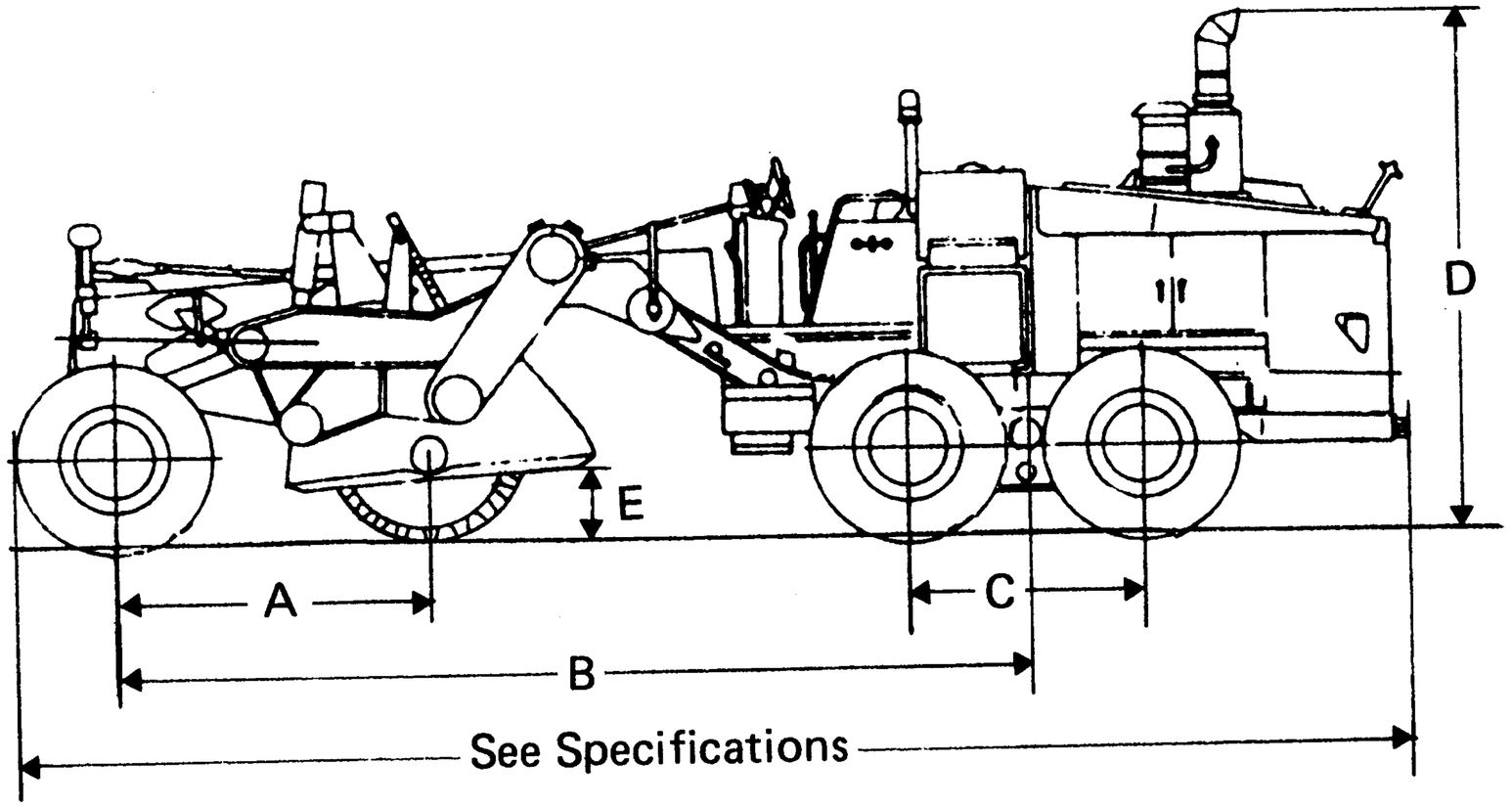
SECTION 7B

OAD STABILIZERS

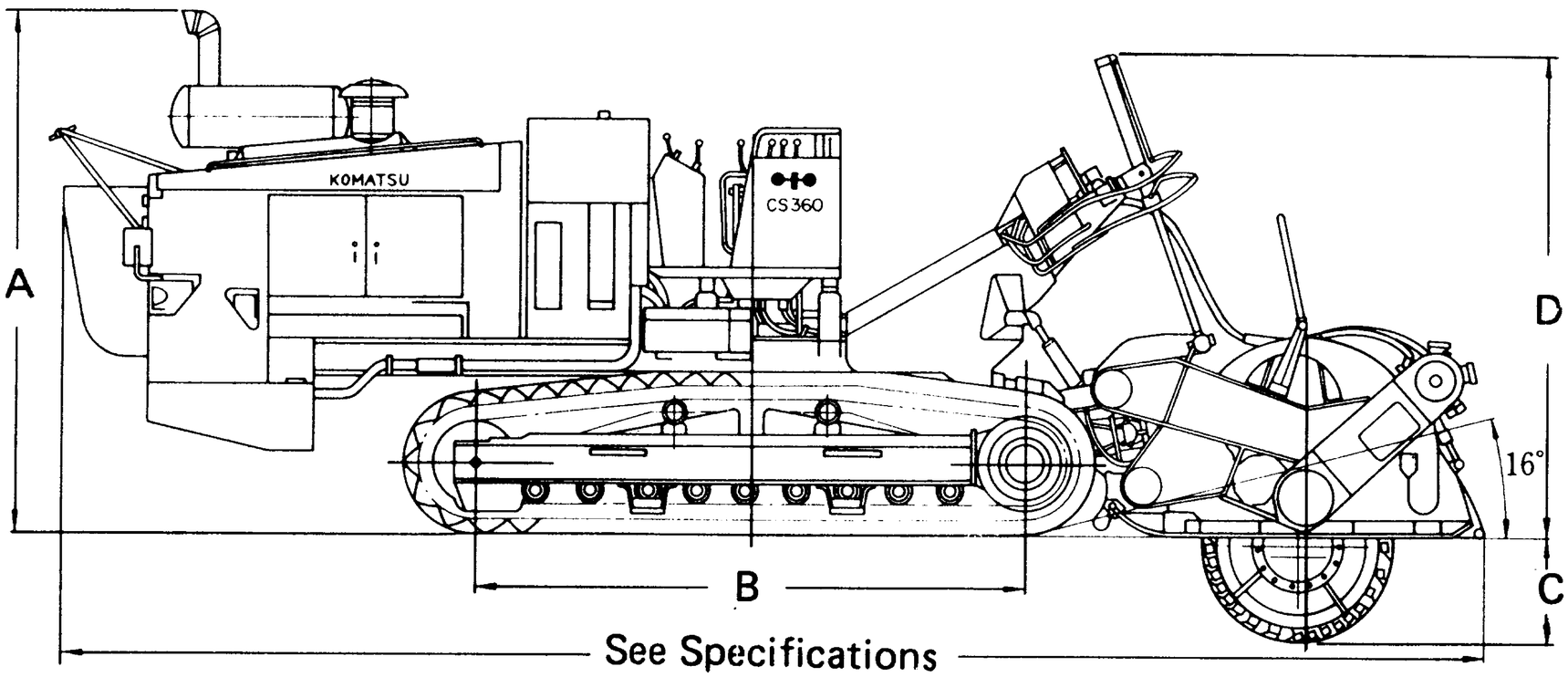
Contents

- Job-proven Komatsu Cummins NTA855 diesel engine delivers a powerful 349 FHP (260KW) enabling the GS360 to perform heavy-duty digging and crushing.
- Maximum digging depth for asphaltconcrete pavement is 150mm (5.9") and 400mm (15.7") on soil.
- Rotor shifts up to 500mm (19.7") to the left and right to permit shift cutting right up to the shoulder.
- With Komatsu's unique secondary crusher, asphalt are crushed down into ideal-sized granules to provide a high quality subbase material.
- The rotor is placed in the center of the machine to make digging progress easier to see from the operator's seat.
- The same tandem drive as that used for motor graders is employed to minimize rotor vibration amplitude and maintain a constant digging depth even when operating on rough terrain.

Item	Model	GS360-1	CS360-1
OPERATING WEIGHT	kg(lb)	18750 (41,335)	23090 (50,900)
FLYWHEEL HORSEPOWER	HP(kW)/rpm	355(265)/2000	355(265)/2000
PERFORMANCE:			
Travel speed	km/h(MPH)	25 (15.5)	3.2 (2.0)
Working speed	km/h(MPH)	3 (1.9)	3 (1.9)
Max.drawbar pull	kg(lb)	10490 (23,125)	12000 (26,460)
Min. turning radius	m(ft.in)	10.4 (34'1")	–
DIMENSIONS:			
Overall length	mm(ft.in)	9220 (30' 3")	9500 (31' 2")
Overall width		2450 (8')	3240 (10' 8")
Overall height		3535 (11' 7")	3455 (11' 4")
Wheelbase		6000 (19' 8")	–
Treads: Front		1970 (6' 6")	–
Rear		2000 (6' 7")	–
Track length on ground		–	3640 (11'11")
Track gauge		–	2380 (7'10")
ENGINE:			
Model		KOMATSU CUMMINS NTA855	KOMATSU CUMMINS NTA855
No. of cyl.-Bore × Stroke	mm(in)	6 – 139.7 × 152.4 (5.5 × 6.0)	6 – 139.7 × 152.4 (5.5 × 6.0)
Piston displacement	ltr.(cu.in)	14.015 (855)	14.015 (855)
CAPACITY:			
Fuel tank	ltr.(U.S.Gal)	400 (106)	400 (106)



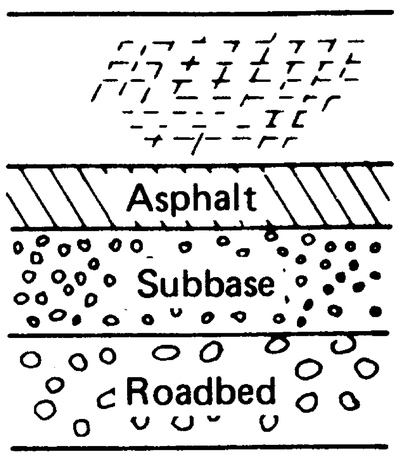
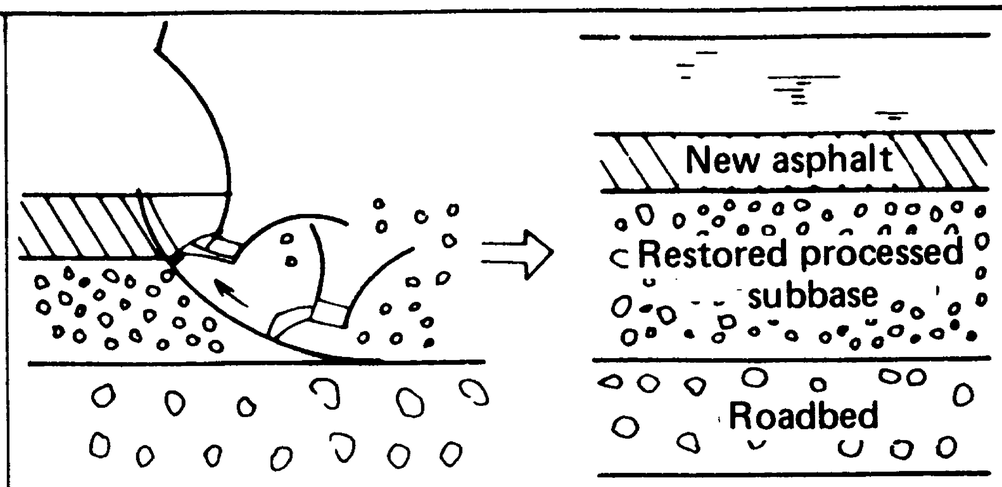
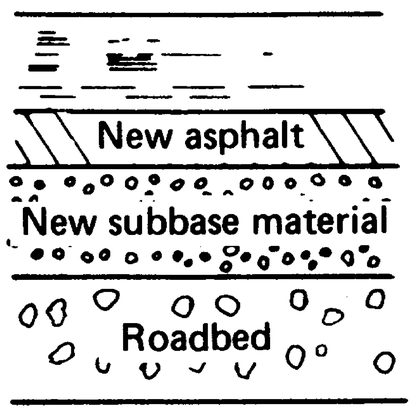
Item	Model	GS360-1
TIRES		14.00-24-16PR
DIMENSIONS: A Distance between centers of front tires and cutter B Wheelbase C Distance between centers of tandem wheels D Height to top of the stack E Max. digging depth	mm(ft.in)	 2100 (6'11") 6000 (19' 8") 1525 (5') 3535 (11' 7") 400 (1' 4")



Item	Model	CS360-1
SHOE WIDTH	mm(in)	860 (33.9")
DIMENSIONS:		
A Height to top of the stack	mm(ft.in)	3455 (11' 4")
B Track length on ground		3640 (11'11")
C Max. digging depth		700 (2' 4")
D Height to lift cylinders		3150 (10' 4")

A.IN-PLACE RECYCLING OF EXISTING PAVEMENT

Replacement of the subbase has always been the first step when replacing a worn-down road. However, this step is not desirable from the standpoint of conservation of resources since the old subbase materials are discarded. The Komatsu GS360 eliminates this problem by restoring the present subbase instead. In the GS360 asphalt restoration process, part of the old surface (which has been sprinkled with a stabilizing agent such as cement or lime), the subbase and the top of roadbed are crushed and mixed at the same time by the stabilizer to produce a high grade subbase material. Compared with the conventional process, this new technique conserves resources, is more economical and takes much less time. The actual saving is about 40% in terms of both cost and time.

<table>
<tr><th colspan="2">State of road wear</th><th colspan="2">Comparison of method</th></tr>
<tr><td rowspan="2">Cracks in surface of asphalt</td><td rowspan="2"> 
</td><td>New method</td><td> 
</td></tr>
<tr><td>Conventional method</td><td>a) old asphalt and subbase — scraped off and discarded
b) replaced with new subbase material roadbed
Roadbed
 
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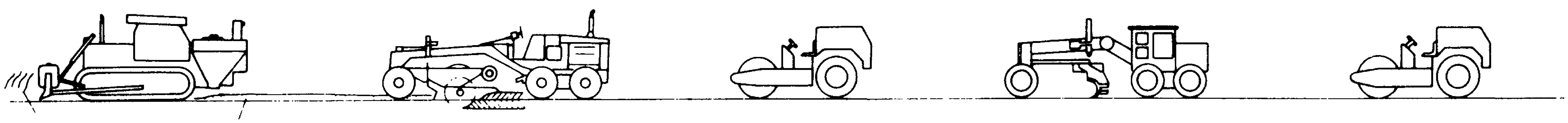
</table>

Comparison of new and conventional method (Asphalt restoration)

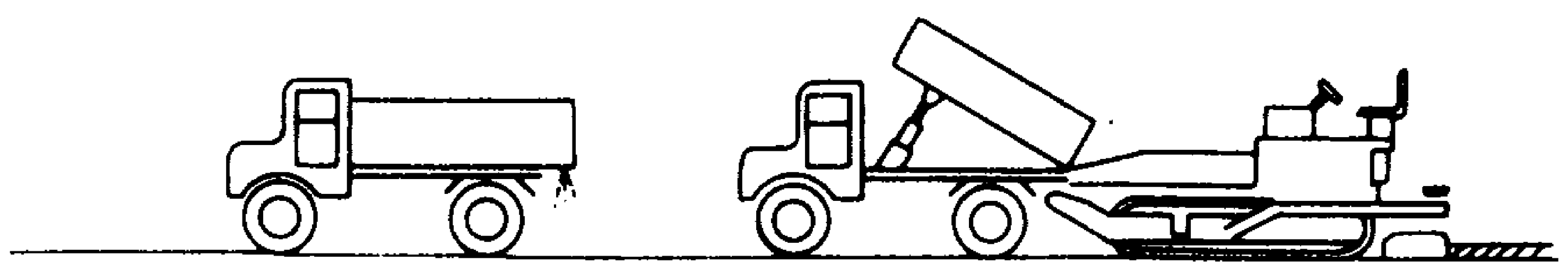
New method

Spread stabilizing agent → **Crushing and mixing** → **Preliminary compacting** → **Grading** → **Final compacting** → **Spreading of emulsifier** → **Surfacing**

- **Spread stabilizing agent**: Stabilizing agent (soil cement) is spread beforehand to strengthen the subbase.
- **Crushing and mixing**: The asphalt and upper subbase are simultaneously crushed and mixed with the stabilizing agent by the stabilizer's powerful rotor.
- **Preliminary compacting**
- **Grading**: Surface unevenness is removed by a grader and, if necessary, crowning is applied.
- **Final compacting**: Surface is compacted by a vibratory roller. When the mixing depth is 250mm (9.8") or more, compacting is done with a vibratory roller. **When the mixing depth is less than 250mm (9.8"), compacting can be done with a pneumatic roller or a deadweight roller.**



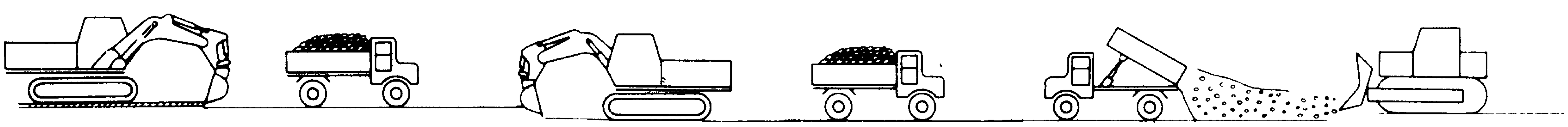
- **Spreading of emulsifier**: Asphalt emulsifier is spread by a spreader.
- **Surfacing**: Asphalt is applied by an asphalt finisher. (All following steps are omitted.)



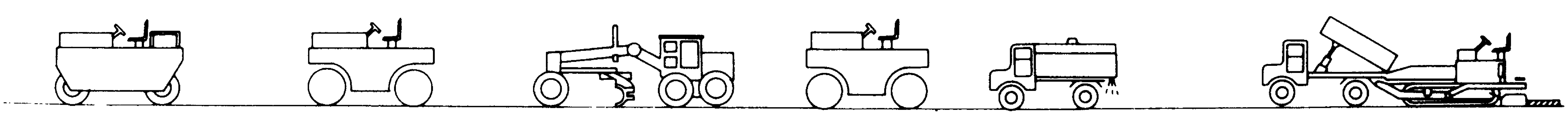
Conventional method

Digging → **Transport** → **Digging** → **Transport** → **Transport** → **Preliminary grading** → **Compacting** → **Compacting** → **Grading** → **Compacting** → **Spreading of emulsifier** → **Surfacing**

- **Digging**: Old asphalt is removed by a hydraulic excavator.
- **Transport**: Old asphalt is trucked away.
- **Digging**: Unsuitable soil is removed by a hydraulic excavator.
- **Transport**: Unsuitable soil is trucked away.
- **Transport**: New road base soil is trucked in.
- **Preliminary grading**: Surface is smoothed by bulldozer.



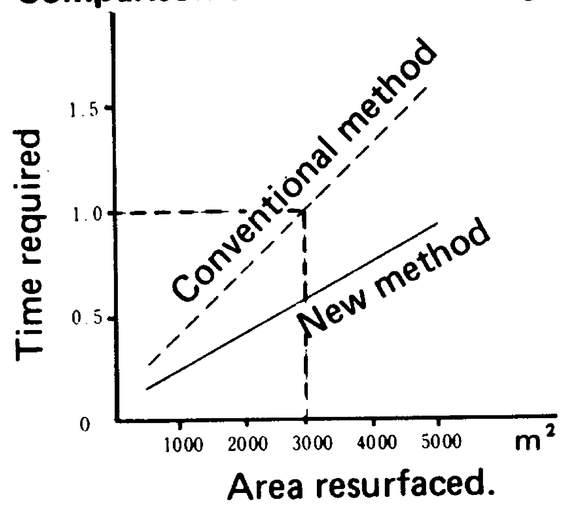
- **Compacting**: Surface is compacted by a pneumatic roller.
- **Compacting**: Surface is compacted by a deadweight roller.
- **Grading**: Surface unevenness is removed by a grader.
- **Compacting**: Surface is compacted by a deadweight roller.
- **Spreading of emulsifier**: Asphalt emulsifier is spread by a spreader.
- **Surfacing**: Asphalt is applied by an asphalt finisher. (All following steps are omitted.)



Advantages of using the new method

Problems with the conventional method	New method
1. Removed materials (asphalt) are discarded (waste of resources)	Old asphalt is crushed and mixed to permit use as the subbase material (no waste of resources)
2. Unsuitable materials are discarded and replaced with new materials	No need to replace present materials with new ones.
3. Increased fuel and labor costs due to transporting the materials mentioned in 1 and 2 above.	
4. For single lane construction, the open lane is often obstructed by dump trucks.	No need for dump trucks so one lane can remain open to normal traffic.
5. Damage to environment by excavation of new materials.	No need to excavate new materials so the environment is not damaged.
6. Construction time is long, disrupting traffic for a long period of time.	Construction time is shorter so traffic is disrupted for a shorter period of time.
7. Construction cost is high.	Construction cost is low.

Comparison of road resurfacing time



Cost Comparison

(The cost of asphalt paving is not included. The figures will change according to the operating conditions and the machines used.)

New method

Area . . . . . 600 m²

Work process and machines	Specifications or model	Quantity of works	Unit cost (YEN)	Work cost (YEN) (Quantity x Unit cost)
1. Crushing old pavement				
(1) Stabilizer	GS360	2.42 (hours)	38,830/h	93,967
2. Leveling and compaction				
(1) Motor grader	3.1m blade width	3.83 (hours)	8,673/h	33,218
(2) Tire roller	18 ton	3.17 (hours)	7,292/h	23,116
(3) Road roller	12 ton	0.83 (hours)	7,087/h	5,882
3. Removing waste				
(1) Wheel loader	2.3m³ Bucket	2.75 (hours)	5,090/h	13,998
(2) Waste	—	36.0 (m³)	2,500/m³	90,000
4. Spreading cement				
(1) Cement	—	19.8 (tons)	15,000/ton	297,000
(2) Spreading	—	5.0 (persons)	10,000/day	50,000
(3) Wheel loader	2.3m³ Bucket	2.1 (hours)	5,090/h	10,689
5. Mixing cement				
(1) Stabilizer	GS360	2.25 (hours)	38,830/h	87,368
6. Leveling and compaction				
(1) Motor grader	3.1m blade width	2.17 (hours)	8,673/h	18,820
(2) Vibratory roller	10 ton	1.25 (hours)	10,751/h	13,439
(3) Tire roller	18 ton	1.17 (hours)	7,292/h	8,532
(4) Road roller	12 ton	0.17 (hours)	7,087/h	1,205
7. Labor	—	10 (persons)	7,900/day	79,000
8. Supervisor	—	1.0 (person)	11,400/day	11,400
Total				837,634
9. Miscellaneous				4,188
Grand Total				841,822

Conventional method (Replacing method)

Area . . . . . 3,000 m^2

Work process and machines	Specifications or model	Quantity of works	Unit cost (YEN)	Work cost (YEN) (Quantity x Unit cost)
1. Breaking and Removing old pavement				
(1) Hydraulic excavator	0.8m^3 Bucket	47.5 (hours)	15,444/h	733,590
(2) Bulldozer	11 ton	47.5 (hours)	9,195/h	436,763
(3) Removing waste	–	1500 (m^3)	2,500/m^3	3,750,000
2. Spreading of subbase material				
(1) Crushed stone	–	600 (m^3)	2,500/m^3	1,500,000
(2) Motor grader	3.1m Blade width	12.5 (hours)	8,900/h	111,250
3. Compaction of Subbase				
(1) Road roller	12 ton	10 (hours)	6,590/h	65,900
(2) Tire roller	18 ton	10 (hours)	6,817/h	68,170
4. Spreading of base material				
(1) Crushed stone	–	810 (m^3)	3,000/m^3	2,430,000
(2) Bulldozer	11 ton	7.5 (hours)	9,195/h	68,963
(3) Motor grader	3.1m Blade width	12.5 (hours)	8,900/h	111,250
5. Compaction of base				
(1) Road roller	12 ton	15 (hours)	6,590/h	98,850
(2) Tire roller	18 ton	15 (hours)	6,817/h	102,255
6. Labor	–	150 (persons)	7,900/day	1,185,000
7. Supervisor	–	15 (persons)	11,400/day	171,000
Total				10,832,991
8. Miscellaneous				54,165
Grand total				10,887,156

Comparison

	New method (Stabilizer Method)	Conventional method (Replacing Method)
Total cost	841,822 (YEN)	10,887,156 (YEN)
Projected area	600 (m^2)	3,000 (m^2)
Cost per area	1,403 YEN/m^2	3,629 YEN/m^2

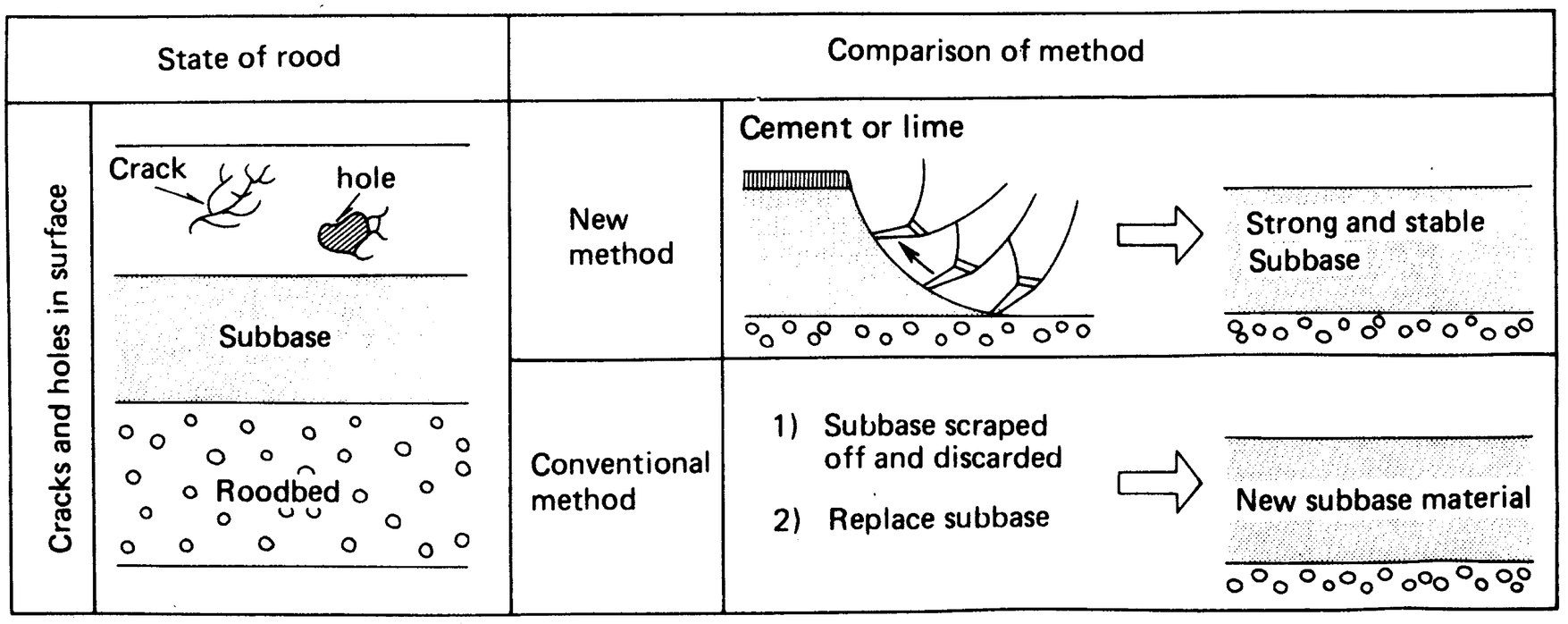
If the GS360 is used in this way, the costs up to laying of asphalt pavement are only 40% of those for the conventional method, there- by achieving an enormous reduction.

B.IMPROVEMENT OF SUBBASE AND ROADBED

In Japan, where there are many volcanoes, large areas of volcanic ash type soil are frequently encountered. The large number of weak spots in areas consisting of this type of soil makes them unsuitable for use in roads, subbase and roadbeds. Consequently, the conventional construction method in these areas entails removing the unsuitable soil and replacing it with a suitable subbase material. However, this technique wastes resources and mars the landscape where the new material is excavated and the old material discarded.

In the new method using the GS360, a subbase stabilizing agent (lime, for example) is spread over the unsuitable soil and mixed with the soil by the stabilizer to create a strong and stable base. This new method can be used for construction of new roads, runways, building sites and other projects where the soil is mainly composed of volcanic ash. It is also suitable for roads that go through rice paddies, land fill sites and other unstable areas.

The figure below shows improvement of the subbase.



Operation of Stabilizer

Comparison of new method and conventional method
(Improving unsuitable subbase and roadbed)

New method

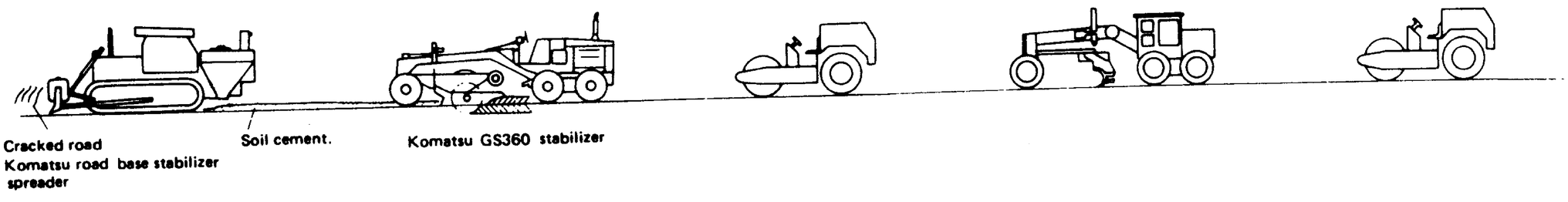
Spread stabilizing agent → **Crushing and mixing** → **Preliminary compacting** → **Grading** → **Final compacting**

Stabilizing agent (soil cement) is spread beforehand to strengthen the subbase.

The asphalt and upper subbase are simultaneously crushed and mixed with the stabilizing agent by the stabilizer's powerful rotor.

Surface unevenness is removed by a grader and, if necessary, crowning is applied.

Surface is compacted by a vibratory roller. When the mixing depth is 250mm (9.8") or more, compacting is done with a vibratory roller.
When the mixing depth is less than 250mm (9.8"), compacting can be done with a pneumatic roller or a deadweight roller.



Conventional method

Digging → **Transport** → **Transport** → **Preliminary grading** → **Compacting** → **Compacting**

Unsuitable soil is removed by a hydraulic excavator.

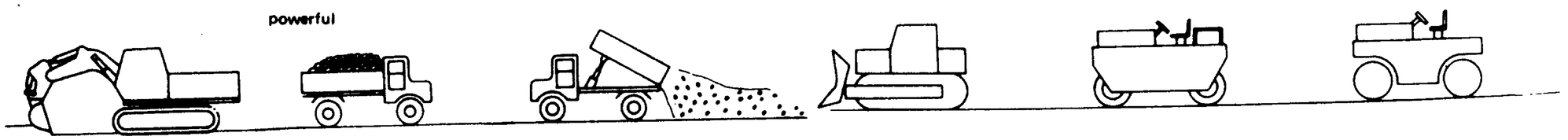
Unsuitable soil is trucked away.

Suitable base material is trucked in.

Surface is smoothed by bulldozer.

Surface is compacted by a pneumatic roller.

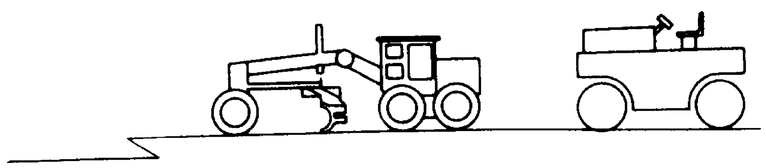
Surface is compacted by a deadweight roller.



Grading → **Final compacting**

Surface unevenness is removed by a grader.

Surface is compacted by a deadweight roller.



Advantages of using the new method

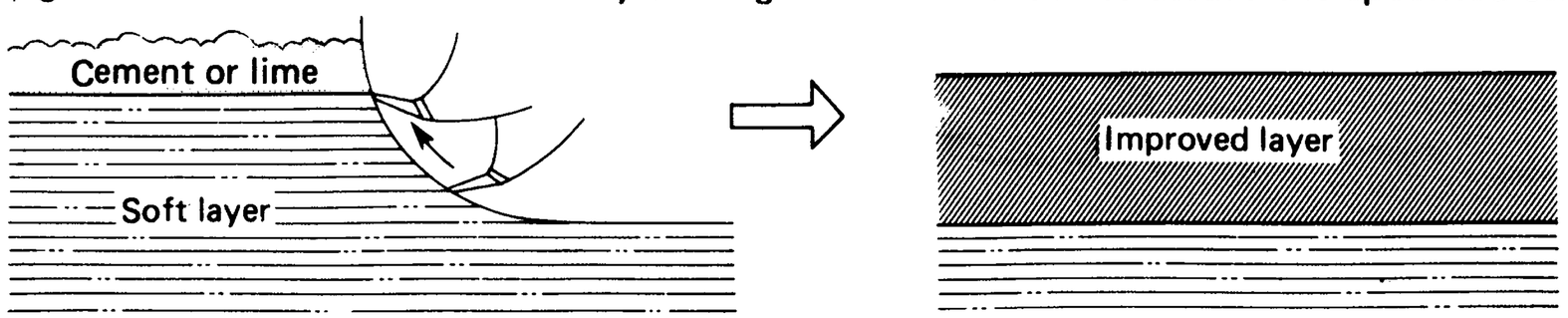
Problems with the conventional method	New method
1. Unsuitable materials are discarded and replaced with new materials	Soil on site is mixed with stabilizer to permit use (no waste of resources). No need to replace present materials with new ones (a stabilizing agent is needed, however).
2. Increased fuel and labor costs due to transporting the materials mentioned in 1 above.	
3. Damage to environment by excavation of new materials.	No need to excavate new materials so the environment is not damaged.
4. Construction time is long.	Construction time is short.
5. Construction cost is high.	Construction cost is low.

C.STABILIZATION OF SOFT GROUND, MAKING NEW SUBBASE COURSE OR ROADBED

(Possible to install 700 mm specification rotor disc)

When reclaiming industrial land, residential land, or open land, if the CBR for the soil is not sufficient, add lime or cement to increase the CBR and improve the land to make it suitable for its use.

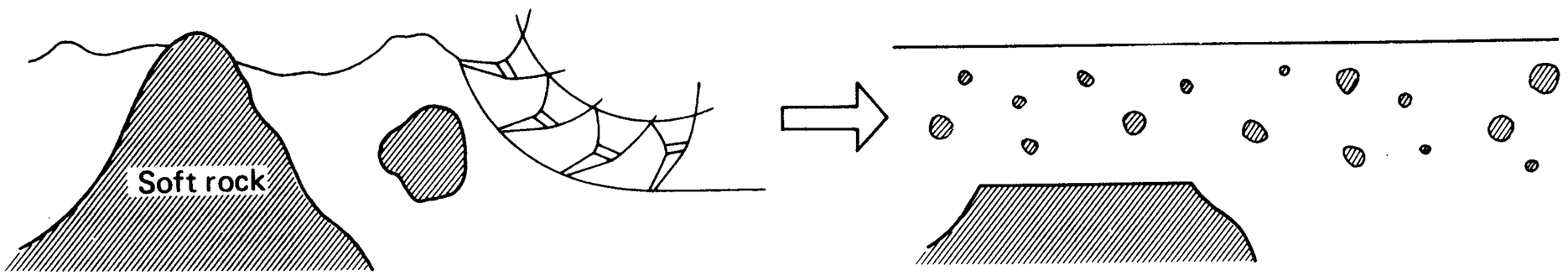
In recent years, it has become difficult to ensure good quality for pit sand, and the number of heavy vehicles traveling over the road is increasing, so when building new roads, the unstable sections (embankments and landfills) are given stabilization treatment by adding cement in order to assure the specified strength.



D.RECLAMATION OF AGRICULTURAL LAND

(The WRR360-1A soft rock crusher must be installed to the GS360) **(See page 15.)**

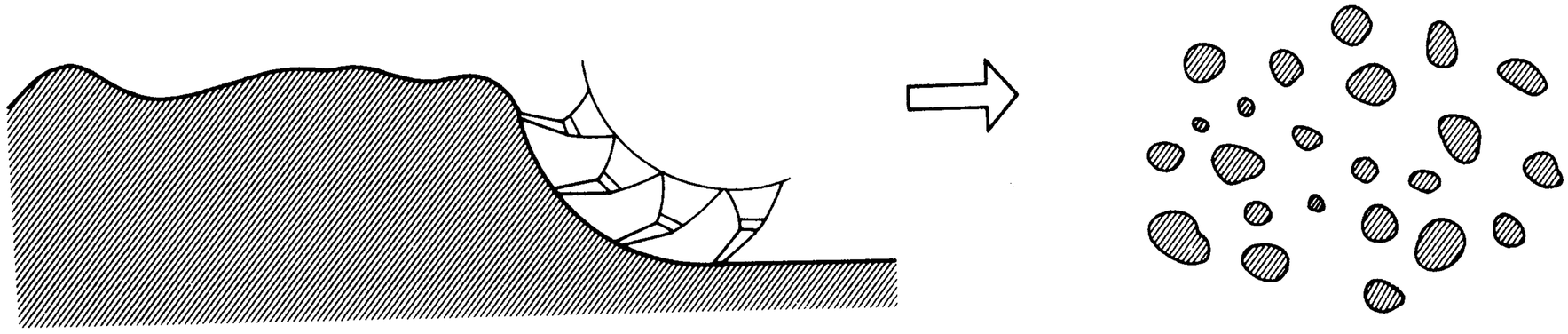
The Komatsu GS360 stabilizer which features a high asphalt-concrete crushing power and excellent efficiency is now being used in roadbed restoration and improvement projects all over Japan. In order to use this same crushing power and performance in other applications as well, Komatsu has developed the WRR360-1A. This machine is designed for use in Okinawa where it is used to crush coral (stones formed from coral reefs, a type of limestone officially called Ryukyu limestone) to permit reuse of the coral as a stabilizing agent and to improve agricultural land by mixing coral granules with the soil.



E.DIGGING ROADBED MATERIALS

(The WRR360-1A soft rock crusher must be installed to the GS360) **(See page 15.)**

On all the islands in Okinawa prefecture, the areas along the shore are almost completely composed of coral. When the supporting force of a roadbed or subbase for a normal road does not meet the standard, the usual procedure is to spread lime, cement or some other additive over the present material and mix the two materials. Lime has excellent long term durability and stability because it hardens due to a chemical reaction with viscous substances and clay contained in the original roadbed or subbase material. By using the lime contained in coral and controlling the size of the coral granules as required, the coral granules can be used to create a very durable and stable roadbed and subbase. Coral granules can also be mixed with soil to improve the quality of agricultural land. Previously, this procedure has been conducted using a bulldozer to perform ripping and a breaker to crush the rocks. Compared with this conventional procedure, the road stabilizer method conserves resources, is more economical and does the job in much less time.



Comparison of new and conventional method