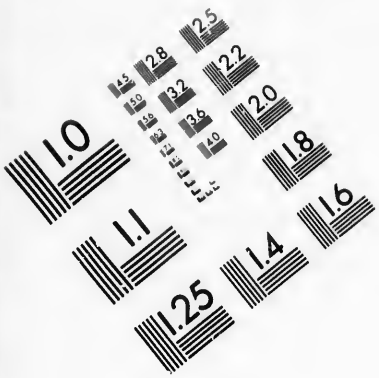

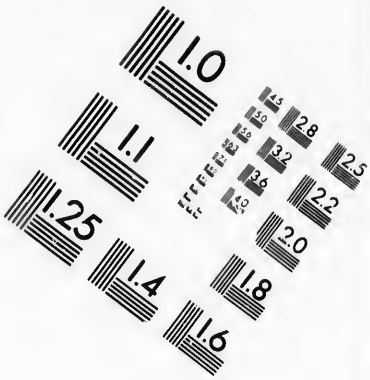

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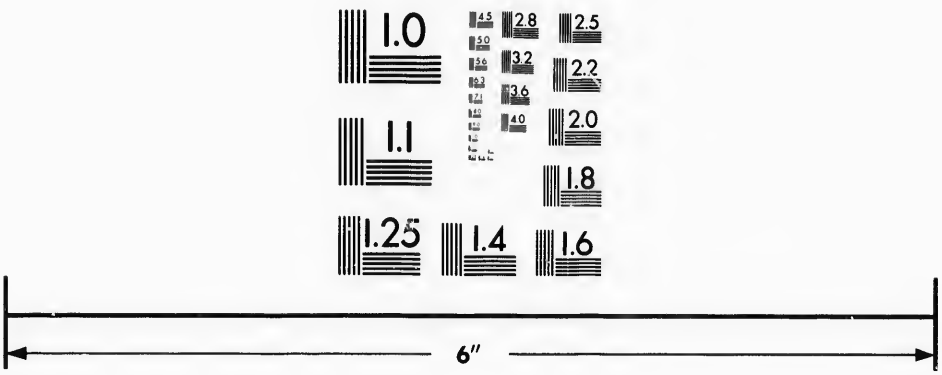

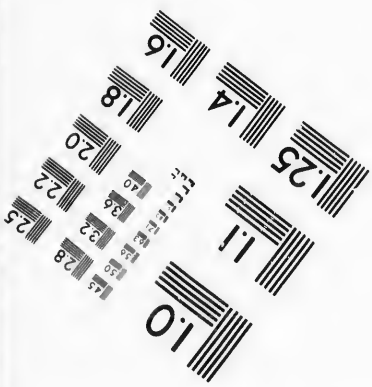

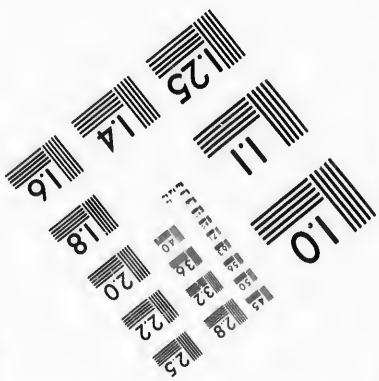

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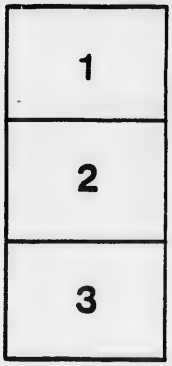

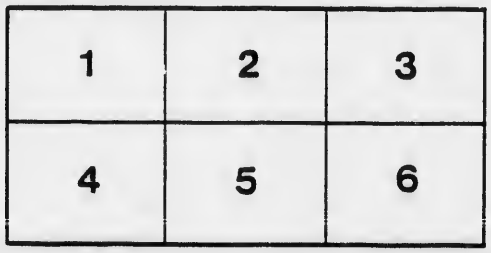

WELLAND CANAL.

SPECIFICATION OF EARTH WORK, &c.

The general dimensions of the Canal to be as follows:—the bottom 40 feet wide, except in short reaches, where it will be 70 feet; depth of water 9 feet. The towing path 15 feet wide on the top, and 3 feet above the water's surface, or so much higher as may be necessary for the ascent to the next reach.

GRUBBING, CLEARING, MUCKING, &c.

From the space required for the canal and its necessary banks and ditches, all trees, saplings, bushes and roots shall be cut and grubbed, and, together with all logs, brush, and wood of every description, removed from the ground hereafter to be occupied by the canal, its banks and drains, as may be directed by the Engineer, so as to do no unnecessary damage to the adjacent lands; likewise all the trees standing beyond the space described, which, by falling, might injure the banks, or obstruct the navigation, shall be cut down and removed, according to the direction of the Engineer. All the clearing, grubbing and removal of wood, must be completed, to the satisfaction of the Engineer, before the work of excavation is commenced.

Wherever the surface of the ground is below the highest water level, it must be removed, for the entire width occupied by the canal and its banks, and to such depth as shall be directed by the Engineer: the loose earth thus excavated, to be placed at such distance from the banks as he may require; and in all cases care must be taken to place the purest, most solid and water tight earth in the part of the banks adjoining the canal, and to place all such materials as are coarse or permeable to water, in the outer extremity of the banks; or, if required, to remove them altogether beyond the limits of the same.

The slope, in all cases, to be two feet horizontal, to one vertical, uniform, and neatly trimmed, so as to present to the eye a fair outline conforming to the line of the canal.

When the cutting exceeds 12 feet, the towing path shall be 15 feet, and the berm bank 6 feet, or so wide as the Engineer may direct; to which must be added, such space as may be deemed necessary for side ditches proportioned to the depth of cutting. In all cases where it may be necessary to spoil, the foot of the slope of the spoil banks, must be at least 16 feet from the edge of the cut: their upper surfaces to be smooth, having a uniform slope from the inside, of one in twelve; their side slopes two to one, and their height uniform and even, as directed by the Engineer.

In forming the embankments, the materials shall be hauled by teams, in carts or otherwise, and laid on in courses not exceeding 18 inches,

PUDDLING.

If the directions given, be properly attended to, from the nature of the materials it would appear, that puddle walls will not be required, in any of the embankments; should such, however, be deemed necessary, they must be carried up regularly with the embankment, and the bottom must also be excavated for lining, (if it be requisite.)

When puddle is used, the material, (good clay mixed with a suitable quantity of gravel, if so directed by the Engineer,) is to be laid on in layers not exceeding eight or nine inches in thickness; and this, well picked free from sods, stones, &c., shall be mixed, chopped, and worked with sufficient water, by vertical incisions with the shovel, not more than one inch apart, and trodden until the feet shall sink seven or eight inches at every step. The bottom of each course to be intimately blended with the top of the under one, and the lowest course similarly incorporated with the bottom of the trench. The puddling to be discontinued, when the Engineer considers the season unfavorable. The embankment connecting the reaches of the new canal with those of the present, shall be constructed as above described; and whenever sufficient materials for these, or other embankments, cannot be obtained from the excavation of the pits or reaches, they shall be borrowed from such places as the Engineer may direct. In rock, the width of the bottom shall be 70 feet; the slopes one in five; and no payment will be made for any materials excavated, beyond those limits. The rock shall be excavated in such manner, and disposed of in such places, as the Engineer may direct, and shall be considered the property of the Board of Works.

The final measurement of the work will comprehend simply the total excavation.

If at any time the Engineer may think it expedient to change the direction of the canal, or make any other alterations, they shall be made on such conditions as he shall judge to be fair and equitable.

Proposals are to be made for the cubic yard, which must include the cost of clearing, grubbing, mucking, hauling, and all contingencies; for which no payment will be made.

Payments will be made monthly, according to the estimates returned by the Assistant Engineer—from which 15 per cent. will be deducted, and also other deductions made, at the discretion of the Engineer, as the depth of cutting, length of haul, and nature of the materials to be excavated, may vary.

Welland Canal Office, St. Catharines, Oct. 1, 1842.

SPECIFICATION OF THE LOCKS.

The Locks are to be 122 feet from mitre to mitre, and 26 feet in the clear, between the piers: the height of the side walls, 23 feet 6 inches above the foundation floor: the upper and lower gates will be of the same size. Instead of the usual breast wall, there will be a rough rubble slope wall, above the stop gate sills, to support the bottom of the upper reach. The side walls of the chamber are to have in front, a batter of one inch to the foot; the beds and builds of the courses are to be at right angles to the face, behind; the walls will be vertical, for two-thirds of their height; thence will be diminished by steps, to four feet—the width of the coping—all the stones of which will be secured to each other, by iron clamps. The other dimensions, forms, heights and batters, may be seen by reference to the plans and sections.

THE LOCK PIT

Shall be excavated about 204 feet in length, and as wide as the Engineer may direct, to contain the chamber, its walls and back puddle, on each side 3 feet in thickness; its depth to be 14 feet below the bottom of the canal, in the lower level. In all cases, care must be taken to keep the lock pits free from water until the mortar shall have set. If solid rock should be met, in any of the foundations, the Engineer may consider it sufficient to excavate 1 foot below the mitre sill, except in the recesses, and 36 feet in width. The various parts of a timber foundation about to be described, will not then be necessary; and in their stead, in the recesses, will be oak timbers, imbedded in beton, as may be directed by the Engineer. The materials excavated from the pit, to be transported to such places, and disposed of in such manner, as he may direct. In rock, the pits will be excavated, with the sides vertical: in earth, with a slope of 1 to 1: the removal of slides, pumping, &c., must be executed at the expense of the contractor. The price paid for excavation, must cover the cost of embankment behind the locks.

PUDDLE TRENCHES.

Three puddle trenches are to be dug across the pit; their depth will depend on the nature of the soil: they are to be 3 feet wide, 50 feet long, incorporated with the back puddle, which will extend the entire length of each wall. The puddling to consist of such materials as the Engineer shall direct, to be thoroughly mixed, kept wet, and rammed into the ditches and between the foundation timbers, if there be any interstices: the operation to be performed in every respect, as directed in the specification for earth work.

SHEET PILING.

There are to be three courses of sheet piles, composed of 4 inch pine plank, extending across the lock, at the points designated on the plan, tongued and grooved, as there described; the top to be well secured, by oak trenails, to the foundation timbers, and caulked and sawed off, one inch above the lower surface of the 3 inch plank, in a groove in which, they will be fitted with white lead.

THE FOUNDATION TIMBERS

To be squared or flattened, from pine timber large enough to square 12 inches; to be 46 feet long, or so long as to extend from the back of one wall to that of the other: they will be placed side by side. The timbers from the row of sheet piling to the hollow quoin, are to be of white oak; the others of pine—the former counterhewn on three sides, or, if necessary, jointed with a plane, so as to fit closely, throughout their entire length, and present, on the top, a smooth and uniform surface: at intervals of five feet, they may be fastened one to another by oak trenails, 24 inches by 2, passing quite through both; they must then be carefully caulked, so as to render the whole perfectly water tight; they are also to be drawn and kept together by the three bolts, of 2 inch iron, running quite through them and the scantling in front of the sheet piling. All the timbers must be counterhewn on the upper surface, so as to make an even bed for the floor, and on the under side, when, in the opinion of the Engineer, necessary: they are to be carefully bedded, and well rammed to their proper positions.

THE FLOOR

Is to consist of two courses—the lower of 3 inch pine plank, laid lengthwise; the upper of 2 inch, laid transversely; the lower course to extend under the lock walls, and on it the masonry is to be raised; they are both to be nicely jointed, so as to make perfectly water tight joints, and in the intervals between the sheet piling and mitre sill, to be well caulked, tongued and grooved. Every one of the lower planks is to be well trenailed, every 3 feet, by a 2 inch oak trenail, passing at least 6 inches into the foundation timbers. The upper course of planks will be fastened by 5 inch spikes, except in the intervals above mentioned, where trenails will be used in both planks. A 3 inch check course will be cut in the mitre sill, for the reception of the lower planks, in which they will be firmly fitted with white lead; and also a rebate, for the chamfered edge of the chamber flooring.

THE MITRE] SILLS

Are to be of the best white oak, 18 by 18 inches, and 15 feet 2 inches long; they are to mitre at their ends, so that the contained angle formed by the exterior of the gates, may be 126°, and to be framed and jointed, according to the plan—a check 3 inches in depth, having been cut out of the platform, (above described, as formed by the foundation timbers, well bolted and caulked,) corresponding to the mitre sills, and filled with patent felt, saturated with boiling tar: the mitre sills are to be placed in their berths, and well bolted down, as represented in the plan, by screw bolts of 1¼ inch iron, with heads in the foundation timber, and the nuts countersunk in the iron plates: the iron plates shewn in the plan, to be countersunk. The main sill is to extend on each side, 4 feet un-

der the wall; to be 15 by 18 inches, bolted to the foundation timber, in the same manner as the mitre sill. The king post, and other parts, to be laid down, in every respect as represented in the plan; the tenons to extend 7 inches into the main and mitre sills. All the timber and planking used in the work, to be of the first quality, free from winding, sap, shakes, unsound knots, and all other defects.

MASONRY.

The face to be of cut stone; the back, of the best coursed rubble. All the stones, of which the walls are to be built, shall be sound, free from seams, shakes, veins, and all other imperfections.

The height of the courses may vary from 12 inches to 24, at the discretion of the Engineer. The depth of the bed of the stretchers, shall not be less than 1½ times the height of course, but in no instance less than 2 feet 6 inches; and in the alternate courses, so much more as will be necessary to form a bond of at least 9 inches, with the stones above and below.

The stretchers shall not be less than 2½ feet long, on the face: the headers shall not be less than 5 feet deep, nor less than 2 feet 6 inches long, on the face; and shall be placed at intervals of not more than 8½ feet from centre to centre.

The face of the headers and stretchers generally, shall be neatly and closely punched, or bush hammered, and have a chisel draft of one inch around the arrises: their top and bottom beds, and end joints, shall be dressed so truly as to make ½ inch joints for 18 inches from the face; the remainder so as not to exceed ½ an inch joint: the stretchers must have the full dimensions for at least 2 feet, and the headers 3 feet 6 inches from the face; for the remainder of their depth, they may be allowed to diminish moderately, at the discretion of the Engineer.

Each stone of the face, shall break joints of at least 1 foot, with those on which it rests.

The quoin stones shall be laid alternately, headers and stretchers; the former, at least 3 feet 6 inches face, and 5 feet bed; the latter, at least 5 feet face, and 3 feet 6 inches bed.

The coping shall not be less than 4 feet depth of bed, 16 inches height of course, nor less than three feet long. In the intervals between the headers of the face, shall be headers of the same dimensions, in the rubble work of the backing—all the stones of which shall be of large size, in courses corresponding to the face. The entire work shall be well bedded, bonded, and grouted; and when the courses in front exceed 18 inches in height, those of the backing may be made up by two courses of 9 inches each—the other dimensions of the stones being large.

The horizontal joints of the backing, shall not exceed ½ inch. The vertical shall not exceed 1½.

The face to be laid in the best hydraulic cement; the backing in the best common mortar—the lime to be procured from such places as the Engineer may direct. The mortar for the backing masonry, shall be composed of clean sharp sand and good roach lime, and water, mixed in such proportions as the Engineer may direct, during the progress of the work.

The lime shall be fresh from the kiln, and not exposed to the weather until used; and the materials of which the mortar is composed, shall be intimately mixed, in a pug mill, and no more shall be made than is sufficient for the day's consumption. The grout shall consist of mortar as above described, with such addition of lime and water, as may be directed by the Engineer.

The cement shall be used for the depth of 2 feet 6 inches, and 3 feet 3 inches, in the alternate courses, from the face: it shall be composed of the best hydraulic lime, (from such places as the Engineer may designate,) not manufactured more than two months previous to the time of using, and clean sharp sand, in such proportions as may be directed by the Engineer, and made in the manner before described for mortar: it shall be transported from the manufactory to the place where it is to be used, in tight casks, which will effectually prevent its injury from the weather; and none shall be used that has been wet, or in any way damaged, nor until it shall have been tested and approved by the said Engineer, or some person under his direction. Tight houses shall be erected on the work, to protect the casks containing the lime, from the weather. If the Engineer shall so direct, no cement shall be made more than 3 hours before it is to be used; and the grouting for the vertical joints, shall be used immediately after it has been made, and shall consist of hydraulic lime, without sand, if so directed; and before it shall be poured into the vertical joints of the cut work, these joints, where connected with the backing, must be filled with thick cement. Where the courses are inclined, after the thin grout shall have been poured in, the upper part must be filled with grout of a thicker description. In the backing, no chips nor small stones shall be filled into any space, until the grouting shall have been poured in.

Cranes shall be used, and every precaution taken to prevent the bond of the mortar from being broken. There shall not be more than one unfinished course, at any time. The Board of Works will obtain the right of quarry, in Hutt's quarry; but in every other case, the contractor must procure it for himself; and in all cases, such service grounds as may be required by the contractors, during the execution of the work, whether at the work or quarries, must be procured by themselves. The Board will, however, at all times invest the contractors with the power given by the act, for the obtaining of such.

The stone, it is expected, can be furnished from Hutt's quarry—from which to Thorold, a railway has been constructed, by the Board of Works—to be kept in repair at the expense of the contractors, by persons employed under the direction of the Engineer. The contractors must agree to all arrangements which the Engineer may consider expedient for their mutual accommodation, and the waste materials from the quarries, must be disposed of as he may direct. In all matters, as well those adverted to above, as those which have not been noticed, the directions of the Engineer are to be complied with.

Welland Canal Office, St. Catharines, Oct. 1, 1842.