

7.20 FERTILIZER

Fertilizer shall include the following information on the bag ticket or manufacturer's invoice:

- net weight
- name of the manufacturer and/or distributor
- guaranteed analysis of the fertilizer

These should be checked by the inspector in order to insure correct fertilizer grade and amount. "Fertilizer Grade" refers to the percentages of nitrogen (N), phosphoric acid (P_2O_5) and potassium (K_2O) present. The contractor must furnish a list of the number of containers and a corresponding weight ticket from an approved scale for fertilizer used in the work.

Fertilizer spilled on the ground shall be promptly cleaned up in accordance with *Iowa Administrative Rule 21-44.57(4)*.

7.21 EXAMPLE CALCULATIONS

A. CHEMICALLY COMBINED FERTILIZER

(Note that the examples are in English units only.)

Example No. 1

Specified: 500 pounds of 12-12-12 chemically combined commercial fertilizer per acre. The contractor may furnish an equivalent grade such as 10-10-10, 13-13-13, 14-14-14, 15-15-15, 16-16-16, etc., chemically combined fertilizer. The nutrients in the above grades of fertilizer are of the same ratio (1-1-1).

To calculate the pounds of 13-13-13 fertilizer needed to provide the plant nutrients specified for 500 lbs. of 12-12-12, divide the percent of the required analysis by the percent of the furnished analysis for the same nutrient.

$$\frac{500 \text{ lbs.} \times 12\% \text{ required}}{13\% \text{ furnished}} = \frac{500 (12)}{13} = 462 \text{ lbs. per acre}$$

Therefore, 462 lbs. of 13-13-13 is equivalent to 500 lbs. of 12-12-12.

If hydro-seeder is used, the contractor may furnish each nutrient as a separate material or use two or more chemically combined nutrients.

Example No. 2

Specified: 500 lbs. of 12-12-12 per acre. The contractor may furnish the following fertilizer grades to meet the nutrient requirements: 30-10-0, 16-48-0, and 0-0-60.

- 1) Compute the lbs. of each nutrient required per acre:

$$\begin{aligned} 500 \text{ lbs.} \times 12\% \text{ (N)} &= 60 \text{ lbs. N} \\ 500 \text{ lbs.} \times 12\% \text{ (P}_2\text{O}_5) &= 60 \text{ lbs. P}_2\text{O}_5 \\ 500 \text{ lbs.} \times 12\% \text{ (K}_2\text{O)} &= 60 \text{ lbs. K}_2\text{O} \end{aligned}$$

2) Compute the lbs. of 0-0-60 needed to furnish 60 lbs. of K_2O :

$$\frac{60}{60\%} = \frac{60}{.60} = 100 \text{ lbs. of 0-0-60}$$

3) Compute the lbs. of 30-10-0 and the lbs. of 16-48-0 needed to furnish 60 lbs. of N and 60 lbs. of P_2O_5 :

X = 30-10-0 component Y = 16-48-0 component

a) $N = .30X + .16Y = 60$

$P_2O_5 = .10X + .48Y = 60$

b) Solve equations in (a) simultaneously

$$30 (.30X) + 30 (.16Y) = (30) (60)$$

$$: 9X + 4.8Y = 1800$$

c) $10 (.10X) + 10 (.48Y) = (10) (60)$

$$1X + 4.8Y = 600$$

d) Subtract equation (c) from equation (b) and solve for X.

$$9X + 4.8Y = 1800$$

$$\underline{-(1X + 4.8Y)} = 600$$

$$8X = 1200$$

$$X = 150 \text{ lbs.}$$

e) Substitute X into 1st equation in (a) and solve for Y.

$$.30X + .16Y = 60$$

$$(.30) (150) + .16Y = 60$$

$$45 + .16Y = 60$$

$$.16Y = 60 - 45$$

$$.16Y = 15$$

$$Y = 93.7 \quad (\text{or } 94 \text{ lbs.})$$

- 4) 150 lbs. of 30-10-0 per acre
 94 lbs. of 16-48-0 per acre
 100 lbs. of 0-0-60 per acre

The above quantities supply the nutrient requirements per acre.

B. COLD BLENDED FERTILIZER

Since cold blended fertilizer is now allowed and can be a combination of different ingredients, let's try to understand the basic information first and then perform some calculations to determine if the contractor has brought enough for what is expected. Again, the overall cold blended fertilizer can be from separate ingredients such as Diammonium Phosphate (DAP), Monoammonium Phosphate (MAP), Muriate of Potash, and/or urea. Thus, one needs to understand: (1) what is required; (2) what is in these ingredients; and (3) how much of each ingredient is needed to meet the overall requirements.

Example No. 1

The plan requires 100 pounds of 6-24-24 fertilizer per acre.

The required fertilizer means the fertilizer must have at least:

- 6 pounds of nitrogen (N)
- 24 pounds of phosphoric acid (P_2O_5)
- 24 pounds of potassium (K_2O).

The fertilizer that is brought to the site is a cold mix with DAP and Potash. The DAP by itself is 18-46-0 and the Potash by itself is 0-0-60. The ticket indicates that there are 52.2 pounds of DAP and 40 pounds of Potash per acre for this cold blend.

From the 52.2 pounds of DAP (18-46-0) the amount of nitrogen (N), phosphoric acid (P_2O_5) and potassium (K_2O) can be calculated as follows:

Nitrogen:	$52.2 \text{ pounds} \times 18/100 = 9.4 \text{ pounds}$
Phosphoric acid:	$52.2 \text{ pounds} \times 46/100 = 24.0 \text{ pounds}$
Potassium:	$52.2 \text{ pounds} \times 0/100 = 0.0 \text{ pound}$

From the 40 pounds of Potash (0-0-60) the amount of nitrogen (N), phosphoric acid (P_2O_5) and potassium (K_2O) can be calculated as follows:

Nitrogen:	$40.0 \text{ pounds} \times 0/100 = 0.0 \text{ pound}$
Phosphoric acid:	$40.0 \text{ pounds} \times 0/100 = 0.0 \text{ pound}$
Potassium:	$40.0 \text{ pounds} \times 60/100 = 24.0 \text{ pounds}$

Thus by combining these two products, the overall amounts for nitrogen (N), phosphoric acid (P_2O_5) and potassium (K_2O) are:

Nitrogen (N):	$9.4 \text{ pounds} + 0.0 \text{ pound} = 9.4 \text{ pounds}$
Phosphoric acid (P_2O_5):	$24.0 \text{ pounds} + 0.0 \text{ pound} = 24.0 \text{ pounds}$
Potassium (K_2O):	$0.0 \text{ pounds} + 24.0 \text{ pounds} = 24.0 \text{ pounds}$

This verifies that the provided 92.2 (or $52.2 + 40$) pounds of cold blended fertilizer exceeds the requirement per acre.

Example No. 2

From Example No. 1, let's go one step further. The plan actually requires 500 pounds of 6-24-24 fertilizer per acre. In Example No. 1, the required amount of fertilizer was 100 pounds per acre. Now since the required amount is 500 pounds, the amounts of DAP and Potash, in this case, will have to be multiplied by a factor of 5 ($500/100 = 5$). Thus:

For the required 100 pounds of 6-24-24 fertilizer per acre, it is acceptable to have 52.2 pounds of DAP (18-46-0) and 40 pounds of Potash (0-0-60) cold-blend or total weight of 92.2 pounds.

For the required 500 pounds of 6-24-24 fertilizer per acre, the cold blend must have a least 261 pounds (52.2×5) of DAP and 200 pounds (40×5) of Potash or total weight of 461 pounds.

Example No. 3

Example No. 2 shows the amounts of different ingredients for the cold blend fertilizer with DAP and Potash when the plan requires 500 pounds of 6-24-24 fertilizer per acre (261 pounds of DAP and 200 pounds of Potash). The inspector should recognize that number of acres which are being seeded and calculate the amount of fertilizer that should be spread.

For example: The plan requires 500 pounds of 6-24-24 fertilizer per acre and there are 35 acres that will be seeded. The contractor brings in the cold blend fertilizer with DAP and Potash. From Example No. 2, the following calculations should be done:

DAP amount: (261 pounds/acre) \times 35 acres = 9,135 pounds of DAP

Potash amount: (200 pounds/acre) \times 35 acres = 7,000 pounds of Potash

The inspector can use the same calculation procedure to figure the amounts of different ingredients for the project(s). The following are some quick guidelines to check the amounts **per acre**.

For 500 pounds of 6-24-24 fertilizer per acre with a cold blend with MAP, Urea and Potash, the individual amounts are:

- 231 pounds of 11-52-0 MAP
- 10 pounds of 46-0-0 Urea
- 200 pounds of 0-0-60 Potash

For 500 pounds of 6-24-24 fertilizer per acre with a cold blend with DAP and Potash, the individual amounts are:

- 261 pounds of 18-46-0 DAP
- 200 pounds of 0-0-60 Potash

For 400 pounds of 6-24-24 fertilizer per acre with a cold blend with MAP, Urea and Potash, the individual amounts are:

- 185 pounds of 11-52-0 MAP
- 8 pounds of 46-0-0 Urea
- 160 pounds of 0-0-60 Potash

For 400 pounds of 6-24-24 fertilizer per acre with a cold blend with DAP and Potash, the individual amounts are:

- 209 pounds of 18-46-0 DAP
- 160 pounds of 0-0-60 Potash

For 750 pounds of 13-13-13 fertilizer per acre with a cold blend with MAP, Urea and Potash, the individual amounts are:

- 188 pounds of 11-52-0 MAP
- 167 pounds of 46-0-0 Urea
- 163 pounds of 0-0-60 Potash

For 750 pounds of 13-13-13 fertilizer per acre with a cold blend with DAP, Urea and Potash, the individual amounts are:

- 212 pounds of 11-52-0 DAP
- 129 pounds of 46-0-0 Urea
- 163 pounds of 0-0-60 Potash

For 450 pounds of 13-13-13 fertilizer per acre with a cold blend with MAP, Urea and Potash, the individual amounts are:

- 113 pounds of 11-52-0 MAP
- 100 pounds of 46-0-0 Urea
- 98 pounds of 0-0-60 Potash

For 450 pounds of 13-13-13 fertilizer per acre with a cold blend with DAP, Urea and Potash, the individual amounts are:

- 127 pounds of 11-52-0 DAP
- 77 pounds of 46-0-0 Urea
- 98 pounds of 0-0-60 Potash

Again, the separate amounts are for one acre. The inspector should multiply these amounts by the number of acres being seeded.

7.22 APPLICATION OF FERTILIZER

The fertilized area shall be disced and rolled with a cultipacker prior to seeding. The project engineer may approve the substitution of a harrow if a cultipacker cannot be operated satisfactorily.