Outline

- Types of storages
- NRCS Practices
- Technical Note and Fact Sheet
- Design Criteria
- Design Examples
- EQIP
- NRCS Engineered barn projects
Open Feedlots

- Typical open lot with sediment basin and holding pond
  - Designed based on the drainage area
  - 365 days of required storage for open lot runoff
  - Sediment Basin is partially based on the amount/size of animals
Mono-Slopes and Hoop Barns

- **Barn** – solid manure storage
  - Roof eliminates runoff
  - Designed based on the manure and bedding accumulation
  - 270 day minimum requirement for solid storage
  - Provide manure storage for:
    - Any bed pack to be removed during storage period
    - Scraped alley that is scraped daily, weekly, etc.
Hoop Barn
Mono-Slope Barn
Manure Storage within the bed pack
Manure Storage stacking area in the barn
Manure Storage stacking area in the barn
Manure Storage stacking pad outside of the barn
When using a non-covered stacking area

- Collect runoff from the stacking pad in a holding pond
- **OR** utilize a vegetated treatment area to collect runoff from a non-covered stacking pad
Roofs and Covers (367)

- Structural Design Criteria
- Animal Space Requirements
Additional Criteria For Solid Manure Storage Facilities

- 5 Choices of Floor requirements
- Design Storage Requirements
  - Manure/Bedding
  - Runoff (if not under a roof)
  - No residual storage or freeboard required for solid manure storage facility
Barn Technical Note

- The technical note describes the different bedding and manure management practices used by producers. It also explains how to size a facility, in order to meet the manure storage requirements.

Barn Technical Note

- Section 1 – Planning: A good read for designers and planners.
- Section 2 – Site Visits: A summary of some of the sites we visited to develop the design procedure.
- Section 3 – Barn Design: If you are doing design, you should read this section. Not that important for planners.
Barn Technical Note

- Section 4 – Design Spreadsheet: If you are doing design, read this section or read the instructions within the spreadsheet file.
- Section 5 – Additional Information: If you are doing design, read this section. There are links to papers, websites, and a webcast.
- Appendix B and C: SDSU Opportunities Farm data
Bedded Pack Barns
Fact Sheet

What is a Bedded Pack Barn?

A bedded pack barn is an alternative for livestock producers in South Dakota. Producers are increasingly utilizing this type of animal housing for beef cattle feeding and dairy operations in this region. There are different variations of bedded pack barns, which include different types of buildings, different types of bedding and different types of bedded pack management.

The two most common types of bedded pack buildings are hoop structures and mono-slope structures. Hoop structures are generally constructed with wood or concrete sidewalls, tubular steel truss system, and a woven polyethylene fabric cover. Mono-slope structures have been typically constructed with concrete walls, steel frame, and steel roof.

![Typical Mono-Slope Barn](image)

![Typical Hoop Barn](image)

From a manure management standpoint, bedded pack barns provide two distinct differences from traditional open lots. The first is that the bedding on the barns absorbs the water in the manure and the second is that the roof keeps precipitation out of the cattle feeding area. This eliminates runoff from the feeding operation and the need for runoff collection, storage, and treatment measures. For facilities with geotechnical conditions not conducive to constructing runoff storage ponds, this can make a barn the preferred option to feed cattle at the location.

Advantages of a bedded pack barn versus a traditional open lot:

- Required animal density is lower, so the overall space required for the cattle feeding area is smaller.
- Collection, storage and application of open lot runoff are eliminated.
- Manure storage and application is more predictable and consistent than open lot runoff. Open lot runoff depends on variable precipitation, not on manure and bedding accumulation.
- Lower chance of a catastrophic manure spill since manure is stored and handled as a solid.
- There is a somewhat controlled environment inside of the barn for the animals and the producer.
- In locations with high ground water where a holding pond is not feasible, a barn may provide an option to feed cattle.

Disadvantages of a bedded pack barn versus a traditional open lot:

- Higher initial investment.
- Adequate bedding and an area to store the bedding are necessary.
- Ventilation of the facility must be managed.
- More regular maintenance to add bedding and remove manure and bedded pack from the barn.
Bedded Pack Barns
Fact Sheet

SD NRCS Bedded Pack Barn Design Worksheet

- Instructions
- Reference Documents
- Data
- Facility Info
- Scenarios 1, 2, 3, 4
Barn Solid Manure Storage Design

- Section 3 of Technical Note - Barn Design:
  - Old Equation: Total volume required = manure volume + half of the bedding volume
  - New Equation: Total volume required =
    (weight of the solid portion of the manure + weight of the solid portion of the bedding) / (1 – bedded pack moisture content) / (bedded pack density)
Site 1: The facility will consist of one 200’ x 50’ hoop barn for 200 finishing beef cattle. The bedded pack is not aerated, and the feed alley and excess bedded pack will be put in an outside manure stacking facility.
Site 2: A 100’ x 500’ mono-slope facility with 1,000 finishing beef cattle. The bedded pack is not aerated. Producer wants a stacking bay one end of the building for feed alley manure and excess bedded pack.
Cost Share Options

- NRCS EQIP
  - Environmental Quality Incentives Program
  - Sign up deadline each fiscal year and then applications are ranked
  - Payments are made for NRCS practice activities
NRCS EQIP

What strings are attached to EQIP for a barn?

- Encouraged to replace and abandon uncontained open lots with the barn to get a higher EQIP priority
- Must meet our standards
  - Liner (concrete, clay, synthetic, etc.) in the floor of solid stacking areas
  - Roof structural requirements need to be met and certified
  - Manure volume requirements
Mono-slope Barn Example

- The project consists a new 1,000 head mono-slope barn. The area of the barn is 100’ by 500’ (50,000 square feet). The north feed alley is under the roof and is 15’ wide. The barn has a concrete floor with a compacted clay liner below the concrete.
# Mono-slope Barn Example

- For FY 2012 EQIP:

## Practice Payment and Technical Service Payment Quantity List (FY 2012 EQIP Contract)

<table>
<thead>
<tr>
<th>Practice</th>
<th>Practice Extent</th>
<th>Practice Payment Unit</th>
<th>Technical Service Payment Quantity</th>
<th>Technical Service Payment UNIT from Techreq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste Storage Facility Concrete floor for bedded pack roofed structure</td>
<td>1,000.0</td>
<td>AU</td>
<td>1,000.0</td>
<td>AU</td>
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<tr>
<td>Roofs and Covers Livestock Roofed Structure</td>
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<td>AU</td>
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<td></td>
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</table>
Mono-slope Barn Example

- For FY 2014 EQIP:

**Directions:** Fiscal Year 2014 EQIP payments will be made by practice. The intent of this form is to provide a format to list all of the practices for a project with the appropriate practice units that are listed in the 2014 EQIP Practice Payment Schedule. In addition, it provides a listing of the appropriate Technical Service Payment Unit (formerly NTE rate) and quantity for TSP reimbursement. Choose a practice in the “Practice” column and then enter the appropriate practice extent (quantity) in the “Practice Extent” column, and Technical Service Payment Quantity in the Technical Service Payment Quantity column. (If this project is not a FY - 2014 EQIP contract, then use the appropriate FY spreadsheet.)

**SD NRCS Practice Payment & Technical Service Payment Quantity List (FY2014 EQIP)**

<table>
<thead>
<tr>
<th>Certification of Quantities</th>
<th>Description of Quantities (check one):</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Preliminary Estimate Quantities:</td>
</tr>
<tr>
<td></td>
<td>Final Design Quantities:</td>
</tr>
<tr>
<td></td>
<td>As-Built Quantities:</td>
</tr>
<tr>
<td></td>
<td>Quantities:</td>
</tr>
</tbody>
</table>

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<tr>
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<th>Technical Service Payment Quantity</th>
<th>Technical Service Payment UNIT from Techrep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste Storage Facility (313): Bedded Pack - Concrete Floor and Concrete Walls</td>
<td>50,000.0</td>
<td>SqFt</td>
<td>1,000.0</td>
<td>AU</td>
</tr>
<tr>
<td>Pond Sealing or Lining, Compacted Clay Treatment (521D): Use On-Site Material</td>
<td>2,778.0</td>
<td>CuYd</td>
<td>2,778.0</td>
<td>CuYd</td>
</tr>
<tr>
<td>Roofs and Covers (387): Timber or Steel Sheet Roof</td>
<td>50,000.0</td>
<td>SqFt</td>
<td>1,000.0</td>
<td>AU</td>
</tr>
</tbody>
</table>
Barn Project - TSP Project

- Proceed as a normal TSP project
- Need to meet applicable standards and provide documentation as required in the Statements of Work
- Certify all of the practices as normal with the standard Warranty of Services Form
NRCS engineer will:

- Be responsible for certifying the practices with their Job Approval Authority
- Generally handle the manure storage volume calculations
- Generally handle the design of the barn floor
- Generally handle the initial planning, locating the barn, contract quantities, operation and maintenance agreement
NRCS engineer will:

- Coordinate with the producer and consulting engineer to design and certify certain parts of the building
- Coordinates getting the SD-ENG-59 form completed for design
- Coordinates getting SD-ENG-59 form completed after construction
ROOFED ANIMAL PRODUCTION FACILITIES CERTIFICATION

Use this form to certify the design of the roof structure for a roofed animal production facility that has been designed by a non-Natural Resources Conservation Service (NRCS) engineer. South Dakota (SD) NRCS considers a “roof structure” to include the roof itself and the required piers, columns, walls, footings, pilings, etc., that are used to support or hold up the roof. This form should be completed and sealed by the SD registered professional engineer who designed the roof structure or portion of the roof structure for this project. Check the structural components that are being certified:

- [ ] Roof
- [ ] Piers
- [ ] Columns
- [ ] Walls
- [ ] Footings
- [ ] Floor
- [ ] Pilings
- [ ] Other: ____________________________
United States Department of Agriculture Program Participant Information:

Storage Facility Producer __________________________________________________________

Facility Location ________________________________________________________________

Profession Engineer Information and certification:

To the best of my professional knowledge, judgment, and belief, the design, construction drawings, and specifications of this animal manure storage structure meet the SD NRCS Waste Storage Facility and other appropriate SD NRCS standards. The design also complies with appropriate federal, state, and local building codes and requirements.

Design Engineer’s Name (print) __________________________________________________

__________________________________    ______________________
Design Engineer’s Signature       Date

(Stamp)

Attach to this form:
  o Plans and specifications for the structure(s) indicated above
ROOFED ANIMAL PRODUCTION FACILITIES CERTIFICATION

Use this form to certify the construction of the roof structure for a roofed animal production facility that has been designed by a non-Natural Resources Conservation Service (NRCS) engineer. The SD NRCS considers a “roof structure” to include the roof itself and the required piers, columns, walls, footings, pilings, etc. that are used to support or hold up the roof. This form should be completed and sealed by the SD registered professional engineer who is certifying the construction of the roof structure, or portion of the roof structure for this project.

Check the structural components that are being certified:

- [ ] Roof
- [ ] Piers
- [X] Columns
- [X] Walls
- [X] Footings
- [ ] Floor
- [ ] Pilings
- [ ] Other: ________________________________
United States Department of Agriculture Program Participant Information:

Storage Facility Producer __________________________________________

Facility Location ______________________________________________

Profession Engineer Information and certification:

To the best of my professional knowledge, judgment and belief, the construction of this roof structure meets the SD NRCS Waste Storage Facility and other appropriate SD NRCS standards. The construction also complies with appropriate federal, state, and local building codes and requirements.

Design Engineer’s Name (print) __________________________________

Design Engineer’s Signature  Date
(Stamp)

Attach to this form:

- As-Built plans and specifications for the structure(s) if the construction differed from the original design plans for the project
Consulting engineer will:

- Design and certify certain structural parts of the building
- Completes the SD-ENG-59 form for the design of certain structural parts of the barn
- Completes the SD-ENG-59 form for the construction certification of certain structural parts of the barn
Barn Project – NRCS Engineer Lead

- The consulting engineer:
  - is not certifying the design or completion of the NRCS conservation practices
  - Does not have to be a certified TSP on Techreg
  - Is responsible for designing according to the appropriate conservation practice standards
  - Is not responsible for completing all of the items in the Statements of Work
Barn Projects

- The bottom line is to communicate with each other to determine whether you are working as a normal TSP project or as a project that is a NRCS engineer lead project. Certify the project accordingly.
"Yes...I believe there's a question there in the back."