NATURAL RESOURCES CONSERVATION SERVICE
MONTANA CONSERVATION PRACTICE JOB SHEET

HIGH TUNNEL SYSTEM (FT^2)

CODE 325

DEFINITION

A high tunnel is an enclosed polyethylene, polycarbonate, plastic or fabric covered structure at least 6 feet in height, which is used to cover and protect crops from sun, wind, excessive rainfall, or cold to extend the growing season in an environmentally safe manner.

PURPOSE

The purpose of the high tunnel is to improve plant health and vigor.

CONDITIONS WHERE PRACTICE APPLIES

A high tunnel may be used on land capable of producing crops. This practice applies where sun or wind intensity may damage crops or an extension of the growing season is needed due to climate conditions.

The practice does not apply to crops not grown in the natural soil profile (i.e., tables/benches, portable pots, hydroponically, etc.).

CRITERIA

Crops must be grown in the natural soil profile, raised beds can be used but the maximum depth is 12 inches.

This practices does not include greenhouses or low tunnel systems.

This practice cannot be used to provide shelter or housing for any livestock, or to store supplies or equipment.

Locate structures on a level surface, near a viable water source for irrigation and avoid buried public utilities.

The high tunnel structure must be planned, designed and constructed from a manufactured kit of metal, wood or durable plastic frames and must be at least 6 feet in height at the peak of the structure. The high tunnel can be covered with polyethylene, polycarbonate, plastic or fabric.

Generally, the end walls are framed-in to create door and ventilation areas and can be greenhouse grade plastic, polycarbonate, wood or other materials.

It is the responsibility of the organic producer's to make sure that all permissible activities, design, material used, and material specifications are consistent with the USDA Agricultural Marketing Service National Organic Program, National Standards on Organic Agricultural Production and Handling.

Design and select the tunnel structure and cover to withstand expected wind loads or manage the tunnel system in a manner that limits wind damage.

Outside the high tunnel structure, vegetate all exposed surfaces disturbed during construction in accordance with CPS Code 342, Critical Area Planting. If climatic conditions preclude the use of seed or sod, use CPS Code 484, Mulching.

MONTANA SPECIAL PROVISIONS:

High Tunnels shall be purchased from a kit complete with ground posts, steel tubing, side support rails, and shall meet the following minimum specifications:

1. Tubing shall be manufactured from minimum 1.66-inch diameter, 16 gauge steel.
2. The rafter spacing shall be 4-foot maximum with a minimum of 3 purlins per high tunnel.
3. As a minimum, a 6-mil greenhouse grade, UV resistant polyethylene cover, with a 4-year warranty shall be used.
4. As a minimum, 2-inch by 6-inch heartwood (higher grade) redwood or cedar or 5/4 x 6" recycled plastic lumber baseboards shall be fastened to the structure in accordance with the manufacturer's recommendations.
5. Prior to construction, the ground surface must be level so that anchor ground posts can be set uniformly and to the proper depth in accordance with the manufacturer's specifications.
6. Consider roll-up sides, mechanical vents, fans, and/or structure orientation for adequate ventilation.
7. Consider shelterbelts, windbreak fences, or orientation relative to existing building or other structures to reduce wind damage potential.
8. If the structure must be orientated perpendicular to the prevailing wind, or snow loads are anticipated, consider additional purlins, cross bracing at least every second or third rafter, concrete anchors at the corners, and/or 4" x 4" posts on both ends and framing the ends with solid materials to stiffen the ends.

9. Consider a heavy weight covering (5.2 ounce) or polycarbonate to increase the durability, stability, and the snow load capacity.
10. The approving NRCS official will review the manufacturer's specifications and compare the requirements to as-built conditions to certify the installation for payment. Changes to the structure should be accompanied with verification from the producer that the changes were acceptable to the manufacturer and that any warranties remain in effect.

NOTE: Most high tunnels are not guaranteed to withstand snow loads or high winds. It is recommended that the cover be removed at the end of the growing season in areas where snow loads may damage the structure. It is the responsibility of the contract holder to repair and maintain the structure for the lifespan of the practice (five years). It is also recommended that the contract holder check on insuring their high tunnel before installation.

CONSIDERATIONS

Water runoff may be captured and used for irrigation purposes especially in areas with poor quality groundwater.

Water runoff from the high tunnels can cause erosion and ponding issues that may require the application of other practices such as critical area plantings and mulching. These additional practices may be planned and installed as a condition for the installation of a high tunnel.

Control weeds with fabrics, covers, mulches, hand weeding or other methods.

Consider management techniques to maintain or improve soil health.

In areas of high snow loads or high wind speeds, consider additional structural support from manufacturer.

Consider setting end posts in concrete, the use of heavier 12 to 14 gauge steel, and a double layer of plastic to increase integrity of the structure.

Consider a minimum clearance of 10 to 20 feet between side-by-side high tunnel installations for snow removal and cover installation.

Consider potential shading of high tunnel structures by other structures or trees and locate at a distance of two times the height of the tree or structure.

Consider additional conservation practices such as roof runoff structure, diversion, critical area planting, mulching, crop rotation, irrigation water management, salinity management, nutrient management or integrated pest management as needed.

PLANS AND SPECIFICATIONS

Prepare plans and specifications in accordance with the criteria of the National Handbook of Conservation Practices (NHCP) standard and this jobsheet.

OPERATION AND MAINTENANCE

Follow Operation and Maintenance criteria in NHCP standard, also if salts are a potential resource concern, a water well analysis in addition to soil testing will assist in managing salt build-up in the soil.

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LANDOWNER/OPERATOR	FIELD NUMBER	TRACT	CTU

PLANNER	FIELD OFFICE	DATE

MATERIALS LIST:

High Tunnel Structure and material (type), size(s)_____

Supporting Practices (Check all that apply):

- ☐ Critical Area Planting (job sheet attached)
- ☐ Irrigation System, Microirrigation
- ☐ Irrigation Water Management
- ☐ Other_____
- ☐ Roof Runoff Structure
- ☐ Mulching
- ☐ Nutrient Management
- ☐ Other_____

HIGH TUNNEL SYSTEM CONSTRUCTION

- Contact the Montana One Call Center at 811 at least two (2) working days in advance of construction, for location of underground utilities.
- Prepare site according to manufacturer's instructions.
- Lay out building location according to site plan.
- Assemble high tunnel structure according to manufacturer's instructions.
- Install supporting practices as required, according to construction plans provided.

OPERATION AND MAINTENANCE

- Periodically inspect structure and cover for damage. Reinstall or repair promptly.
- Follow manufacturer's instructions for operation and maintenance of the high tunnel structure.
- Avoid damage to structure from equipment operated in and around the high tunnel.
- Remove snow and ice promptly to prevent structure failure.
- Inspect runoff control measures after every significant rainfall event. Repair promptly.
- Remove and store high tunnel cover at the end of each growing season, unless manufacturer warrants the cover for snow loads. Replace cover prior to use in the spring.

APPROVALS:

I have received a copy of the job sheet and understand the contents and requirements.

NRCS Conservationist	JOB APPROVAL AUTHORITY	**Date**
Producer		**Date**

CERTIFICATION STATEMENT:

I hereby certify that this practice has been installed in accordance with NRCS standards and specifications.

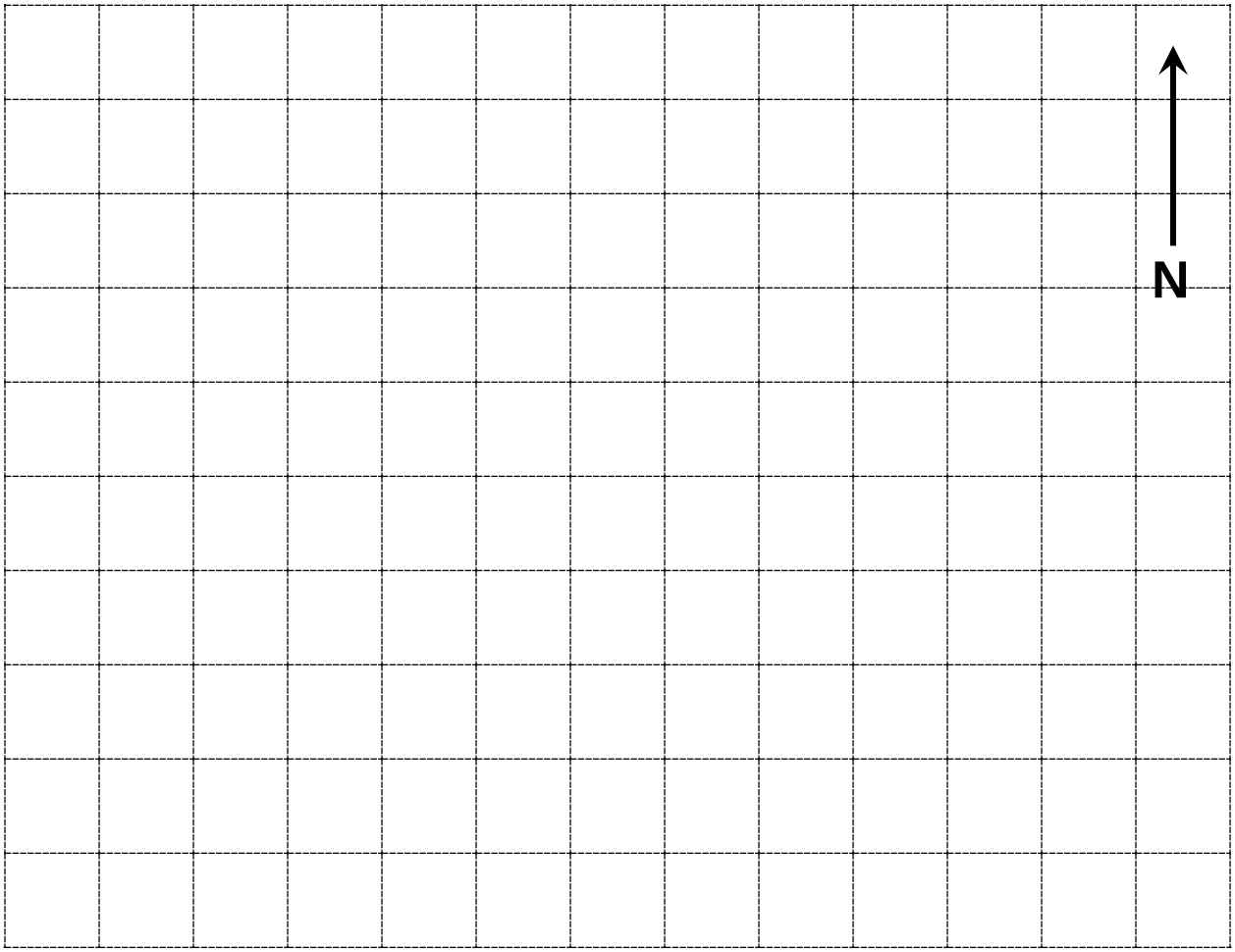
NRCS Conservationist	JOB APPROVAL AUTHORITY	**Date**
		Date

MT325-JS6

High Tunnel System – Layout and Location

Plan view of the high tunnel system site shown below. Include prevailing wind direction, runoff, shelterbelt or windbreak location and measurements (length, width and height), erosion control, weed control and compaction reduction measures, if any.

Scale 1" = _____ ft. (NA indicates sketch not to scale: grid size = 1/2" by 1/2")



ADDITIONAL SPECIFICATIONS AND NOTES:

HIGH TUNNEL SYSTEM – CONSTRUCTION CHECKOUT

HIGH TUNNEL STRUCTURE – *AS-BUILT MEASUREMENTS*	
Dimensions:	Length:_____(ft) Width:_____(ft) Height at Center: _____(ft)
Covering type and thickness:	
Structure manufacturer, model, and series name:	
Anchoring system: type, measurements, depth, number and location of anchors.	
Foundation/base and structure level.	
1. Cross bracing 2. Number of purlins:	Location:_____ Number:_____ Location:_____ Number:_____
End framing description:	Material type:_____ Description:
Changes to manufacturer's specifications:	Describe changes: Approved by manufacturer: Y☐ N☐
Ventilation system description:	

SUPPORTING PRACTICES INSTALLED (CHECK ALL THAT APPLY):

Quantities and detailed checkout information for supporting practices shall be documented separately.

- ☐ Critical Area Planting
- ☐ Roof Runoff Structure
- ☐ Irrigation System, Microirrigation
- ☐ Mulching
- ☐ Irrigation Water Management
- ☐ Nutrient Management
- ☐ Other(s)_____

Reset Job Sheet **Print Job Sheet**

NRCS Approval

Engineering Approval by_____ Job Class_____ Date_____

Bio/Veg Approval by_____ Job Class_____ Date_____

Owner/Operator Review

I have reviewed the drawings, construction specifications, and special provisions, and agree to construct this project in accordance with them. Modifications to the final drawings, specifications, or special provisions during construction will require approval from the NRCS prior to installation.

I agree to obtain all the necessary permits, easements, and water rights. I will inform the NRCS of all conditions pertaining to project construction as stated in the acquired permits. I agree to comply with all Federal, State, and local laws and regulations pertaining to this construction.

I acknowledge responsibility for marking private underground utilities affected by the project. The excavator will call the Utility Notification Center at least two full working days before excavation begins to ensure that all publicly owned underground utilities will be marked. The "Call Before You Dig" phone number for Montana (except for Lincoln and Flathead Counties) is 811 or 1-800-424-5555. The "Call Before You Dig" phone number for Flathead and Lincoln Counties is: 1-800-551-8344 (there is no 811 equivalent for this area).

_____ _____

One-Call Ticket Number Date

_____ _____

Owner/Operator Date