is the centre of the horizontal cut on the bench-mark which is the reading.

Excavator

This operation is the one that either saves the money or wastes it. See that the target rates are realistic.

When timbering has to follow an excavator, the speed of the excavator must be reduced to enable the timber men to follow up and make the cut safe; otherwise, owing to the nature of the ground and changes in the weather, falls will occur which will be expensive to clear out and more difficult to timber with the consequent extra cost on labour and materials. Clear materials out of the path of machines, and see that spoil is not haphazardly deposited on materials. Take precautions to preserve overhead lines from jibs—failure to do this will entail heavy costs and cause accidents. 'Bottom up' all excavations by hand. No excavator driver can produce a solid base to a trench or excavation; if he tried to do this, the teeth of the machine leave the ground loose and unstable. He should leave the last 75 mm (3 in.) for the labourers to trim and grade. Use marking tapes when back-filling over services.

If foundation excavations are cut tidily and straight, concrete will not be wasted. Do not use oversize buckets on the excavator—the extra excavation will need extra, unpaid-for concrete. Keep machinery from coming too close to excavations and thus causing banks to collapse; collapsed banks mean that time has to be spent on re-excavating by hand, or taking out wet concrete that has become fouled by loose earth getting into it.

Formwork

Formwork is an expensive 'hired' material, as it has no part in the structure, being only a means of providing a

shape for another material. Careful thought must therefore be given to its economical use.

Interchange of ideas must take place to arrive at a standard way of making, fixing and erecting, and—more important—striking formwork. Repetitive formwork should be clearly marked, so that on striking it can be cleaned, set aside and taken to the place where it will be used next. Nails should be carefully extracted when the timber is being re-used, and the timber stacked for disposal when of no further use. Reasonably simple calculations can be made by the average foreman carpenter to determine the size of soffit joists and bearers.

Most deckings can be formed by 50 × 100 mm (2 × 4 in.) joists and 75 × 150 mm (3 × 6 in.) bearers, and the position of the propping can be easily ascertained by calculation.

The internal corners of formwork should have a timber or polystyrene strip down the joint to facilitate easy striking. The use of new timber on every occasion is very conducive to enhanced bonuses! When fixing formwork to concrete manhole covers, do not forget to leave the aperture; someone has to climb inside to strike the props. When the formwork has been fixed, see that it is cleaned out properly by water, or air jet, as much money can be spent making good to inferior faces and soffits. Protect all formwork by strong strutting and propping. Shield raking struts at ground level from damage by vehicular traffic.

Steel-fixing

Steel reinforcement is a commodity that is not self-protecting. It flops about, it sags and it suffers foot traffic (and on occasion vehicular traffic). Keep it clean and preserve it from distortion. It is not always beneficial to have mild-steel bar reinforcement sent to your job already bent: tags get torn off; it arrives out of sequence; other bars are borrowed to make up deficiencies; bars are used to tie up and to strut; at the end, shortages are apparent and then the extra material has to be procured at short notice and at extra expense, or else more is ordered in anticipation of this in the early stages and at the end there is surplus. Consider carefully with the planner whether the bending cannot be done better on the site, or better still arrange for planned deliveries wherever possible.

See that the packing blocks are made and cured in ample time, or consider using one of the many proprietary preformed supports now available. Make provision for proper packing and supports where wheelbarrows or foot traffic must pass over the fixed reinforcement. Protect the bars from oil and other deleterious material. Protect reinforcement from damage on every possible occasion.

Concreting

In cold weather, heating by steam or other means may be necessary for the aggregate to prevent disintegration caused by frost entering the work. In hot weather, curing is essential. Make sure you have a supply of hessian or other means of curing on the site. Protect fresh concrete from frost and heavy rain. Use the specified mixes and adhere to any quoted water/cement ratios. In the event of collapse, make sure that the concrete does not have a chance to set in a solid lump: turn a water hose onto it to separate the cement, and break it up with jack hammers into handleable sizes before it goes hard. Keep the work below clean. Pay great attention to the positioning of holes and mortices. Make use of polystyrene, which should be burned out with a blow lamp. Pay attention to construction joints, and day-to-day joints. Expose the aggregate at joints while the concrete is still green.

It is essential for good concreting that the mixes are adhered to, and that the mixes are constant. To ensure this, there must be complete segregation between the sand and aggregate bins, by using good strong concrete or timber divisions between them and by storing on clean hard bases of a lean concrete.

Structural steelwork

Structural steelwork needs little attention in the way of protection. It is usually so massive that it suffers little physical damage and, as it is so often fixed by specialists, it gives little concern to the contractor. However, care should be taken to see that all scarred and rusted metal is wire-brushed and painted before it is erected and built into the work. Always stack roof trusses on edge; do not lay flat one upon another.

Brickwork and blockwork

The protection of brickwork starts as soon as the bricks come onto the site. At one time, all bricks were off-handled and stacked—except on the least important jobs, and even then the facings were stacked—but latterly it is all too often seen that bricks are shot off the lorry; even package bricks are treated this way. There is a cost in every tender for the proper off-handling of bricks.

Each course of stacked brick requires the end bricks laid two courses flat so as to tilt the bricks to the centre of the stack. This will prevent the end of the stack collapsing and causing unnecessary breakages and accidents. A brick stack should be cleared from the roadside face, not from the back, to enable the next batch to be off-loaded onto the depleted stack when the lorry arrives.

In wet and dirty weather, use unwanted plywood to protect the stacks of bricks from splashing by passing lorries. Cover up the newly built work with polythene sheeting if any operations (especially wet trades) are being done above. Cover up the top courses during wet and frosty conditions and turn the scaffold-boards back at the end of the day's work. See that all damp-proof

courses are fixed in the correct places. Do not forget the damp-proof course in parapet walls. See that the weep holes are in fact clear and clean. Use cavity battens all the time; cleaning out the bottom of cavities when the mortar has hardened is expensive, and nothing looks worse than the replaced bricks at the bottom of the wall after bricks have been cut out to do this.

Well built blockwork will reduce plastering costs, so use profiles to keep as flat a face as possible. Cut blocks with the proper tools. Try to 'course' blockwork to a given height to prevent cutting, which is costly in both labour and material.

Clear the rubbish away as it gathers; it makes the work more comfortable and prevents accidents.

See that the precast concrete lintels are bedded the correct way up. If they are cast on site, make sure that the tops are clearly marked.

If plugging has to be done subsequently for fixing purposes, have the joints creased while the mortar is still soft. Built-in timber pallets for frames and casings should be so arranged that the carpenter does not have to nail into end grain. Where holes will be required, check the positions and build the bricks in wet sand. For building up these holes later, it is always good practice to set aside a few bricks from the delivery that was made when this particular area of work was built; in this way, the textures can be matched. If it is necessary to clean down brickwork, take all the necessary precautions with the hydrochloric acid and see that it is suitably diluted. Study the instructions carefully. It should be remembered that the mortar should always be less dense than the brickwork being used. This is not always appreciated, and specifications often demand a mortar that is far too strong for the requirements. In frosty weather, brickwork is less liable to spall if the mortar is weaker than the brick, thus maintaining the appearance of the work.

Always use 'gauge rods' for building corners, as two bricklayers on two corners will seldom reach the same height if they are not used.

Always use a 'dead man' if the other corner cannot be raised. Never build brickwork by guesswork.

Metal windows

Metal windows require particular attention with regard to protection. They are often fixed by subcontractors, with assistance from the builder in off-loading, stacking, hoisting and distribution. They should always be examined in detail when being off-loaded and all damaged or scratched units should be set aside and the supplier notified at once. They should be stacked properly and safely, with some packing between each frame. Always stack with the longest length on the ground, as this minimizes distortion.

Protect thresholds and cills by fixing boards securely to them; if these are moved or taken away, replace them as soon as possible. Make every effort to protect anodized aluminium windows by keeping off all mortar or plaster; any such splashes should be removed at once with clean water—*never* with abrasive. Never use a metal tool to knock in a frame; use a piece of timber between the hammer face and frame.

Carpenter and joiner

The men engaged in this trade are among the first on the contract and the last to leave, and their work, while being continuous, is split up into clearly defined phases. Basically, the carpenter's trade is confined to the use of rough and unprepared timber, while the joiner operates on a bench on a site using prepared and wrought timber and fixing special materials like plastics panelling and, of course, the ironmongery. His timber is often supplied with blemishes both natural and artificial, which are beyond his control and which entail site treatment before fixing.

The natural faults should be eliminated as far as possible by a keen supervision in checking that the class of timber being supplied was the grade that was ordered. Codes of practice are in fact in print outlining the tolerances that are acceptable in the soundness and appearance of timber.

The artificial blemishes are occasioned by bad machining in the preparation of the timber, such as rippling and the use of blunt machine blades. Action should be taken in the early stages so that good clean bright material is received, as otherwise much time has to be spent on cleaning it up. (This is always put down on the allocation sheets as remedial work, thus upsetting bonus rates, when in fact it is not remedial work but sub-standard material being received and used.)

Try to fix carcassing timber so that the larger knots are always in compression. See that borings for wiring and conduits are, wherever possible, bored in or near to the neutral axis. Lay joists with any camber uppermost; if this conflicts with large knots, discard the timber by setting it aside and use it for cutting up for shorter spans.

Carcassing or first fixing is much a matter of ordinary trade skill and common sense. Particular attention should be given in fixing door linings and door frames to see that they are fixed out of wind and to see that the heads are levelled.

Many framings which have valuable facings fixed on them are usually executed in sawn timber as described in a B.o.Q. This is bad practice, because a face will only follow a base; if the base is not dead flat, neither will the face be. In cases such as this, confer in the early stages with the architect to obtain permission to use wrought timber. Architects will always accept advice on sound practical methods.

In fixing joiners' work, make use of masking tapes. It is common sense to protect door jambs from wheelbarrows and scarring by carrying in other materials, but it is still not done on jobs. The costs of remedial work and painters' daywork sheets far outweigh the expense of this elementary protection.

Cover window boards, and especially the cills, to prevent damage when material is passed through the

window. Use short ends of flooring board for tread protection; always use the same width and thickness of protection on a staircase, as irregular sizes on the same flight will prove a death-trap. Protect the newel posts. Wedge open or lock doors when leaving, which brings me to the question of key boards. Appoint one of your foremen as the site key steward. Remember that to get re-cuts for lost keys is time-consuming, just when the contract, or sections of it, are due for handing over. Fix mirrors at the very latest stage; the proportion of damaged mirrors can rise quite easily to 50% or more. Polythene sheeting is so cheap that it should be used on every conceivable occasion to protect work. Remedial work on fixed joinery is always best achieved by keeping one man on it throughout the contract. This type of work calls for craftsmanship and dedication if it is to be done properly. However, prevention is better than cure, and stringent efforts in protection will eliminate or drastically cut down this unwarranted expense and save wasting valuable material. Stop materials and tools being stored in finished cupboards and fixtures as much as possible. (The storage of picks and shovels and buckets in cupboards is not very conducive to the preservation of good surfaces for the painter to work on!) Do not allow the plasterer and floor layer to take joinery timber for rules, straight-edges and profiles. They should provide their own but, if they do not, you be the judge as to what timber they may have. Joinery is usually better done by men delegated to certain recognized tasks rather than by a craftsman covering the whole range of fixing. See that steel pilot screws are first used when fixing brass, aluminium or other soft metal to hardwood; nothing looks worse than a screw missing from a hinge because someone screwed the head off it.

Plastering

The plasterer's work is ornamental and provides the base for the decorator; it should therefore be good, to give him a chance to produce on his part a good finish. Angles should be worked clean and true. Prevent doors and other articles being stacked against walls, unless some protection is used; prevent water, oils, acids and flames from coming into contact with plaster. Do not plaster staircases until it is really necessary to comply with your programme.

Clear away the rubbish as it gathers, to stop it being trodden into other finished work. Each trade should clear up its own rubbish, but the final disposal of debris is the general contractor's responsibility. Do not let plasterers, or in fact any trade or subcontractor, leave their rubbish where it collects.

Plastering is a wet and dirty trade, so be alive to the hazards it causes. By preventing these hazards, you will automatically protect other tradesmen's work.

On outside work, care must be taken to clean window glass, ledges and cills as soon as they are affected, as it is impossible to clean off mortar or plaster weeks afterwards without doing irreparable damage and thus adding more unwarranted expense to the contract.

Clear the ground to its final formation before external rendering or other finishing is done. Eliminate the cause of mud splashing on completed work and, by exercising some forethought, eliminate unnecessary patching. See that the proper size and length of pipe sleeve is used when pipes are being fixed. A great amount of protection is given to the work by the simple process of cleaning up and washing down on every possible occasion.

Wall and floor tiles

Wall tiling does not usually require much protection, but floor tiling and specialist floors do. After tiling walls clean off excess grout as soon as practical. External corners must be protected with masking tape. Protect other work from the activities of wall tilers—do not allow them to stand in baths or on lavatory pans.

When walls are being tiled, see that the second course of tiles is fixed first; the bottom course must be cut to fit below. This will ensure that all courses are level throughout. Consult the drawings and make arrangements for the correct positioning of fixing modules, for flush-mounted switches, shaving units, etc. Use rubber grummets when screwing fittings and mirrors to tilework.

Do not have finished floors laid before walls, as the grit and chippings will tread into flooring and very soon ruin it.

Floor finishes require protection from the moment they are laid until the client walks in, but the materials require care as soon as they arrive on the job. Although most of these floors are laid by sub-contractors, the main contractor is responsible for the receiving, off-handling, storage, distribution and protection of the goods. See that the building is at the right temperature before laying vinyl flooring, i.e. about 16°C (60°F), and lay such floors after all other trades have finished.

Remember you have a liability from start to finish. Replacements and remedial work in this trade are most expensive and time-consuming at a stage when you have no time to spare. Insist that tiled floors are set out correctly; they must not be laid against one wall in the hope that it is straight and at right-angles to the adjacent wall. Cuts are to be made and fitted to the perimeter of the area being laid. Insist that vinyl tiles are never laid until the painter has finished; but your right to insist on this implies that enough time is available for laying.

Marble and terrazzo treads and risers must have strong and firmly fixed protection; paste paper protection on marble or other types of solid balustrade. Time floor-laying so that wet trades do not occasion damage. See that the holes in travertine marble floors are not filled with mortar, plaster or dirt. Pay special attention to the doorway traffic on this type of floor. In fact, be prepared to cover the whole floor with a fibre board such as Celotex; the expense will always be covered by the saving of damage.

Never try to clean off vitreous or other highly finished

floors by abrasives; the glaze will be ruined and you will provide a first-class second-hand floor.

On the other hand, if floor cleaners or acids have to be used, see that they are suitably diluted; neutralize the floor at the earliest possible time, before putting down the temporary coverings.

When moving equipment onto finished floors, always see that there is enough manpower available to carry it, not drag it. A week's work can be ruined in two minutes.

Off-load the materials carefully, stack the boxes or cartons carefully in the dry, and do not store outside unless forced to do so by lack of space. Keep paving slabs on timber runners; two hard surfaces in contact will produce spalled edges. Store and distribute to prevent theft. Return surplus materials to stores as soon as possible.

Plumber

Plumbing work on a contract is executed in phases, and action must be taken to ensure that the first fixed work is not damaged when buried or hidden. Tell the carpenter and joiner where pipes are run so that he will miss them when nailing and fixing his work. Clean filings and dirt from tanks; if this is not done, there is likely to be excessive rusting in the tank bottom and a subsequent leak.

Fasten all fixings and fittings at the time of installation. Do not leave water fittings finger-tight; there are sure to be one or two forgotten and when the water is turned on the inevitable flood takes place causing damage to many other trades.

Plumbers' tools are nearly all of heavy metal, so keep them out of baths and washhand basins. Plumbers' work is dirty; prevent the operatives putting hand marks on work that is well forward. Gather up the short off-cuts of pipes; they are very dangerous to others carrying or moving materials around. Exercise care in using the correct size spanners, wrenches and other tools in installing the work—nothing looks worse than scarred plated fittings. See that the pipe sleeves are there when wanted and that they are the right diameter and length for the job they are to do. Wrap plated towel rails with protecting material. Dismantle and reassemble stopcocks and other control units; the client may not be as strong as the plumber who fitted them. Pay some attention to the colour-banding of pipes, checking that it is correct.

Plumbing materials are expensive, and coloured suites hard to rematch if one article is damaged and has to be changed at some much later date. See that all external service pipes are placed at the correct depth as a protection against frost. Fix marker tapes to indicate the run of externally buried pipes, so that machinery can be kept clear when excavating.

Put walking boards on flat roofs of lead or other metal; protect the rolls from foot and wheeled traffic. Cover rainwater and other roof outlets to prevent materials entering and causing subsequent blockages. Provide cement dams to holes in concrete flats.

Protect lavatory pans properly; someone is sure to use them for hop-ups. Protect baths with hardboard or blockboard, not forgetting to leave a hole just below the taps so that, if water has been turned off and taps left open, flooding will not occur when the water supply is restored. Wrap the taps in polythene sheeting. Leave off all plugs and chains until just before handing over date. Most architects and clerks of works will accept the omission of plugs and chains at the taking-over stage, if an arrangement is made to fix them when actually required. See that a lead washer is fixed on the underside of the plug chain fixing bolt, as one turn too tight and you have another damaged washhand basin to replace.

Glazier

It is not good practice to glaze too early in the course of construction, simply to make conditions easy for the operatives. Glazing should be done at the proper time and within the sequence of the phase schedule to minimize breakages and scratched glass.

Glass should never be cut too tightly for the frame it has to fill, and care must be taken to see that it is not cut too small. Glazing spring clips and 'metal' putty should always be used on metal frames, and glazing sprigs and 'wood' putty on wooden sashes (not forgetting the priming coat of paint on timber sashes).

All glass that is not flat—that is, figured glasses such as Arctic and Cotswold types—must always be glazed with the smooth side to the weather. All medium and large sheets glazed to timber sashes should have a small piece of wood fixed under the edge, close to the bottom hinge, and a similar piece about the size of a matchstick against the edge opposite the top hinge. This will prevent the toe of the sheet of glass from pressing down on the bottom rail and making the toe of the sash drop and cause subsequent binding and remedial work.

See that the face putty masters the sight-line of the sash rebate, and that it is painted within a couple of weeks to prevent cracking by the sun.

Give some thought to lining up the reinforcement in pairs of corridor doors when using polished Georgian wired glass, and see that the wash leather or other substitute bedding material is neatly cut off. Never use abrasives to clean glass; a penny rubbed in a circular motion should take off anything that has adhered to the glass without causing damage.

As soon as it is in position, mark the glass with ordinary ball whiting to show that it is there, or fix company-supplied stickers.

Do not let windows swing to and fro in the wind; make someone on the site responsible for their safety. Close pivot-hung sashes.

When fixing mirrors to walls, use the rubber grummets provided with the dome-headed fixing screws and refrain from giving the screw that last turn.

Stack glass against a wall on its long edge—a dozen sheets at a time is more than enough—and use gloves or folded newspaper to prevent accidents.

Replace the lids on putty drums after use and store away from the sun or frost. Putty may be softened by heat or a very little raw linseed oil, and hardened by mixing in a little plaster, which will also make it handleable if too soft.

Decorator

This trade is the one that is expected to make all the other trades look good, so you should have tried to protect the work done previously so that the decorator has the best possible chance to do this. On the other hand, you must see that he does what he is paid to do—in the form of rubbing down, filling in, stopping holes, and using the materials specified. See that the undercoat is not emulsion paint (unless specified), that the correct number of coats are put on and that they are not overthinned.

Assist the decorator at all times by giving him clean conditions in which to do his work. Have all the other trades finished and out of his way and lock up finished work.

See that other materials are properly masked by him when he is spraying and that he in his turn protects the work that has been done before. Keep his feet off window cills, bath edges and pan edges. Do not let him clean his brushes on the plastered walls or in wash basins.

When ironmongery and other fittings have to be taken off before decorating, ask the joiner to do it—it is his job and he will do less damage to screw heads—and see that the slots in the screws go the long way of what they are fixing, when they are replaced.

Make sure that any touching up is done properly and that paint colours match the originals. It may be necessary to repaint or redecorate whole areas to rectify bad or damaged work.

Drainlayer

Once completed, the drainage is mainly hidden and any damage cannot be easily rectified. (Suspended cast-iron drains in basements are, of course, visible.)

The practice of laying earthenware drainpipes on brick-on-edge and then concreting the base and benching at one go is to be deprecated. This method of laying is the cause of breakages at the joints, as the brick-on-edge sinks in the soft ground when the concrete is placed on the pipes from above.

Always start a drainage system at the low end; this will prevent water following the excavation, as it will be able to get away at the connection to the existing system. Cover up the joints of newly laid pipes with some flexible material or hessian, and also the complete run with boards as a protection against children throwing bricks into the trench. Cover up uncompleted manholes and block up all open ends of runs with a brick to prevent pieces of brick and timber from entering and causing subsequent blockages.

Use the correct type of gasket for the work: tarred for salt-glazed pipes and un-tarred for cast-iron pipes, and then only sufficient to centre the pipe and to prevent the jointing material entering the pipe. Do not caulk lead joints to cast-iron drainpipes too hard, or the gasket and the lead will be driven into the pipe causing an obstruction; use a 1:1 cement:sharp sand mortar for salt-glazed pipe jointing. (Cement without sand will shrink, causing leaks under pressure, as will cement and soft sand.)

Bed and surround fittings properly and, by using bends, keep the gully square to the work. Take care that the pipes do not get cracked when being cut. Test all salt-glazed pipes for soil drains by tapping with a pebble: A sound pipe will give a good clear ring when struck. Stack pipes properly.

Continually check the invert levels at each manhole level, as it is very costly to take out drains laid with a back fall.

See that the opening in the cover is so placed that a man can in fact mount the step-irons easily, and that when spaced 300 mm (12 in.) apart they make the best ladder in a confined space.

Use shear legs when lowering concrete manhole rings into place; the rings are not usually reinforced and will break if dropped or handled roughly.

Have proper drain-testing equipment at hand and an ample supply of drain stoppers and rods. In clearing a blockage, it is of little use to try to force the obstruction down the pipe. It is far better to go to the low end and force the obstruction back and out of the hole it went into. If this does not clear the pipe, a section will have to be cut out and this should be made good in a proper way by the use of double collars.

PART THREE

Sequence of specialist trades and skills

As in Part Two, we shall be dealing with the sequence of trades and skills found in a typical Bill of Quantities. The specialist trades involved are:

(1) Electrician
(2) Heating and ventilating
(3) Suspended ceilings
(4) Carpet laying and interior furniture fixing
(5) Lift installation
(6) Equipment
(7) Miscellaneous

Electrician

The electrician's trade is prone to damage, sabotage and theft. See that holes in concrete slabs are correctly positioned. Make an effort to mark on walls and floors where conduits run, to obviate the danger of nailing through them. Clearly mark where a cluster of conduits meet, and take some care in the positioning of switch boxes. There will be measurements on the drawings, so adhere to them. Fix all electrical fittings as late as possible with the finishing schedule.

As there is little that can be done about the wires that are pulled out completely from the conduit or cut short at the end of the tube, there must be constant supervision, immediate disciplinary action and good store-keeping; these are the only means of protection against theft and damage.

Heating and ventilating

Although heating and ventilating is a specialist trade, usually undertaken by nominated sub-contractors, it must be protected by all other trades during its installation.

Except with the permission of the H & V contractor, ceiling-fixed pipe-hangers should not be used by other trades for the suspension of their work. There are strong similarities between heating and ventilating and plumbing: the same care and protection should be exercised, such as attention to stop valves, pipe sleeve, etc. Asbestos lagging in boiler houses is a long, slow and dirty job. See that the floors beneath are suitably covered and left clean. In these restricted pipe areas, the painter and other trades must be prevented from causing damage to the lagging by throwing equipment across the lagged pipes to reach places.

Prevent men leaning other materials against vertical preformed lagging as it has little or no resistance to crushing. Remember that every failure to protect work on your part will inevitably result in a daywork sheet being presented to you later.

See that frail metal air ducts are protected, especially in the early stages. If you have the unloading to do, stack them in such a way, and in such a place, that men *cannot* walk over them.

Remember one of the most important tricks of the trade, which is that 'a fitting should always be fixed so that it looks right'. The reason for this is that the item to which it is being fixed may not be perfect and errors are accentuated when a fitting such as a grille is fixed dead level against a line which is 'running' and it is too late to make a structural alteration.

When plaster patching is needed around vents or fittings, be sure to instruct the plasterer not to scratch the polished surface with his tools. Keep mortar and other staining materials off teak-louvred doors and ventilators to plant rooms and have the protective coat of oil or polyurethane applied as soon as possible. See that pipe-hangers are vertical before the painting is done, as otherwise ladder work will be necessary against new work, to do the patching and touching up when the collar is moved to its correct position.

Suspended ceilings

If work has to be done within the confines of finished suspended ceiling, use duck-boards to prevent men from putting their feet through it. Check in the early stages that sufficient hangers are fixed, and that they are in fact secure, vertical and strong enough to bear not only themselves but the weight of anyone who has to work above them.

See that the architect, the ceiling fixer and the electrician work together with regard to the placing of lights above ceilings of the Isora type, as these are liable to distort if placed too close to the heat of the lamp.

Clean off all rubbish that falls onto transparent or opaque ceilings of this type, as clearing later is costly and time-consuming at the wrong time in a contract.

Carpet-laying and fixed furniture

It is the main contractor's liability to see that all floors are clean and smooth before carpets are laid. See that

sections of carpet-fixing battens are not missed in doorways and other obvious places. Ascertain in the *early* stages of the contract what thicknesses of carpet are being laid, and obtain a letter from the architect specifying what door clearance is required, so that at the appropriate time the joiner can hang the doors without the need for further adjustment.

Also establish who is responsible for the protection of laid carpets; if the main contractor is responsible, put polythene sheeting or other protective coverings down as soon as possible and fix to the carpet with a suitable masking tape (one that will not damage the pile when being cleared away). Where excessive foot traffic takes place, as in corridors or doorways, the expense of covering with a soft wallboard will be repaid and this cost is often recoverable from the architect.

Cover fixed furniture and prevent men from putting tools, teacups, tool boxes or other objects on flat polished surfaces, and stop them using the furniture as hop-ups or sawing stools. Lock up finished rooms as soon as possible and have one man responsible for the keys.

Lift installation

Check the position of the lift shaft! See that all small pieces of formwork are stripped as the building of the shaft proceeds. Remove pieces of brick from lift-shaft steelwork.

Protect the entrance jambs and keep this protection in a good state. Cover the lift floor with hardboard and the walls and ceiling with soft wall-boarding on a self-supporting sub-framing. Do not screw protection to the lift walls.

Arrange for the lifts to be returned to the lift engineers in plenty of time for them to execute final testing and refurbishing, as this operation always takes longer than was envisaged.

Never do any work above, below or adjacent to a lift unless a lift engineer is in attendance and suitable warning notices are exhibited.

Make a polythene-covered frame for the lift gear in the plant room to minimize dust and dirt getting into the machinery. The main contractor has to pay for this to be cleaned when the lifts are handed over.

Equipment

Kitchen and other specialist equipment is both costly and susceptible to damage: it arrives at the most inopportune times, because it usually takes so long to make and is often subject to alteration in the manufacturing process, and so one must always be prepared for its arrival, handling, protection and positioning. Off-load it carefully. Stack it level under cover, on boards, in as clear a space as possible. Cover it with polythene sheeting and place insulating board on all flat surfaces. It requires the same protection when positioned, and men must be prevented from using the tops as work benches when it is being installed. When vinyl flooring is laid after the installation of equipment, it must be passed under the feet of the equipment, not cut to fit around.

Prevent fire hoses from being used as water supplies, and protect them from the painter.

Miscellaneous

For the general well-running of the contract, a team spirit must be engendered right from the start. No matter what your position on the contract is, give your instructions clearly and do check that the other man knows what you are talking about; if he knew it all in the first place, he would perhaps be doing your job. Leadership is never a case of pulling one's rank: the stripes are only there to show that the authority is available if required. Enforce fair discipline.

Look out for and rectify anything that has been missed in these remarks, which have been written with the intention of making us more efficient and happy at our job.

PART FOUR

Obtaining the materials

Now that we have discussed the ways and means of protecting materials on site, some detailed consideration must be given to getting the materials to the site. It must first of all be decided what is required and how it is to be obtained. Apart from your own common sense and experience, it will be seen as soon as the bar charts are produced that materials will be required to be delivered in sequence. As all materials cannot be produced and delivered at the same time, ordering at the right time is vital. It is no use expecting complicated joinery fittings to be delivered within a week of ordering and on the other hand it is quite apparent that weeks or even months are not required for the delivery of cement and aggregates. As regards the ordering of 'long time delivery' materials, two dictums are very apt. They are 'It is never too soon' and 'It is later than you think'.

Use your telephone; there are plenty of colleagues in the group who will be only too pleased to help you if you ask.

Start a plan register in the early stages of your contract. Split it into sections covering architects, engineers, structural steel, subcontractors, drawings and sketches, etc. Keep it up to date daily by withdrawing all superseded drawings from your plan table and registering the fact that you have done so. New drawings are produced to acknowledge that additions or omissions have taken place, and these will mean that your material quantities must be altered. Do not throw away superseded drawings; mark them carefully, store them away, and date the new drawing as it is received. Do not keep this information to yourself; tell everyone, and see that the new drawings (and, if necessary, additional copies) are issued to all who will need them.

Study carefully the contract specification and the Bills of Quantities, with due reference to any British Standards required. Do not flick through these volumes, but get into your mind what they are all about. Convince yourself you really do know what you are going to build, and ask for more information on anything about which you are in doubt.

Study the drawings you have (others will follow) until you can read them like the morning paper.

Having convinced yourself that you know what it is all about, make a list of every room in the building and every space outside the building. List the rooms in the building, floor by floor, starting from the left-hand bottom corner, and repeat this sequence on the succeeding floors. Check your list.

Next, go through the Bills of Quantities, marking down in trade sections every item of material that is mentioned (not the quantities—they come later). Then go through the drawings and list every item of material that is marked or drawn on them. When this is done, you may find that you are hard-pushed for time; if so, you will have to solicit the aid of a surveyor or planner to take off some of the quantities.

At this stage, you must separate the items to be ordered under three general headings. The 'long-time delivery' items, the 'ordinary-time delivery' items and those that can be asked for on a day-to-day basis, as required. The quantities must now be taken off for the various trades and sections and your knowledge will now be called into play to determine the factual waste allowance to be made when ordering. Doing this correctly will have a definite financial bearing on the success of your contract.

It must be fully realized that some of the materials you require will not be mentioned in the Bills of Quantities or on the drawings. Among these are plant and small tools, nails and other fixings, and protective material. These you must assess yourself with the assistance of your team.

Concurrently with ordering your materials, you must make arrangements for receiving, off-loading, handling and storing, issuing and distribution.

Mark your site plan where heavy and bulky materials can be placed to minimize excessive handling. Install a checker or storekeeper to receive the goods and to say where they are to be put. Arrange adequate off-loading facilities. See that material is handled carefully and stored correctly. Have a proper system of issuing work and see that materials are distributed at the time needed and as close to the work as possible. Arrange for protective materials to be distributed and used as soon as the work is done, and arrange for over-issued items to be returned to store as soon as possible.

In some cases, the material must be protected before it leaves the stores; for example, baths, washhand basins and lavatory pans.

Work can be further protected and materials conserved by bringing bad workmanship or bad practices to the notice of the management at the internal site meetings. It should be remembered that contra charges have a salutary effect on damage and bad workmanship.

And, finally, think carefully about the cost of protection. Which is better: to protect the work, or to take the risk by neglecting to do so?

Your ability as a builder will soon give you the correct answer.

The following list mentions some of the materials you may require on your contract. It is by no means comprehensive, but is printed as a guide.

Excavator, concretor and externals

Pegs
Profile boards
Setting-out lines
Setting-out squares
Pocket levels
Mini-maxi thermometer
Aggregate-testing equipment
Sand, sharp
Aggregates
Cement
Lime
Formwork timber
Mild-steel bar reinforcement
Tying wire
Nails
Bolts
Reinforcement supports
Mould oil
Timber path edging
Kerbs, large and small
Concrete posts
Straining wire and fittings
Wire fencing
Fabric reinforcement
Building paper
Polythene sheeting
Metal road forms and pins
Timber gates and fittings
Wire fencing
Tarmacadam
Asphalt
Chippings

Bricklayer, wall and floor tiler and roofer

Cement
Building sand
Lime
Plasticizers
Bricks, common
Bricks, facing
Bricks, engineering
Bricks, sand-lime
Bricks, fixing
Concrete blocks, all types
Clay blocks
Cavity battens
Cavity wall ties
Dpc, lead-lined
Dpc, bitumastic
Dpc, asphalt
Dpc, slate
Air bricks, cast-iron
Air bricks, terracotta
Glazed wall tiling
Proprietary 'glaze' wall finishes
Floor tiles, pvc
Floor tiles, rubber
Floor tiles, cork
Quarry tiles
Wall tiles
Flat steel corbels
Specialist wall coverings
Specialist floor coverings
Fireplaces and fittings
Metal door cramps
Roof tiles, clay or concrete
Roof tiles, glass
Roofing felt, smooth and sarking
Felt nails and tile nails
Tile battens
Nails
Chimney pots or linings
Anchor slots and ties

Carpenter and joiner. Ironmongery and steelwork

Carcass timber, various sizes
Plain edge flooring
Tongued-and-grooved flooring
Planed-all-round timber
Hardwood flooring, various
Carpet-fixing battens
Nails, various
Screws, various
Wall fixings, various
Shelving brackets
Timber cupboards and hanging rails
Door frames, hardwood and softwood
Door linings, hardwood and softwood
Doors, all types
Hinges, various
Bands, gudgeons and screws
Timber gates and parts
Locks and fastenings
Plywood
Blockboard
Fibre boards
Plastics surfacings
Window and cill boards
Window blinds and cords
Architraves
Skirtings
Picture rails
Shelvings
Timber sections generally
Asbestos sheeting, flat and corrugated
Asbestos hooks and nails and washers
Staircases and accessories
Shiplap boarding
Steel sections
Bolts, nuts and washers

Metal sections
Cat ladders
Floor channels and gratings
Wire partitioning and gates
Steel door linings
Steel doors
Fire reels and hoses
Floor-dividing strips, metal and plastic

Plasterer

Sand
Shingle, washed
Cement
Lime
Pigments for colouring concrete
Cement paint
Tyrolean compound
Plaster board, nails and scrim
Fibre board, nails and scrim
Plaster lath, nails and scrim
Plasters, rendering and setting
Plaster air vents, various
Patent external rendering
General-purpose adhesive
Aluminium foils
Angle beads and profiles
Plasticizers
Waterproofing compounds
Screeding compounds
Dividing strips
Asbestos sheeting and nails
Plaster of Paris
Expanded metal
Metal hangers
Mesh
Acoustic ceiling tiles

Plumber

Cast-iron drainage
Blue lead
Lead wool
Gutters, fittings and brackets
Rainwater pipes, fittings and pipe nails
Soil pipes, fittings and pipe nails
Holderbats, various
Service pipes (metal) and fittings
Service pipes (plastics) and fittings
Baths and fittings
Shower trays and fittings
Washhand basins and fittings
Washhand brackets
Lavatory pans and fittings
Waste-water pipes and fittings
Sinks and fittings
Sink brackets
Bidets and fittings
Fire precaution equipment
Cisterns and fittings
Tanks, metal and plastics
Solid-fuel back boilers
Oil-fuel heaters
Electric heaters
Gas heaters
Gasfitters pipework and fittings
Cylinder jackets and ties
Toilet roll holders
Towel rails and fittings
Radiators and fittings
Soil pipe balloons
External watering appliances
Kitchen equipment, all types
Slop stones and fittings
Washing troughs, stands and fittings
Meters

Drainlayer

Cast-iron manhole covers and frames
Clay drainpipes and fittings
Concrete manhole covers
Manhole step irons, various
Land drainpipes
Concrete drainpipes
Concrete manhole bases
Concrete manhole ring sections
Pitch-fibre drainpipes and fittings
Fresh air inlets

Glazier and painter

Clear glass
Polished Georgian glass
Wired cast glass
Float plate glass
Obscured glass
Special glass, coloureds
Mirrors and fittings
Metal-sash putty
Wood-sash putty
Linseed oil
Glazing springs and sprigs
Ball whiting
Knotting
Wood filler
Plaster-based fillers
Putty
Glass-paper
Priming, various types
Paint, undercoating
Paint, gloss
Paint, emulsion
Distempers
Varnishes
Enamels
French polish
Wallpapers and adhesives
Decorative wall coverings
Plastics paints
Road-marking paints

Thinners, all types
Barrier cream

Miscellaneous
Protective materials for all stages of the contract. Store sheds, compounds and materials for stacking on.

Many of the items contained in the preceding list will not *directly* concern you as the main contractor, but a perusal of them will refresh your mind as to the work you may have to execute in connection with them, after they arrive and until they are fixed.

APPENDIX A

Summary of hazards and appropriate protective measures

Hazard	*Material*	*Precautions as applicable*	*Consequence of failure*
(1) Sun	Timber Joinery and plywood Bitumastic materials Insulating boards Plaster boards	Cover with polythene or other good sheeting Prime Stack on skids Place in stores or in compound	Twisting, cracking and distortion Expansion when fixed Cracked and broken sheets Materials become useless
(2) Rain and snow	All materials not impervious to the weather Sanitary ware	Waterproof covers tied down Stack well off the ground Place in store of compound	Shrinkage Spalling Rot Cracking Inferior materials Factory protection destroyed
(3) Wind	All materials, especially formwork and wall and roof sheetings	Tie down covers properly Securely strut and complete fixings	Damage to work already erected Nuisance from noise at night Dirty site
(4) Traffic	All materials Trenches Wet concrete Strutting	Barriers and proper runs Shields Store in correct places	Damage to materials Collapse of trenches Damage to work Collapse of work Accident hazards
(5) Collapse	Concrete Soffits Wall forms Excavations	Adequate strutting No interference to supports, etc. Observe time limits for propping Observe weather conditions for striking time	Damage Delays to contract Unwarranted costs Insurance claims
(6) Fire	All materials Offices Canteens Stores	Care and attention to rules Enforce rules	Loss Damage Delay to contract Shortage of materials Insurance claims
(7) Oils Acids	All materials, especially floors	Proper storage Care and attention to rules Fix taps on drums	Loss Damage Delay to contract Shortages of materials Insurance claims
(8) Burst pipes Running taps	Anything on site Offices Canteens Stores	Immediate attention and protection Efficient installation	Damage to unfixed materials and the building itself Dirty site Ice conditions Delay to contract

Continued

Hazard	*Material*	*Precautions as applicable*	*Consequence of failure*
(9) Thefts	All materials Small plant	Record cards Security compound Collect surpluses Do not over-issue	Excessive cost and shortage of materials Delay to contract Insurance claims
(10) Undue waste	Small plant Timber materials Small useful articles	Proper stacking Proper handling Control Collect surplus Use off-cuts	Excessive cost and shortage of materials Delay to contract Insurance claims
(11) Dirt Mud	Timber Bricks Plaster board Cement Lime Flooring finishes	Coverings Hardstandings Storage Protection	Losses Inferior materials Delays Reactions from operatives
(12) Damage	All materials Small plant	Proper stacking Proper handling instructions and good operatives	Losses Delays Accidents Inferior materials Inferior workmanship
(13) Dropping Falling	Particularly fragile materials	Proper slings and ropes Correct placing Good storage	Breakages Accidents Delays Inferior materials and work
(14) Bad workmanship	All materials	Instruction Guidance Discipline Supervision	Spoilt work Wasted materials Delays Bad relations
(15) Being buried	Base-plates Fittings Small tools Bricks, etc. Aggregates	Clean site Collect when done with Raised stacking Restraining bays	Excessive costs Delays Shortages
(16) Rats and other vermin	All parts of contract	Clear away all waste Clear away food and papers Provide bins in canteen for disposal Enforce site discipline	Vermin infestation and hence disease and discomfort
(17) Unsanitary behaviour	Walls Floors Ceilings	Provide latrine buckets on floors of high buildings 'Sentry-box' lavatories Clear away after use Provide proper facilities on contract Enforce site discipline	Stained and discoloured areas on materials Discomfort from bad smells Cutting out and making good Bad relations with architect and clerk of works
(18) Explosions	Explosives Shot-firing guns Cartridges	Observe strict precautions issued Provide facilities for experts Use only Tornado guns Top-class security Operatives must be licensed	Loss of life Damage to contract Accidents Insurance claims

APPENDIX B

Schedule of protection

Notes on good contract procedure for the guidance of site personnel.

Good relations between contractor and supplier are essential. When considering the handling, storing and protection of materials, it is necessary always to bear in mind five things requiring the most attention (there are, of course, other minor factors). Add your own observations to the schedules.

(1) Action against wet conditions	(Skids, packings and coverings)
(2) Action with regard to fragile materials.	(Storage, racking and careful handling)
(3) Action against loss, theft and shortages.	(Security, issuing and checking)
(4) Storage and compound space must be available.	(Early planning and temporary roads)
(5) Phased deliveries to suit programme.	(Planning and co-operation)

Materials	*Protection is required against*	*Storage arrangements*	*Handling*	*Consequence of neglect or failure*
Sand, sharp Sand, soft Aggregates Granite chippings	Difference in type between ordered and delivered materials Frost, rain and snow Becoming mixed with other aggregates	Cover in frosty conditions Restrain in prepared bays Keep separated Use hardstandings of weak concrete Use discarded plywood sheets	Watch calibration marks Periodic checks across a weighbridge Keep materials trimmed Aggregate-heating equipment Water-heating equipment Discard frost-affected materials Keep vehicular traffic off aggregate and sand heaps on site See that spare wheels are not in load	Extra expense Dirty and unsafe conditions Breakdown of specification Fines washed out of aggregates, which will lead to incorrect concrete mixes Holes in concrete necessitating remedial work
Hardcore Pulverized fuel ash Ashes	Being dirty Containing timber		Have delivered to correct place	Replacement Settlement Double handling
Ready-mixed concrete	Difference in type between ordered and and delivered material Frost, rain and snow Careless placing Incorrect w/c ratios Incorrect mixes	Strong secure storage hoppers (if used) Tip on boards or hardstandings if to be double-handled	Good access roads to point of discharge or hoisting Do not overload dumpers and barrows Good safe barrow runs Check delivery by calculation of formwork Check delivery by use of gauge box Arrange time schedules for deliveries Order correct requirements Have some ready use for surplus	Extra expense Dirty and unsafe conditions Breakdown of specification Shortages when wanted Delays to programme Accidents

Continued

Materials	*Protection is required against*	*Storage arrangements*	*Handling*	*Consequence of neglect or failure*
Ready-mixed mortars	Difference in type between ordered and delivered materials Frost, rain and snow Incorrect mixes	Restrain on good bases with edge boards Cover in frost	Order correct requirements Off-load close to work Do not overload dumpers or barrows Clean barrows	Extra expense Dirty and unsafe conditions
Cements Limes	Frost, rain and snow Rising damp Bursting bags	Store in sheds Cover with tarpulins or polythene sheeting Provide timber floor raised off ground Silos (for cement)	Use first delivered bags first Use burst bags as soon as possible Distribute correct quantities around site Off-load and on-load carefully Have properly working draw plates on silos	Extra expense Dirty and unsafe conditions Delays
Formwork carcassing timber Plywoods and blockboards Premade panels Hardboards Metal shapes	Difference in type between ordered and delivered materials Frost, rain and snow Mud splashes Cutting to excessive waste Damage by vehicular traffic Theft	Cover with sheetings tied down On proper skids off the ground Lay boards flat Strips between stacked panels	Stack scantlings one end fair Keep stacks tidy Cut only to give minimum waste Preserve off-cuts for packings and other uses Re-use to destruction	Extra expense Dirty and unsafe conditions Shortages when wanted Delays to programme
Formwork accessories Bolts Packings Tying wire Props Nails	Being lost Being buried Theft Over-issuing from stores Becoming unsafe and unserviceable	Place in stores or compound Keep threads greased	Issue from stores in boxes or cartons Return surplus to stores or compound before concreting Issue correct quantities Withdraw bolts carefully to protect threads Have set of re-threading taps and dies on site	Extra expense Shortages when wanted Delays to programme
Mild-steel bar reinforcement Mesh reinforcement	Mud Oils and acids Distortion Misplacing Identification tags being torn off Vehicular traffic Falling objects	Lay on skids (bent) Place in racks (straight) Spread out and separate Lay on skids (flat mesh) Pack off ground (roll mesh)	Off-load close to work Provide in-road Have some spare to replace damaged bars and for supporting and holding Provide proper bolt croppers Preserve off-cuts for manhole covers, etc. Provide large enough steelyard Strut and secure fixed work Hoist with care Use correct size mandrels	Extra expense Shortages when wanted Delays to programme Damaged bars or material
Mould oil Diesel oil Paraffin	Theft Waste Being used for fires	Place drums on supports in compound Keep out of sun	Fit taps to drums Use proper measuring jugs and funnels	Extra expense Dirty and unsafe conditions

Materials	*Protection is required against*	*Storage arrangements*	*Handling*	*Consequence of neglect or failure*
	Being used to clean machinery	Keep out of stores but under control of storekeeper Obey prescribed fire and storage regulations	Use suitable brushes and containers for mould oil Use spraying machine for mould oil	Shortages when wanted Damage to work
Petrol	Theft Waste Fire	Obey prescribed fire and storage regulations, in compound Have first-aid equipment available Keep out of stores	Use proper containers Never transport in open buckets Keep out of drains	Extra expense Dirty and unsafe conditions Serious fire hazards to personnel and contract Explosions
Explosives Cartridges Shot-firing guns	Theft Accidents Fire Misbehaviour of operatives	Vehicle to be as close to work as is safe and under constant guard First-aid equipment to be instantly available	Operators to be licensed and registered One man at carrying vehicle at all times Constant checking of materials used against magazine store to register shortages or loss Notify police of operations	Accidents Damage to work Police proceedings Excessive losses Crime elsewhere
Precast concrete special items Kerbs (all sizes) Paving slabs Concrete posts Cills and lintels	Difference in type between ordered and delivered materials Frost, rain and snow Rough handling Breakages Throwing off lorries Vehicular traffic	Small items in compound on boards (covered) Slabs on edge, on skids As close to work as possible Timber slips between good faces	Off-load and on-load carefully Keep lorries off kerbs and pavings Provide adequate lifting tackle for heavy objects Protect fair edges Hoist at correct points to minimize stress Bed cills only at ends	Extra expense Shortages when wanted Delays to programme
Building paper Polythene sheeting	Theft Waste Displacement when fixed Rain and snow	Stack on end in store (building paper) Lay flat in store (polythene sheeting)	Careful issuing Weigh down with bricks Prevent foot traffic Use knife for cutting (do not tear)	Extra expense Shortages when wanted
Bricks Concrete blocks Breeze blocks	Difference in type between ordered and delivered materials Frost, rain and snow Rough handling Bad stacking Wrong positioning (over service runs) Bad weather and mud Double handling Tipping Being used as hardcore	As close to work or hoist as possible Facings on boards Keep straw between bricks Stack on broadcast ash or sand to prevent ground salts rising Separate sand-lime bricks from facing bricks to prevent effloresence (at least 10 m (30 ft) apart)	Off-load and on-load by hand Consider packaged bricks Cover facings and sand-lime bricks with polythene sheeting tied down Employ hod carriers Hand-stack in barrows and dumpers Use up bats	Extra expense Dirty and unsafe conditions Delays to programme Shortages when wanted Unsightly work

Continued

Materials	*Protection is required against*	*Storage arrangements*	*Handling*	*Consequence of neglect or failure*
Damp-proof course (slate)	Frost, rain and snow Rough handling Being walked on when fixed Careless cutting	On boards in compound Cover with polythene sheeting Safe space near building Stack on edge	Extra care in off- and on-loading and stacking Use hods, not barrows Return surplus to stores Check shortages—often due to breakages	Extra expense Shortages when wanted Rising damp due to cracked slates
Damp-proof course (felts) Roofing felt Sarking felt	Sun Being walked on when fixed Theft Rubbish left on flats Damage caused by ends of scaffolding tubes	Stack on end in store Cover, if stacked in compound Keep away from traffic Protect from fire	Exercise usual care Weigh down dpc with bricks when fixed Cut with knife or trowel (do not tear)	Extra expense Delays if blown off Replacement if damaged by grit or bats being trodden in Delays to programme
Air bricks Gratings Glass bricks	Loss and waste Chipping by bad stacking Being buried Careless handling	Stack in stores on floor Use straw or paper dividers	Issue by number Keep straw or paper between terracotta and glass bricks Carry by hod (not barrows or dumpers)	Excessive costs Delays in replacing specials
Wall ties Anchor fittings	Loss Being buried Waste	Keep in stores or compound	Correct issuing Return surplus to stores	Excessive costs Delays Bad workmanship
Glazed tiles Pvc tiles Rubber tiles Cork tiles Quarry tiles	Scarring and marking Using wrong tools when fixing fixtures Theft Chippings being trodden into floors, etc. Foot traffic Mixing plasters and mortars on finished floors Paint tins, drums and bucket marks on floors Lack of protective coverings	In stores under proper control Check often that required quantities are in fact in stores Store quarry tiles on boards in compound and cover them	Care in issuing quantities Return surplus to stores Keep in cartons Do not stack too many cartons on each other Lay cartons of white glazed tiles on side Cover finished work where possible (cills) Clear away all debris Cover floors with polythene sheeting secured with masking tape Erect barriers Lay decorative tiles as late as possible, after painter Lay in correct temperatures	Extra expense Shortages when wanted Delays to programme
Adhesives Masking tapes	Frost and sun Theft Unclosed drums Using wrong types of tape	In stores or office	Keep lids on drums Do not mix too much Do not dispose of surplus down sinks and bowls Observe instructions on drums Issue as required	Extra expense Shortages when wanted

Materials	*Protection is required against*	*Storage arrangements*	*Handling*	*Consequence of neglect or failure*
Specialist wall and floor coverings	All hazards applicable to your own work are applicable to subcontractors	Provide store sheds and coverings if placed in compound Check shortages and breakages and notify suppliers and subcontractors at once In stores (contractors) In stores (subcontractors)	Cover material Off- and on-load carefully Distribute on site only to subcontractor's instructions Collect surplus material	Claims from subcontractors Loss of insurance Bad contract relations with subcontractors Inferior work Delays
Mouldings Planed timber Shelvings Facias, etc.	Difference in type between ordered and delivered materials Frost, rain and snow	In racks under cover in compound or on covered skids	Prime as soon as possible Cut and issue to size where possible Preserve off-cuts Return surplus to compound Provide adequate protection when fixed where applicable Maintain protection	Extra expense Shortages when wanted Delays to programme Unsatisfactory unfinished work Remedial work and undue maintenance
Made joinery and fittings etc. Staircases	Difference in type between ordered and delivered materials Frost, rain and snow Damage at all stages	Store under cover in compound or stores on dry bases Adjacent to final fixing position Cover with polythene sheeting or tarpaulins tied down	Prime as soon as possible Provide adequate protection where applicable Phase deliveries to fit programme Careful handling when distributing Maintain protection	Extra expense Shortages when wanted Delays to programme Unsatisfactory finished work Remedial work and undue maintenance
Plywoods Blockboards Fibre boards Decorative boards Asbestos sheeting	Theft Being walked on Being left out in rain or sun General damage by tools and materials containers	In stores or compound Properly covered if exposed to weather Packed well off ground	Lay flat on sufficient skids Issue as required Conserve off-cuts Provide protection where applicable	Extra expense Shortages when wanted Delays to programme Unsatisfactory finished work Remedial work and undue maintenance
Doors Panelling Counters	Difference in type between ordered and delivered material Frost, rain and snow Being walked on Grit and dirt Being scarred or scratched Being used as scaffolding	Lay flat on skids in covered areas Keep away from foot traffic routes Store in fixing position as soon as possible to balance moisture content	Protect from slamming Cover hardwood faces with polythene sheeting Protect bolection mouldings Refer to architect's schedules Check shortages often Maintain protection	Extra expense Shortages when wanted Delays to programme Remedial work and excessive maintenance
Nails Bolts Screws	Theft Waste Weather Being buried	Have nail and bolt bins in stores Racking	Use nail boxes Careful issuing from stores Use carpenter's labourer Return surplus to stores	Extra expense Shortages when wanted Delays to programme

Continued

Materials	*Protection is required against*	*Storage arrangements*	*Handling*	*Consequence of neglect or failure*
All ironmongery (usually nominated) Locks Kicking plates Door closers, etc.	Theft Waste Wrong positioning Damage	Proper racking and marking in stores Issue against architect's schedules	Constant reference to architect's schedules Re-issue in cartons Careful issuing to foreman only Use key boards Use masking tape Return surplus to stores	Extra expense Shortages when wanted Delays to programme
General small metalwork items Dividing strips Sections Shelf brackets Fixings, etc.	Distortion Theft Waste Damage	Proper racking in stores	Re-issue in cartons where possible Careful issuing to foreman only Return surplus to stores Preserve off-cuts	Extra expense Shortages when wanted Delays to programme
Metal doors Metal frames Metal windows	Damage Dirt and mortar droppings Distortion Barrows and other items being carried in or passed through Vehicular traffic	Store flat in compound on skids with adequate distance pieces and cover If stacked on edge, place longest side down on ground on sufficient skids and protection between each item (timber off-cuts are ideal)	Preserve distance pieces on frames; keep square Take care of projecting handles and hinges Transport around site with care Fix protection as soon as possible Apply necessary paintwork before fixing Hoist with great care Report damage if subcontractor's material Clean with care (no abrasives)	Extra expense Shortages when wanted Delays to programme Remedial work and excessive maintenance
White cement Pigmented cement Tyrolean compounds Colouring compounds Prepared plasters Screeding compounds The above if in drums	Frost, rain and snow Becoming stale Burst bags Rising damp Walking over	In sheds on timber floors Cover under and over with sheeting, on platforms In stores	Off-load and on-load with care Use burst bags immediately Transport small quantities by bucket Use first-delivered bags first Keep drums sealed	Extra expense Dirty and unsafe conditions Shortages when wanted Delays to programme Becomes useless
Plaster board *a* Plaster lath *b* Fibre boards *c* Paramount partitions Fibrous plaster work *d* Wood-wool slabs *e* Compressed straw boards *f*	Frost, rain and snow Foot traffic Vehicular traffic Rising damp Breakages General damage Leaving off coverings Transporting in dirty lorries Cutting to waste	Stack flat on timber floor Cover above and below Keep dry Store in compound Protect from fire	Do not stack too many on each other Prevent bottom sheets being broken Transport with great care Keep out of rain Fix *a*, *b*, and *c* always from centre outwards and leave small gap at edges Fix *d* slack and make good Cover *e* and *f* with finishing as soon as laid	Extra expense Shortages when wanted Delays to programme Excessive remedial work

Materials	*Protection is required against*	*Storage arrangements*	*Handling*	*Consequence of neglect or failure*
Acoustic tiles Plaster air vents	Damage Breakages Wet Theft	In stores in cartons	Keep in cartons Handle with care Careful issuing Notify subcontractor about damages and shortages Keep dry	Shortages when wanted Loss of insurance claims Excessive remedial work and maintenance
Acoustic tile fixings and accessories Angled and flat beads	Damage Distortion Theft Careless working in ducts above	In racks in stores In boxes in stores	Handle carefully Keep in packagings Notify subcontractor about damage and shortages Use walking boards in ducts above	Shortages when wanted Loss of insurance claims Excessive remedial work and maintenance
Wire mesh Expanded metals Accessories and wire	Frost, rain and snow Damage Cutting to waste Rust Mud	Lay flat on boards in stores or compound Keep covered Hang coiled wire in stores Keep accessories in boxes	Transport and handle carefully Preserve off-cuts Return surplus to stores Misuse of wire Use correct tools for cutting	Shortages when wanted Extra costs Delays
Cast-iron drainage and fittings Spun pipes	Breakages Cutting wrong lengths Foreign matter entering pipes Wrong schedules Vehicular traffic Cracked pipes (by dropping)	Stores in compound Keep types of fittings together, and pipes in pipe lengths	Handle castings carefully Plug ends of branches when fixed Check stock of fittings often	Extra expense Shortages when wanted Delays to programme
Lead wool Blue lead Plugging compounds Gaskets and gasket string	Theft Burning in pot Waste Being used for rope	Keep in stores	Do not over-issue Return surplus to stores Keep gaskets dry for cast-iron work	Extra expense Shortages when wanted
Manhole covers and frames	Difference in type between ordered and delivered materials Breakages (do not drop from lorries) Fitting covers in wrong frames Fitting in wrong positions Losing lifting keys Rocking when bedded (wrong cover in frame)	In compound Keys in stores (labelled)	Check light, medium and heavy weights, for site positioning, before issuing Pack and bed frames out of twist Seal properly with 1:3 grease : sand mix Hang keys in stores till handing-over date Check stocks and types often	Extra expense Shortages when wanted Remedial work Noisy covers in traffic Foul smells escape
Floor ducting covers and frames	As for manhole covers and frames Distortion Incorrect refixing positions Fitting too tightly in frames Unsightly floor lines	Metal in compound Timber in stores	Maintain original fixing position if raising (Number covers on underside when fixing) Produce numbered sketch for maintenance engineer Check BoQ to see whether edges are to be ground square, and make sure this is done before delivery	Extra expense Delays to programme Remedial work Excessive maintenance

Continued

Materials	*Protection is required against*	*Storage arrangements*	*Handling*	*Consequence of neglect or failure*
Rainwater gutters (metal and plastics) Rainwater pipes (metal and plastics)	Breakages Damage Discharging rainwater leads on to finished brickwork Roof tilers' feet	In racks in compound or in plumbers' stores	Handle with care Return surplus to stores Complete sections of work at one time Fix after facias have been undercoated	Extra expense Shortages when wanted Delays to painters Damage to brickwork Flooding to site
Rainwater gutter fittings Rainwater pipe fittings (metal and plastics)	Loss Breakages Damage	In boxes in stores In boxes in compound	Handle with care Return surplus to stores	Extra expense Shortages when wanted Delays to painters
Rainwater accessories Stop-ends Bobbins Pipe nails Bolts Holderbats, etc.	Loss Breakages Theft Shortages	In boxes in stores	Careful issuing Return surplus to stores	Extra expense Shortages when wanted Delays to painters
Soil pipes and fittings	Breakages Damage	In compound or in stores	Return surplus to compound	Extra expense Shortages when wanted Delays to programme (late testing)
Service pipework, metal and plastics	Difference in type between ordered and delivered materials Damage Theft	In racks in stores or compound	Careful issuing Return surplus to stores	Extra expense Shortages when wanted
Service pipe accessories and fittings. Stopcocks, etc.	Difference in type between ordered and delivered materials Damage Theft Being buried	In boxes in stores or in plumbers' stores	Careful issuing Return surplus to stores	Extra expense Shortages when wanted
Baths, metal or plastics	Damage and rough usage Being dropped Poor inspection on delivery Being stood in or on Falling objects	Store in compound, on felt-covered skids, *separately* and upside down	Handle and transport with care in clean lorries Put down with care Do not drop Fix adequate boarded and masked protection before distribution Fix as late as possible in the programme Maintain protection	Extra expense Shortages when wanted Delays to programme
Basins Pans Shower trays Bidets Sinks Slop stones Urinals, etc. (white glaze or porcelain)	Damage and rough usage Hair cracks Poor inspection on delivery Falling objects Being stood on Hob-nailed boots Being used by painters and other trades for washing tools and containers	In stores or specially prepared bay in compound Cover with sheetings tied down or otherwise secured Keep water out of bends	Protect with masking tape before distribution Handle with great care Keep out of traffic ways Protect further when fixed Off- and on-load with special care and with sufficient manpower Use no abrasives to clean Maintain protection	Extra expense Shortages when wanted Delays to programme Remedial work and maintenance Daywork charges from other trades

Materials	*Protection is required against*	*Storage arrangements*	*Handling*	*Consequence of neglect or failure*
Sanitary fittings Flush pipes Seats Showers Taps Wastes Cisterns Accessories Soap dishes Pulls and chains Etc.	Theft Poor inspection on delivery Damage Acid in traps Tightening screws and fixings too much	In racks in stores Keep in cartons In plumbers' stores	Issue in boxes or cartons Continually check for shortages and damage Keep issuing of items under tight control Return surplus to stores Report all damage or losses to foreman in good time Fix and refix protection at all times (tapes or coverings) Use no abrasives or acids to clean	Extra expense Shortages when wanted Delays to programme Remedial work and maintenance Daywork charges from other trades
Tanks, metal and plastics Cisterns, metal and plastics Radiators Towel rail heaters	Rain, frost and snow Damage and rough usage Being used as scaffolding Being dropped Filings and metallic cuttings being left in tanks or cisterns Careless hoisting Loose connections Scarring of metal Being used for wrongful purposes	In stores or compound (as applicable) Direct to point of fixing	Hoist with care Do not drop Wash out before fixing tanks Preserve factory protection Protect when fixed as necessary with sheetings Complete fixing to next stopcock at one operation Paint necessary items before fixing Paint walls behind radiators before fixing	Extra expense Dirty and unsafe conditions Shortages when wanted Delays to programme Remedial work and maintenance Flooding
Kitchen equipment and accessories	Damage and rough usage Being used as scaffolding Being used as work benches Abrasion Acids and oils Damaging other work when distributing Scratches	Direct to point of fixing if possible, otherwise careful and intelligent storage, under cover Keep accessories in boxes and cartons in stores	Preserve factory protection Protect when fixed as necessary with sheetings Use masking tape on exposed edges and corners Do not drag over finished floor Notify all damage immediately to suppliers and fixers Use no abrasives or acids to clean (use plastics pan cleaners and non-abrasive detergents)	Extra expense Shortages when wanted Delays to programme Remedial work and maintenance Excessive replacement costs Contra charges Loss of insurance
Glass	Breakages Theft Scratching Wrong placing Weather side reversed Bad stacking Mortar and plaster	In stores or compound Protect from frost and rain	Stack on longest edge on skids Preserve paper dividers or straw between sheets Never lay flat Transport by slatted carriers and webbing (frails)	Extra expense Shortages when wanted Delays to programme Excessive waste Insurance losses

Continued

Materials	*Protection is required against*	*Storage arrangements*	*Handling*	*Consequence of neglect or failure*
Glass *continued*			No more than twelve sheets in one stack Use gloves or folded paper when handling Exercise great care when hoisting and setting down crates Use labels or whiting on glass when fixed	
Mirrors	Breakages Theft Damage to silvering Damage to edges and corners Bad stacking Plaster and paints	In stores or at point of fixing Protect from damp	Generally as for glass Issue with care Use fixing grummets and *do not* tighten screws to glass Protect edges with masking tape Move and distribute with great care Mark mirrors with whiting when fixed Clear away broken glass as it occurs Fix as late as possible to suit programme and phase deliveries	Extra expense Shortages when wanted Delays to programme Very excessive waste
Plastics handrails	Knobs of plaster and mortar on metal cores Painting balustrades after fixing Damage Unfinished ends and poor joints	Not applicable (being fixed when delivered)	Clean dirt off metal cores before fixing Paint balustrades completely before subcontractor fixes them Protect as soon as fixed; leave protection on till handing-over date Keen supervision	Extra expense Remedial work Daywork sheets from subcontractors Bad finish to work
Putties	Frost, rain and snow Theft Going hard Being left lying about Use by other trades	In stores At point of using	Keep lids on drums Return surplus to store *Soften* with raw linseed oil or heat *Harden* with plaster	Extra expense Shortages when wanted
Paints (all types) Oils and thinners Emulsion paints Distempers, etc.	Difference in type between ordered and delivered materials Frost, rain and snow Theft Waste Going hard Excessive dilution Mixing different types Leaking tins and containers Using for fires Using for cleaning machinery Dirty working conditions Fire	In stores Near to point of application In drums on racks and fitted with taps in stores	Keep lids firmly closed Cover floors Issue with care Return surplus to store and put in 'smudge' drum Use proper measuring utensils and funnels	Extra expense Shortages when wanted Delays to programme Remedial work and maintenance Insurance claims

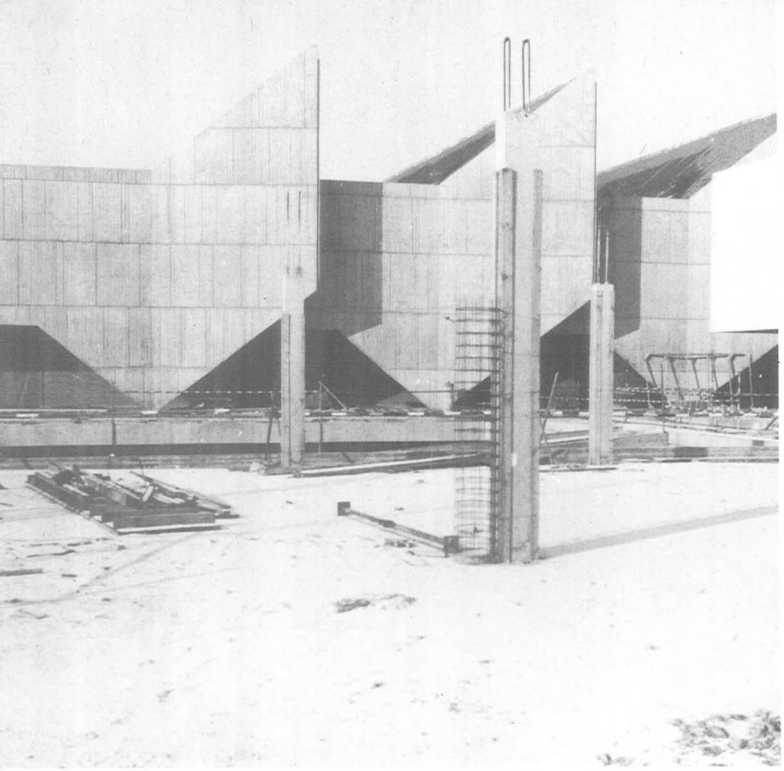
Materials	*Protection is required against*	*Storage arrangements*	*Handling*	*Consequence of neglect or failure*
Painting accessories Knotting Plaster and wood-based fillers Glass-paper French polish	Theft Waste Dirty working conditions Incorrect working temperatures for polishing	In stores	Re-seal packages Re-stopper bottles Issue carefully Have heat on for polishing	Extra expense Shortages when wanted
Wallpapers Decorative wall coverings Borders	Damp Damaged ends Being left lying about Placing other materials against finished walls Dirty working conditions	In racks in stores or In painters' stores	Issue carefully Issue borders by measurement Return surplus to stores	Extra expense Shortages when wanted Delays to programme Remedial work
Adhesives	Theft Waste Marking other work	In stores or In painters' stores	Issue carefully Return unused surplus to stores Flush well down drains Keep lids on drums	Extra expense Delays to programme Blocked drains
Conduits—electrical	Theft Distortion by foot traffic Damage Damp Being left lying about Nailing through conduits	In racks in stores	Return surplus to stores Carry forward to next point of installation Mark run of conduits to avoid nailing through	Extra expense Shortages when wanted Broken earthings
Fittings—electrical Switches Plugs Wiring Lamps Shades Tubes Cords Etc.	Theft Loss Damage Damp Being left lying about Sabotage Incorrect positioning	Keep under lock and key in stores Keep returns in cartons	Issue very carefully by numbers or measurement Issue to foreman only Return surplus to stores Check stocks often Fix fittings as late as possible to suit programme Exercise *strict* site discipline and good storekeeping	Extra expense Shortages when wanted Delays to programme Remedial work and maintenance Contra daywork sheets
Asbestos lagging Applied Pre-formed	Damp Foot traffic Climbing over and using as scaffold Crushing General damage Spoiling other work by dropping and splashing Rough usage	In cartons in stores At point of application	Handle carefully Keep in cartons Check shortages	Extra expense Shortages when wanted Delays to programme Contra daywork sheets Remedial work Maintenance
Sheet-plate ducting Accessories	Using as scaffolds Crushing and distortion Wet storage conditions Vehicular traffic Loose jointing Insecure hangers	In compound covered on skids At point of installation Accessories in stores	Notify subcontractor of damaged deliveries Transport around site carefully Hoist carefully	Extra expense Shortages when wanted Delays to programme Leaking joints Loss of insurance Remedial work

Continued

Materials	*Protection is required against*	*Storage arrangements*	*Handling*	*Consequence of neglect or failure*
Carpets	Wet and damp Irregular and dirty screeds Theft Damage Dirty conditions and late tradesmen	In clean stores At point of laying, under lock and key	Notify supplier of any damage or shortages urgently Lock up rooms or isolate areas as soon as laid Protect properly with polythene sheeting and mask edges Ascertain door clearances in early stages	Extra expense Shortages when wanted Delays to programme Loss of insurance Remedial work Maintenance

The production of this schedule will indicate that for the correct storage and handling of materials, an honest and efficient storekeeper is essential.

The protection of the materials is the responsibility of the site staff and the consequences of failure are a reflection on everybody.



1

2

Good practice

1: Fair-faced columns protected at corners.

2: Bin dividers for concrete aggregates on a clean site.

3: Damp-proof course properly stacked on non-returnable brick pallets. Other materials stacked neatly.

4: Room numbered. Protection to frame of room being used as specialist's store.

5: Bath covered (to be secured later with marking tape when panelling is fixed). Complicated bath framing detail well executed.

3

5

4

7

6

8

Bad practice

6: The result of the bulging out of a face shutter.

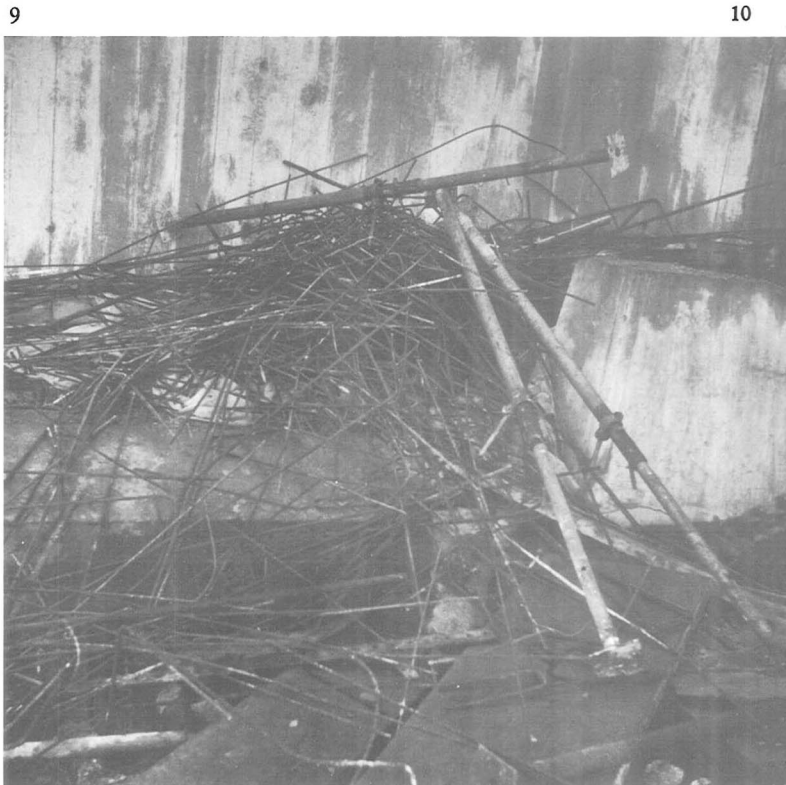
7: A dirty and untidy site.

8: Waste concrete on a dirty site.

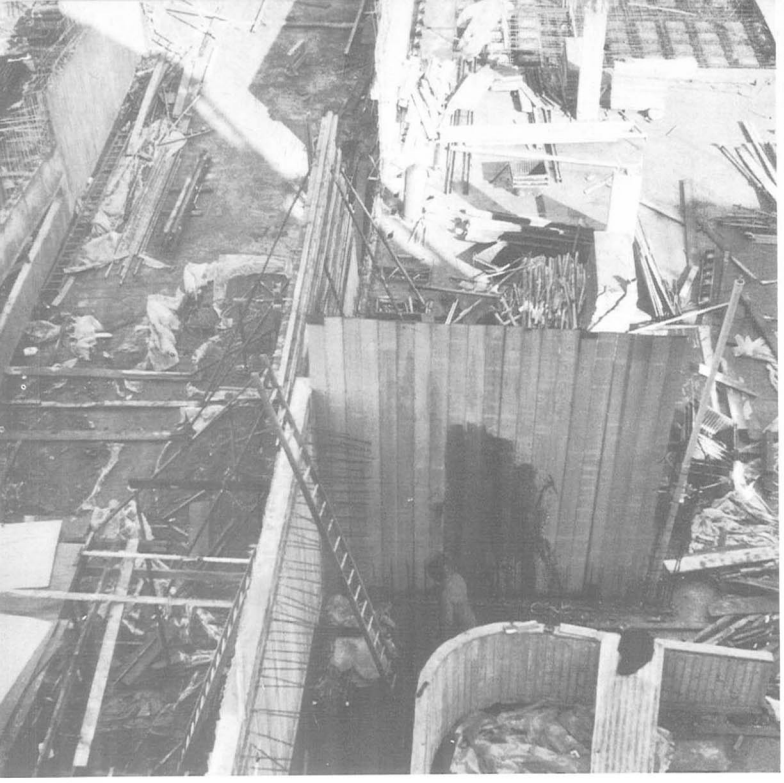
9: A collapsed barrow-run: an accident hazard.

10: Distorted and unusable mild-steel rod.

9



10



11

12

Bad practice

11: Oiling formwork with a rag on a stick.

12: A dirty workshop, with accident hazards. Exhaust of saw inside workshop.

13: Made joinery left uncovered.

14: Unsorted mild-steel rod lying about in heaps in a steel yard.

15: Water-bar 'crosses' still lying about. Damage to duct covers. General untidiness.

13

15

14

17

16

18

Bad practice

16: Scaffold fittings left in basement.

17: Waste concrete on a dirty site.

18: Rubbish left in basement.

19: Waste concrete and untidy site.

20: Unsorted timber, some of which could have been salvaged, taking up space.

19

20

Conservation and protection of building materials

G.T.B. WINSTANLEY, CGIA, AIOB, FIBICC

CEMENT AND CONCRETE ASSOCIATION PUBLICATION 12.055

CI/SfB (B1d)

UDC 69.004.4