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Technical Note N-507

SPECIFICATIONS FOR THE MODEL 42 SNOW MIXER

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U. S. NAVAL CIVIL ENGINEERING LABORATORY
PORT HUENEME, CALIFORNIA

SPECIFICATIONS FOR THE MODEL 42 SNOW MIXER

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Type B

by

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ABSTRACT

Outline specifications for procurement of special equipment for compaction of snow in Polar regions are being prepared by the Laboratory. This technical note contains the specifications for the Model 42 snow mixer presented in the Naval Civil Engineering Laboratory Technical Report R-108 Snow-Compaction Equipment - Snow Mixers.

This unit, which is a ski mounted, towed-type piece of equipment, is used to pulverize and intermix (depth-process) the natural snow. The Model 42 snow mixer is especially suitable for use in deep snow fields where its 42 inch depth can be used to produce a snow mat up to 28 inches thick for greater load bearing capacity.

INTRODUCTION

During the past ten years, the Naval Civil Engineering Laboratory has developed techniques and special equipment for compacting snow in Polar regions. This development is now sufficiently advanced that outline procurement specifications are being prepared for the special equipment. This Technical Note contains the specifications for the Model 42 snow mixer developed for this work.

This snow mixer which features a two-point ski-suspension system, is a highly maneuverable towed-type piece of equipment and was developed for depth-processing natural and once-processed snow, and in repairing the surfaces of compacted snow.[1] The basic snow mixer was developed around the Pettibone-Wood Manufacturing Company, North Hollywood, California, Model P-800 Speedmixer under NCEL contract in 1956[2] and was modified for improved performance by Pettibone-Wood under an NCEL contract in 1958. The design is detailed in the manufacturer's drawing listed in the Appendix.

Based on 1963 prices, the cost of the Model 42 snow mixer is approximately $32,000. Its total weight is 14,830 pounds and assembled for use it occupies 2561 cubic feet. For shipment, this can be reduced to 1385 cubic feet.[2]

1. SCOPE

The contractor shall provide the snow mixer detailed in Manufacturer's drawings listed in the Appendix and described in paragraph 2 below, and shall furnish all services and materials for its fabrication.

2. SNOW MIXER DETAILS

The Model 42 snow mixer, developed around an existing towed construction pulverizer, for use on snow in Polar regions, shall consist of the following components: A two point ski-suspension system to be towed through the front ski, which shall turn 90 degrees right and left. The center-to-center distance between the skis shall be 25 feet. The end driven 42 inch diameter rotor assembly consisting of 60 tines shall be capable of making a cut 8 feet wide enclosed under a semi-teardrop shape mixing hood each controlled independently of each other through hydraulically controlled lifting arms. The power train shall consist of a winterized, 112 hp, turbocharged, six-cylinder diesel engine, four-speed transmission and a shaft-driven differential and axle. The overall dimensions shall be 31 feet 9 inches long, 9 feet 9 inches wide and shall not exceed 9 feet 2 inches high with a cab.

3. DETAIL REQUIREMENTS OF MODIFICATIONS

The modifications shall be similar to those shown in the Manufacturer's drawings listed in the Appendix. All modification work shall be of minimum weight consistent with heavy duty construction and at the same time be easily disassembled into components for shipment.

a. Frame: The frame shall be made of structural steel and consist of a front and rear section which are bolted together. The relatively short front section shall carry the engine, power train, hydraulic lifting yoke and the cab. The relatively long rear section shall carry the rotor and mixing hood suspended within the rear frame. A flanged, heavy-duty 6-inch pipe shall extend across the rear frame members at a point 10 inches to the rear of the tailing edge of the mixing hood. This flanged pipe shall be bolted to the inside of the side frame members in order that it may be removed for dismantling.

b. Skis: The two-point ski suspension shall consist of a front-ski drawbar assembly and a full-width rear ski. Both skis shall be trunnion mounted to permit limited oscillation. The front ski shall be 67 inches long by 35 inches wide attached to the front frame section through a kingpin to allow 90 degree turns. The rear ski shall be 60 inches long and 94 inches wide, and fasten to the end members of the rear frame section. The leading and trailing edges of both skis shall be beveled to obtain a 25 degree angle of approach to the snow surface.

c. Engine: The Model 42 snow mixer shall be equipped with a winterized 112 hp, turbocharged, six-cylinder diesel engine similar or equal to Caterpillar Model D-318 engine. All hydraulic hose used in connection with the hydraulic system shall be the low temperature type usable to -65 degrees Fahrenheit and shall conform to Military Specifications MIL-H-8794.

d. Power Train: A four-speed transmission similar or equal to the Fuller Model 4B86 shall be used on this snow mixer. The drive to the rotor shaft shall be by the use of heavy duty roller chain through each end of a shaft-driven differential and axle similar and equal to Timken Model L100.

e. Rotor: The end-driven 42-inch-diameter rotor shall be 7 feet 6 inches long mounted on a rotor shaft 99-1/2 inches long. The rotor assembly shall consist of 15 friction-driven tine plates. Each plate shall be fitted with four "L"shaped, 12-inch-long tines for a total of 60. The end of each tine shall be twisted alternately 45 degrees to the axis of the rotor. Each tine plate shall be rotated 30 degrees from the adjacent plates. These tines shall be similar or equal to Pettibone-Wood No. 32-1244 rotor tines.

f. Mixing Hood: The semi-teardrop-shaped mixing hood shall completely enclose the rotor and be designed to control the flow of material around the rotor. This hood like the rotor shall be suspended between the rear frame members. Stops shall be welded to the sides of the hood and to the frame members to prevent the depression of the trailing edge of the hood below the horizontal plane of the skis. A hinged tail gate shall be furnished on the rear trailing edge of this hood to facilitate repairs and cleaning of the rotors and/or rotor tines.

g. Hydraulic Lifting Yoke: The details of this yoke are covered in the Manufacturer's drawings. The position of both hood and rotor shall be independently controlled through lifting arms or links attached to separate hydraulically actuated yokes or lift frames. Both hood and rotor shall be so installed to lift it clear for travel. The depth of the rotor cut shall be manually adjustable in 2-inch increments by stops on the lifting arms.

h. Cab: The Model 42 snow mixer shall be fitted with a commercial insulated metal cab with sufficient windows to allow good visability on all sides. This cab shall be fitted with a suitable heavy duty hot water heater similar or equal to a Kysor Model TC Assembly K630, complete with front windshield defroster. The heater shall be connected to the liquid coolant system of the diesel engine with low temperature hose conforming to Military Specifications MIL-H-8794.

i. Treatment and Painting: The snow mixer shall be treated and painted in accordance with the paint manufacturer's procedures, using No. 12197 orange gloss conforming to Federal Standard 595.

4. PACKAGING

The Model 42 snow mixer may be shipped assembled on short hauls via trucking or rail. The shipment of a completely assembled snow mixer will result in an overall length of 28.7 ft, 9.7 ft width, 9.2 ft high and a cube of 2561. The length can be reduced to 22.5 ft by turning the front ski sideways after being loaded and the height may be reduced by removal of the engine exhaust stack, the cab and by replacing the hood and rotor lifting links with short shipping links or cable. For overseas shipment, the shipping space can be reduced to 1385 cubic feet by removing the rear frame members and relocating the rear ski to a point directly under the rotor assembly.[2]

REFERENCES

1. U. S. Naval Civil Engineering Laboratory. Technical Report R-114, "Snow Compaction - Techniques", by E. H. Moser, Jr., Port Hueneme, California, 29 June 1962.

2. U. S. Naval Civil Engineering Laboratory. Technical Report R-108 and R-108 Supplement, "Snow Compaction - Snow Mixers", by R. C. Coffin, Jr., E. H. Moser, Jr., Port Hueneme, California, 19 January 1961.

Appendix

Snow Compaction Equipment - Model 42 Snow Mixer.

Pettibone-Wood Manufacturing Company drawing numbers covering 1958-1959 modifications to their Model P-800 Speedmixer for snow mixing.

6500	6548	32-1250	32-1341
6501	6549	32-1254	32-1342
6504	25-1375	32-1261	32-1348
6514	32-1030	32-1262	32-1357
6523	32-1031	32-1264-1	32-1358
6524	32-1032	32-1264-3	32-1359
6525	32-1033	32-1266	32-1466
6526	32-1037	32-1274	32-1488
6527	32-1052	32-1281	32-1489
6528	32-1091	32-1282	32-1490
6529-1	32-1105	32-1284	32-1491
6529-2	32-1108	32-1293	32-1493
6531	32-1126	32-1297	32-1494
6539	32-1135	32-1299	32-1495
6540	32-1196	32-1300	32-1496
6541	32-1212	32-1301	32-1497
6543	32-1244	32-1332	32-1498
6547	32-1245	32-1337	36-5125
			36-5141