

Project FishScale or How to Extend a Fish Pond

**A Guide for Such Other Sundrie Persons
as May Wish to Follow Our Example**

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Introduction

This goal of this project was to convert a small, oval (10'x7'x2' deep) pond into something larger, deeper and more suitable for some rapidly growing koi.

The conclusion was to build upwards to a height of 2'-2'6", around the existing pond, using railway sleepers. Railway sleepers were chosen for two reasons: they are quick and simple to lay compared with laying bricks/blocks, and they are heavy enough not to need foundations dug. If you shop around they may also work out cheaper (overall) than bricks/blocks.

The disadvantage of sleepers is that they need to be stabilised. After much debate (with friends with heavy construction experience) we settled on placing the sleepers on a (roughly) 3" bed of dry mix ballast & cement, bolting the sleepers together using 1m long, 16mm diameter steel bolts with the extra length of bolt protruding downwards through the dry mix and into the ground (in this case London clay). The sleepers were bolted with a nut top and bottom. The top corner joins of the structure were then cross-bolted with short lengths of 16mm bolt rebated into the sleepers. (Actually we cheated on a couple of corners and secured them with lots of 6" nails between the various levels of sleepers. This was because we found that, due to the positioning of some bolts and the condition of some sleepers, there was not a suitable position for a cross-bolt. But this seems to have worked.) The side centre joins were stabilised with diagonally placed metal strip screwed to the sleepers. See the plan and all will no doubt become clear.

The walls were completed with slats of untreated, air-dried oak which should weather to a silvery colour and last many years.

Advice

Do not expect to do this work on your own! Unless you are very strong you will not move a railway sleeper unaided - they weigh around 100Kg each.

For the construction you will need at least 4 pairs of hands. Of these 2 need to be strong enough to carry sleepers between them. I suggest you will stand a much better chance of succeeding if one of the team has some construction site experience and one is an experienced carpenter.

For installing the pond liner, again you will need at least 4 pairs of hands for a liner of this size. And again my advice is that one person in this team should have some previous experience of installing pond liners.

Don't try to do too much at once. This project was deliberately phased so that if work had to stop at any time (through lack of money, labour, health or weather) then it didn't matter and the fish would come to no harm. The only critical phase, that must be completed without interruption, is the final installation of the liner and move of the fish. Also I had originally planned to install permanent mains water to the new pond as a part of this work, but I had to abandon that due to lack of time - it can be done later!

Outline Project Plan

Task#	Task	Dependencies	Notes/Comments/Advice
1	Project Start		
2	Preparation Phase		Planning was done April/May 1999, and re-done at regular intervals during the project. This is the final version of the plan, and even this is not quite what we did!
3	Draw Plans	1	See below
4	Develop Project Plan	1	Well this is it!
5	Agree Design/Plans	3	Yes, do ensure that you get the advice of others, and agreement from the SO
6	Research New Filter	3	Depends on pond size and expected stocking levels
7	Agree Quantities Materials	5	Do your own calculations - don't necessarily trust mine!
8	Find Materials Suppliers	5	Mostly, I suggest, your LFS (local fish shop!) and a builders merchant
9	Agree Dates	5	
10	Design New Filter Outfall	6	
11	Research Coping	5	I still don't know the answer to this question; but do not use railway sleepers
12	Plan Water Main Extension	5	Not done
13	Cost Materials	7,8	Shop around!
14	Go Decision	4,8,6,9,13,5	Decide if you can start, and when. Do you have the money, help and time needed? If not, don't start!
15	Assemble Groundwork Team	14	
16	Assemble Navvy Team	14	
17	Assemble Fish Team	14	
18	Groundwork Phase		This phase was 1 days work for 2 guys; done 15/06/1999
19	Agree Start Date	14	
20	Lift Marginal Plants etc.	19	Where will you put them? Will they be replaced in the new pond?
21	Buy Plumbing Parts (1)	19	Make sure you have the bits you need for moving filters etc.
22	Clear Ground	20	
23	Move Old Filter	20	

Task#	Task	Dependencies	Notes/Comments/Advice
24	Revamp Old Filter Pipes	23SS	
25	Ground Clear	22,23SS	
26	Construction Phase		You will need help for this; do not try to move railway sleepers on your own!
27	Agree Start Date	25	
28	Buy Ballast	27	See below for quantities. Buy everything & get it delivered in advance.
29	Buy Cement	27	
30	Buy Railway Sleepers	27	
31	Buy Steel Pins	27	Don't forget to buy an extra one for the cross-bolts
32	Buy Rendering	27	We used mortar and foam filler
33	Buy Tarpaulin for Lawn Protection	27	
34	Buy Water Main Materials	27,12	Not done
35	Buy Nuts for Pins	31	You'll need 2 per pin for the verticals and 8 nuts for the cross bolts as a minimum
36	Buy/Hire Drill, Countersink & Saw	30	Provided by one of team (the carpenter). You'll need a circular saw, handsaw, heavy-duty drill and long auger bits
37	Construction Materials Available	28,29,30,31,36,32,33,35	Construction (tasks 37 thru' 51) took 5 fit guys 2 long days (9am Sat to 9pm Sun); 10-11/07/1999.
38	Dig Trench	37	Not done
39	Dig Holes for Pins	38	Not done; as the plan shows we discarded the original idea of setting pins in concrete
40	Clear Spoil	38,39	
41	Cut Railway Sleepers	40	Needs an experienced circular saw user; straight cuts are difficult with a chainsaw
42	Set Pins	41	Not done
43	Lay Ballast	42	
44	Drill Sleepers	42	This needs a heavy duty power drill and long augers
45	Ensure Level	43	Get the ballast level before you lay the first sleeper, and keep checking the levels as you proceed.
46	Lay Sleepers	44,43,42FS+1d,45	
47	Ensure Level	46SS	Ensure the top of the sleepers is level; we were only 5-10mm out along the length of the pond - not bad for sleepers which don't come exactly precision cut.

Task#	Task	Dependencies	Notes/Comments/Advice
48	Bolt Sleepers	46,47	Top and bottom nuts; top nuts need to be rebated into sleeper; measure distance between nuts very carefully or you end up with too deep a rebate that you can't get a box spanner in.
49	Lay Water Main	34,46	Not done
50	Fill/Render Inside Wall	48	We used mortar for the worst parts and foam filler for the cracks just before installing the liner. You may also want to finish off the outside edge of the ballast foundation with a skirt of concrete.
51	Wall Built	50	
52	Infrastructure Phase		This can be done in small pieces over several weeks, even years.
53	Measure for Liner	51	Length = Int. Length + 2xDepth + 2 Feet Width = Int. Width + 2xDepth + 2 Feet
54	Order Liner & Underlay	53	
55	Install Water Supply	49,54	Not done
56	Buy New Filter	54	You need to decide how much filtration, and of what type, you want on your pond; talk to your LFS
57	Buy New UV	56SS,54	
58	Buy New Pump	56SS,54	
59	Buy Electrical Parts	57,58	You'll need connectors, switches, cable, conduit, etc.
60	Connect Water Supply to Main	55	Not done
61	Buy Plumbing Parts (2)	56,57,58	You'll need flexible hose, plastic waste pipe & elbows, jubilee clips, solvent cement, etc.
62	Extend Electrics	59	I had to extend my existing electrical supply. Don't forget to use rubber/armoured cable and put it in a conduit.
63	Prepare Filter/Pump/UV Plumbing	56,57,58,62	Create a level base for your filter and get all the electrics & pipework done as much in advance as possible
64	Pond Materials Available	56,57,58,61,59	
65	Test Filter & Pump	63	I forgot this and so later had a leak I could have cured easily at this stage!
66	Liner & Underlay Available	54FS+10d	
67	Infrastructure Available	65,66,60	Now you're ready to move the fish

Task#	Task	Dependencies	Notes/Comments/Advice
68	Move Phase		
69	Agree Date	67	
70	Acquire Temporary Holding Tank(s)	67	Ask your LFS or buy water storage tanks or a kiddy's paddling pool
71	Buy Sand	67	
72	Buy Pond Additives	67	Dechlorinator, StressCoat, Bacteria
73	Buy Coping	67	Can be done later
74	Move Starts	69,70,71,72,73	Once started this must be completed. Tasks 74 thru' 96 took 5 guys one long day (9am to 9pm); Saturday 24/07/1999
75	Pump Out Water to Tanks	74	Empty the old pond (keep the water)
76	Move Fish to Temporary Tanks	75	Catch the fish ...
77	Salvage Wildlife	75	... and the frogs etc.
78	Remove Old Liner & Debris	76	Clear the debris if your old pond is inside the new one
79	Old Pond Cleared	78	
80	Renovate Old Hole	71,79	Clear away stones, tree roots, etc. and lay 1" layer of sand as a base.
81	Install Underlay	80	
82	Install New Liner	81	You need to run in water and fold liner as your go
83	Measure Hose Flow Rate	80,82	See how long your hose takes to fill a large container of known volume; convert this to gallons/hour
84	Complete Filter etc. Plumbing	82	Get the filter up & running
85	Fill Pond (& Measure Volume)	82,83	This is the task which takes the time! As this happens the liner has to be folded into place. Time the filling to find volume.
86	Add Known Amount of Old Water	85SS	
87	Add Water Conditioner	85SS	
88	Return Fish	86	A good opportunity to count, measure, and give them a health check - I had a lot more fish than I thought!
89	Add StressCoat	87	
90	Add Wildlife Escape Hatch	85	Don't forget the frogs, etc. - they can't climb vertical butyl liner (especially when they are small)
91	Start Filter	85,89,84	

Task#	Task	Dependencies	Notes/Comments/Advice
92	Seed Filter with Old Brushes	91	Seed new filter with media from the old one
93	Add Bacteria Starter	91	
94	New Pond Running	93,88	
95	Install Coping	94,73	Now trim off the excess liner/underlay, leaving a neat lap of liner across the sleepers, and tack the liner to the sleepers. The coping can be done later if necessary, as we did. You might want to net the pond as well.
96	Pond Complete	94,90,95	
97	Completion Phase		
98	Monitor Fish for Stress	96	Watch the fish carefully for a week or two and treat any injury/illness that becomes obvious. Also track the water chemistry.
99	Dismantle Holding Tanks	96	Now you can clear up ...
100	Return Holding Tanks	99	... return the things you borrowed ...
101	Organise Topping Out Party	96	
102	Clear Rubbish	99	
103	Replant Marginals	102	... add plants if you want ...
104	Topping Out Party	101	... and celebrate to thank all your helpers
105	Project Complete	104,98,102,103,100	

Costs & Materials

All costs include VAT.

Qty	Description	Cost (£)
26	Railway Sleepers (including delivery)	441.81
13	Threaded Steel Pins (16mm x 1m) + 36 Nuts	40.55
2	Foam Filler	12.98
24	Bags Ballast	28.80
8	Bags Sand	9.80
	6" Nails	10.16
3	Bags Cement	9.87
	Plumbing Parts, Hose, Gate Valves, etc.	132.79
	Butyl Liner (30 year guarantee) 27'x24'	280.00
	Underlay 7' wide x 100'	110.00
	Cloverleaf Genesis 3500 Filtration Unit, Cyprio Prima XL 1300 Pump, TMC ProClear Advantage 30w UV	504.00
	Pond Net	7.99
90m	Untreated 3"x1" Oak Board, Screws	281.84

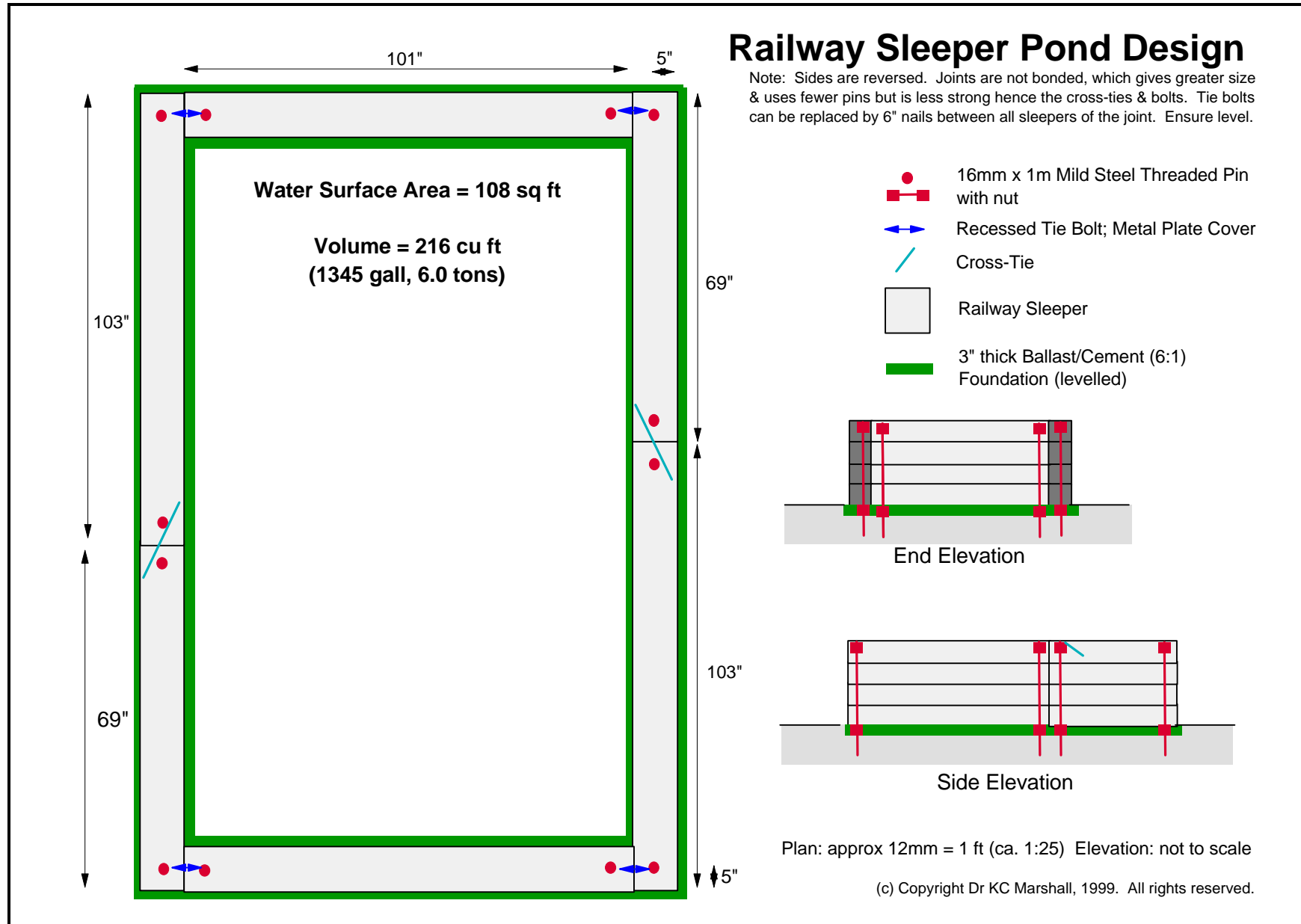
The following costs have not been included:

- Food and beer (and BBQ charcoal) for the workers
- Plants, tubs, rocks, ornaments, etc.
- Transport - it can be surprising how much time and petrol it takes going hither and yon buying things and looking at (for instance) filtration units.

Plan and Elevation Drawing

Notes:

1. The scale is correct only if the drawing is printed full size on A4 paper.
2. The water volume quoted on the plan drawing is an approximate calculation for the volume of water in the above ground section, *ie.* that contained by the sleeper walls.
3. The final pond holds approximately 7900 litres or 1750 gallons.



Photographs of Progress

The following photographs show the progress of construction, in roughly the sequence it was done.



The old pond, before work started: overgrown and too small for large koi - although a good wildlife habitat.



The old pond after the ground had been cleared.



The author (yellow shirt), John (left) and Brian debate placement of the first sleeper. [Photograph © Copyright Noreen Marshall, 1999]



The first couple of sleepers in place. The ballast foundation and steel pins are clearly visible, as is the old pond.



Another view of the first couple of sleepers laid. Despite the young helpers it looked like, and was, a construction site.



Here the last sleeper has just been laid. In the far corner John considers fitting the first of the cross-bolts. Note a large orange koi looking very out of place.



Completed sleeper construction showing old pond and filter still in place



An improvised piece of fish storage. Here the fish have been removed from the old pond and are in the large bath. The filter has been lashed up to protect both the fish and the bacteria for a few hours.



An expert check that the author had correctly measured the depth of the pond - he had! The small size of the old pond (now empty) is clearly visible. [Keith (foreground), young Ben and Ken.]



Fitting the underlay: make sure all the joins and folds are neat and secure. [L to R: Keith, Ben, Ken]



Another view of Keith and Ken fitting the underlay. Notice the old butyl liner on the path at right. Also shown is the concrete skirt which finishes off the dry mix ballast/cement on which the sleepers were laid.



Fitting the liner: as the water is added it is essential to ensure all the folds are neat and tidy; this means one or two people in the water! [Keith (foreground) and Ken]



Detail of the electrics. Power is distributed from the waterproof switch box mounted below the filtration unit. All the electrical appliances are removable by disconnecting the waterproof connectors. Note the gate valve on the filter vortex above the switch box, and the base for the filtration system built from spare pieces of sleeper and paving slabs. The switch box was later covered with a spare flap of butyl liner for added weather protection. When draining the filter chambers temporary flexible hosing will be fitted to the gate valves to run the water away from site.



The final construction showing the UV unit (humped shape, back right), the filtration unit (back to front: vortex, brushes, bio-media) and filter outfall. The clump of rush (sitting on an inverted old tank) was put back in the new pond to afford some haven for the remaining frogs. Note also the net held in place temporarily by bricks; a more permanent solution will be found once the coping is fitted to the walls.



The new pond in evening sunlight a couple of days after completion. Note that the coping is still missing from the walls and net is held in place with bricks. Filter in foreground.



The pond in late April 2000, after a mild winter, and with the coping on the walls just completed. The slat-work is made from untreated, air-dried oak, 3x1", set 1" apart and at a 30° angle; the slats are screwed onto rails of the same timber.

Project FishScale



Mid-May, about 2-3 weeks after completion of the coping, with planters and ornaments (including the cat, Harry) in place.



Early June 2000 and the planting in the pond is completed and the plants beginning to grow. The plastic duck (which doesn't look too awful!) is attached to the pond pump by a string so that it is easier to remove the pump from the depths of the pond for cleaning.

The Fish

When we emptied the old pond we found the following fish (all measurements are Standard Length, *ie.* excluding the tail) ...

2	40cm	Gold Koi (Ogon)
1	38cm	Yellow Koi (Ogon)
2	38cm	Ghost Koi
1	25cm	White Koi (Doitsu)
1	20cm	Roach
1	15cm	White Lionhead Comet
1	15cm	White Comet
6	15cm	Sarassa Comets
1	10cm	White Goldfish
9	7cm	Goldfish (of various colourings)
13	5cm	Goldfish (of various colourings)

All the 5cm and 7cm goldfish are 1998 fry which have survived. Included in this batch is at least one Chocolate Oranda, which shows some must be the offspring of the Chocolate Oranda which died during Winter 1998/9. None of the koi is of high quality, except just perhaps the white Doitsu.

In May 2000 the following koi were added to the pond: 14" Tancho, 14" Kohaku, two 6" Kohaku, 4" Doitsu Kujaku, 4" Shusui.

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I would like to thank all those who have helped with this project; without them it would not have been possible. My special thanks to ...

Roger Woods	Construction advice, ideas and encouragement
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Brian Monaghan	Construction advice, labouring and carpentry
Ken Walton	Hydraulics advice, labouring
Keith Woods	Ground clearance, labouring, liner installation
Jason Monaghan	General help, carpentry
Ben Prior	General help
Arran Monaghan	Getting in the way
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And, of course, anyone else who I have forgotten!

All photographs are by the author, except where stated.