

PART 1: GENERAL**1.1 SUMMARY**

- A. This section specifies the use of HydroStraw® Cellulose Fiber Plus as an allowable hydraulic fiber mulch for use in temporary cover by mulch, temporary cover by seeding or permanent cover by seeding applications. Do not use HydroStraw® Cellulose Fiber Plus as a channel liner or for areas receiving concentrated flow.
- B. Related Sections: Other Specification Sections, which directly relate to the work of this Section may include, but are not limited to the following:
1. *Section XXXXX – EARTHWORK*
 2. *Section XXXXX – LANDSCAPING*
 3. *Section XXXXX – SITE STABILIZATION*
 4. *Section XXXXX – SEEDING, FERTILIZING, AND MULCH*

1.2 APPLICATIONS

Use HydroStraw® Cellulose Fiber Plus alone on non-sensitive sites and where in-field mixing of additional tackifiers is specified. Use HydroStraw® Cellulose Fiber Plus when the site requires immediate erosion protection as a result of enhanced vegetation establishment.

- A. **USE AS A BLOWN STRAW REPLACEMENT** with hydraulically applied straw conversion.

Replace the recommended blown straw rate per acre or hectare with the recommended HydroStraw® rate per acre or hectare less the hydraulically applied fibers for seed, fertilizer and tackifiers application. Table 1 is an example:

Table 1: HydroStraw® Cellulose Fiber Plus Mulch Replacement

Example Blown Straw Specification		HydroStraw Recommendation	
Mulch Fiber seed and fertilizer	500 lbs / ac	HydroStraw seed and fertilizer	1,000 lbs / ac
Blown Straw	4,000 lbs / ac	HydroStraw	2,000 lbs / ac
Mulch Fiber tackifier application	500 lbs / ac	HydroStraw	-0-
TOTAL Fiber Pounds Per Acre:	5,000 lbs / ac	TOTAL Fiber Pounds Per Acre:	3,000 lbs / ac

Example Blown Straw Specification		HydroStraw Recommendation	
Mulch Fiber seed and fertilizer	560 kg / ha	HydroStraw seed and fertilizer	1,120 kg / ha
Blown Straw	4,483 kg / ha	HydroStraw	2,242 kg / ha
Mulch Fiber tackifier application	560 kg / ha	HydroStraw	-0-
TOTAL Fiber Kilograms Per Hectare:	5,603 kg / ha	TOTAL Fiber Kilograms Per Hectare:	3,362 kg / ha

B. HIGHER LOADING RATES

HydroStraw® Cellulose Fiber Plus Mulch performance is reduced by using lower than recommended mulch to water ratio. HydroStraw® formulation is designed for maximum performance with the following mulch to water mixture ratio:

RECOMMENDED HYDROSTRAW® CELLULOSE FIBER PLUS MULCH MIXTURE RATES

- 60 lbs (27 kg) per 100 Gallons (379 Liters) for hose work
- 75 lbs (34 kg) per 100 Gallons (379 Liters) for tower work

Higher loading rate reduces the amount of water required for the application of HydroStraw® Cellulose Fiber Plus Mulch.

C. VEGETATION ESTABLISHMENT

The annually renewable straw fiber in HydroStraw® Cellulose Fiber Plus Mulch enhances vegetation establishment by aiding in moisture retention and compensating for seed to soil contact. Complete soil coverage is needed to improve moisture retention and improve seed germination. Low rain fall regions may consider higher HydroStraw® application rates to increase moisture retention to improve the establishment of vegetation.

1.3 SUBMITTALS

- A. Submit the manufacturer’s product data and installation instructions. This includes but is not limited to the required site preparation, list of required materials and required application rate(s).

- B. Submit a letter from the manufacturer certifying that the hydraulic mulch fiber meets or exceeds all technical and packaging requirements.
- C. Upon request, submit from the manufacturer a *Report of Straw Analysis* test demonstrating the straw contains no viable seed. Ensure the *Report of Straw Analysis* is prepared by registered seed technologist from an accredited ISTA laboratory and is made available per product lot numbers upon request. Samples are taken during the production to represent a uniform sample.
- D. No material will be considered as an equivalent to the HydroStraw® Cellulose Fiber Plus Mulch material specified herein unless it meets all requirements of this specification, without exception. Manufacturers seeking to supply what they represent as equivalent material must submit records, data, independent test results, samples, certifications, and documentation deemed necessary by the ENGINEER to prove equivalency.

1.4 QUALITY ASSURANCE

- A. At the time of delivery, provide the ENGINEER with the specific packing list containing complete identification, including but not limited to the following:
 - 1. Manufacturer name and location.
 - 2. Manufacturer telephone number and fax number.
 - 3. Manufacturer's e-mail address and web address.
 - 4. Hydraulic mulch name, model and/or serial number.
 - 5. Certification that the specific hydraulic mulch meets the physical and performance criteria of this specification.

1.5 DELIVERY STORAGE AND HANDLING

- A. Deliver all materials in moisture resistant factory labeled packages.
- B. Store and handle HydroStraw® Cellulose Fiber Plus Mulch in strict compliance with the manufacturer's instructions and recommendations. Protect the packaged hydraulic mulch from damage from weather, excessive temperatures, and construction operations.
- C. Clean all spills promptly.

PART 2: PRODUCTS

2.1 ACCEPTABLE PRODUCTS & MANUFACTURER

A. HydroStraw® Cellulose Fiber Plus

HydroStraw, LLC
22110 S. State Route 27
Rockford, WA 99030
Toll Free: 800-545-1755
Fax: 815-468-7450
www.hydrostraw.com
info@hydrostraw.com

2.2 MATERIALS

A. All materials shall consist of HydroStraw® Cellulose Fiber Plus and conform to the composition requirements of Section 2.3.

2.3 COMPOSITION

- A. The pre-packaged mulch materials consist of a specially formulated composition of annually renewable straw fiber, natural fibers for fiber matrix entanglement, and a low rate of non-toxic soil stabilizer.
- B. The primary mulch fiber is produced from annually renewable straw fiber.
- C. All mulch fiber materials are free from plastic materials or other non biodegradable substances.
- D. Mulch fiber shall be of such character that the fiber will disperse into uniform slurry when mixed with water.
- E. Mulch fiber is colored green and does not stain concrete or other surfaces.
- F. Mulch fiber and other mulch ingredients are free from growth or germination inhibiting ingredients.
- G. All mulch fiber components are pre-packaged by the manufacturer to assure both material performance and compliance with the minimum requirements of Table 2.
- H. In-field addition of gaur or other binders to the pre-packaged mulch materials may be conducted to enhance performance.

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Table 2: Minimum HydroStraw® Cellulose Fiber Plus Mulch Requirements

Property	Requirement
Physical	
Organic Matter	100%
Toxicity	Non Toxic
Applied Color	Colored green and shall not stain concrete or other surfaces.
Surface Tension	Material evenly disperses and suspends when agitated in water.
Absorbency	When sprayed uniformly at the recommended rate, the mulch fibers form an absorbent mulch cover which will allow percolation of water and increased water infiltration to the underlying soil matrix
Solubility	Mulch Fibers are non water soluble
pH	6.8 +/- 0.5
Average Fiber Length	1/2" +/- 1/4" (1.27 cm +/- .64 cm)
Composition	
Heat & Mechanically Treated (HMT™) - Wheat Straw	44.0% +/- 1.0%
Cellulose Fibers	30.0% +/- 1.0%
Natural Fibers	4.0% +/- 1.0%
Non-Toxic Soil Stabilizer	2.0% +/- 1.0%
Moisture	10.0% +/- 1.0%

2.4 **PACKAGING**

A. Ensure all products are packaged in the following manner:

1. Bag Size: 11.5" W x 17" D x 25" H (29.2 cm W x 43 cm D x 63.5 cm H)
2. Bag Weight: 50 lb (22.7 kg) compressed bales
3. Packaging: Moisture resistant package protected
4. Pallet: 40 bags/pallet 52" W x 45" D x 96" H (132 cm W x 114 cm D x 244 cm H)

PART 3: EXECUTION

3.1 EXAMINATION

- A. Use HydroStraw® Cellulose Fiber Plus Mulch fiber components pre-packaged by the manufacturer to assure material performance.
- B. Examine substrates and conditions before applying materials. Do not proceed with installation until unsatisfactory conditions are corrected. Apply hydraulic mulch to stable slopes that are constructed to divert runoff water away from the face of the slope, eliminating damage to the slope face caused by the surface flow from above the slope.

3.2 INSTALLATION

- A. Use personnel or subcontractors experienced in the proper procedures for mixing and application of hydraulic mulch. Use personnel or subcontractors certified and trained by the manufacturer in the proper procedures for mixing and application of hydraulic mulch.
- B. Strictly comply with the manufacturer's installation and mixing instructions shown in Table 3.

Table 3: HydroStraw® Cellulose Fiber Plus Fiber Mixture Rates

Mulch Fiber Weight	Amount of Water
60 lb (27 kg)	100 Gallons (379 Liters) hose work
75 lb (34 kg)	100 Gallons (379 Liters) tower work

C. Loading and Mixing Instructions

1. Start the flow of water into the tank.
2. Pre-wet hoses and prime the pump by running water through the lines.
3. Engage the agitator at ½ speed.
4. When applying seed and/or fertilizer, add to the tank when the water level reaches ¼ full.
5. **Load all HydroStraw® Cellulose Fiber Plus Mulch fiber components before the tank reaches ¾ full. Do not hesitate to shut off water before this step is completed.**

6. When using additional tackifiers or binders, add towards the end of the mulch loading but before the tank reaches $\frac{3}{4}$ full.
 7. Resume filling the tank with water until the tank is full.
 8. Set the engine to full throttle for approximately $\frac{1}{2}$ minute. Then set the engine throttle to about $\frac{1}{2}$ speed to begin hose application operations.
- D. It is imperative to apply the mulch at the specified mixture rate: too wet of a mixture will cause the fibers to be buried into the soil and also dilutes the fiber binders reducing effectiveness.
- E. Apply Mulch Fiber as a slurry solution by means of approved hydraulic seeding/mulching machines with appropriate nozzles for hydraulic mulch applications.
- F. Apply Mulch Fiber at the specified rates per in Table 4 in a uniform manner.

Table 4: Minimum HydroStraw[®] Cellulose Fiber Plus Mulch Application Rates

Slope Gradient	lb / Acre	kg / Hectare
$S \leq 4:1$	2,000	2,242
$4:1 < S \leq 3:1$	3,000	3,363
$3:1 < S \leq 2:1$	4,000	4,500

- G. Ensure the mulch application is uniform and even throughout the seeded area; mulch shall not be bunched or clumped up on the site.
- H. Avoid creating a “shadowing effect” on the site. Apply mulch fiber from opposing directions to the soil surface in successive layers, reducing the “shadow effect” to achieve maximum coverage of all exposed soil. Start mulch applications on the windward side of the project.
- I. Add seed, lime, and fertilizer as outlined in Section XXXXX *SEEDING, FERTILIZING, AND MULCH*.
- J. Ensure seed to soil contact best management practices are utilized. Improved seed germination and establishment can be achieved by improving the seed to soil contact by drilling or broadcasting the seed application prior to HydroStraw[®] Cellulose Fiber Plus Mulch application.

Applying the seed (Hydroseeding) with HydroStraw[®] Cellulose Fiber Plus Mulch at a rate of 1,000 lbs (1,120 kg) or less per acre or hectare during a first pass application is another option. In this situation, the balance of the targeted HydroStraw[®] Cellulose Fiber Plus Mulch rate is applied during the

second pass application to cover the seed and soil creating an ideal environment for seed germination and establishment.

- K. Increased performance can be achieved by infield mixing of hydro-colloid tackifiers such as guar or other binders per the binder manufacturer's recommended rates.

3.3 INSPECTION AND MAINTENANCE

A. Prepare a maintenance plan that includes the following:

1. Reapplication as directed by the ENGINEER to disturbed areas that require continued erosion control.
2. Maintenance of equipment to provide uniform application rates.
3. Rinsing all mixing and application equipment thoroughly with water to avoid formation of residues and appropriate discharge of rinse water.

B. Degradation can be expected to occur as a result of mechanical degradation, chemical degradation, biological hydrolysis, sunlight, salt, and temperature. Where necessary, reapply in accordance with the manufacturer's instructions. Reapplication is not required unless treated soils are disturbed or turbidity or water quality shows the need for an additional application. If treated soils are left undisturbed, the necessity of reapplication shall be determined by the ENGINEER.

C. Payment for the reapplication shall not be made unless the reapplication is approved by the ENGINEER.

PART 4: ACCEPTANCE MEASUREMENT AND PAYMENT

4.1 ACCEPTANCE

Obtain acceptance and approval of HydroStraw® Cellulose Fiber Plus Mulch installation from the ENGINEER. When requested by the ENGINEER, ensure that a manufacturer's representative is on-site to oversee and approve the initial installation. Obtain a letter from the manufacturer approving the installation when requested by the ENGINEER.

4.2 MEASUREMENT

The quantity for the pay item HydroStraw® Cellulose Fiber Plus Mulch is the surface area covered by the hydraulic mulch applied at the recommended rate and is measured by the one-acre (acre) or one-hectare (hectare) unit in-place, complete, and accepted. The installation may require written acceptance by the manufacturer's representative before acceptance for payment.

4.3 PAYMENT

Payment for HydroStraw® Cellulose Fiber Plus Mulch is full compensation for installing the hydraulic mulch as specified or directed by the ENGINEER and includes furnishing, applying, and maintaining the hydraulic mulch including testing and documentation of Quality Control and Quality Assurance programs and all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessary to fulfill the requirements of the pay item in accordance with the Plans, the Specifications, and other terms of the Contract.

END OF SECTION