Cooling Stations for Red Tart Cherry Orchards
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COOPERATIVE EXTENSION SERVICE MICHIGAN STATE UNIVERSITY

COOLING STATIONS

for red tart cherry orchards

BY

HAROLD P. GASTON, GEORGE MCMANUS, JR., AND B. F. CARGILL*

MORE THAN 500 MICHIGAN CHERRY GROWERS will have cherry harvesting machines by the time the 1968 crop matures. If the crop is of normal size, these machines will probably be used in harvesting more than 100 million pounds of red tart cherries. The quality of the finished canned or frozen product will depend, to a considerable extent, on how quickly the cherries are cooled and how they are handled during the "holding" period, the time between harvest and processing.

The most practical way yet devised to properly handle machine-harvested cherries during this critical time is in cold-water-filled pallet tanks having a capacity of about 1,000 pounds of fruit. Cooling the cherries quickly and holding them in water at temperatures of 60° F or below helps prevent scald, facilitates pitting, and increases finished product yield. Quick cooling also reduces loss of weight which would otherwise penalize the grower. The economic advantages of proper handling are so great that processors insist that the best methods be used.

The conditions under which tank-handled cherries should be held can best be maintained at orchard cherry cooling stations—places at which cherries can be quickly cooled and held in running water for periods of 6 to 8 hours or longer if necessary. Such facilities usually consist of a concrete slab, an abundant supply of water and a means of disposing of it after it has been used.

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COOLING STATIONS INCREASE PROFITS

While some growers have already provided themselves with cooling stations, the results of a recently conducted survey indicate that some of the existing stations should be revamped, and that many new ones will be needed to handle the 1968 crop. This publication provides basic information which will help growers plan, construct, and operate at-the-orchard cooling stations which will benefit the industry and thereby increase grower profits.

Although existing cooling pads have been constructed by growers who machine pick, all water- handled cherries benefit by quick cooling and should therefore be held at a cooling station regardless of how they are harvested.

HOW TO ESTIMATE NEEDED CAPACITY

The capacity of a particular unit should be based on the number of tanks that are to be handled in a 24-hour period and the delivery schedule that is to be maintained. A "rule of thumb" that many growers are using provides that space should be available for about 70 percent of the day's "pick." Growers who operate one mechanical harvester, pick only during the day, and expect to harvest 30 tanks of cherries (approximately 15 tons) should provide space for about 20 tanks. When the station begins to fill up, as it normally will in the early afternoon, the tanks which were filled first can be dispatched to the processor. This will leave room for the balance of the pick, which could be moved to the plant during the late afternoon or evening. The space required for larger or smaller operations can be calculated in the same way—at 70 percent of the estimated total day's pick. Cherry processing research shows that for best results this fruit should not be "soaked" for less than 6 hours or more than 8 hours. Delivery schedules and cooling station capacity should be planned accordingly.

Some growers prefer to provide space for enough tanks to hold all of the cherries that are to be harvested in one day. Doing so makes it possible to make deliveries at the grower's discretion. In the case of a temporary breakdown at the plant, an entire day's pick could be held through the night and delivered the next morning. Growers should realize, however, that while a long soak may provide the solution to a temporary emergency, the practice is not recommended. Soaking cherries more than 8 hours tends to bleach out color and cause the fruit to develop scald and lose weight. Taken together, these things mean lower grades and diminished returns.

Growers who operate their harvesting equipment at night as well as during the day would normally make more deliveries, and might therefore be able to handle their tonnage at a station having a capacity of 50 percent of the 24-hour pick. However, some space in addition to average needs which can be used in emergencies, is well worth the added cost.

CHOOSING THE SITE

The cooling station should be located close to the orchard in which the cherries to be handled are produced. If several orchards are involved, the more central the location, the better.

The pad must be readily accessible by means of an all-weather road which will carry the heavy duty trucks used in moving the tanks.

A double row station that will accommodate 20 tanks should be located on a relatively level area approximately 50 feet by 50 feet, which slopes enough to drain off surface water quickly. An area of this size provides plenty of room to load and unload over-the-road trucks, and to maneuver the lift equipment used in handling tanks. When production is likely to increase, ample space for expansion should be provided.

MAKING THE PLAN

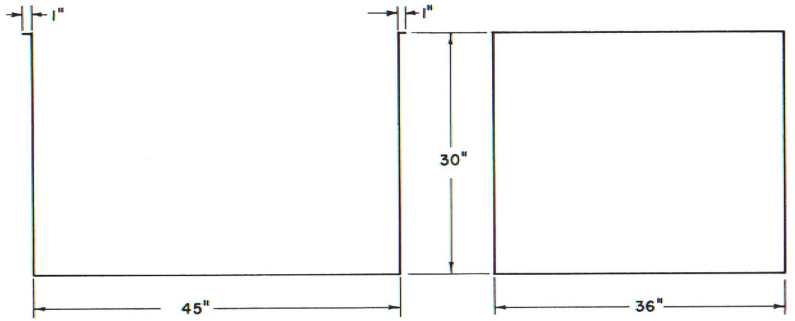
The effectiveness of the cooling station depends, to a considerable extent, on its design and the volume handled. There are several possible designs that should be given consideration before a specific plan is selected.

The single row station provides space for only one row of tanks. This is probably the simplest layout, and inasmuch as all of the tanks can be moved in and out of position from one side, the other side can be used for water disposal.

The double row station provides space for two rows of tanks and should be accessible from both sides. Growers who have a suitable site and a considerable volume of fruit may prefer this design.

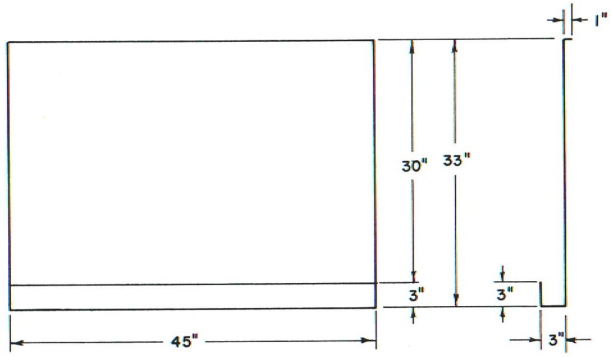
The dual purpose cooling station and storage shed serves as a cherry cooling area during the harvest season, after which the space can be used for a workshop or storage. In this case the station is usually drained down the middle and covered by a clear span building. Growers who need both a cooling station and a storage building may wish to consider a unit of this type. In some cases, existing storage buildings could be converted to cooling stations.

Existing concrete slabs can some times be used to advantage. Some growers have hard surfaced areas in the farmyard which can be used as cooling stations during the cherry harvesting season. Using an existing facility saves the cost of constructing a new one, and in some instances the results are quite satisfactory.



ENDS AND BOTTOM

(36" x 107" ONE ONLY REQUIRED)



SIDES

(45" x 40" TWO REQUIRED)

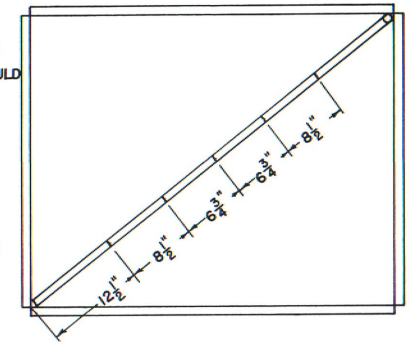
NOTE —

MADE FROM FORMED PANELS WHICH CAN BE OBTAINED FROM STEEL COMPANIES BY ANY FRABICATOR. ALL PIECES ARE 12 GAGE SHEET. TOTAL WEIGHT 227 LBS. THIS TANK MEETS THE APPROVAL OF MANY PROCESSORS WHO CAN FREEZE CHERRIES. A STANDARD SIZE TANK FOR THE INDUSTRY WOULD BE DESIRABLE. CAPACITY = 1000 LBS. NET.

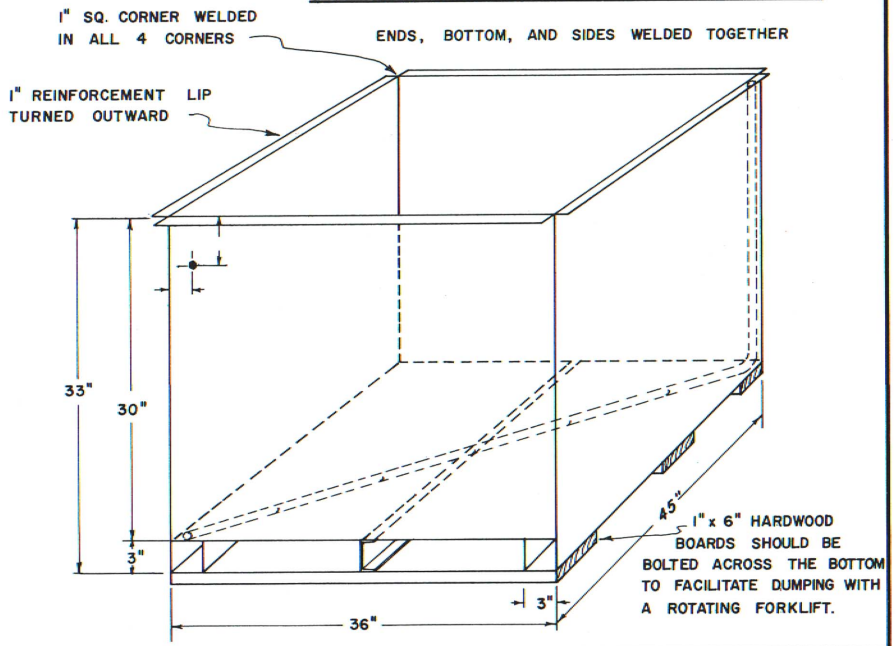
LOCATION OF HOLES OR CUTS IN CONDUIT ARCS OF HOLES / CUTS SHOULD BE EQUAL OR LARGER THAN CROSS SECTIONAL AREA OF CONDUIT.

EXAMPLE: HOLES — USE (10) 1/4" HOLES (TWO AT EACH LOCATION) DRILLED ON OPPOSITE SIDES OF CONDUIT.

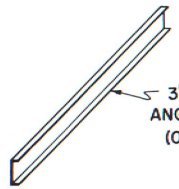
SAW CUT — USE 3/64" WIDE SAW CUT HALF WAY THROUGH CONDUIT AT EACH LOCATION ON BOTTOM OF CONDUIT.



TOP VIEW SHOWING HOLE SPACING IN CONDUIT



1" x 6" HARDWOOD BOARDS SHOULD BE BOLTED ACROSS THE BOTTOM TO FACILITATE DUMPING WITH A ROTATING FORKLIFT.



3" x 12" 12 GAGE FORMED ANGLE x 45" LONG. (ONE REQUIRED)

MICHIGAN STATE UNIVERSITY
COOPERATIVE EXTENSION SERVICE
AGRICULTURAL ENGINEERING DEPT. - EAST LANSING

SUGGESTED TANK FOR TRANSPORTING RED TART CHERRIES IN WATER

PLANNED JHL-BC	APPR. BFC	SCALE 3/32"=1"
DRAWN WOC	DATE 1/3/68	SHEET 1 OF 1
TRACED ADC		
CHECKED JHL	NO. 611-CI-34	

Rev.

FIGURE 1

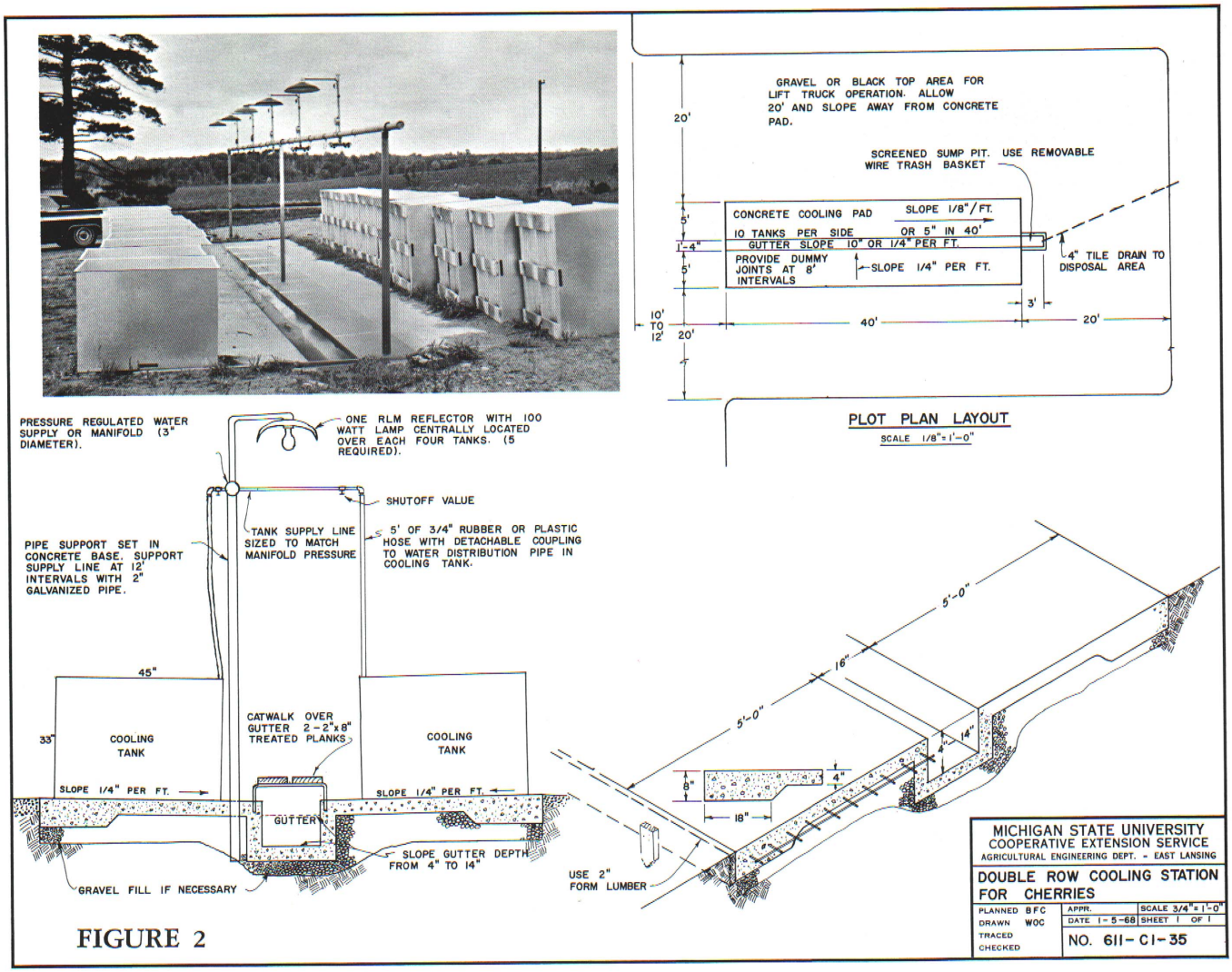


FIGURE 2

CONSTRUCTION

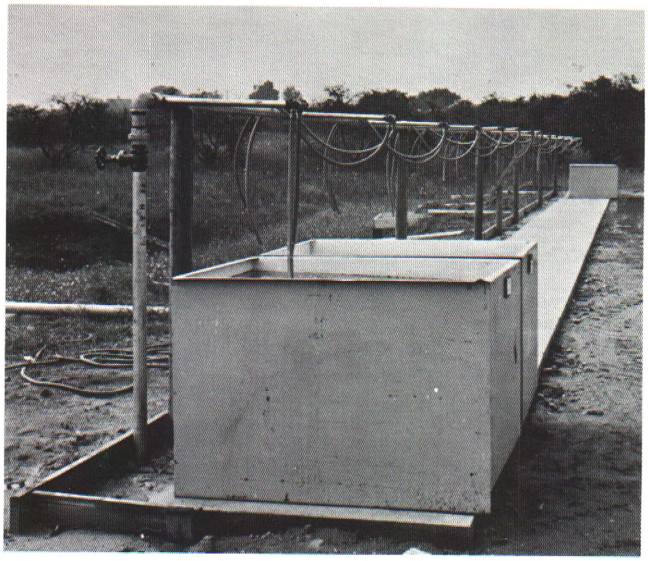
The construction details which follow are based on the assumption that standard 36 feet by 45 feet pallet tanks 30 inches high, made from 12-or 14-gauge steel will be used. Such tanks are approved by most Michigan processors. It is recommended that the cooling water be introduced by means of an L-shaped piece of conduit into which slots have been cut. This introduces cold water at the bottom of the tank, allows it to circulate through the fruit and overflow at the top, carrying with it dirt, stems, leaves, and heat. Such a pipe can be welded into each tank (see Fig. 1) or it can be kept at the pad and placed in one corner and diagonally across the bottom of the tanks as they arrive at the pad.

As already stated, growers who operate one mechanical harvester and pick only during the day should provide space for about 20 tanks. Inasmuch as a 20-tank station provides sufficient space for the majority of growers, the construction of such a typical unit will be discussed.

For a station of this size the two-row pad is probably the most practical. The recommended dimensions are 11 feet 4 inches by 40 feet (See Fig. 2). This provides 60 inches of front to back space, plus a 16-inch gutter for waste water, and 48-inches of width for each standard 36 foot by 45 foot tank.

A 4-inch concrete slab is adequate if fork lift equipment is not operated on the pad. Inasmuch as the stations will be exposed to low winter temperatures, it is recommended that 6-inch by 6-inch number 10 wire mesh reinforcing be used to prevent separation at construction joints.

When ready-mixed concrete is used growers should specify six sacks of cement per cubic yard of concrete, 1-inch maximum coarse aggregate, 6 gallons of water per sack of cement, and a stiff consistency with a maximum 3-inch slump test. When site mixed concrete is used, coarse and fine graded aggregate should be blended with water and cement in the following proportion: mix 2¼ parts of fine aggregate, 3 parts of



The One Row Station

coarse aggregate, and 6 gallons of water with one sack of cement.

Figure 2 shows dimensions and details. Adequate drainage is essential, and the slopes involved are important.

LIGHTING

If the cooling station is to be used at night, adequate lighting should be provided. Flood lights which illuminate the entire area are adequate for loading and unloading. If sorting is to be done at the station, additional light will be needed. In the double row design, a 100-watt light should be centrally located over each group of four tanks. In the single row design, a light should be located over each two-tank group.

WATER SUPPLY

Processors usually insist that growers cool their water-handled cherries to 60° F or less before they are delivered to the plant. The rate at which the fruit cools depends on how warm it is to start with and the temperature of the water used. The temperature of the water in most Michigan wells ranges from 48° to 52° F. If cold water is pumped through warm cherries the temperature of the fruit is reduced. For example, 50° F water which flows at the rate of 10 gallons per minute (gpm) for approximately 40 minutes will cool a tank containing 1,000 pounds of cherries from 80° to 60° F.

Should the temperature of the water be significantly higher than that provided by most Michigan wells, a greater volume would be needed, or a means of cooling the water with ice or mechanical refrigeration should be provided.

In calculating the water supply needed at a given station, it should be remembered that while initial cooling requires approximately 10 gallons per minute, 2 gallons per minute will maintain the temperature during the "holding" period. The total amount of water necessary can be calculated by multiplying the number of tanks to be cooled at one time by 10 (gallons per minute) and adding 2 (gallons per minute) for each of the tanks to be held at any one time. This would mean that a 20-tank station, at which three tanks were being cooled and 17 tanks were being held, would require a maximum of 64 gallons per minute (3 x 10 plus 17 x 2 or a total of 64). In calculating total needs, a reasonable allowance should be added for water that is to be used in filling tanks that come from the processor empty, but are filled before they are sent back to the orchard.

Growers who plan to use water from existing wells should make sure that the supply is adequate. A quick check can be made by measuring the amount of water produced during a 10-minute trial run, during which the pump is operated at its full capacity. If the check shows that the supply is inadequate, an experienced well man should be consulted. Wells and pumps vary considerably in their water yielding capacity — a 2-inch well may yield from 3 to 15 gpm; a 3-inch well from 3 to 30 gpm; a 4-inch well, 3 to 75 gpm; and a 6-inch well from 3 to 120 gpm. The well man should be able to suggest a pump well combination which will fulfill your requirements.

WATER DISTRIBUTION

The cooling station should be provided with a system of pipes and hoses by which the necessary amount of water can be conveyed to each of the tanks. An overhead "main" running the length of the station, with outlets for each tank, is simple and effective. When the water is pumped directly from the well into the main, it should be provided with a pressure shut-off or relief valve, which will prevent the build-up of excessive pressure. Each of the outlets should be provided with a manually operated valve by which the flow can be controlled. A rubber or plastic hose long enough to reach the tank is attached to each of the outlets. These hoses should be provided with "quick couples" by which they can be attached to the "L" shaped pieces of slotted conduit through which the water flows into the tanks. See Fig. 1. Plastic hose may prove unsatisfactory if it tends to stiffen at temperatures of 50°.

The driver who brings filled tanks from the orchard to the cooling station usually takes back tanks that are partially filled with cold water. The water distribution system should provide an outlet which will enable the operator to quickly fill outgoing tanks.

A 3-inch pipe running down the center of the pad at a height of about 7 feet will provide an adequate "main" for the pad shown in Figure 2. The well and pump combination should be such that a water pressure of about 20 pounds per square inch can be maintained in the main. When this is done, ¾-inch outlets at each lateral will supply 10 or more gallons per minute to each of the tanks being cooled, and 2 gallons per minute to the ones being held. Pads of larger capacity usually require bigger mains.

A semi-automatic flow regulating system can be designed for any given set of conditions. Such a system has some advantages but it is more expensive. Growers who are interested in obtaining detailed information may do so by addressing a request to the Agricultural Engineering Dept., Michigan State University, East Lansing, Michigan.

WATER DISPOSAL

Large amounts of water are involved, and the disposal problem should be given consideration before the site is chosen. In addition to the purely physical problems, there are health regulations which should be taken into account. Growers should check the regulations with local health authorities.

The grower whose maximum needs are about 65 gallons per minute should provide disposal facilities which will carry water away at this rate, even though the system would not be called upon to operate continuously at maximum capacity. Total needs should be figured at one-half the maximum rate, or about 35 gpm. In this case the amount of water would be 21 thousand gallons in a 10-hour day.

OPERATING A COOLING STATION

When, on a given day, the first tank of cherries arrives at the station, it should be placed where later tanks can be arranged for easy servicing and record keeping. Arrange them so that the first tank in is the first one out.

As the tanks arrive, the water should be turned on and the flow adjusted to about 10 gallons per minute. During this time a station is filling up, excess water is available. Water is relatively inexpensive and some growers place two hoses in each of the tanks being cooled. This doubles the flow of water and hastens cooling. When the tanks have been allowed to overflow for a while, the leaves and trash that float to the top should be skimmed off and placed in containers for subsequent disposal.

Record the time the cooling operation starts. Any simple convenient system will do. The time can be "chalked" on the tank itself, or recorded on a card which stays with the tank until it reaches the processing plant. Another method is to number the individual tanks and keep the record on a conveniently located clip board. The information regarding each tank should accompany the containers when they are dispatched to the processing plant. This information makes it possible to run some, and perhaps all, of the cherries directly into processing lines.

When the temperature of the tanks has been lowered to 60° F. or less (as determined by a good immersion thermometer), the flow of water should be reduced to about 2 gallons per minute. Water should not be shut off until the tanks are ready to be moved to the plant.

Before the tanks are taken away the water level should be lowered to a point 2 inches to 4 inches below the surface of the fruit. Doing this prevents overflowing and sloshing during transit which might otherwise bruise the fruit.

Cherry growers who provide themselves with good cooling facilities, and operate them properly, will help maintain the fruit quality which increases both demand and profits.

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