Illinois Department of Transportation

# DOCUMENTATION OF CONTRACT QUANTITIES

SPECIFIC TASK TRAINING PROGRAM

S-14

*Conducted by the*

ILLINOIS CENTER FOR TRANSPORTATION (ICT)
AND
IDOT BUREAU OF CONSTRUCTION

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## LINKS

Illinois Center for Transportation (ICT) Doc Class Training Information

Illinois Department of Transportation

Standard Specifications, Supplemental Specifications and Recurring Special Provisions, Construction Manual, Highway Standards, Construction Inspector's Checklists, Project Procedures Guide, IDOT Forms, Work Zone Safety Materials, etc.

Pay Item/ Material Conversion Report

IDOT Materials- Qulified Product Lists

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# Section A

GENERAL REQUIREMENTS

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The policies contained in this section represent the minimum documentation required statewide. Each District may require additional documentation due to conditions specific to the District.

## USE OF THE ICORS FOR DOCUMENTATION

Project records are now maintained on a computer-based system known as the Illinois Construction Records Systems (ICORS). ICORS gives the Resident a computerized Diary and Quantity Book, as well as allowing the generation of a number of documents and reports that replace manually generated reports.

The Documentation procedures for ICORS are the same as for non-ICORS projects, i.e., field books, IDR's, etc. as indicated on under Final Documentation.

ICORS Project Diary (Example page F-3)

Documentation Policy requires the resident's name and signature, and the names and initials of personnel assigned to the project, to be written on the first page of the project diary. In ICORS, this can be accomplished by printing the ICORS diary cover page, and writing the information by hand on that cover sheet. This page is then to be kept in the project files.

If anyone other than the resident makes entries in the diary, they must type in their full name at the end of the day's entry.

The project diary is kept in the ICORS data base, but you must also print the new entries at least weekly. The printed diary pages are to be kept with the signed cover sheet in the project records. An acceptable alternative to this method is to save a snapshot file and store this data on a different CD other than where the contract data is backed up.

Weekly Reports (Example page F-4)

Weekly Reports must be generated every week for Completion Date projects and every week for Working Day contracts not in suspension.

Daily Quantities (Example page F-9)

Quantity documentation is kept on separate source documents (i.e. IDR's, field books, tickets, etc.), and the Daily Quantity (DQ) entry is used only as a means of making entries into the ICORS Quantity Book. The DQ is not a source document. DQ entries must be printed at least weekly and kept in the project records. An acceptable alternative to this method is to save a snapshot file and store this data on a different CD other than where the contract data is backed up.

Quantity Book (Example page F-10)

The Quantity Book is generated only by entries on DQ's. The Quantity Book, the Cover Sheet and the Scale Report must be printed at the end of the project.

Pay Estimates

ICORS Pay Estimates are submitted by e-mail unless the estimate includes a new material allowance. Be sure to check the test estimate prior to submitting the real pay estimate. Do not send the same estimate twice, and do not send consecutive pay estimates within less than five days.

Material Allowances

Material Allowances are generated in ICORS. For new material allowances or additions to existing material allowances, pay estimates must be sent by mail (not email). For these two cases, the hard copy of the estimate, BC-131, BC-49, and invoices must all be submitted together by mail. Subsequent estimates (material allowance decreases or stays the same) should be emailed with the BC-131 file included in the e-mail submittal.

Authorizations

Change authorizations are to be created in ICORS. A complete explanation of the reason for change is necessary for authorization approval. Use a separate attached sheet for this explanation if necessary.

Final Copies

When the project is complete, the following documents should be stored with the job records.

1. A compete hard copy of the Diary. The signed and initialed diary cover sheet must be stored with the complete Diary output.

2. A complete hard copy of the Quantity Book.

3. 2 CD copies of the contract data file.

ICORS Backups

In accordance with Departmental Order 8-2, 4.C.5, users of agency microcomputer systems (including laptops) are responsible for backing up data files stored on local microcomputer disk drive (e.g. C/ drive). The required frequency for backups to be done is any time data files have been appended, altered, modified or created. For personnel using ICORS, a backup must be made once a day any day data is entered into ICORS and a record of this backup must be kept on or with Form BC 2331, ICORS PC Backup Schedule. Detailed instructions are included with Form BC 2331.

## PROJECT DIARY

The Project Diary is one of the most essential records kept on the job. The Resident or a designated representative is required to keep a daily diary on each contract.

The diary must be a bound hardback book, unless using ICORS or CMMS. There must be a separate diary for each contract. Journal type entries must start at the beginning of the diary book. All entries must be in order by date. (No wrap around entries will be allowed.) Preprinted dates may be modified. All entries throughout the dairy must be in ink.

The first entry in the diary must include the year, the name and signature of the Resident (and designated representative, if applicable), the complete official designation of the section, and the name of the Contractor. (Example page F-1) This may seem nonessential, but diaries have been thrown out of court because they were not properly identified.

The District's (or Local Agency's) return address must be noted on the title page so that it may be returned if it is ever lost.

A list of all personnel assigned to the job or who work on the job shall be entered in front of diary (print full name). Each person shall put his/her initials after his/her name.

An entry must be made in the project diary for each day of the project, including weekends and holidays, except when the project is officially suspended. Entries must begin by the official start date or when the Contractor begins work, whichever is first. (Example page F-2)

The diary need not repeat the detailed entries reported on the Inspectors' daily field inspection reports but should contain only general information about these operations. The diary should contain a day to day record of all significant items relating to the project. Since it may become important evidence in future claims or litigation it is essential that the diary be complete.

The diary shall not be used as a Quantity Book or field book; only a reference to the work in progress is sufficient.

A complete legible diary will be accepted in court if the need arises. Diary entries made by the Resident do not need to be signed or initialed. Only entries in a project diary made by someone other than the Resident or designated representative need to be signed by the person making that entry.

Information entered in the diary must never be erased, whited-out, or eradicated in any manner. To correct information already entered, cross out information to be changed. The information changed should be initialed and dated by the person making the change.

A partial list of items to be noted in a project diary is:

1. Weather – project location specific (how the weather affects the controlling item of work).

2. Progress Schedule Controlling Item of Work and actual work done by Contractor's forces during the day.

3. Number of persons working. (The entries should contain enough information to supplement your required monitoring of DBE activities as per 49CFR 26.37(b) of the Code of Federal Regulations).

4. Working days charged (working day contracts), workable days charged (completion date contracts) and reason for partial or non-working/workable days.

5. Traffic control inspections and changes.

6. Important orders, discussions, or meetings with Contractor.

7. Official visitors and inspections.

8. Opening or closing detours, lane closures, changes in lane closures.

9. Work or materials rejected and reasons.

10. Time of shutting down or resuming of work and explanations.

11. Account of any time spent by Contractor's workers or equipment on disputable items of work.

12. The presence of railroad flaggers and whether the Contractor is to be reimbursed for their services.

13. Length and cause of any delay.

14. Arrival and departure of major equipment.

15. Record of important faxes and telephone calls.

16. Unusual conditions, if any, such as high water, bridge failures, slides, accidents/injuries, etc.

17. Approval for extra work, unless documented elsewhere, such as a prior approval authorization (BC 2256) or an RE memo attached to the authorization for the extra work pay item.

18. Field review with prime and affected subcontractor personnel to determine the timing and placement of erosion/sediment control measures per Construction Manual Section 280 for projects involving these measures.

19. Discussion regarding any specific safety related instruction given to field staff.

At the completion of the project, the diary shall be filed as part of the permanent job records.

## THE QUANTITY BOOK

Instructions pertaining to contract quantities are found in Article 104.02 and Section 109 in the Standard Specifications and the Method of Measurement and Basis of Payment articles for each construction pay item.

For each contract you will be issued a Quantity Book in which contract items are to be posted. The Quantity Book is to be considered the keystone of the complete record keeping structure you will be building in the field. The daily quantities posted here will be referred to when each pay estimate is prepared. (Note: For projects using CMMS, the Quantity Book shall be electronic within CMMS.)

**Title Page (Form BC 623)** – Example page F-5. The title page in the Quantity Book shall either be filled in by a rubber stamp, typewriter or neatly printed in ink. For state-run projects, the "Address" at the bottom of the page refers to the District in which the project is located. For Local Agency projects (county, city etc.) the address should be that of the local agency.

**Index of Sheets (Form BC 624)** – Example page F-6. The computerized index is prepared in the same item-to-item order as the first pay estimate. If additional line items are later added to the contract, they can be added at the end of the index, under the appropriate fund type.

**Quantity Record (Form BC 625)** – Example page F-7. The job designation block and the upper left-hand side of Form BC 625 will be filled in by a computer run following project award. A separate filled in sheet will be provided for each pay estimate line item. These extra sheets will require the Resident to fill in by hand the complete job designation and quantity information. The lines provided for authorization additions and deductions are to be filled in as authorizations are submitted and approved. The final total quantity in the authorization box should be identical to the final measured and approved amount completed and accepted.

The column headed "Date" should be the dates the quantity was placed.

The "Station to Station, Location, or Description" shall describe the actual area where this item was placed.

Quantities placed are to be kept daily when this particular pay item is constructed. The column "To Date" shall show the accumulative total of this item as additional days of work are entered. This will facilitate the checking of material inspection reports and plan quantities for additions and deductions so that BC 22's may be kept current.

When the pay item is complete, the quantity shall be marked final after the last entry on the quantity book page.

"Evidence of Material Inspection" – An entry must be made in this column each time an entry is made in the quantity column. Evidence of material inspection, as described in the *Project Procedures Guide*, shall be such items as a State of Illinois stamp number, inspection report, plant report, or other information, written or verbal, to indicate that the material is satisfactory. When the information is verbal, it should be recorded in the Project Diary. The Resident should follow up any verbal approvals with written acceptance verification for his/her project files. The evidence of inspection required in the *Project Procedures Guide* should be strictly adhered to for both Progress and Final Documentation and must lead to a verifiable source of the information required. All delivery tickets shall be retained in the project files.

Also, the District's Certification of Materials, which is prepared when the project is finalized, can be expedited if the inspector would list under "Evidence of Material Inspection" such additional information as: the name of the plant, quarry or manufacturer of the material together with any identifying marks, imprints, or tags on the material. In any case, the name of the producer of the material must either be noted in this column, or cross-referenced in the project files. For example, if evidence of material inspection is noted only as "Approved Source & Tickets," then the producer's name must be noted on the delivery tickets. If the producer's name is not noted on the tickets, then it must be noted with the evidence of material inspection in the Quantity Book.

"Source of Progress Documentation" – Except for Lump Sum, Each, and Calendar Month items, each entry in the Quantity Book must be supported by either progress or final documentation. This column is to be used to cross reference to the source document. The Quantity Book is the start of the audit trial for all information required to support all progress and final payments for each item.

"Source of Documentation for Final Quantity" – Except for Each, Lump Sum, and Calendar Month items, this area must sufficiently identify the source documents which support the final quantity for this item. This area shall also be used to cross reference to other supporting documentation such as depth checks.

**Inspection Reports (Form BC 625)** – Example page F-8. On the opposite side of Form BC 625, within the block titled INSPECTION REPORTS, it is acceptable to record a statement such as "See MISTIC Form MIRC08, file" or directly log the quantity. Periodically, the quantities of materials shown on these MIRC08 printouts should be compared to the quantities actually used. The District Materials section should be contacted if insufficient quantity of inspected material is being assigned to your project.

For items in which a weight scale is used to determine the final quantity, the top of this page will be used to record the information on the scale decal placed by the *Department of Agriculture*. (See Documentation of Pay Quantities based on Weight Tickets)

## FIELD INSPECTION REPORTS/SOURCE DOCUMENTATION

Each inspector is to provide a concise, accurate, daily account of the contractor's work so it may be recorded and furnished to the Resident at the end of each working day. This record is to be completed by the inspector actually doing the inspection for the Resident and filed in project records. This record may be documented using any of the appropriate documents listed under Final Documentation later in this section.

Source documentation is required for all quantities of work for which payment will be made. The source document shall contain all information necessary to identify the contractor or subcontractor performing the work, date work as completed, location of work, quantity of work completed and depth checks (if required). The document can also be used to record material inspection. The source document shall also contain initials and dates for all parties involved in inspecting and measuring the work and calculating and checking the quantity of work completed. This information may be documented using any of the appropriate documents listed under the Final Documentation later in this section.

When the BC 628 Inspector's Daily Report/IDR (Example page F-23) is used to document the work, the completed BC 628's shall be kept in chronological order and filed in a binder.

When a field book is used to document a pay item, all quantities for that particular pay item should be kept in consecutive pages in the field book, and the field book index kept up to date.

When a calculation file is used to document a pay item, all quantities for a particular pay item shall be kept in consecutive pages and filed, with pay item number and cross references clearly marked. In addition, if an individual document includes more than one (loose-leaf) page, then each page should indicate that it belongs to the same document. This could be indicated, for example, by noting such information as the date, IDR number or "page _ of _."

When weight tickets are used to document a pay item, all tickets pertaining to that pay item shall be kept separately from other project tickets (i.e. separate envelopes).

## FIELD BOOKS

All field books that are to become part of the permanent job records will conform to the following:

1. The field books will be hard cover bound books.

2. The inside cover must show the complete project designation (job stamp) and the return address for the District (or local agency).

3. If more than one field book will be included in the projects records, the cover must also show identification (for example, F.B. #1) for cross-referencing purposes. The outside cover also should show the project designation.

4. An index of pages must be completed for the final records. The index must contain enough detail to show the reviewer the contents and general location of the contents in the field book. (Example page F-11)

Use of a field book is required for:

1. Permanent survey records, layout records and cross-sections

2. Concrete Superstructure pour summary (Example page F-12)

Field Book required when not using forms:

3. PC Concrete paving summary (Example page F-13), or Form BC 2531 (Example page F-15, 16)

4. Hot-Mix Asphalt (HMA) paving summary (Example page F-14), or Form BC 2529 (Example page F-17,18)

QC/QA projects do not eliminate the documentation requirements above for PCC and HMA Paving. The use of field books for other types of records is optional.

## INITIALS AND DATES

All documents will include the initials of the person (or persons) who performed each of the tasks involved in inspecting and documenting the work, as well as the date (or dates) each task was performed. "Inspected by" initials and dates are optional. "Measured by", "Calculated by" and "Checked by" are required. Initials and dates must be hand-written on all hard copy source documentation. Each person will initial his/her own work, except that when more than one person performs the same task, one of those persons may also record the initials of each of the other persons involved in that task.

Electronic initials and dates are allowed on electronic source documents in the Construction Materials Management System (CMMS).

When a document refers to another document, the referencing document does not need to repeat the initials and dates shown on the referenced document.

## **PLAN QUANTITY ACCEPTANCE**, Example pages F-20-22

As stated in Article 109.02, payment to the Contractor will be made only for the actual quantities of work performed and accepted or materials furnished in accordance with the contract. Most final pay quantities will be based directly on measurements and calculations performed by the Resident in the field. However, for a number of pay items, the Method of Measurement specified in the contract documents allows the Department and the Contractor to agree in writing that the plan quantity is accurate and will be used for the final quantity; see Article 202.07(a).

This agreement is based on three points: (1) the plans accurately reflect the existing jobsite conditions, insofar as existing conditions will affect the final quantity of the agreed to items; (2) the plan quantity was accurately calculated; and (3) the work will be built to the lines, grades and dimensions shown on the plans, insofar as they pertain to the pay quantity of the agreed to items.

Form BC 981, Agreement on Accuracy of Plan Quantities is to be used for this agreement. This form lists most of the items in the Standard Specifications for which agreement to contract quantities is permitted. Extra spaces are available on the form for other items allowed by the contract documents. Form BC 981M may be used for metric contracts. In accordance with the Specifications, this agreement must be in writing for any given item before any work is started which would affect the measurements for that item.

The main purpose of the BC 981 is to save the Resident time in documenting the accuracy of the final quantity paid to the contractor. The BC 981 is an acknowledgement that for certain items, at least, it is possible to determine during the design phase accurate final pay quantities. The Regional Engineer's signature on the BC 981 indicates that the Regional Engineer is satisfied that with the quality controls in place in the district the quantities agreed to are accurate.

Even with these controls, however, errors are still possible, and the Specifications make two provisions for this. First, if the plans have been altered or some other development arises which calls into question the applicability of the plan quantity, either party has the right to request in writing and thereby cause the quantities involved to be measured.

Second, if an error has been discovered after the work has started, then that portion of the quantity which is affected by the error will be measured and the final quantity will be adjusted accordingly. In order for this provision to apply, however, the plans must distinguish where the individual quantities apply. This situation could arise, for example, if the plans indicate the quantity of trench backfill required for each run of storm sewer. If the layout for one of the runs is altered then the trench backfill would have to be measured for that run only, and the final quantity for trench backfill would be adjusted by the measured difference for that run.

For items agreed to, the source of documentation for final quantity noted in the Quantity Book will be "BC 981." If errors are found or changes are made to the plan quantity after the work has begun on an agreed item, adjustments to the plan quantity must be documented with appropriate measurements. The final pay quantity will then be the agreed plan quantity plus or minus the documented adjustment to the plan quantity. In this case, the source of documentation for final quantity noted in the Quantity Book is the BC 981, as well as the measurements and calculations used to document the adjustment to plan quantity.

Even though the BC 981 is signed in the office, the Resident is responsible for administering the agreement correctly. When the Resident cites the BC 981 as the source of documentation for the final quantity, the Resident is stating that the three points mentioned above have been satisfied. The BC 981 is merely an alternate means of documenting the accuracy of final pay quantities; it does not mean that the Resident can ignore the actual quantities of work performed.

As the work progresses on the agreed to items, the Resident should be aware of how the estimated progress quantities compare to the plan quantities. If the estimated payments are disproportionate to the Contractor's actual progress on the items, then the Resident should investigate the reason for the discrepancy.

For some of the items for which the Standard Specifications allow agreement to contract quantities, such agreement may not be appropriate in all situations. In general the following restrictions apply:

- Granular backfill, such as PGE, for undercuts must be measured by before and after cross sections. If the plan quantity for excavation includes undercut for PGE, then the excavation quantity may be agreed to only if the plans distinguish the undercut quantity from the rest of the excavation. In this case, the estimated undercut quantity should be noted on the BC 981, and it will be adjusted for the actual measured quantity.

- If the plans contain both earth and rock excavation, and they are contiguous, plan quantities cannot be accepted for the rock excavation unless the unit prices for earth and rock excavation are the same. Otherwise, it will be necessary for the actual quantity of rock excavation to be determined by before and after cross sections. Then, the previously agreed plan quantity of earth excavation will be adjusted by the measured difference in rock excavation. As with the undercut example above, the plan estimate for rock excavation should be noted on the BC 981.

- Plan quantity shall not be agreed to for any item for which the unit of measure is TON (M TON).

## PROGRESS DOCUMENTATION

In order to properly document the quantities shown on partial payment estimates, progress entries in the Quantity Book are required. These daily quantities can be based upon either estimates or final measurements. In either case, progress documentation must be kept on file (preferably on the Inspector's Daily Report or in a field book) to indicate how the quantity was established. Make cross-reference notes in the Progress Documentation Source column of the Quantity Book.

The following guidelines can be used in establishing estimated quantities. Quantities that are estimated should be labeled as such. If a method other than one of those shown below is used to estimate a quantity, the method must be documented, clear and reasonable.

**Excavation Pay Items** – cubic yard (cubic meter)
Example pages D-1, F-23, 24

(1) Estimate percentages of plan balance quantities

(2) Upgrade quantities as balance volumes are completed, or

(3) Use load counts, when available. Use 80% of struck capacity.

(4) Other.

**Concrete Items** – cubic yard (cubic meter)
Example page F-26

(1) Extract the daily volumes from your Computation Check file

Or

(2) Use a reasonable percentage (typically 90%) of actual delivered concrete.

(3) Upgrade each completed structural item with the plan Bill-of-Materials quantity

(4) Other.

**Reinforcement Bars** – pounds (kilograms)
Example page F-26.

(1) Establish a lbs/yd³ (kg./m³) factor from plan quantities; use it as concrete volumes are placed or as the bars are tied in place.

(2) Upgrade each completed structural item with the plan Bill-of-Materials quantity

(3) Other.

**Pipe Pay Items** – feet (meter)
Example page F-27

(1) Count and record pipe sections as installed.

(2) Upgrade completed runs with plan quantities

**Length and Area Pay Items** – feet, sq. ft., and sq. yd. (meter and sq. meter)

(1) Base computations on paced dimensions

(2) Station to Station staked dimensions

(3) Plan quantity schedules

**Sodding** – sq. yd. (sq. meter)

(1) Pay 25% upon placement of sod

(2) Pay 75% upon acceptance of sod

(3) Refer to Article 252.12 and 252.13

**Each and Lump Sum Items**

If payment is to be made when the item is partially completed, record station or location, date and estimated percentage of completion in the Quantity Book.

For **Traffic Control** items, the following procedure is to be used to estimate progress payments (Example page F-28):

- Except for temporary bridge or traffic signals, when the traffic control devices required by the standard or special provision are installed, pay 25% of the lump sum (or each) bid price. On subsequent pay estimates, prorate 65% of the price, based on the actual vs. expected time of usage according to the progress schedule. When the devices have been removed the remaining 10% will be paid.

  When it appears, (due to less than anticipated quantities of work performed), a negative adjustment to a traffic control pay item will be required per Article 701.20 (a) of the SSRBC, the Engineer shall make appropriate adjustments to the estimated progress payments noted above, in order to minimize the amount of overpayment to the contractor, until such time as final payment and required adjustments for the traffic control pay item are determined.

- For temporary traffic signals and temporary bridge signals, pay 60% after initial installation is complete and the signals are operating. The remaining 40% will be paid after the temporary signal installation has been completely removed.

**Blasting Residue Containment Disposal**

(Lump Sum) includes numerous contractor submittals, preliminary testing, specialized equipment, regulated disposal and extensive documentation, so the contractor is to be paid in accordance with the following schedule. However, the full amount should not be paid until all of the required disposal documentation has been submitted to the Engineer.

- Pay 30% on the first day of paint removal operations
- Prorate 50% as removal is completed
- Pay final 20% when all disposal documentation has been completed and the final testing is completed.

**Topsoil Excavation and Placement** (Example page F-29)

Since this pay item pertains to that material obtained from within the limits of the right of way and is measured in cubic yards (cubic meters) in its original position, for progress documentation purposes it may be necessary to pay 50% of the volume computed by method of average end areas in its original position upon completion of the excavation. The remaining 50% of the volume shall be paid after the placing and finishing of the topsoil to the lines, grades, and the minimum thickness shown on the plans.

## ITEMS THAT MUST BE FINAL MEASURED

While payments for most items can be estimated under some circumstances (see Construction Manual Section 109), some types of work require that the final measurements be taken each day. Information needed to determine final quantities for such pay items must be obtained at the time the work is done as it will be difficult or impractical to compute quantities with the acceptable accuracy at a later date. Examples: removal items, piling, most weight ticket items, trench backfill, and similar items which, when covered, are impossible to measure later.

## USE OF COMPUTERS FOR FINAL DOCUMENTATION (Example page F-30, 31)

The use of computers to determine final quantities is encouraged especially for excavation quantities, reinforcement bars and area items. If computer printouts are used to support pay item quantities paid, the following information is required for proper documentation:

A. Compiled calculation programs verified and approved for use by the District.

   1. Pay item number and description, with contract number (or job stamp).

   2. Printout of the input data, initialed and dated by the person who checked the input;

3. Hard-copy of the results.

B. Electronic spreadsheets

1. Printout of the spreadsheet. The printout must show:

   a. Pay item number and description, with contract number (or job stamp).

   b. Input data

   c. Description of how the results are calculated (e.g. sample formulas)

   d. Calculation results, with page subtotals (if applicable)

   e. Cross-references to any other referenced documents

2. The hard-copy of the spreadsheet must be manually initialed and dated by:

   a. The person who prepared the spreadsheet, and

   b. The person who checked the spreadsheet printout or the person who checked the formulas embedded in the spreadsheet. (i.e. “Prepared by:” and either “Checked By” or “Formulas Checked By” initials and dates.)

   In addition, if field measurements are entered directly in the spreadsheet, the printout must include “Measured By” initials and dates.

C. Other programs, not verified and approved for use by the Department. Because the Department has no way of knowing the accuracy of other programs, the following general rules apply:

1. A record of the original field measurements (if applicable) must be included in the project files.

2. The measurements, or a computer-interpolated version of the measurements, must be in the same format as would normally be required if the measurement had been recorded manually (e.g. station, offset and elevation for cross-section data, or length and width for rectangular field measurements). In other words, the raw data must be in, or be put in, a format that could be understood by the reviewer;

3. The program must be identified, including version numbers;

4. Input data, if entered manually, must be checked;

5. The preparer may be required to demonstrate that the results are correct. This may be accomplished by manually calculating a sample of the results, under the supervision of the Department.

6. All other documentation requirements shall apply.

The documentation for each item shall be kept on file and marked with the item number for easy cross reference.

## EXTRA WORK (ARTICLE 109.04)

Extra work will be paid for at either the contract price, a lump sum price or agreed unit prices, or on a force account basis. (See Construction Memorandum No.9, "Force Accounting Article 109.04" and Construction Memorandum No. 4, "Authorization of Contract Changes Articles 104.02 and 109.04")

Agreed Unit Price Items:

To establish a new unit price item will require a copy of the correspondence from the Contractor and an answering authorization from the Engineer. A memorandum from the District Estimator agreeing with the Contractor's proposed unit prices is also necessary. In order to expedite the review and processing of an AUP request by the District Estimator, if higher than typical bid prices for a given type of work effort are requested by the contractor, justification for the higher costs (confined work area, lower production rates, small quantities, limited availability of material, etc.) should be clearly documented in the contractor's request.

Force Account:

The Engineer must have copies of:

(a) Proper authorization.

(b) Daily copies of Form BC 635, Extra Work Daily Report, prepared by the Resident or Inspector, jointly signed with the contractor, recording labor, equipment, and material used. In limited cases, more than one day's work will be allowed on a BC 635, but only when the workers, equipment and time do not change from day to day.

(c) Contractor's bill. The format should be in accordance with the sample bill shown in Construction Memorandum No. 9, Force Account Billing.

(d) Balancing authorization.

## MATERIAL ALLOWANCE

Example page F-32 & F-33. Payment may be made for materials such as fabricated structural steel on the basis of a material allowance if the Contractor requests payment for materials in storage. (See Article 109.07 of the Standard Specifications, and Construction Manual Section 109).

The pay estimate should be accompanied by Form BC 49, Materials Allowance Affidavit; Form BC 131, Statement of Material Allowances; and material supplier invoices and freight bills.

Within 60 days of payment to the Contractor we need copies of proof that the Contractor has paid for the material. Rubber stamp "Paid" will not do. In the event the Contractor does not provide the Resident with proof of payment (copy of cancelled check or copy of paid invoice signed and dated) for the material within 60 days of receipt of the payment, the dollar figure entered on the next pay estimate should be reduced by the value of the subject material. As a rule of thumb, the Resident may use a time limit of 70 days from the date the pay estimate was mailed, to account for processing time and time spent in the mail. See the Forms Section for specific instructions for preparing Forms BC 49 and BC 131.

## MAXIMUM PAYMENT

Example page F-34, 35. Throughout the Specifications there are numerous references to pay items on which final payment cannot be made for more than __% of the amount specified by the Engineer. The following is a listing of Pay Items and the applicable percentages that limits maximum payment. (Generally, maximum payment percentages apply only to those Pay Items paid for on the basis of volume or weight.)

**Items With "Maximum Pay" Percentages**

| | | |
|---|---|---|
| NITROGEN FERT NUTR | POUND (KILOGRAM) | 103% |
| PHOSPHORUS FERT NUTR | POUND (KILOGRAM) | 103% |
| POTASSIUM FERT NUTR | POUND (KILOGRAM) | 103% |
| AGG SHLDS (A or B) | TON (M TON) | 108% |
| AGG SURF CSE (A or B) | TON (M TON) | 108% |
| AGG BASE CSE (A or B) | TON (M TON) | 108% |
| AGG BASE CSE REPAIR | TON (M TON) | 108% |
| INCIDENTAL HMA SURFACING | TON (M TON) | 103% |
| HMA BIND CSE | TON (M TON) | 103% |
| HMA SURF CSE | TON (M TON) | 103% |
| MIX FOR CR, JTS & FLGWYS | TON (M TON) | 103% |
| LEVEL BIND (MACH & HAND) | TON (M TON) | 103% |
| BIT MATLS (PRIME CT) | GAL or TON (LITER) | 105% |
| BIT MATLS (TACK COAT) | POUND | 105% |
| BIT MATLS (COVER & SEAL CTS) | GAL or TON (LITER) | 105% |
| COVER COAT AGG | TON (M TON) | 110% |
| SEAL COAT AGG | TON (M TON) | 110% |
| GRANULAR EMBANKMENT SPECIAL | TON (M TON) | 108% |
| POROUS GRANULAR EMBANKMENT | TON (M TON) | 108% |
| AGRICULTURAL GROUND LIMESTONE | TON (M TON) | 108% |
| SUBBASE GRANULAR MATL, TY (A, B, or C) | TON (M TON) | 108% |

**Daily yield checks should be run on these items so that the Contractor can be notified when he/she is exceeding the maximum specified amounts of quantity. The limit of the final amount paid shall be plan quantity plus (or minus) theoretical quantities approved by authorization, multiplied by the above percentage.**

## YIELD CHECKS (Example page, F-14)

A yield check is a calculation to determine if the correct amount of material was used in the work:

$$\text{Yield (\%)} = \frac{\textbf{Quantity of material delivered}}{\textbf{Theoretical quantity required}} \times 100$$

Frequent yield checks are a good engineering practice, and they may help uncover problems in the work early in the project. Yield checks documented by inspectors provide a timely and valuable source of information to the Resident.

While performing yield checks are highly recommended for all materials used in the work, they are required to be documented for the following items:

| Item | Frequency |
|---|---|
| HMA Paving | Frequently, each day of paving |
| PC Concrete Paving | At end of each day of paving |

Also, many items include materials for which the contract specifies the application rate of the material. Ensuring the correct application of such a material is an important part of inspecting and approving the pay item work. The Resident's signature on the pay estimate assures the Department that the materials and procedures used were in accordance with the specifications for each pay item paid for on that estimate. Application rates are recommended, but not required, to be documented explicitly. However, there must be enough information in the project records that the application rate can be verified if the need arises.

## THICKNESS DETERMINATION SCHEDULE (Example page, F-36)

In order to clarify the requirements for thickness determinations, we have compiled data from the *Project Procedures Guide*, the Standard Specifications and the Supplemental Specifications into an attached Thickness Determination Schedule. The Schedule refers to the specification article, the minimum frequency for making checks, the source documents for recording the thickness and the method of measurement. It should be pointed out that minimum checking may not be sufficient to verify plan thickness and should be increased as conditions dictate. There are many time-honored engineering methods for determining thickness; i.e., before and after rod and level shots, before and after stringline measurements, direct probe, and measurements of density holes. All are acceptable. **Blanket statements such as "all sidewalk was 4 inches (100mm) or deeper" and "all patches were 9 inches (225 mm)" are NOT acceptable. Actual measurements must be recorded**. In addition, some items such as full-depth HMA and PCC pavement require that cores will be taken and measured by other than project personnel. This coring will be the responsibility of the Contractor, at locations determined by the Resident. (See Construction Manual Art. 407.10-4(b)).

Thickness deficiencies identified by the Resident during construction should immediately be brought to the attention of the Contractor and corrective actions taken. Thickness deficiencies identified during coring will require adjusted prices or removal and replacement per the Standard Specifications. Large contract deductions or removals are the Department's last resort and are a source of embarrassment to both the Contractor and the Department. Special care must be exercised in urban, curbed areas where corrective actions are limited.

The schedule also includes miscellaneous items marked "All Others." This category covers many square foot and square yard (square meter) and foot (meter) items. Control and documentation of the depth of these items are also very important and should be handled in the same manner as all other items listed.

The location of where the thickness determinations were taken, along with the results, should be clearly noted on the source document. The location of the source document, whether it be field books or IDRs, must be clearly indexed and referenced through the Quantity Book. Many of the problems encountered in verifying thickness checks are in the locating and identifying them in the project records. Please have the source document properly cross-referenced.

Thickness determinations are a department policy requirement. The use of proper procedures for thickness determinations will significantly reduce the chances for unacceptable work.

| TYPE OF CONSTRUCTION | SPEC. REFERENCE | MINIMUM FREQUENCY | DOCUMENT RECORD | METHOD OF MEAS. |
|---|---|---|---|---|
| BASE COURSES | | | | |
| Agg Base Course | 351.06 | 1000 lf (1 per 300 m) | F.B., IDR | 1/ |
| PCC Base Course | 420.15 & C.M. 43 | 250 lf (1 per 75 m) | F.B., IDR * | 1/, 2/ |
| PCC Base Course Widening (under 6') | 354.09 | 1000 lf (1 per 300 m) | F.B., IDR * | 1/, 2/ |
| HMA Base Course | 355.09 | 250 lf (1 per 75 m) | F.B., IDR * | 1/, 3/ |
| HMA Bse Cse Wid. | 356.07 | 250 lf (1 per 75 m) | F.B., IDR * | 1/, 3/ |
| Soil – Cement | 352.17 | 1000 lf (1 per 300 m) | F.B., IDR | 1/ |
| SUBBASES | | | | |
| Subbase Gran Matl | 311.07 | 1000 lf (1 per 300 m) | F.B., IDR | 1/ |
| HMA Agg Mixture | 312.14 | 250 lf (1 per 75 m) | F.B., IDR | 1/, 10/ |
| Cement Agg Mixture | 312.14 | 250 lf (1 per 75 m) | F.B., IDR | 1/, 9/ |
| Pozzolanic Agg Mixture | 312.14 | 250 lf (1 per 75 m) | F.B., IDR | 1/, 9/ |
| Cement Agg. Mixt. II | 312.14 | 250 lf (1 per 75 m) | F.B., IDR | 1/, 9/ |
| PAVEMENT & SURFACE COURSES | | | | |
| Agg Surface Course | 402.06 | 1000 lf (1 per 300 m) | F.B., IDR | 1/ |
| PCC Pavement | 420.15 & C.M. 43 | 250 lf (1 per 75 m) | F.B., IDR * | 1/, 4/ |
| HMA Full Depth | 407.10 | 250 lf (1 per 75 m) | F.B., IDR * | 1/, 5/ |
| Pavement Removal | 440.07 & Suppl. Specs | 1 per location or when thickness changes | F.B., IDR * | 1/ |
| SHOULDERS | | | | |
| Agg Shoulders | 481.06 | 1000 lf (1 per 300 m) | F.B., IDR | 1/ |
| PCC Shoulders | 483.07 | 250 lf (1 per 75 m) | F.B., IDR * | 1/, 7/ |
| HMA Shoulders | 482.06 | 1000 lf (1 per 300 m) | F.B., IDR | 1/, 8/ |

| TYPE OF CONSTRUCTION | SPEC. REFERENCE | MINIMUM FREQUENCY | DOCUMENT RECORD | METHOD OF MEAS. |
|---|---|---|---|---|
| PATCHING | | | | |
| HMA Patching | 442.11 | 1 per patch | F.B., IDR | 6/ |
| PCC Patching | 442.11 | 1 per patch | F.B., IDR | 6/ |
| ALL OTHERS | | | | |
| PCC Sidewalk | 424.13 | 1000 sf (1 per 100 m²) | F.B., IDR | 1/ |
| PCC Slopewall | 511.06 | 1000 sf (1 per 100 m²) | F.B., IDR | 1/ |
| PCC Median | 606.15 | 1000 sf (1 per 100 m²) | F.B., IDR | 1/ |
| PCC Curb, Gutter, Combination Curb & Gutter | 606.15 | 250 lf (1 per 75 m) | F.B., IDR | 1/, 11/ |
| PCC Paved Ditch | 606.15 | 250 lf (1 per 75 m) | F.B., IDR | 1/ |
| Top Soil | 211.08 | 2500 SY(1 per 2090m²) | F.B., IDR | 12/ |
| Lime Modified Soil | 310.15 | 1500 ft. (1 per 450m) | F.B., IDR | 12/ |
| Thermoplastic Pvt. Mkg. | 780.13 | Once per size, per color | F.B., IDR | 1/ |
| Pay Items where a specific thickness is required and the Method of measurement is not by volume or weight | | | F.B., IDR | |

Note: Thickness check shall include the entire typical cross section at the locations designated.

* Cores required: In addition to making field thickness measurements, the District may cut cores and make independent measurements. The core results will be the basis for adjustment in unit prices for deficient pavement.

1/ Thickness determinations shall be documented by before and after cross sections or before and after measurements from an established reference elevation such as a stringline, form line or edge of pavement.

2/ Thickness determinations will be made during (in the plastic state) and after placement of the material and recorded at the frequency shown in this table. Thin base course, as determined by core measurements, will require an adjustment in the contract unit price as per Art. 420.15.

3/ Thickness determinations will be made during and after placement of the material and recorded at the frequency shown in this table. Thin base course, as determined by core measurements, will require an adjustment in the contract unit price as per Art. 420.15.

4/ Thickness determinations shall be made during (in the plastic state) and after placement of the material and recorded at the frequency shown in this table. Thin pavement, as determined by core measurements, will require an adjustment in the contract unit price as per Art. 420.15.

5/ Subgrade shall be checked after trimming from an established reference elevation such as stringline. All thickness checks shall be recorded at the frequency shown in this table. Thin pavement, as determined by core measurements, will require an adjustment in the contract unit price as per Art. 407.10.

6/ Thickness shall be determined by measurements from the existing edge of pavement or form line.

7/ Thickness determinations shall be made during (in the plastic state) and after placement of the material and recorded at the frequency shown in this table. Shoulder areas less than 90% of the plan nominal thickness shall be removed and replaced in accordance with Art. 483.07.

8/ Thickness determinations shall be made during and after placement of the material and recorded at the frequency shown in this table. Shoulder areas less than 90% of the plan nominal thickness shall be brought to the proper thickness by placing additional shoulder material or by complete removal and replacement of the deficient shoulder area. However, the final shoulder elevation shall not exceed the plan elevation or elevation established by the Engineer by more than ⅛ in. (3 mm).

9/ Thickness determinations shall be made during and after placement of the material and recorded at the frequency shown in this table. Subbase areas less than 90% of the plan nominal thickness shall be brought to the nominal thickness by increasing the thickness of the PCC pavement or by removal and replacement with new mixture. When continuously reinforced concrete pavement is to be constructed, correction shall be removal and replacement only. However, the surface elevation of the completed subbase shall not exceed the surface elevation of the completed subbase shall not exceed the surface elevation shown on the plans or established by the Engineer by more than 3/16 in (5 mm).

10/ Thickness determinations shall be made during and after placement of the material and recorded at the frequency shown in this table. Subbase areas less than 90% of the plan nominal thickness shall be brought to the nominal thickness by increasing the thickness of the PCC pavement, by placing additional bituminous aggregate mixture or by removal and replacement with new mixture. When continuously reinforced concrete pavement is to be constructed, correction shall be removal and replacement only. However, the surface elevation of the completed subbase shall not exceed the surface elevation shown on the plans or established by the Engineer by more than 3/16 in (5 mm).

11/ Thickness may be determined at the edge of pavement, back of curb, slipform template, or any other location at which the thickness of the item can be verified.

12/ Thickness determinations shall be documented by before and after cross sections or before and after measurements from an established reference elevation such as a stringline, form line or edge of pavement or by measuring the depth in a hole dug in the completed work, or when IBV's are conducted indicating the depth of acceptable subgrade improvement.

## CROSS-SLOPE DETERMINATION REQUIREMENT FOR SIDEWALKS

(Example page F-36) In order to verify compliance with Americans with Disabilities Act (ADA) requirements, cross-slope checks on sidewalks are of utmost importance. Although it must be understood that it is essential to *verify* grade and slope measurements on all sidewalk and other pedestrian circulation paths, the following represents the minimum frequency required for *recording* cross-slope measurements. Similar to the *Thickness Determination Schedule*, **blanket statements such as "All sidewalk cross-slopes measured less than 2 percent" are not acceptable. Actual measurements must be recorded.** It should be pointed out that minimum checking as stated herein may not be sufficient to verify plan slopes. The frequency of checking and documenting cross-slopes should be increased as conditions dictate, and each district may require more stringent documentation requirements than represented here. Slope deficiencies identified by the Resident during construction should immediately be brought to the attention of the Contractor and corrective actions taken. The location of where the cross-slope determinations were taken, along with the results, should be clearly noted on the source document, or cross-referenced to another document. Sidewalks shall have cross-slope determinations documented every 1000 sf, the same as the current thickness determination requirement frequency for sidewalk.

## DOCUMENTATION PROCEDURES FOR CONSTRUCTION ENGINEERING PERFORMED BY CONSULTANTS

Refer to Construction Memorandum 61 for detailed procedures regarding Consultant Construction Engineering Services.

## REGULATED SUBSTANCES MONITORING

The '*Removal and Disposal of Regulated Substances (BDE)*' special provision, under 669.11, Basis of Payment, states 'Regulated substances monitoring, including completion of form BDE 2732 for each day of work, will be paid for at the contract unit price per calendar day, or fraction thereof to the nearest 0.5 calendar day, for REGULATED SUBSTANCES MONITORING.'

For documentation purposes, the guideline is as follows: If monitoring activities occur for 4 or more hours on a given calendar day, pay 1.0 CALENDAR DAY. If monitoring activities occur for less than 4 hours, pay 0.5 CALENDAR DAY. In no case should there be more than 1.0 calendar day paid on a given calendar day. In all cases, payment is also based on the receipt of Form BDE 2732, 'Regulated Substances Monitoring Daily Record'.

## DOCUMENTATION OF PAY QUANTITIES BASED ON WEIGHT TICKETS

Pay quantities established based on truck weight tickets are not directly measured by Department representatives. For this reason, the following steps are taken to ensure that the quantities shown on the weight ticket are accurate:

1. The total weight of a truck cannot be obtained by adding separate axle weightings (see Obtaining Tare and Gross Weights of Trucks below).

2. The scale must be checked by the Department of Agriculture (DOA). In accordance with the DOA's Bureau of Weights and Measures Inspection Program, permanent scales are to be checked during each period of 12 months, which means that the scale is inspected at some time within each calendar year. Temporary scales are to checked at each setup. A check by a DOA-approved commercial scale company will be acceptable if the DOA is unable to provide a current inspection. The date on the decal, identification number on the decal and location of the scale shall be recorded in the Quantity Book. **No payment is to be made for items measured on an unapproved scale.**

3. A State representative should be at the scale to witness the weighing and initial the tickets. This requirement may be waived under certain conditions (see Daily Tare Weights, Automatic Ticket Printers, Weekly Independent Weight Checks, and Small Quantities).

4. Every effort should be made to personally collect and initial all delivery tickets for tonnage pay items, however, the inspector is only to initial those tickets that he/she personally collects. A memorandum should be written to the contract file explaining why the inspector was not present in the witnessing the delivery of the material. A daily yield check should be conducted to justify the total amount placed.

For certain materials, a correction factor is to be applied to the pay quantity shown on the tickets (see Aggregate Moisture Correction and Agricultural Ground Limestone Correction).

### Obtaining Tare and Gross Weights of Trucks

All materials, which are paid for on the basis of truck weights, shall be weighed in accordance with the following procedure. Reference for this procedure is the Illinois Weights and Measures Act, which refers to the National Bureau of Standards Handbook 44.

"A vehicle or a coupled vehicle combination shall be commercially weighted on a vehicle scale only as a single draft. That is, the total weight of such a vehicle or combination shall not be determined by adding together the results obtained by separately and not simultaneously weighing each end of such vehicle or individual elements of such coupled combination. However:

(a) the weight of a coupled combination may be determined by uncoupling the various elements (tractor, semitrailer, trailer), weighing each unit separately as a single draft, and adding together the results, or

(b) the weight of a vehicle or coupled-vehicle combination may be determined by adding together the weights obtained while all individual elements are resting simultaneously on more than one scale platform."

### Daily Tare Weights

(Example page F-37) To determine the pay weight of material delivered by truck, both gross and tare weights must be measured. Ordinarily, both measurements are to be witnessed by a representative of

the Department. Frequently, however, the contractors or suppliers loading operations make two separate weightings for each truck burdensome. For this reason, the Departments permits the tare weights of each truck to be measured a minimum of once each day, and the measured tare weight of each is then to be used for the remainder of the day.

When daily tare weights are used, the inspector is to witness and record the tare weights for each truck used in that day's supply operations. The inspector's record must identify each truck, the tare weight of the truck, and whether the driver was in the truck during the measurement. Form BC 1465, Report of Truck Tare Weights, is available for this use. (See Small Quantities)

**Weight Checks**

A weight check is a comparison of the net weight of material shown on the delivery ticket to the net weight measured on another scale. The purpose of a weight check is to give some assurance that the amount of material paid for, as shown on the delivery tickets, is the amount of material delivered to the job site.

For HMA tonnage items, contractors determine the shipping weight either by direct weighing or by using the nominal batch weights. The Standard Specifications require that scales used to measure HMA be equipped with automatic printers (Art. 1102.01(a)(7)). For batch plants the specifications also allow the use of the batch weights, instead of direct scale measurement, when surge or storage bins are not used (Art. 406.13(b)). There are three types of weight checks described in the following sections, one for weekly Independent Weight Checks, and two types (which should be alternated) for ticket weights determined from batch weights. All three types require reweighing the net weight of the material on the selected truck. The difference between them is the source of the weight for comparison with the independent scales.

**QC Checks by Contractor**

On HMA QC/QA contracts, the contractor is also required to perform scale checks and independent weight checks as part of the QC process. Scale checks performed by the contractor are for the purpose of ensuring the accuracy of the scale equipment. The procedures used by the contractor are the same as used by state representatives for performing the three types of weight checks described in the section above, except the contractor may use the approved platform scales at the plant site or a commercial scale approved by the Engineer. The plant scale must not be the scale used for the original measurement, but may be owned or controlled by the contractor or material supplier. QC checks performed by the contractor do not satisfy the requirement for independent weight checks to be performed by Department personnel.

**Automatic Ticket Printers**

Article 1102.01 (a)(7) defines an automatic ticket printer as follows:

"The automatic printer shall be an integral part of the scale equipment or the scale and printer shall be directly connected in a manner that will prohibit the manual entry of weights except as provided in a, below.

a. If the platform scale equipment measures gross weight (mass), the printer will record the gross weight (mass) as a minimum. Tare and net weights (masses) shall be shown on weight tickets and may be printed automatically or entered manually.

b. If scale equipment on a platform scale zeros out the truck tare automatically, the printer shall record the net weight (mass) as a minimum.

c. If the scale equipment on a surge bin weigh hopper zeros automatically after discharging each batch, the printer shall record the net weight (mass) as a minimum.

d. If the scale equipment on surge bins automatically shuts down the feed system and weighs the amount in the silo before and after discharge, the printer shall record the net weight (mass) as a minimum."

For any weights recorded by an automatic ticket printer, no inspector will be required to witness the weighing and initial the ticket at the scale location. If tare weights or net weights are not automatically measured, then an inspector must still witness and record the tare weights (see Daily Tare Weights).

**Weekly Independent Truck Weight Check/Action Report (Example pages F-38-40)**

A weekly random check must be performed by a State (or Local Agency and QC) representative to verify the actual weight of material delivered. Independent weight checks are to be performed as follows:

1) The check weights will be measured on an independent, approved platform scale other than the scale on which the original measurement is performed and not owned or controlled by the contractor or material supplier. The independent scale must be approved, and the DOA decal information is to be recorded on the BIC 7000.

2) Trucks are to be selected after leaving the plant, preferably at the paving location. Inspections should be unannounced and randomly scheduled. Under no circumstances should the inspector report to the plant and request a truck be loaded for an independent weight check.

3) Gross and tare weights must be measured and recorded, so that the actual net weight of material can be determined. Ensure the independent scale has been zeroed prior to determining both the gross and tare weights.

4) The independently measured net weight must agree with the weight shown on the tickets within a tolerance of 0.50 percent (HMA) 0.70 percent (aggregate):

   Tolerance (%) = (delivery ticket net wt – weight check net wt) x 100 / (weight check net wt)

5) The RE and the contractor shall be provided a copy of the BIC 7000. The information shall also be reported to the District Office which will in turn inform any other RE being supplied from the same producer. The independent weight check results are to be recorded and placed in the job file available for inspection, with corrective action taken for deviations from tolerance noted.

6) If the independent weight check results are not within tolerance, an Out of Tolerance Action Report, form BIC 7001, must be completed and submitted within seven (7) calendar days of the failed independent weight check. At the contractor's request, the empty vehicle may be re-weighed on a second independent approved scale. The three empty weights will be analyzed to determine the validity of the independent weight check.

7) Independent weight checks must be performed at least once per week per scale (this includes any scale and batch weights) when any item is placed for which payment is based on weight tickets. If the same scale is used for several contracts during the week, a weight check performed for any one of the contracts will be sufficient for all of the contracts, as long as a copy of the check is included in the records for each of the projects. (See Small Quantities)

8) The contractor must respond to the Engineer, in writing, within 7 calendar days as to the cause and correction of the deficient scale.

Note:

a) The DOA performs maintenance checks of scales that have current decals. If the scale is out of tolerance a red tag is used and the scale is not usable. The scale cannot be used during the time it has a red tag.

b) The Bureau of Investigations and Compliance (BIC) is conducting random independent weight checks utilizing statewide independent scales. When an independent weight check is performed by BIC, the Resident can utilize the weight check to satisfy the weekly independent weight check requirement outlined above.

(See Article 109.01 for additional instructions)

**Documentation for Payment of Hot-Mix Asphalt Based on Batch Weights**

The Specifications provide for measurement of the mixtures by either weighing the mixtures on approved platform scales or on the basis of plant batch weights. When measured on the basis of plant batch weights, occasional checks shall be made by weighing full truckloads of the mixture on the approved platform scale at the plant site, or on a commercial scale approved by the Engineer. This check serves two purposes:

(a) To check the accuracy of the scales, either batch, surge bin or the platform scales; or

(b) The accuracy of batching the mixture

The frequency of check weighing should be a minimum of one per week; however, when the plant is in continuous daily operation, the frequency preferably should be one per day.

The accuracy of the scales should be checked by observing the actual scale weight of the batches produced and comparing the total with the net weight of a truck load from the platform scale. Variations between these weights of more than 0.5 percent would indicate the batch scales or the platform scales should be checked by the Illinois Department of Agriculture.

Scale Accuracy Check (0.5% Tolerance)

| | |
|---|---|
| 1. Tare a truck on an approved platform scale | 15000lbs |
| 2. As you observe the scale dial stopping on or near the preset scale face marker, record the actual accumulative aggregate weight. Add in the mineral filler and paving asphalt weights. | 3,979.0<br>3,951.0<br>4,149.0<br>3,960.0<br>4,101.0<br>24,289 lbs. |

3. Gross the truck on the platform scale. 39,401 lbs.

$$\text{Tolerance, } 0.5\% = \frac{\text{net wt.}(3-1) - \text{summation of weighed batches}}{\text{net wt.}(3-1)}\ x100$$
$$= \frac{24{,}401 - 24{,}289}{24{,}401}\ x100$$
$$= 0.46\% \text{ O.K.}$$

The accuracy of batching the mixture should be randomly checked with the batch weights compared to the platform scales. The results, with an allowance for accuracy in weighing, should be checked within 0.5 percent of the gross load on the platform scale. If batch weights vary more than 0.5 percent, the batch scales should be recalibrated.

Batching Accuracy Check (0.5% Tolerance)

1. On an approved platform scale weigh a random truck after it has been loaded. 37,840.0 lbs.
2. Empty it on the job.
3. Tare the returning truck on the platform scale. 14,191.0 lbs.

Actual net weight = 23,649.0 lbs.

4. Record the load ticket 24,000.0 lbs.

$$\text{Tolerance, } 0.5\% = \frac{\text{load ticket } (4) - \text{actual net weight } (1-3)}{\text{actual net weight}}\ x100$$
$$= \frac{24{,}000 - 23{,}649}{23{,}649}\ x100 = 1.48\% \text{ Re check and/or recalibrate}$$

The Specifications also require the batch scales to be calibrated at the beginning of each construction season and at other times as deemed necessary by the Engineer. The accuracy certification will be by the Department of Agriculture.

The calibration and check weighing results are to be recorded and placed in the job file available for inspection with corrective action taken for deviations from tolerance noted.

Each of the above checks can be run on alternate occasions. Report these accuracy checks on Form MI 305, Bituminous Daily Plant Output, Independent Weight Check Form BIC 7000, or other methods using the above format. Results shall be placed in the job file.

**Aggregate Moisture Correction (Example page, F-41)**

To correct the scale weight of Type A aggregate items, where a moisture deduction is applicable (see Art. 311.08(b)), the following formulas shall be used.

(a) $\text{actual moisture} = \frac{(\text{wet weight of sample}) - (dry\ weight\ of\ sample)}{(\text{dry weight of sample})}$

(b) $\text{pay weight} = \frac{(\text{scale weight}) \text{x} (1 + \text{allowable moisture})}{(1 + \text{actual moisture})}$

Note: Actual moisture content test results shall be rounded to the nearest 0.1% in accordance with the Manual of Test Procedures for Materials.

**Agricultural Ground Limestone Correction**

(Example page F-42) In accordance with Article 250.09, the pay weight for this item is to be adjusted using a source correction factor for the source of the agricultural limestone. This correction factor is stored in the MISTIC system, and is available upon request from the district Materials Engineer.

The adjusted pay weight is to be calculated as follows:

Adj. pay weight = (ticket weight) / (4 year source correction factor)

**Small Quantities**

Witnessing the weighing and initialing of weight tickets at the scale site for materials paid on the basis of weight tickets should have a high priority. However, due to logistics between sources and jobsites, small quantities may be accepted providing the receiving inspector is satisfied that prior to accepting the material the weight appears satisfactory. Under these conditions, the Resident is permitted to waive the following inspection requirements for items whose pay quantity is determined by scale measurements.

1. No inspector will be required to be present at the scale to witness the weighing and initial the tickets.

2. No inspector will be required to witness and record tare weights for that day (if otherwise applicable).

3. No independent weight checks (if otherwise applicable) will be required as a result of that day's delivery of material.

4. No moisture determination will be required (if otherwise applicable) for that day.

Limits on accepting the Contractor's or Supplier's weight tickets in accordance with this section are as follows:

- Aggregate – Not to exceed 500 tons (500 m ton) per day
- Hot-Mix Asphalt – Mixtures for roadways should not exceed 250 tons (250 m ton) per day.
- Bituminous materials – Not to exceed 4000 lbs (1800 kg) per day.
- Other materials consistent with this section.

Unlimited quantities for the following items:

- Fertilizer Nutrients
- Calcium Chloride
- Hydrated lime for lime stabilized soil
- Agriculture ground limestone

**Individual Load Ticket Waiver For Recycled Aggregates Paid On Square Yard or Cubic Yard Basis**

When recycled PCC or bituminous concrete is allowed for use in lieu of virgin aggregate for a square yard or cubic yard pay item (i.e. Agg. Subgrade 12) and the material is crushed/milled, graded and properly tested, the requirement for individual load tickets can be waived. Instead, the contractor can provide a daily tabulation of each truck used to provide this material. This tabulation will contain, at a minimum, the truck number, struck capacity (volume calculation), number of loads delivered for each vehicle and the total calculated volume for the day. Eighty percent of this calculated volume can then be used for yield check determinations.

Progress documentation quantities should also use 80% of the daily volume determined above for estimating cubic yard items. Station to station length times the average width calculations can be used for estimating square yard items. Depth check measurements and documentation are still required. Final documentation of the quantity will consist of field measurements and calculations or Agreement on Accuracy of Plan Quantities using Form BC 981. Verbal approval by the Bureau of Materials, properly documented in the Resident's diary and quantity book, is evidence of material inspection for progress payments. Final Evidence of Material Inspection should be noted in the quantity book as "Material and gradation approved by Bureau of Materials". Copies of the gradation testing data must be in the Resident's final job records.

## FINAL DOCUMENTATION

The final quantity for all items appearing in the Quantity Book must be cross-referenced to one of the following which will serve as documentation and which will show measurements and calculations used in determining the final quantity.

Note: Calendar Month, Calendar Day, Each and Lump Sum items entered directly into the Quantity Book will not require a cross reference but these items will require a cross-reference if documented on a source document other than the Quantity Book.

(a) Field measurement books. (hardback only)
(b) Inspector's Daily Report, BC 628, if identified as a "final field measurement."
(c) Cross-section paper for cross sections only.
(d) Weight tickets bound and summarized by means of an adding machine tape or spreadsheet. Example page F-41.
(e) Project diary for calendar month or calendar day items.
(f) Calculation file for such items as concrete structures and reinforcement bars.
(g) Agreement on Accuracy of Plan Quantity, BC 981.
(h) Force account file with Extra Work Daily Report, BC 635, and contractor's invoice.
(i) Weekly Trainee Report, SBE 1014, file with signed reports for Trainees.
(j) Built According to Standard #____.
(k) Computer printout/spreadsheet.
(l) Traffic Control Surveillance Report, BC 2240.

The cross-referenced note for final measurements and calculations shall be placed at the bottom of the Quantity Book page, Form BC 625, and should be made only to the document(s) containing the information used in obtaining the final quantity. On items requiring depth checks, the final source of

documentation in the quantity book shall include a reference to the depth check documentation location, if that information is located in a different location (Example page, F-7).

All calculations made to determine final pay quantities must be checked by someone other than the preparer. (See Section D for Recommended Checking Procedures)

All documents in the project files must be identified with the project designation (contract number or job stamp), except that documents identified above (Quantity Book, project diary and field books) and any document circulated outside the field office must contain the complete project designation (job stamp).

In addition, if an individual document includes more than one (loose leaf) page, then each page should indicate that it belongs to the same document. This could be indicated, for example, by noting such information as the date, IDR number or “page __ of __.”

# Section B

FINAL DOCUMENTATION
REQUIREMENTS BY PAY UNIT

The following is a general breakdown of most pay units showing the degree of accuracy for measuring each and information required for documenting each. It is acceptable to leave final quantities to the same accuracy as the daily quantities.

| PAY UNIT | ACCURACY OF MEASUREMENT | REQUIRED DOCUMENTATION |
|---|---|---|
| **Acre**<br>(Hectare)<br>*Seeding*<br>*page F-43*<br><br>*Tree Removal (acres) refer to Art. 201.10(b)(2)* | 1. Summation of final quantity to nearest 0.1 acre (0.1 hectare). | 1. Field measurements used to calculate the final quantity<br>$\text{Area (acre)} = \frac{\text{L (ft) x W (ft)}}{43{,}560}$<br>$\text{Area (ha)} = \frac{\text{L (m) x W (m)}}{10{,}000}$, or<br>2. Form BC 981 (where applicable). |
| **Calendar Day**<br>*Traffic Control Surveillance*<br>*page F-44* | 1. Daily or fraction thereof, to the nearest 0.01 CAL DAY. | 1. Monthly entries in the Quantity Book cross referenced to daily, summarized BC 2240's, Traffic Control Surveillance Reports, or<br>2. Other source documents. |
| **Calendar Month**<br>*Engr. Field Office*<br>*page F-2* | 1. Monthly or fraction thereof.<br>2. Summation of final quantity to nearest 0.5 month. | 1. Project Diary entry, Quantity Book entry, or other source document on the date the office or lab is ready for use, and the date the Contractor was notified the office or lab would no longer be needed, and<br>2. Monthly entries in the Quantity Book. |
| **Cubic Yard**<br>(Cubic Meter)<br>*Structure Ex.*<br>*page F-45*<br><br>*Trench Backfill*<br>*page F-46*<br><br>*P.G.E. Note on*<br>*page F-25*<br><br>*Conc. Struct.*<br>*Page F-47, 48*<br><br>*Conc. Outlet*<br>*page F-49* | 1. Final quantity of concrete measured to nearest 0.1 cubic yard (0.1 cubic meter)*.<br>2. All other items measured to the nearest 0.1 cubic yard (0.1 cubic meter) daily and the final quantity summarized to the nearest cubic yard (cubic meter)*.<br><br>* Note: Individual dimensions shall be measured at least to the nearest 0.1 ft (0.03m) | 1. Field measurements used to calculate the final quantity or the statement "built to plan dimensions" when they are used to calculate the final quantity, and<br>2. Calculations. Or<br>3. "Built according to Standard ___"; "Built according to plan detail sheet__" statements . Or<br>4. Form BC 981 (where applicable) with calculations for daily estimates<br>5. Depth checks (where applicable). |
| **Each / Lump Sum**<br>*Surf. Var's. F-50*<br>*Traf Cont Price Adj F-52, 53* | 1. Each | 1. Recorded by Station or location and date in the Quantity Book<br>2. Calculations required for any adjustments. |

| PAY UNIT | ACCURACY OF MEASUREMENT | REQUIRED DOCUMENTATION |
|---|---|---|
| **Foot**<br>(Meter)<br>*Elec. Cables*<br>*page F-54, 55*<br><br>*Pipe Culvert*<br>*page F-56*<br><br>*Piling*<br>*page F-57-60* | 1. Each run measured to the nearest 0.1 ft. (0.1 m).<br>2. (English) Summation of final quantity to the nearest foot. (Metric) Leave final quantity to nearest 0.1 meter. | 1. Field Measurements.<br>2. Depth checks (where applicable) |
| **Gallon**<br>(Liter)<br><br>*Prime Coat page F-61 (on adding machine tape)* | 1. Summation of final quantity to nearest gallon (liter). | 1. Calculations based upon initialed weight tickets and Specific Gravity per gallon (liter). The Specific Gravity is given on the shipping or storage ticket.<br>$\text{Vol (gallon)} = \frac{\text{net wt. (lbs)}}{8.328 \text{ x Sp. Gr.}}$<br>$\text{Vol (liter)} = \frac{\text{net wt. (kg)}}{\text{Sp. Gr.}}$<br>2. Record of the D.O.A. decal date, I.D. number, and scale location. |
| **Hour**<br>*Trainees*<br>*page F-62* | 1. Hourly | 1. Monthly entries in the Quantity Book cross referenced to summarized, weekly prepared SBE 1014's. |
| **Pound**<br>(Kilogram)<br>*Rebar*<br>*page F-31, 47*<br><br>*Str. Steel*<br>*page F-63*<br><br>*Fertilizer*<br>*page F-64*<br><br>*Prime (Tack) Coat*<br>*page F-71, 72* | 1. Summation of final quantity to nearest pound (kilogram). | 1. Calculations based on the Bill-of-Materials. Use the weight table shown in Art. 508.10, or<br>2. "Built according to Standard ____"; "Built according to plan detail sheet__" statements, or<br>3. Weight tickets or bag counts, accompanied by conversion calculations (Fertilizer Nutrients), or<br>4. Form BC 981 (where applicable)<br>5. For prime (tack) coat paid by the pound, the "Required Documentation" under the **Ton** Pay Unit shall apply where applicable. |

| PAY UNIT | ACCURACY OF MEASUREMENT | REQUIRED DOCUMENTATION |
|---|---|---|
| **Square Foot or Square Yard**<br>(Square Meter)<br>*PCC Sidewalk*<br>*page F-36*<br><br>*Patching*<br>*page F-65*<br><br>*Base Cse Wid*<br>*page F-66*<br><br>*Slopewall*<br>*page F-67* | 1. Individual areas measured to the nearest 0.1 sq. ft. or 0.1 sq. yd. (0.1 sq. meter) *<br>2. Summation of final quantity to nearest sq. ft. or sq. yd.(square meter).<br><br>* Note: Individual dimensions shall be measured at least to the nearest 0.1 ft (0.03m) | 1. Field measurements and calculations used to calculate the final quantity or the statement, ”built according to plan detail sheet___”,, or<br>2. Form BC 981 (where applicable), and<br>3. Depth checks (if applicable).<br>4. For sidewalk, cross-slope verification in order to comply with ADA requirements. |
| **Ton**<br>(Metric Ton)<br>*Aggr Gr Limestone*<br>*page F-42*<br><br>*Aggr Base Cse*<br>*page F-41*<br><br>*HMA SC*<br>*Page F-34, 17, 18* | 1. Nearest 0.1 tons daily.<br>2. Summation of final quantity to nearest ton except for bituminous materials, tack, or prime coat; where the final quantity shall be to the nearest 0.1 tons. | 1. Weight tickets showing the material, date and weight, and<br>2. Daily adding machine tape showing: job designation, pay item number & description, date, location, net weight & pay weight corrected for moisture and/or 4-year lime conversion factor, if required, with "Calc. By:" and "Checked By:" initials and dates, and<br>3. Record of the Department of Agriculture decal date and identification number in the Quantity Book or a record of a DOA-approved commercial scale company, and<br>4. Independent Truck Weight Check (not needed for Small Quantities), and<br>5. Scale check for HMA batch plants or when automatic printer tickets are used in lieu of scale inspector, and<br>6. Tickets should have the jobsite inspector's initials on them, and<br>7. Tickets should have the scale inspector's initials (where applicable), and<br>8. Daily tare weights on each truck recorded and retained (where applicable). |

| PAY UNIT | ACCURACY OF MEASUREMENT | REQUIRED DOCUMENTATION |
|---|---|---|
| **Unit**<br>*1000 gal. (1000 liters or 5000 liters)*<br><br>*Suppl. Water page F-68* | 1. Nearest 0.1 daily.<br>2. Summation of final quantity to nearest unit. | 1. Meter tickets or<br>2. Weight tickets and calculations<br>$\text{Vol (gallon)} = \frac{\text{net wt. (lbs)}}{8.328 \times \text{Sp. Gr.}}$<br>$\text{Vol (liter)} = \frac{\text{net wt. (kg)}}{\text{Sp. Gr.}}$<br>(Sp. Gr. for water = 1.0)<br>or<br>3. Volume measurements of conveyance and calculations or<br>4. Record manufacturer rated capacity of truck tank when full loads are used. |
| **Unit**<br>*100 ft.(30 m)* | 1. Nearest 0.1 daily.<br>2. Summation of final quantity to nearest unit. | 1. Field measurements. Measure each side separately for Excavating and Grading Existing Shoulders.<br>2. Record by Station (left or right) or location.<br>3. Calculations. |
| **Unit**<br>*100 plants or 100 seedlings Seedlings page F-69* | 1. Perennial plants to the nearest 0.05 daily;<br>Seedlings to the nearest 0.1 daily.<br>2. Summation of final quantity to nearest unit. | 1. Record by Station (left or right) or location.<br>2. Calculations. |
| **Unit Diameter**<br>*Tree Removal page F-70* | 1. Summation of final quantity to nearest unit diameter. | 1. If a tree tape was used, make a note of this with your field measurements. If a tree tape was not used, the actual field measurements must be shown along with calculations for the appropriate Unit Diameter.<br>Unit Dia. = circumference (in.) / (English) $\Pi$<br>Unit Dia. = circumference (mm) / (metric) $25\,\Pi$<br>(Note: Art. 201.10 defines $\Pi$ = 3.1416)<br>and<br>2. Calculations. |

# Section C

**(Updated to 2024 Project Procedures Guide, Attachment 3)**

FINAL DOCUMENTATION REQUIREMENTS BY PAY ITEM

For payment of work, two key pieces of information are needed: 1) Documentation of the quantity of work performed and 2) Evidence of material inspection. This section provides a synopsis of the type of records, measurements and calculations needed to document the work performed and required evidence of materials inspection needed to insure the materials provided meet contract requirements. Evidence of Materials Inspection categories and abbreviations are listed below.

• **BBS 59 (BB59)** – This Department form is a report of acceptance of fabrication of structural steel. The Bureau of Bridges and Structures usually performs this type of inspection and testing.

• **BILL OF LADING (BOL)** – A shipping ticket that accompanies a product to the job site and which identifies the product, source, and lot.

• **CBM (CBM)** – Bureau of Materials approval letter specific to a batch/lot/heat, etc. for a specific contract or producer/supplier.

• **CERTIFICATION (CERT)** – Manufacturer's written certification that indicates material complies with the specifications or contract. Supplier certifications are not acceptable.

• **DAILY PLANT REPORTS (DPR)** – For HMA, reports generated that provide mixture test results and other production data. For non-QMP projects, Daily Plant Reports are the responsibility of the Inspector. For QMP projects, refer to the appropriate special provisions to determine responsibility for Daily Plant Reports. For example, for QC/QA for PCC, the Daily Plant Report is often only the form BMPR MI504 completed by the Producer, Contractor, etc. for aggregate gradations.

• **ILL OK STAMP (ILOK)** – Material is stamped by an IDOT Inspector with an "ILL OK" stamp indicating prior inspection and acceptance. An inspection tag may be used as Evidence of Materials Inspection and approval. A Resident Engineer must make note of the stamp or collect the inspection tag to ensure proper documentation of material inspection.

• **LA-15 (LA15)** – This **Department** form is a supplier's certification indicating material is from approved stock. The form is sometimes used as a Bill of Lading to indicate prior approval. The form should include supplier, proper contract/job designation, material description, manufacturer, specific approved material (test ID number, lots, or batches), and quantity. Additional information on LA-15's is provided in Attachment 1.

• **MARK (MARK)** – A commercial label, tag, or other marking which indicates product specification compliance and/or an approved source/manufacturer. A Resident Engineer must make note of the label, tag, or other marking to ensure proper documentation of material inspection.

• **NONE** – No evidence of material inspection is required. Typical of where work item requires material to be removed from the project or material is naturally in place on the project prior to the contract.

• **QUALIFIED PRODUCT/PRODUCER LIST (LIST)** – The material appears on a current list of Department-approved products or approved sources found at the Department's web site, IDOT Website, under "Doing Business/Material Approvals." Contact the inspecting district's Materials Office for information on aggregates.

• **TEST (TEST)** - Approved test result available via the **MISTIC** system or from locally performed lab or field tests (e.g., soil density).

• **TICKET (TICK)** - A ticket from an approved source indicating **Department** material or aggregate gradation, job designation, purchaser, and weight (if applicable).

• **VISUAL ACCEPTANCE (VIS)** – A RE memo denoting visual inspection is required in the project file, and input into MISTIC is required. A Resident Engineer must make note of the visual acceptance to ensure proper documentation of material inspection.

• **VISUAL EXAMINATION (VISE)** – Same as VIS, but no RE memo or input into MISTIC is required. A Resident Engineer must make note of the visual examination to ensure proper documentation of material inspection.

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 201 | Tree Removal<br>Tree Removal Special | Unit | 1. Field measurements.<br>2. Sta. to Sta. groupings listing individual measurements.<br>3. Tree tape or computations.<br>If a tree tape is used, it must be indicated. | | None |
| 201 | Tree Removal | Acre<br>HA | 1. Form BC 981 or<br>2. Calculations based on the horizontal area within the limits specified on the plans or by the Engineer. | | None |
| 201 | Temporary Fence | Foot<br>Meter | | | VISE |
| 201 | Fertilizer Nutrients | LB<br>Kg | See requirements for these items listed under Section 252 and additional information on page C-5 of this section. | | CERT (bulk) or MARK (bags) |
| 201 | Supplemental Watering | Unit | See requirements for this item listed under Section 252. | | Potable source |
| 202 | Earth Excavation | CY<br>Cu M | 1. Form BC 981 or<br>Before & after cross-sections & calcs. | 39 | None |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 202 | Rock Excavation | CY<br>Cu M | 1. Before & after cross-sections & calcs or<br>2. When the unit prices of Rock Excavation & Earth Excavation are identical, authorized approval can be obtained for a Plan Quantity Agreement for both, Form BC 981. | 39 | None |
| 202 | Earth Excavation Widening | CY<br>Cu M | 1. Before & after in-place measurements & calcs<br>Width & depth not to exceed plan dimensions. | 39 | None |
| 203 | Channel Excavation | CY<br>Cu M | 1. Form BC 981 or<br>2. Before & after cross-sections & calcs. | 39 | None |
| 203 | Rock Excavation in Channel | CY<br>Cu M | 1. Form BC 981 or<br>2. Before & after cross-sections & calcs. | | None |
| 204 | Borrow Excavation | CY<br>Cu M | 1. Before & after cross-sections & calcs. | 39 | Soil from outside ROW: Letter of approval from District Materials Engineer |
| 204 | Furnished Excavation | CY<br>Cu M | 1. Furn. Exc. = [Emb - Suitable Exc. (1 - SF)], where SF = 0.25 shrinkage factor unless otherwise shown in the plans<br>2. See Section 200 of Const. Manual | 39 | Soil from outside ROW: Letter of approval from District Materials Engineer |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 206 | Granular Embankment Special | Ton<br>M Ton | 1. Wt. tickets with moisture correction.<br>2. 108% maximum pay.<br>3. Department of Agriculture scale decal information. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 206 | Granular Embankment Special | CY<br>Cu M | 1. Form BC 981 or<br>2. Before & after in-place measurements & calcs.<br>Width and depth not to exceed plan dimensions. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 207 | Porous Granular Embankment | Ton<br>M Ton | 1. Wt. tickets with moisture correction.<br>2. 108% maximum pay.<br>3. Department of Agriculture scale decal information. | 39 | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 207 | Porous Granular Embankment | CY<br>Cu M | 1. Before & after cross-sections & calcs. | 39 | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 208 | Trench Backfill | CY<br>Cu M | 1. Form BC 981 or<br>2. Trench measurements & calcs.<br>Dimensions used in calcs shall not exceed maximum allowable. See Art. 550.04 of the Std. Specs for maximum trench width, or<br>3. Trench measurements & calcs using the Standard Tables. (for concrete pipe, only) | | Approved source & Shipment ticket<br>or<br>LIST + TICK |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 209 | Porous Granular Backfill | CY<br>Cu M | 1. Trench measurements & calcs.<br>Dimensions used in calcs shall not exceed maximum allowable. See Art. 550.04 of the Std. Specs for maximum trench width, or<br>2. Trench measurements & calcs using the Standard Tables. (for concrete pipe, only) | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 210 | Geotechnical Fabric for Ground Stabilization | SY<br>Sq M | 1. In-place measurement for calcs. (Do not pay for overlapping fabric) | | CERT or LA15 |
| 211<br><br>&<br>211 | Topsoil Furnish & Place<br><br><br>Compost Furnish & Place | SY<br>Sq M | 1. Form BC 981 or<br>2. Surface measurements of all authorized areas, and calculations.<br>3. Depth checks. | | TEST<br><br><br>CERT |
| 213 | Exploration Trench | Foot<br>Meter | 1. In-place measurements of the open trench.<br>2. Depth checks. | | None |
| 250 | Seeding<br>&<br>Interseeding | Acre<br>HA | 1. Form BC 981 or<br>2. Slope measurements of the surface area seeded and calculations. | | CERT<br>or<br>ILOK<br>or<br>LA15 |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 201<br>250<br>252 | Nitrogen Fertilizer Nutrient<br>&<br>Phosphorus Fertilizer Nutrient<br>&<br>Potassium Fertilizer Nutrient | LB<br>Kg | 1. Wt. tickets or bag counts with computations.<br>LB = Total lbs X % of nutrient<br>The scale & job site inspectors' initials must be on tickets.<br>2. 103% maximum pay.<br>3. DOA scale info (if weight tickets used) | | CERT (bulk) or MARK (bags) |
| 250<br>252 | Agricultural Ground Limestone | Ton<br>M Ton | 1. Weight tickets<br>2. Calculations showing that the pay quantity has been corrected using the 4-year source correction factor.<br>3. 108% maximum pay.<br>4. Dept. of Agriculture scale decal information. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 311 | Subbase Granular Material | Ton<br>M Ton | 1. Wt. tickets with moisture correction, if required.<br>2. 108% maximum pay.<br>3. Dept. of Agriculture scale decal information. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 311 | Subbase Granular Material | CY<br>Cu M | 1. Form BC 981 or<br>2. In-place surface measurements and calcs.<br>Width and depth not to exceed plan dimensions. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 311 | Subbase Granular Material | SY<br>Sq M | 1. Form BC 981 or<br>2. In-place surface measurements and calcs.<br>Width not to exceed plan dimensions.<br>3. Depth checks. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 312 | Stabilized Subbase | SY<br>Sq M | 1. Form BC 981 or<br>2. In-place surface measurements and calcs.<br>Width not to exceed plan dimensions.<br>3. Depth checks. | | HMA: DPR + TICK + TEST<br>CAM II: DPR + TICK + TEST<br>CAM & PSM: TEST |
| 351 | Aggregate Base Course | Ton<br>M Ton | 1. Weight tickets with moisture correction, if required.<br>2. 108% maximum pay<br>3. Dept. of Agriculture scale decal information. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 351 | Aggregate Base Course | CY<br>Cu M | 1. Form BC 981 or<br>2. In-place measurements and calculations.<br>Width & depth not to exceed plan dimensions. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 351 | Aggregate Base Course | SY<br>Sq M | 1. Form BC 981 or<br>2. In-place surface measurements and calcs.<br>Width not to exceed plan dimensions.<br>3. Depth checks. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 352 | Processing Soil Cement Base Course | SY<br>Sq M | 1. Form BC 981 or<br>2. In-place surface measurements and calcs.<br>Width not to exceed plan dimensions.<br>3. Depth checks. | | TEST |
| 352 | Cement | LB<br>Kg | 1. Wt. tickets of bag counts and calculations.<br>2. 105% maximum pay.<br>3. Dept. of Agriculture scale decal information. (if wt. ticket used) | | (LIST or TEST) + BOL |
| 353<br>&<br>354<br>PCC Base Course Widening<br>&<br>355<br>HMA Course Widening<br>&<br>356<br>HMA Base Course Widening | PCC Base Course | SY<br>Sq M | 1. Form BC 981 or<br>2. In-place surface measurements and calcs.<br>Width not to exceed plan dimensions.<br>3. Depth checks. | | DPR + TICK + TEST |
| 358 | Preparation of Base | SY<br>Sq M | 1. Form BC 981 or<br>2. Measurements of affected areas and calcs. | | None |
| 358 | Aggregate Base Repair | Ton<br>M Ton | 1. Wt. tickets with moisture correction.<br>2. 108% maxium pay.<br>3. Dept. of Agriculture scale decal information. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 402 | Aggregate Surface Course | Ton<br>M Ton | 1. Wt. tickets with moisture correction, if required.<br>May be stockpiled ONLY when used for Temporary Access (Art. 402.10)<br>2. 108% maxium pay.<br>3. Dept. of Agriculture scale decal information. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 402 | Aggregate Surface Course | CY<br>Cu M | 1. Form BC 981 or<br>2. In-place measurements and calculations.<br>Width and depth not to exceed plan dimension. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 402 | Aggregate Surface Course | SY<br>Sq M | 1. Form BC 981 or<br>2. In-place measurements and calculations.<br>Width not to exceed plan dimensions.<br>3. Depth checks. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 403 | Bit Materials (Prime Coat)<br>&<br>Bit Materials (Cover & Seal Coats)<br>&<br>Polymerized (Cover & Seal Coats) | Gal<br>Liter | 1. Weight tickets and calcs or<br>2. DOA-approved meter tickets corrected for temp. Not truck distributor meter, unless meter has DOA decal.<br>3. 105% maximum pay.<br>4. Dept. of Agriculture scale decal information. | | (LIST or TEST) + BOL |
| 403 | Bit Materials (Prime Coat)<br>&<br>Bit Materials (Cover & Seal Coat) | Ton<br>M Ton | 1. Weight tickets.<br>2. 105% maximum pay.<br>3. Dept. of Agriculture scale decal information. | | (LIST or TEST) + BOL |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 403 | Cover Coat Aggregate<br>&<br>Seal Coat Aggregate | Ton<br>M Ton | 1. Wt. tickets with moisture correction.<br>2. 110% maximum pay.<br>3. Dept. of Agriculture scale decal information. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 406<br>408 | Bit Materials (Prime Coat)<br>Polymerized (Prime Coat) | Gal<br>Liter | 1. Weight tickets and calculations, or<br>2. DOA-approved meter tickets corrected for temp. Not truck distributor meter.<br>3. 105% maximum pay.<br>4. Dept. of Agriculture scale decal information. | | (LIST or TEST) + BOL |
| 406<br>408 | Bit Materials (Prime Coat)<br>Polymerized (Prime Coat) | Ton<br>M Ton | 1. Weight tickets<br>2. 105% maximum pay.<br>3. Dept. of Agriculture scale decal information. | | (LIST or TEST) + BOL |
| 406<br>408 | Aggregate Prime Coat | Ton<br>M Ton | 1. Weight tickets<br>2. Dept. of Agriculture scale decal information. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 406 | Mix for Cracks Joints & Flangeways<br>&<br>Leveling Binder Machine Method<br>&<br>Leveling Binder Hand Method<br>&<br>HMA Binder Course<br>&<br>HMA Surface Course Class I or Superpave | Ton<br>M Ton | 1. Weight tickets initialed at jobsite<br>2. Daily weight totals tabulated on calculator tape.<br>3. Platform scale tickets used in weight checks (where applicable).<br>4. Dept. of Agriculture scale decal information.<br>5. 103% maximum pay.<br>6. Smoothness test (for HMA surfaces) | | DPR + TICK + TEST |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 407 | HMA Pavement (Full Depth) | SY<br>Sq M | 1. Form BC 981 or<br>2. In-place surface measurements and calcs, width not to exceed plan dimensions.<br>3. Depth checks. | | DPR + TICK + TEST |
| 408 | Incidental HMA Surfacing | Ton<br>M Ton | For all plants:<br>1. Weight tickets initialed at jobsite<br>2. Daily weight totals tabulated on calculator tape.<br>3. Platform scale tickets used in weight checks (where applicable).<br>4. Dept. of Agriculture scale decal information.<br>5. 103% maximum pay. | | DPR + TICK + TEST |
| 420 | PCC Pavement<br>&<br>HE PCC Pavement<br>&<br>PCC Pavement (Jointed) | SY<br>Sq M | 1. Form BC 981 or<br>2. In-place surface measurements and calcs. Width not to exceed plan dimensions.<br>3. Depth checks.<br>4. Surface tests (and price adjustment if necessary). | 39 | DPR + TICK + TEST |
| 420 | Bridge Approach Pavement<br>&<br>PCC Bridge Approach Shoulder Pavement | SY<br>Sq M | 1. Form BC 981 or<br>2. In-place surface measurements and calcs. Width not to exceed plan dimensions.<br>3. Depth checks. | 39 | DPR + TICK + TEST |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 420 | Bridge Approach Pavement<br>Connector | SY<br>Sq M | 1. Form BC 981 or<br>2. In-place surface measurements and calcs. Width not to exceed plan dimensions.<br>3. Depth checks. | 39 | DPR + TICK + TEST |
| 420 | Welded Wire Reinforcement | SY<br>Sq M | 1. Same as pavement quantity | 88 | LIST + CERT |
| 420 | Protective Coat | SY<br>Sq M | 1. Form BC 981 or<br>2. In-place measurements and calculations of the area where Protective Coat is applied. | | LA15 or ILOK or TEST or CBM |
| 421 | Continuously Reinforced PCC Pavement | SY<br>Sq M | 1. Form BC 981 or<br>2. In-place surface measurements and calcs. Width not to exceed plan dimensions.<br>3. Depth checks. | | DPR + TICK + TEST |
| 421 | Pavement Reinforcement | SY<br>Sq M | 1. Same as pavment quantity | 88 | LIST + CERT + MARK |
| 421 | Wide Flange Beam Terminal Joint Complete | Each | 1. Date and Station in Quantity Book. | 88 | Concrete: DPR + TICK + TEST<br>Rebar: LIST + CERT + MARK<br>Epoxy Coated Rebar: LIST + CERT + MARK<br>Steel beam: BBS 59 + CERT |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 421 | Protective Coat | SY<br>Sq M | 1. Form BC 981 or<br>2. Measurements and calculations of the area where Protective Coat is applied. | | LA15 or ILOK or TEST or CBM |
| 424 | PCC Sidewalk | SF | 1. Form BC 981 or<br>2. In-place surface measurements and calcs.<br>3. Depth checks.<br>4. Cross slope checks. | 86 | DPR + TICK + TEST |
| 481 | Aggregate Shoulders Type A<br>&<br>Aggregate Shoulders Type B | Ton<br>M Ton | 1. Wt. tickets with moisture correction, if required.<br>2. 108% maximum pay. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 481 | Aggregate Shoulders Type A<br>&<br>Aggregate Shoulders Type B | CY<br>Cu M | 1. Form BC 981 or<br>2. In-place measurements and calculations.<br>Width and depth not to exceed plan dimensions. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 481 | Aggregate Shoulders Type A<br>&<br>Aggregate Shoulders Type B | SY<br>Sq M | 1. Form BC 981 or<br>2. In-place surface measurements and calcs.<br>Width not to exceed plan dimensions.<br>3. Depth checks. | | Approved source & Shipment ticket<br>or<br>LIST + TICK |
| 482 | HMA Shoulders | SY<br>Sq M | 1. Form BC 981 or<br>2. In-place surface measurements and calcs.<br>Width not to exceed plan dimensions.<br>3. Depth checks. | | DPR + TICK + TEST |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 501 | Concrete Removal | CY<br>Cu M | 1. Field measurements and calculations. | | None |
| 502 | Structure Excavation<br>&<br>Cofferdam Excavation<br>&<br>Rock Excavation for Structure | CY<br>Cu M | 1. Measurements of material in orginal position and calculations. See Spec. for maximum allowable limits of excavation for payment, or<br>2. For BC 981, except for Rock Excavation for Structure, which must be measured. | | None |
| 503 | Class MS Concrete<br>&<br>Concrete Handrail<br>&<br>Concrete Encasement | CY<br>Cu M | 1. Form BC 981 or<br>2. Calculations in permanent file verifying plan, or revised, quantity and<br>3. A statement indicating the structure was built in accordance with plan dimensions or a sketch showing measurement dimensions.<br>4. Price adjustment (per Art. 503.22) if required. | | DPR + TICK + TEST |
| 503 | Concrete Structures<br>&<br>Concrete Superstructures | CY<br>Cu M | 1. Form BC 981 or<br>2. Calculations in permanent file verifying plan, or revised, quantity and<br>3. A statement indicating the structure was built in accordance with plan dimensions or a sketch showing measurement dimensions.<br>4. Deductions for volume of piling, except H pile per Art. 503.21 (b).<br>5. Price adjustment (per Art. 503.22) if required. | | DPR + TICK + TEST |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 503 | Rubbed Finish<br>Form Liner Textured Surface | SF<br>Sq M | 1. Form BC 981 or<br>2. Measurements and calculations for the areas specified on the plans. | | None |
| 504 | Precast Concrete Bridge Slab<br>&<br>Precast Prestressed Concrete Deck Beams | SF<br>Sq M | 1. Form BC 981 or<br>2. Measurements and calculations of horizontal surface area. | | Precast Bridge Slab: LIST + ILOK<br>Precast Bridge Beams: LIST + ILOK<br>Prestressed Bridge Beams: ILOK |
| 505 | Furnish & Erect Structural Steel | LB<br>Kg | 1. Approved Shop Drawings<br>2. Approved shipping weight tag or platform scale ticket or<br>3. Measurements, and calculations based on standard AISC section weights, deducting for holes, cutouts, etc.<br>4. If authorized changes are made, the calculations for the changes necessary. | 87 | Steel: Fabrication Inspector's Release (BBS 59) + CERT<br>High-strength steel bolts: CBM or LA15 or ILOK or TEST |
| 508 | Reinforcement Bars | LB<br>Kg | 1. Form BC 981 or<br>2. Calculations in permanent file verifying plan, or revised, quantity. Use the table given in Article 508.10. | 88 | Rebar: LIST + CERT + MARK<br>Epoxy Coated Rebar: LIST + CERT + MARK |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 509 | Steel Railing<br>&<br>Aluminum Railing<br>&<br>Pedestrian Railing<br>&<br>Bicycle Railing | Foot<br>Meter | 1. Approved Shop Drawings<br>2. Measurements of overall length of top rail.<br>Measure through all posts and gaps. | 87 | Steel Railing: CBM<br>Aluminum Railing: CERT or LA15<br>Fasteners: CBM or LA15 or ILOK or TEST<br>Post, Anchoring Device: CERT or LA15 |
| 511 | Slope Wall | SY<br>Sq M | 1. Form BC 981 or<br>2. Measurements of the surface. The construction of anchor and cut-off walls is incidental to this item.<br>3. Depth checks. | 88 | Concrete: DPR + TICK + TEST<br>Mesh: LIST + CERT |
| 512 | Furnishing Piles | Foot<br>Meter | 1. Itemized list sent to the Contractor by the Engineer authorizing the length of piling to be ordered.<br>2. Piling field notes showing field measurements of the piles.<br>3. Piling Diagram Report BC 2184 | | Precast Concrete: LIST + ILOK<br>Prestressed Concrete: ILOK<br>Steel H or Metal Shell: Cert or LA15 or ILOK<br>Timber: CERT or MARK or LA15 |
| 512 | Drive Piles | Foot<br>Meter | 1. Piling field notes showing field measurements of the piles left in place below the cut-off elevation.<br>2. Piling Diagram Report BC 2184 | | None |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 542 | Concrete Collar | CY<br>Cu M | 1. Form BC 981 or<br>2. Statement, "Built according to Standard _____", or<br>3. If a standard collar is not used, computations verifying the plan quantity are required.<br>Rebar should be paid separately in lbs. (kg), as per Art. 542.11. | | Cast in Place: DPR + TICK + TEST<br>Precast: LIST + MARK |
| 550 | Storm Sewer | Foot<br>Meter | 1. In-place measurements.<br>See Article 550.09 & 602.12 regarding the method of measurement at drainage structures. | | Concrete: LIST + MARK<br>Plastic: ILOK or LA15 or TEST<br>Clay: ILOK or LA15 or TEST |
| 580 | Membrane Waterproofing | SY<br>Sq M | 1. Form BC 981 or<br>2. Measurements and calculations of the Surface areas covered. | | LA15 or TEST |
| 606 | Concrete Curb | Foot<br>Meter | 1. In-place field measurements along the face.<br>See Article 606.14 regarding the method of measurement at drainage structures.<br>2. Depth checks. | 86 | DPR + TICK + TEST |
| 606 | Concrete Gutter<br>&<br>Comb. Concrete Curb & Gutter | Foot<br>Meter | 1. In-place field measurements in the flow line.<br>See Article 606.14 regarding the method of measurement at drainage structures.<br>2. Depth checks. | 86 | DPR + TICK + TEST |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 606 | Paved Ditch | Foot<br>Meter | 1. In-place field measurements in the flow line. The construction of anchor and cut-off walls is incidental to this item.<br>2. Depth checks. | | DPR + TICK + TEST |
| 611 | Class SI Concrete Misc. | CY<br>Cu M | 1. Form BC 981 or<br>2. Calculations in permanent file verifying plan, or revised, quantity and<br>3. A statement indicating the structure was built in accordance with plan dimensions or a sketch showing measured dimensions. | | DPR + TICK + TEST |
| 630 | Steel Plate Beam Guard Rail | Foot<br>Meter | 1. Measurements of the overall length of the rail element to the limits shown on the plans. End sections are incidental and will NOT be paid for separately. | 87 | Steel Plate Rail element: LIST + CERT<br>Steel Post: CERT or LA15<br>Barrier end section: NCHRP 350 Pdts. = (LIST + CERT) or LA15<br>Non-NCHRP 350 Pdts. - CERT or LA15<br>Fasteners: (MARK + CERT) or TEST<br>Wood Post: CERT or MARK or LA15 |
| 663 | Calcium Chloride Applied | Ton<br>M Ton | 1. Weight tickets. | | Dust Palliative: TEST<br>Accelerator: CERT |

| SECTION | CODE NO. & ITEM | PAY UNIT | REQUIRED DOCUMENTATION | CONST. MEMO. | EVIDENCE OF MATERIAL INSPECTION |
|---|---|---|---|---|---|
| 664 | Chain Link Fence | Foot<br>Meter | 1. In-place measurements along fence from center to center of end posts, excluding the length occupied by gates. | | CERT or LA15 |
| 665 | Woven Wire Fence | Foot<br>Meter | 1. In-place measurements along fence from center to center of end posts, excluding the length occupied by gates. | | CERT or LA15 |
| 780 | Thermoplastic Pavt.<br>Marking Letters & Symbols<br><br>Preformed Plastic Pavement Markings, Letters and Symbols | SY<br>Sq M | 1. Calculations based on the size of letter or symbol specified in the contract.<br>See table in Art. 780.12 for letter or symbol areas.<br>2. Applied thickness (thermoplastic). | | Preformed Plastic Pavement Markings and Thermoplacstic Letters/Symbols: CERT or LA15<br>Preformed Plastic Pavement Markings and Thermoplastic Tape: LA15 or ILOK or CBM<br>Preformed Plastic Pavement Markings and Themoplastic Component Material: LA15 or ILOK or CBM |
| 780 | Thermoplastic Pavt. Marking Line<br>&<br>Paint Pavement Marking Line<br>&<br>Epoxy Pavement Marking<br>&<br>Preformed Plastic Pavt. Marking Line<br>&<br>Modified Urethane Marking Line<br>&<br>Polyurea Marking Line | Foot<br>Meter | 1. Measurements of each size line applied and accepted.<br>2. Applied thickness (epoxy, modified urethane, polyurea, and thermoplastic). | | Thermoplastic Tape: LA15 or ILOK or CBM<br><br>Themoplastic Component Material: LA15 or ILOK or CBM<br><br>Epoxy, modified urethane, polyurea, thermoplastic, and preformed plastic pavement markings: LA15 or CBM |

# Section D

REFERENCE TABLES

## ESTIMATING DAILY EARTH VOLUMES WITH LOAD COUNTS

Page A-10 of this Documentation Guide presents a concept called "Progress Documentation." Simply stated, it is necessary to provide documented entries in the Quantity Book as work progresses, even though final measurements will usually be provided after the pay item is completed. Therefore, with many pay items, the progress documentation may be based upon nothing more than a recorded estimate of work done.

This section deals with a method of estimating Excavation pay items.

Enclosed is a brief excerpt of hauling volumes of some of the scrapers and hauling units being used in the State. If a piece of equipment is being used and the inspector is estimating earth volumes by load count, have the Contractor provide a specification sheet for the piece(s) of equipment in question. The specification sheet will provide struck capacities. Information can also be obtained from online resources or from the District estimator. Examples are included herein. The following example indicates the procedure that may be used in estimating earth volumes utilizing the struck capacities as shown on available equipment manufacturer's specification sheets or other commercially available resources. Provide a reference to the information on your calculation sheet and store a copy in the job files and/or attach to the daily report.

1. Obtain the daily load count from the contractor. Spot-check occasionally for accuracy.

2. From the specification sheet for the piece of equipment in question, select the struck capacity for the model being used.

3. Multiply the product of the load count and struck capacity by 80%. (This factor may vary somewhat with various materials and loading procedures, but any factor differing from 80% must be documented as to explain the reasoning.)

   Example: 70 loads hauled by a CAT 621G.

   The days volume = 70 loads x 15.7 cy x 80%= 879 cy
   879 cy x 0.764555 $m^3$/cy = 672 $m^3$

4. The above information and calculations shall be recorded on source documentation, such as the Inspector's Daily Report, Form BC 628, (Example, page F-24). When subsequent days of excavation take place with the same hauling units, if these are also estimated quantities, the source documents shall reference the first source document on which the struck capacity is shown.

RITCHIE Specs Everything about Equipment

Select language

Current number of specifications

Home → Spec Search → con → Motor Scraper → Caterpillar → 621G

# CATERPILLAR 621G MOTOR SCRAPER

VIEW ARTICLES ON THIS ITEM

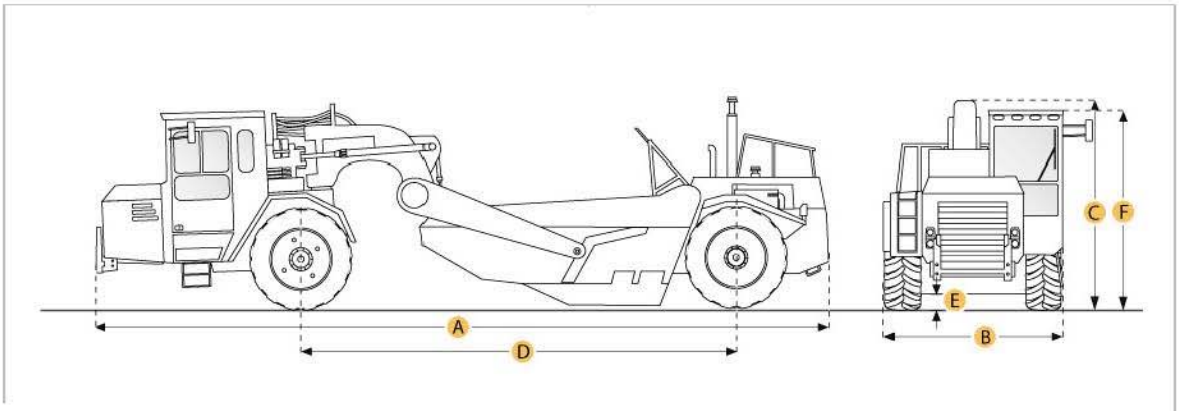
Print specification

**Looking to purchase this item?**

Find a Caterpillar 621G Motor Scraper being sold at Ritchie Bros. auctions.

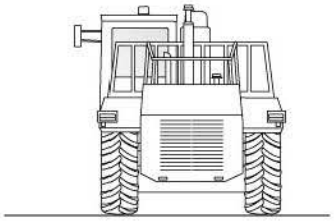
**Need to sell equipment?**

Complete this form and a Ritchie Bros. representative will contact you.




Selected Dimensions

| Dimensions | | |
|---|---|---|
| A. OVERALL LENGTH | 42.4 ft in | 12917 mm |
| B. OVERALL WIDTH | 11.4 ft in | 3467 mm |
| C. OVERALL HEIGHT | 12.2 ft in | 3705 mm |
| D. WHEELBASE | 25.4 ft in | 7722 mm |
| E. TRACTOR GROUND CLEARANCE | 1.8 ft in | 553 mm |
| F. HEIGHT TO TOP OF CAB | 11.3 ft in | 3423 mm |



Specification

| Tractor Engine | | |
|---|---|---|
| MAKE | Caterpillar | |
| MODEL | C15 ACERT | |
| GROSS POWER | 393 hp | 293 kw |
| NET POWER | 365 hp | 272 kw |
| DISPLACEMENT | 893 cu in | 14.6 L |
| **Operational** | | |
| FUEL CAPACITY | 160 gal | 606 L |
| COOLING SYSTEM FLUID CAPACITY | 28 gal | 107 L |
| ENGINE OIL FLUID CAPACITY | 9.5 gal | 36 L |
| TRANSMISSION FLUID CAPACITY | 19 gal | 72 L |
| DIFFERENTIAL FLUID CAPACITY | 38 gal | 144 L |
| HYDRAULIC SYSTEM FLUID CAPACITY | 37 gal | 140 L |
| WHEEL COOLANT FLUID CAPACITY - EACH | 12 gal | 45 L |
| OPERATING VOLTAGE | 24 V | |
| ALTERNATOR SUPPLIED AMPERAGE | 75 amps | |
| TIRE SIZE | 33.25-R29 | |
| **Transmission** | | |
| TYPE | 8-speed automatic Powershift with Electronic Control | |
| NUMBER OF FORWARD GEARS | 8 | |
| NUMBER OF REVERSE GEARS | 1 | |
| MAX SPEED FORWARD | 32 mph | 51.5 km/h |
| MAX SPEED REVERSE | 5.7 mph | 9.2 km/h |
| **Weights** | | |
| TOTAL OPERATING - EMPTY | 73788.7 lb | 33470 kg |



8/7/2018 Caterpillar 621G Motor Scraper

| | | |
|---|---|---|
| FRONT AXLE - EMPTY | 50177.2 % | |
| REAR AXLE - EMPTY | 23611.5 % | |
| TOTAL OPERATING - LOADED | 126589.4 lb | 57420 kg |
| FRONT AXEL - LOADED | 67093.3 lb | 30433 kg |
| REAR AXLE - LOADED | 59496.1 % | |
| **Bowl** | | |
| RATED PAYLOAD | 52800 lb | 23950 kg |
| HEAPED CAPACTIY | 22 yd3 | 17 m3 |
| STRUCK CAPACITY | 15.7 yd3 | 12 m3 |
| MAX DEPTH OF CUT | 13.1 in | 333 mm |
| WIDTH OF CUT | 9.1 ft in | 3023 mm |
| **Dimensions** | | |
| OVERALL LENGTH | 42.4 ft in | 12917 mm |
| OVERALL WIDTH | 11.4 ft in | 3467 mm |
| HEIGHT TO TOP OF CAB | 11.3 ft in | 3423 mm |
| OVERALL HEIGHT | 12.2 ft in | 3705 mm |
| WHEELBASE | 25.4 ft in | 7722 mm |
| TRACTOR GROUND CLEARANCE | 1.8 ft in | 553 mm |

Viewing Photo 1 of 5

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OEM specifications are provided for base units. Actual equipment might vary with options.

RITCHIE Specs Everything about Equipment

Select language

Current number of specifications

Home → Spec Search → con → Rock Truck → Terex → TR45

# TEREX TR45 ROCK TRUCK

VIEW ARTICLES ON THIS ITEM

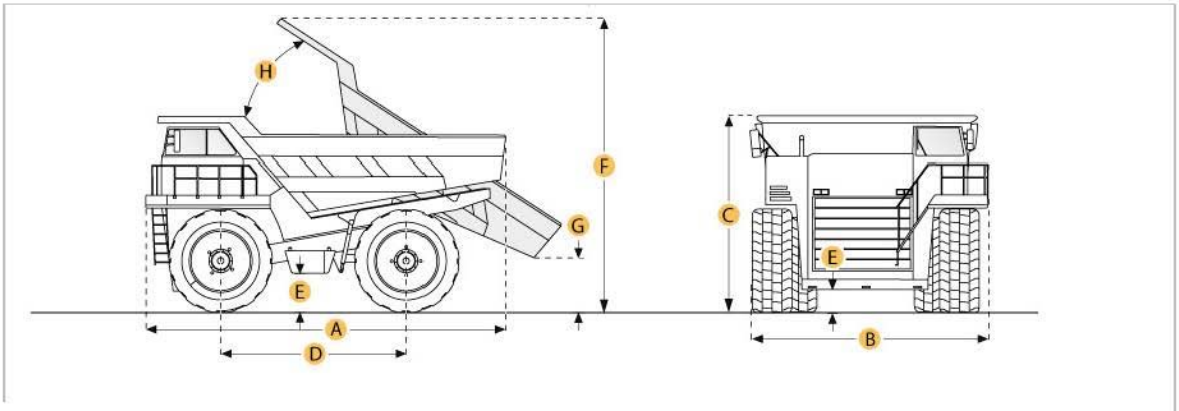
Print specification

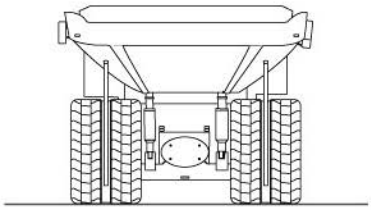
**Looking to purchase this item?**

Find a Terex TR45 Rock Truck being sold at Ritchie Bros. auctions.

**Need to sell equipment?**

Complete this form and a Ritchie Bros. representative will contact you.



Selected Dimensions

| Dimensions | | |
|---|---|---|
| A. OVERALL LENGTH | 28.5 ft in | 8700 mm |
| B. OVERALL WIDTH | 15.2 ft in | 4630 mm |
| C. OVERALL HEIGHT | 13.9 ft in | 4245 mm |
| D. WHEELBASE | 12.9 ft in | 3940 mm |
| E. GROUND CLEARANCE | 1.9 ft in | 585 mm |
| F. DUMP HEIGHT | 25.1 ft in | 7645 mm |
| G. DUMP GROUND CLEARANCE | 1.9 ft in | 585 mm |
| **Dump** | | |
| H. DUMP ANGLE | 58 degrees | |

Specification

| Engine | | |
|---|---|---|
| NUMBER OF CYLINDERS | 6 | |
| MAKE | 2347 | |
| MODEL | QSK19-C525 | |
| GROSS POWER | 525 hp | 391.5 kw |
| NET POWER | 495 hp | 369.1 kw |
| POWER MEASURED @ | 2100 rpm | |
| DISPLACEMENT | 1150 cu in | 18.8 L |
| MAX TORQUE | 1775 lb ft | 2406.6 Nm |
| TORQUE MEASURED @ | 1300 rpm | |
| ASPIRATION | turbocharged | |
| **Operational** | | |
| FUEL CAPACITY | 160.1 gal | 606 L |
| COOLING SYSTEM FLUID CAPACITY | 38 gal | 144 L |
| ENGINE OIL CAPACITY | 16.4 gal | 62 L |
| DIFF AND FINAL DRIVE FLUID CAPACITY | 15.9 gal | 60 L |
| STEERING SYSTEM FLUID CAPACITY | 22.5 gal | 85 L |
| HYDRAULIC SYSTEM FLUID CAPACITY | 97.2 gal | 368 L |
| OPERATING VOLTAGE | 24 V | |
| ALTERNATOR SUPPLIED AMPERAGE | 70 amps | |
| TIRE SIZE | 21.00-35 bias ply | |
| **Transmission** | | |
| TYPE | Allison M5610AR | |

8/7/2018 Terex TR45 Rock Truck

| | | |
|---|---|---|
| NUMBER OF GEARS - FORWARD | 6 | |
| NUMBER OF GEARS - REVERSE | 2 | |
| MAX SPEED | 40.4 mph | 65 km/h |
| **Weights** | | |
| EMPTY WEIGHT | 81870 lb | 37135.6 kg |
| LOADED WEIGHT | 171870 lb | 77958.9 kg |
| WEIGHT DISTRIBUTION FRONT - EMPTY | 48 % | |
| WEIGHT DISTRIBUTION REAR - EMPTY | 52 % | |
| WEIGHT DISTRIBUTION FRONT - LOADED | 34 % | |
| WEIGHT DISTRIBUTION REAR - LOADED | 66 % | |
| **Dump** | | |
| RATED PAYLOAD | 90000 lb | 40823.3 kg |
| LOAD CAPACITY - STRUCK | 25.6 yd3 | 19.6 m3 |
| LOAD CAPACITY - HEAPED | 34 yd3 | 26 m3 |
| DUMP ANGLE | 58 degrees | |
| RAISE TIME | 13 sec | |
| LOWER TIME | 9 sec | |
| **Dimensions** | | |
| OVERALL LENGTH | 28.5 ft in | 8700 mm |
| OVERALL WIDTH | 15.2 ft in | 4630 mm |
| OVERALL HEIGHT | 13.9 ft in | 4245 mm |
| WHEELBASE | 12.9 ft in | 3940 mm |
| GROUND CLEARANCE | 1.9 ft in | 585 mm |
| DUMP HEIGHT | 25.1 ft in | 7645 mm |
| DUMP GROUND CLEARANCE | 1.9 ft in | 585 mm |

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OEM specifications are provided for base units. Actual equipment might vary with options.

When performing a series of arithmetic operations (i.e. addition, subtraction, division, multiplication, exponents), you must perform those operations in a particular order. There is a mnemonic to help you remember the order - PEMDAS:

P Parentheses

E Exponents

M Multiplication

D Division

A Addition

S Subtraction

If you have a series of operations, do what's in parentheses first, then apply exponents, then do any multiplication or division, and finally do any adding or subtracting.

Example: $4 + 3\left(2 - \frac{1}{4}\right) - 2^3 = ?$

Do what's in parentheses first (find Lowest Common Denominator - LCD): $2 - \frac{1}{4} = \frac{8}{4} - \frac{1}{4} = \frac{7}{4}$

So now we have $4 + 3\left(\frac{7}{4}\right) - 2^3 = ?$

Now apply exponents: $2^3 = 8$

So now we have $4 + 3\left(\frac{7}{4}\right) - 8 = ?$

Now do multiplication: $3\left(\frac{7}{4}\right) = \frac{21}{4}$

So now we have $4 + \frac{21}{4} - 8$

Now do addition and subtraction (find LCD): $4 + \frac{21}{4} - 8$

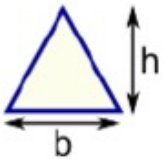
is the same as $\frac{16}{4} + \frac{21}{4} - \frac{32}{4} = \frac{5}{4}$

So our answer is $\frac{5}{4}$.

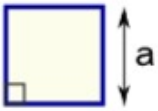
Note: "**h**" is at right angles (90°) to base "**b**". When taking field measurements make sure data is collected with this in mind.

# Area of Plane Shapes

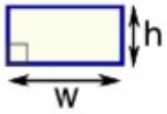
*Learn more about Area, or try the Area Calculator:*



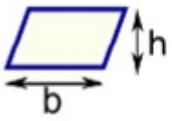

**Triangle**
Area = ½ × b × h
b = base
h = vertical height



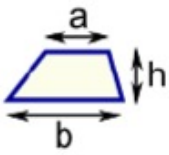

**Square**
Area = $a^2$
a = length of side




**Rectangle**
Area = w × h
w = width
h = height



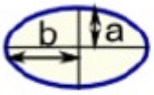

**Parallelogram**
Area = b × h
b = base
h = vertical height



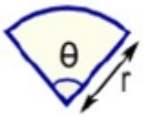

**Trapezoid (US)**
**Trapezium (UK)**
Area = ½(a+b) × h
h = vertical height




**Circle**
Area = $\pi \times r^2$
Circumference = $2 \times \pi \times r$
r = radius

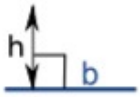



**Ellipse**
Area = πab

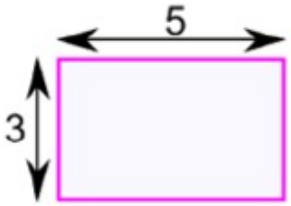



**Sector**
Area = ½ × $r^2$ × θ
r = radius
θ = angle in **radians**

Note: **h** is at right angles to **b**:




**Example: What is the area of this rectangle?**

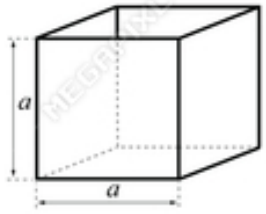



The formula is:

Area = w × h
w = width
h = height

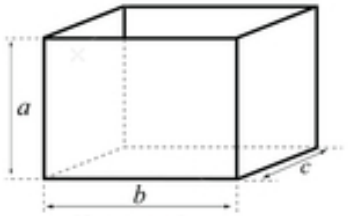
# Volume of 3D shapes

## Cube



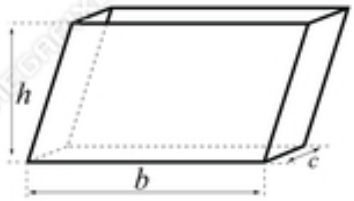

$V = a^3$

## Cuboid



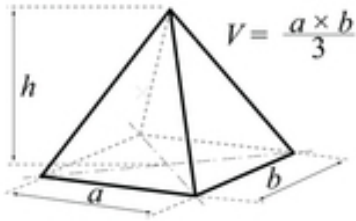

$V = a \times b \times c$

## Parallelepiped



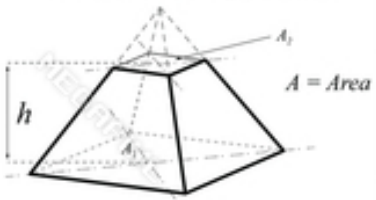

$V = h \times b \times c$

## Pyramid



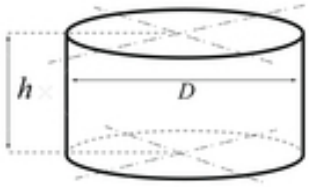

$V = \frac{a \times b}{3}$

## Frustrum of a pyramid



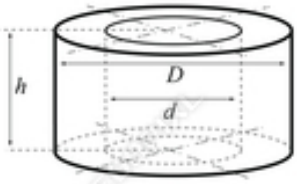

$V = \frac{h(A_1 \times A_1 + \sqrt{A_1 \times A_2})}{3}$

## Cylinder



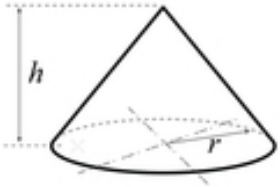

$V = \frac{1}{4}\pi D^2 h$

## Hollow Cylinder



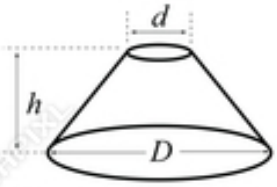

$V = \frac{1}{4}\pi(D^2 - d^2)$

## Cone



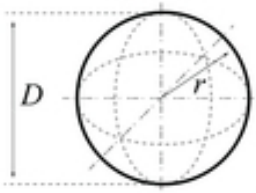

$V = \frac{1}{3}\pi r^2 h$

## Frustum of a Cone



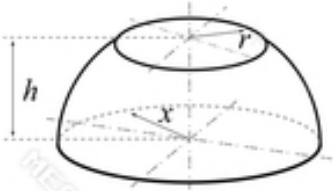

$V = \frac{(\pi h(D^2 + Dd + d^2))}{12}$

## Sphere



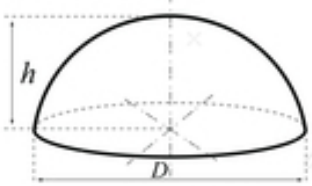

$V = \frac{3\pi r^3}{3} = \frac{\pi D^3}{6}$

## Zone of a Sphere



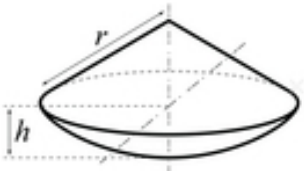

$V = \frac{\pi h(3r^2 + 3x^2 + h^2)}{6}$

## Segment of a sphere



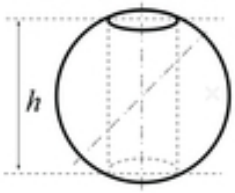

$V = \frac{\pi h(\frac{3}{4}D^2 + h^2)}{6}$

## Sector of a Sphere



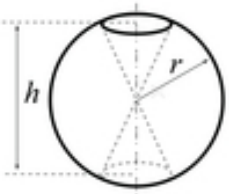

$V = \frac{2\pi r^2 h}{3}$

## Sphere with Cylinder



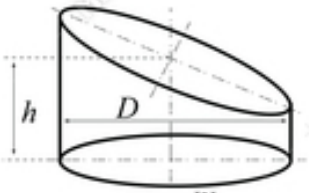

$V = \frac{\pi h^3}{6}$

## Sphere with two cones



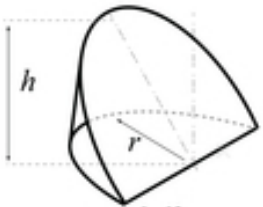

$V = \frac{2\pi r^2 h}{3}$

## Sliced Cylinder



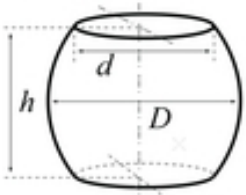

$V = \frac{\pi d^2 h}{4}$

## *Ungula*




$V = \frac{2r^2 h}{3}$

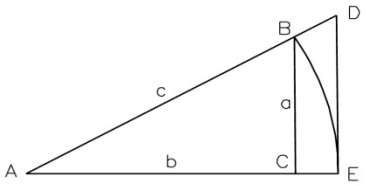
## Barrel



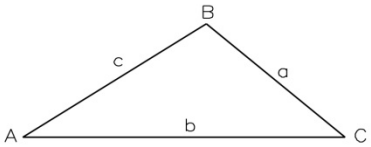

$V = \frac{\pi h(2D^2 + d^2)}{12}$

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This section presents mathematical formulas used by IDOT for various quantity determinations.



Right Triangle



Oblique Triangle

## Right Triangles

$\sin A = \frac{a}{c} = \cos B$

$\cos A = \frac{b}{c} = \sin B$

$\tan A = \frac{a}{b} = \cot B$

$\sec A = \frac{c}{b} = \operatorname{cosec} B$

$\operatorname{cosec} A = \frac{c}{a} = \sec B$

$\cot A = \frac{b}{a} = \tan B$

$a = c \sin A = c \cos B = b \tan A = b \cot B = \sqrt{c^2 - b^2}$

$b = c \cos A = c \sin B = a \cot A = a \tan B = \sqrt{c^2 - a^2}$

$c = \frac{a}{\sin A} = \frac{a}{\cos B} = \frac{b}{\sin B} = \frac{b}{\cos A}$

## Oblique Triangles

| Given | Sought | Formula |
|---|---|---|
| A, B, a | b, c | $b = \frac{a}{\sin A} \cdot \sin B$ $\quad c = \frac{a}{\sin A} \bullet \sin (A+B)$ |
| A, a, b | B, c | $\sin B = \frac{\sin A}{a} \cdot b$ $\quad c = \frac{a \sin (A + \text{arc sin } (b \sin A / a))}{\sin A}$ |
| C, a, b | $\frac{1}{2}(A + B)$<br>$\frac{1}{2}(A - B)$ | $\frac{1}{2}(A+B) = 90° - \frac{1}{2}C$<br>$\text{Tan } \frac{1}{2}(A - B) = \frac{a - b}{a + b} \cdot \tan \frac{1}{2}(A+B)$ |
| a, b, c | A | Given $s = \frac{1}{2}(a+b+c)$, then:<br>$\sin \frac{1}{2} A = \sqrt{\frac{(s - b)(s - c)}{bc}}$<br>$\cos \frac{1}{2} A = \sqrt{\frac{s(s - a)}{bc}}$<br>$\tan \frac{1}{2} A = \sqrt{\frac{(s - b)(s - c)}{s(s - a)}}$<br>$\sin A = 2\frac{\sqrt{s(s - a)(s - b)(s - c)}}{bc}$ |
| | Area | $\text{Area} = \sqrt{s(s - a)(s - b)(s - c)}$ |
| c, a, b | Area | $\text{Area} = \frac{1}{2} ab \sin C$ |

*Nomenclature*

A = total surface area
d = distance
h = height
p = perimeter
r = radius
s = side (edge) length, arc length
V = volume
$\theta$ = vertex angle, in radians
$\phi$ = central angle, in radians

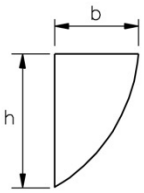
*Circle*



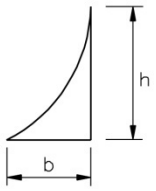

$p = 2\pi r$

$A = \pi r^2 = \frac{p^2}{4\pi}$

*Parabola*

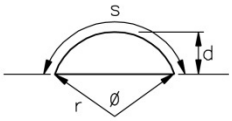



$A = \frac{2bh}{3}$




$A = \frac{1}{3}bh$

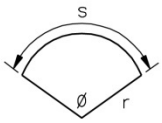
*Circular Segment (1)*




$A = \frac{1}{2}r^2(\phi - \sin\phi)$

$\phi = \frac{s}{r} = 2\left(\arccos\frac{r-d}{r}\right)$

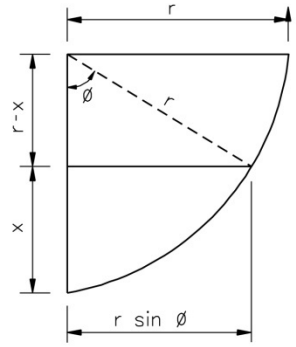
*Circular Sector*




$A = \frac{1}{2}\phi r^2 = \frac{1}{2}sr$

$\phi = \frac{s}{r}$

*Circular Segment (2)*




$\cos\phi = \frac{r-x}{r}$

Area of Circle Segment

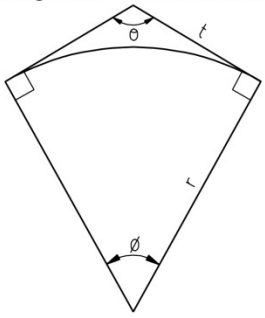
$\frac{\phi}{360°}\pi r^2$

Area of Triangle

$\frac{1}{2}(r - x)(r \sin\phi)$

*External Area*

Total Area - Area of Circle Segment = External Area




$t = \frac{r}{\tan\frac{\theta}{2}}$

$\phi = 180° - \theta$

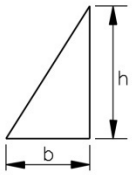
Total Area = $rt = \frac{r^2}{\tan\frac{\theta}{2}}$

Area of Circle Seg. = $\pi r^2 \frac{\phi}{360}$

Ext. Area = $r^2\left[\frac{1}{\tan\frac{\theta}{2}} - \pi\frac{\phi}{360}\right]$

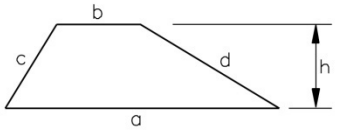
| Number of Sides | Name of Polygon |
|---|---|
| 3 | triangle |
| 4 | rectangle |
| 5 | pentagon |
| 6 | hexagon |
| 7 | heptagon |
| 8 | octagon |
| 9 | nonagon |
| 10 | decagon |

*Triangle*




$$A = \frac{1}{2}\,bh$$

*Trapezoid*

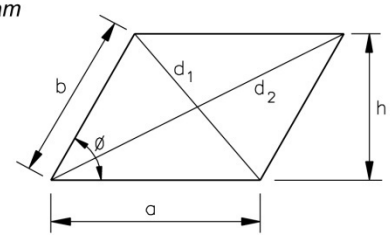



$$p = a + b + c + d$$

$$A = \frac{1}{2}\,h\,(a + b)$$

The trapezoid is isosceles if c = d.

*Parallelogram*




$$p = 2\,(a + b)$$

$$d_1 = \sqrt{a^2 + b^2 - 2ab(\cos\phi)}$$

$$d_2 = \sqrt{a^2 + b^2 + 2ab(\cos\phi)}$$

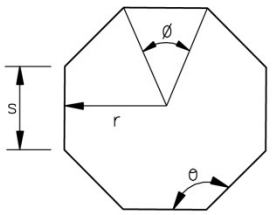
$$d_1^2 + d_2^2 = 2\,(a^2 + b^2)$$

$$A = ah = ab(\sin\phi)$$

If a = b, the parallelogram is a rhombus.

*Regular Polygon*

(n equal sides)




$$\phi = \frac{2\pi}{n}$$

$$\theta = \frac{\pi\,(n - 2)}{n}$$

$$p = ns$$

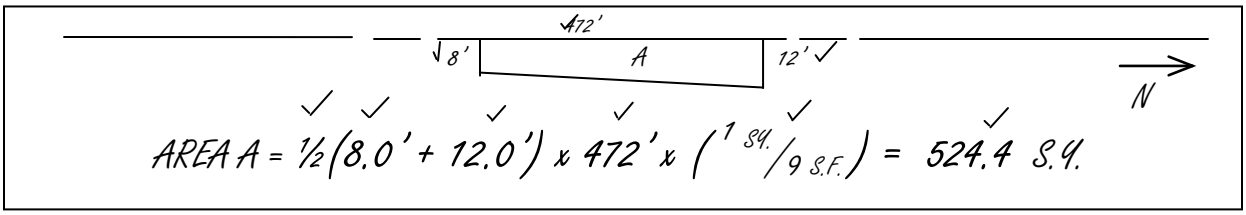
$$s = 2r\left(\tan\left(\frac{\phi}{2}\right)\right)$$

$$A = \frac{1}{2}\,nsr$$

## RECOMMENDED CHECKING PROCEDURES

*The Checker assumes responsibility for all errors made by the Preparer that are not caught by the Checker!*

- DO NOT ERASE ERRORS! Cross out the original entry with a single line and correct.

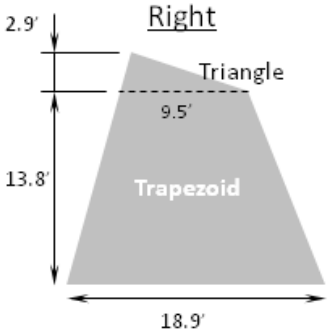



- Show what you have checked by making small check marks.
- Checking involves much more than punching numbers into a calculator. The following is a partial list of things that the checker should be reviewing:
  - All items on any sketches were properly labeled, and the measurements were correctly transferred from the original sketch to the equations.
  - The correct equation was used.
  - The Stationing is correct.
  - The Pay Item, Pay Item Number, and Fund Code are correct.
  - All necessary yield checks have been made. You should also note if the yield is within the spec. *(If it is out of spec, then an explanation of the factors that would account for the deviation or actions that were taken should be noted.)*
  - The "Quantity and Units" column of the IDR matches the calculated value and the pay item requirements.
  - All numbers have been correctly rounded-off, in accordance with Section B of the Documentation Manual.
  - Each pay item is labeled as an "estimate" or a "final measurement." (A final measurement is one that cannot or will not be re-measured.)
  - The date, Contractor/Subcontractor, weather, and job stamp information have been completed on the IDR.
  - "Measured by," "Calculated by" and "Checked by" have been initialed and dated.
  - All tonnage and gallon tickets have been initialed, correctly tallied and bound.
  - The "Evidence of Inspection" has been completed in accordance with the PPG, or Section C of the Documentation Manual.

*Remember: "Any place a mistake might be made, sooner or later, it will be made!"*

*Break areas into geometric shapes that you can calculate & use the correct formulas!*

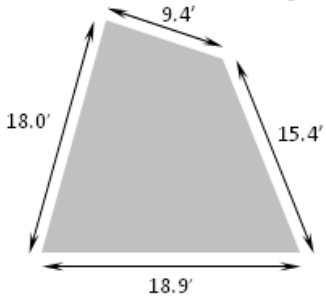
Right




$$\frac{2.9'(9.5')}{2} + 13.8'\frac{(9.5' + 18.9')}{2} = 209.7 \text{ SF}$$

$$= 23.3 \text{ SY}$$

Wrong

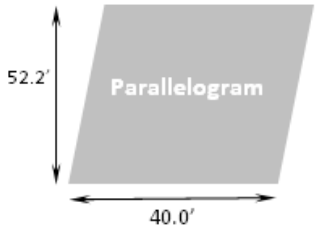



$$\frac{(18' + 15.4')}{2} \times (9.4' + 18.9') = 236.3 \text{ SF}$$

$$= 26.3 \text{ SY}$$

23.3SY ≠ 26.3 SY

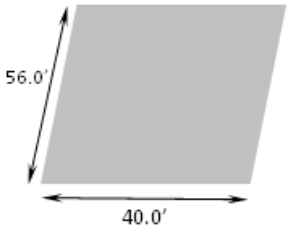
Right




40.0′ x 52.2′ = 2088.0 SF

= 232.0 SY

Wrong

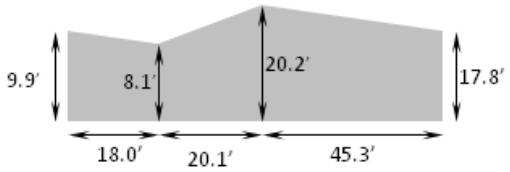



40.0′ x 56.0′ = 2240.0 SF

= 248.8 SY

232.0 SY ≠ 248.8 SY

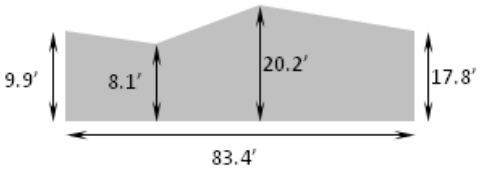
Right




$$\frac{(9.9' + 8.1')}{2}18.0' + \frac{(8.1' + 20.2')}{2}20.1' + \frac{(20.2' + 17.8')}{2}45.3' = 1307.1 \text{ SF}$$

$$= 145.2 \text{ SY}$$

Wrong




$$\frac{(9.9' + 8.1' + 20.2' + 17.8')}{4} \times 83.4' = 1167.6 \text{ SF}$$

$$= 129.7 \text{ SY}$$

145.2 SY ≠ 129.7 SY

# Common Conversions

Acre = 43,560 sq ft

Weight of 1 gallon of water = 8.328 lb

Weight of 1 cubic foot of water = 62.4 lb

Weight of 1 gallon of liquid other than water = 8.328 lb/gal x Specific Gravity of material (Sp. Gr.)

Volume in gallons = $\frac{net\ weght\ of\ material,\ lb}{8.328\ lb/gal\ x\ Sp.\ Gr.}$

Pi π = 3.1416

Typical weight of HMA = 112 lb/sq yd/in

Typical weight of reinforced concrete = 150 pounds/cu ft

1 Square yard = 9 Square feet

1 Cubic yard = 27 Cubic feet

1 Ton = 2,000 Pounds

Other conversions can be found in the Appendix of the Standard Specifications for Road and Bridge Construction.

# Section E

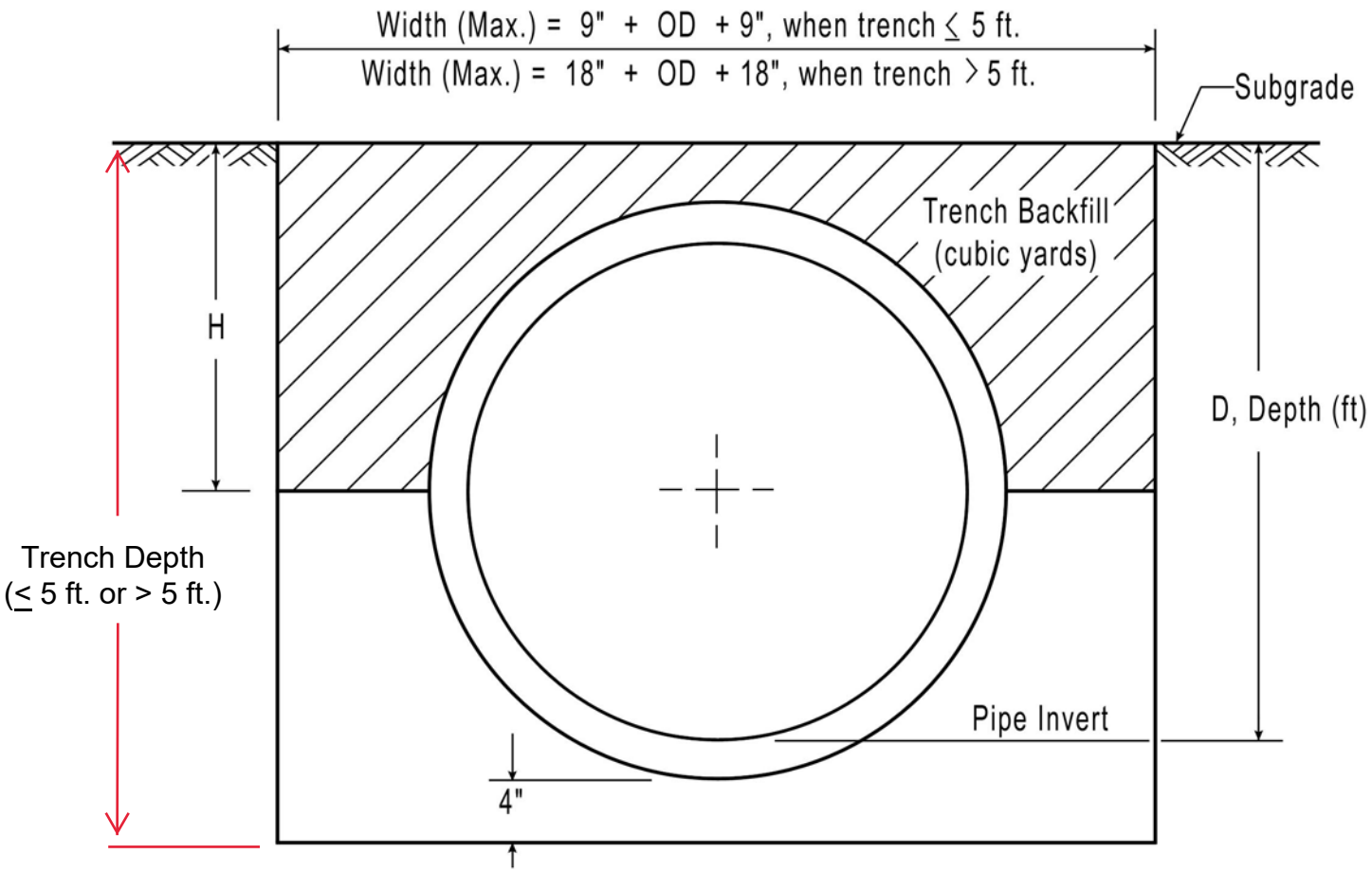
## TRENCH BACKFILL TABLES FOR CONCRETE PIPES

These tables can be used by the designer or the engineer to determine the volume of TRENCH BACKFILL that can be paid for when backfilling storm sewer trenches. Maximum trench widths adopted by the January 1, 2022 Standard Specifications are used.

**NOTE:** If the trench depth is 5ft. (1.5m) and less, with protection, the values included in the tables herein will be of no value. The engineer will have to calculate the actual volume of TRENCH BACKFILL using the formulas included within this section.

The calculated volumes are based on the use of standard **English sized pipes** which meet the tolerances of the Metric pay item.

# TRENCH BACKFILL TABLE FOR CIRCULAR CONCRETE PIPE, ENGLISH




EXAMPLE

Given: Pipe = 42” Storm Sewer

Average Depth, D = 6.8 feet

Trench Length = 84.7 feet

Find: Cubic Yards of TRENCH BACKFILL

Solution:

| | | |
|---|---|---|
| From Table, Cubic yard/lin. ft. | | = 1.093 |
| x Trench length | | = x 84.7 |
| TRENCH BACKFILL | | = 92.6 cu. yds. |

NOTE: If the field engineer measures a width of trench less than the maximum permitted, the values included herein will be of no value. The actual volume of TRENCH BACKFILL used will therefore have to be calculated using the following formula:

$$\text{Cubic Yards} = \left[(H' x W') - \left(\frac{\textit{Pipe End Area}}{2}\right)\right] x\, L' \times 1/27$$

# VOLUME OF TRENCH BACKFILL (CU.YDS.) PER LINEAL FT. OF STORM SEWER

| Inside Diameter<br>Wall thickness | 8”<br>1.667” | 10”<br>1.833” | 12”<br>2.00” | 15”<br>2.25” | 18”<br>2.50” | 21”<br>2.75” |
|---|---|---|---|---|---|---|
| 2.0 | 0.138 | 0.136 | 0.132 | 0.121 | 0.105 | 0.083 |
| 2.2 | 0.156 | 0.155 | 0.152 | 0.143 | 0.130 | 0.111 |
| 2.4 | 0.174 | 0.175 | 0.173 | 0.167 | 0.155 | 0.138 |
| 2.6 | 0.192 | 0.194 | 0.194 | 0.190 | 0.180 | 0.166 |
| 2.8 | 0.210 | 0.214 | 0.215 | 0.213 | 0.205 | 0.193 |
| 3.0 | 0.228 | 0.234 | 0.236 | 0.236 | 0.231 | 0.220 |
| 3.2 | 0.246 | 0.253 | 0.257 | 0.259 | 0.256 | 0.248 |
| 3.4 | 0.264 | 0.272 | 0.278 | 0.282 | 0.281 | 0.275 |
| 3.6 | 0.282 | 0.292 | 0.299 | 0.305 | 0.307 | 0.303 |
| 3.8 | 0.300 | 0.311 | 0.320 | 0.329 | 0.332 | 0.330 |
| 4.0 | 0.319 | 0.331 | 0.341 | 0.352 | 0.358 | 0.358 |
| 4.2 | 0.336 | 0.350 | 0.362 | 0.375 | 0.383 | 0.385 |
| 4.4 | 0.354 | 0.370 | 0.383 | 0.398 | 0.408 | 0.413 |
| 4.6 | 0.610 | 0.622 | 0.632 | 0.642 | 0.647 | 0.647 |
| 4.8 | 0.639 | 0.653 | 0.664 | 0.676 | 0.684 | 0.686 |
| 5.0 | 0.668 | 0.683 | 0.696 | 0.711 | 0.720 | 0.724 |
| 5.2 | 0.698 | 0.714 | 0.728 | 0.745 | 0.756 | 0.763 |
| 5.4 | 0.727 | 0.745 | 0.760 | 0.779 | 0.793 | 0.801 |
| 5.6 | 0.756 | 0.776 | 0.792 | 0.813 | 0.829 | 0.840 |
| 5.8 | 0.785 | 0.807 | 0.824 | 0.848 | 0.866 | 0.879 |
| 6.0 | 0.815 | 0.837 | 0.856 | 0.882 | 0.902 | 0.918 |
| 6.2 | 0.844 | 0.867 | 0.888 | 0.916 | 0.938 | 0.956 |
| 6.4 | 0.873 | 0.898 | 0.921 | 0.950 | 0.975 | 0.994 |
| 6.6 | 0.903 | 0.929 | 0.953 | 0.985 | 1.011 | 1.033 |
| 6.8 | 0.932 | 0.959 | 0.985 | 1.019 | 1.048 | 1.071 |
| 7.0 | 0.961 | 0.990 | 1.017 | 1.053 | 1.084 | 1.110 |
| 7.2 | 0.990 | 1.021 | 1.049 | 1.087 | 1.121 | 1.149 |
| 7.4 | 1.019 | 1.051 | 1.081 | 1.122 | 1.157 | 1.187 |
| 7.6 | 1.049 | 1.082 | 1.113 | 1.156 | 1.193 | 1.226 |
| 7.8 | 1.078 | 1.113 | 1.145 | 1.190 | 1.230 | 1.264 |
| 8.0 | 1.107 | 1.143 | 1.177 | 1.224 | 1.266 | 1.303 |
| 8.2 | 1.136 | 1.174 | 1.209 | 1.259 | 1.303 | 1.342 |
| 8.4 | 1.165 | 1.205 | 1.241 | 1.293 | 1.340 | 1.380 |
| 8.6 | 1.195 | 1.235 | 1.274 | 1.328 | 1.376 | 1.419 |
| 8.8 | 1.224 | 1.266 | 1.306 | 1.362 | 1.412 | 1.458 |
| 9.0 | 1.253 | 1.297 | 1.338 | 1.396 | 1.449 | 1.496 |
| 9.2 | 1.282 | 1.327 | 1.370 | 1.430 | 1.485 | 1.535 |
| 9.4 | 1.311 | 1.358 | 1.402 | 1.465 | 1.522 | 1.574 |
| 9.6 | 1.341 | 1.389 | 1.435 | 1.499 | 1.558 | 1.612 |
| 9.8 | 1.370 | 1.419 | 1.467 | 1.533 | 1.594 | 1.651 |
| 10.0 | 1.399 | 1.450 | 1.499 | 1.568 | 1.631 | 1.689 |
| 10.2 | 1.428 | 1.481 | 1.531 | 1.602 | 1.667 | 1.728 |
| 10.4 | 1.457 | 1.511 | 1.563 | 1.636 | 1.704 | 1.767 |
| 10.6 | 1.487 | 1.542 | 1.595 | 1.671 | 1.740 | 1.805 |
| 10.8 | 1.516 | 1.573 | 1.627 | 1.705 | 1.776 | 1.844 |
| 11.0 | 1.545 | 1.603 | 1.659 | 1.739 | 1.813 | 1.882 |
| 11.2 | 1.574 | 1.634 | 1.691 | 1.773 | 1.849 | 1.921 |
| 11.4 | 1.603 | 1.665 | 1.723 | 1.808 | 1.886 | 1.960 |
| 11.6 | 1.633 | 1.696 | 1.755 | 1.842 | 1.922 | 1.998 |
| 11.8 | 1.662 | 1.726 | 1.788 | 1.876 | 1.958 | 2.037 |
| For each additional 0.2’ depth | | | | | | |
| | +0.0292 | +0.0307 | +0.0321 | +0.0343 | +0.0364 | +0.0386 |

**D(ft) = Average Depth of Trench from Subgrade to Invert of Pipe**

# VOLUME OF TRENCH BACKFILL (CU.YDS.) PER LINEAL FT. OF STORM SEWER

| D(ft) = Average Depth of Trench from Subgrade to Invert of Pipe<br>Inside Diameter<br>Wall thickness | 24”<br>3.00” | 27”<br>3.25” | 30”<br>3.50” | 33”<br>3.75” | 36”<br>4.00” | 42”<br>4.50” |
|---|---|---|---|---|---|---|
| 2.4 | 0.116 | | | | | |
| 2.6 | 0.146 | 0.121 | | | | |
| 2.8 | 0.175 | 0.152 | 0.124 | | | |
| 3.0 | 0.205 | 0.184 | 0.158 | | | |
| 3.2 | 0.235 | 0.216 | 0.192 | 0.163 | | |
| 3.4 | 0.264 | 0.248 | 0.226 | 0.199 | 0.168 | |
| 3.6 | 0.294 | 0.280 | 0.260 | 0.236 | 0.206 | |
| 3.8 | 0.323 | 0.311 | 0.294 | 0.272 | 0.244 | |
| 4.0 | 0.353 | 0.343 | 0.328 | 0.308 | 0.282 | 0.216 |
| 4.2 | 0.383 | 0.375 | 0.362 | 0.344 | 0.321 | 0.259 |
| 4.4 | 0.412 | 0.407 | 0.571 | 0.548 | 0.520 | 0.448 |
| 4.6 | 0.642 | 0.632 | 0.616 | 0.595 | 0.569 | 0.502 |
| 4.8 | 0.683 | 0.674 | 0.661 | 0.643 | 0.619 | 0.556 |
| 5.0 | 0.723 | 0.717 | 0.706 | 0.690 | 0.668 | 0.610 |
| 5.2 | 0.764 | 0.760 | 0.751 | 0.737 | 0.718 | 0.663 |
| 5.4 | 0.805 | 0.803 | 0.796 | 0.784 | 0.767 | 0.717 |
| 5.6 | 0.846 | 0.846 | 0.841 | 0.831 | 0.816 | 0.771 |
| 5.8 | 0.886 | 0.889 | 0.886 | 0.879 | 0.866 | 0.824 |
| 6.0 | 0.927 | 0.932 | 0.931 | 0.926 | 0.915 | 0.878 |
| 6.2 | 0.968 | 0.975 | 0.976 | 0.973 | 0.964 | 0.932 |
| 6.4 | 1.009 | 1.018 | 1.022 | 1.020 | 1.014 | 0.985 |
| 6.6 | 1.049 | 1.061 | 1.067 | 1.068 | 1.063 | 1.039 |
| 6.8 | 1.090 | 1.103 | 1.112 | 1.115 | 1.113 | 1.093 |
| 7.0 | 1.131 | 1.146 | 1.157 | 1.162 | 1.162 | 1.147 |
| 7.2 | 1.172 | 1.189 | 1.202 | 1.209 | 1.211 | 1.200 |
| 7.4 | 1.212 | 1.232 | 1.247 | 1.256 | 1.261 | 1.254 |
| 7.6 | 1.253 | 1.275 | 1.292 | 1.304 | 1.310 | 1.308 |
| 7.8 | 1.294 | 1.318 | 1.337 | 1.351 | 1.359 | 1.361 |
| 8.0 | 1.335 | 1.361 | 1.382 | 1.398 | 1.409 | 1.415 |
| 8.2 | 1.375 | 1.404 | 1.427 | 1.445 | 1.458 | 1.469 |
| 8.4 | 1.416 | 1.447 | 1.473 | 1.493 | 1.508 | 1.523 |
| 8.6 | 1.457 | 1.490 | 1.518 | 1.540 | 1.557 | 1.577 |
| 8.8 | 1.498 | 1.533 | 1.563 | 1.587 | 1.607 | 1.630 |
| 9.0 | 1.539 | 1.576 | 1.608 | 1.635 | 1.656 | 1.684 |
| 9.2 | 1.579 | 1.619 | 1.653 | 1.682 | 1.706 | 1.738 |
| 9.4 | 1.620 | 1.662 | 1.698 | 1.729 | 1.755 | 1.791 |
| 9.6 | 1.661 | 1.704 | 1.743 | 1.776 | 1.804 | 1.845 |
| 9.8 | 1.701 | 1.747 | 1.788 | 1.823 | 1.854 | 1.899 |
| 10.0 | 1.742 | 1.790 | 1.833 | 1.871 | 1.903 | 1.953 |
| 10.2 | 1.783 | 1.833 | 1.878 | 1.918 | 1.953 | 2.006 |
| 10.4 | 1.824 | 1.876 | 1.924 | 1.965 | 2.002 | 2.060 |
| 10.6 | 1.864 | 1.919 | 1.968 | 2.012 | 2.051 | 2.114 |
| 10.8 | 1.905 | 1.962 | 2.013 | 2.060 | 2.100 | 2.167 |
| 11.0 | 1.946 | 2.005 | 2.058 | 2.107 | 2.150 | 2.221 |
| 11.2 | 1.987 | 2.048 | 2.103 | 2.154 | 2.199 | 2.275 |
| 11.4 | 2.028 | 2.091 | 2.148 | 2.201 | 2.249 | 2.328 |
| 11.6 | 2.068 | 2.133 | 2.193 | 2.249 | 2.298 | 2.382 |
| 11.8 | 2.109 | 2.176 | 2.239 | 2.296 | 2.347 | 2.436 |
| 12.0 | 2.150 | 2.219 | 2.284 | 2.343 | 2.397 | 2.490 |
| 12.2 | 2.191 | 2.262 | 2.329 | 2.390 | 2.446 | 2.543 |
| For each additional 0.2’ depth: | | | | | | |
| | +0.0407 | +0.0429 | +0.0451 | +0.0472 | +0.0494 | +0.0537 |

# VOLUME OF TRENCH BACKFILL (CU.YDS.) PER LINEAL FT. OF STORM SEWER

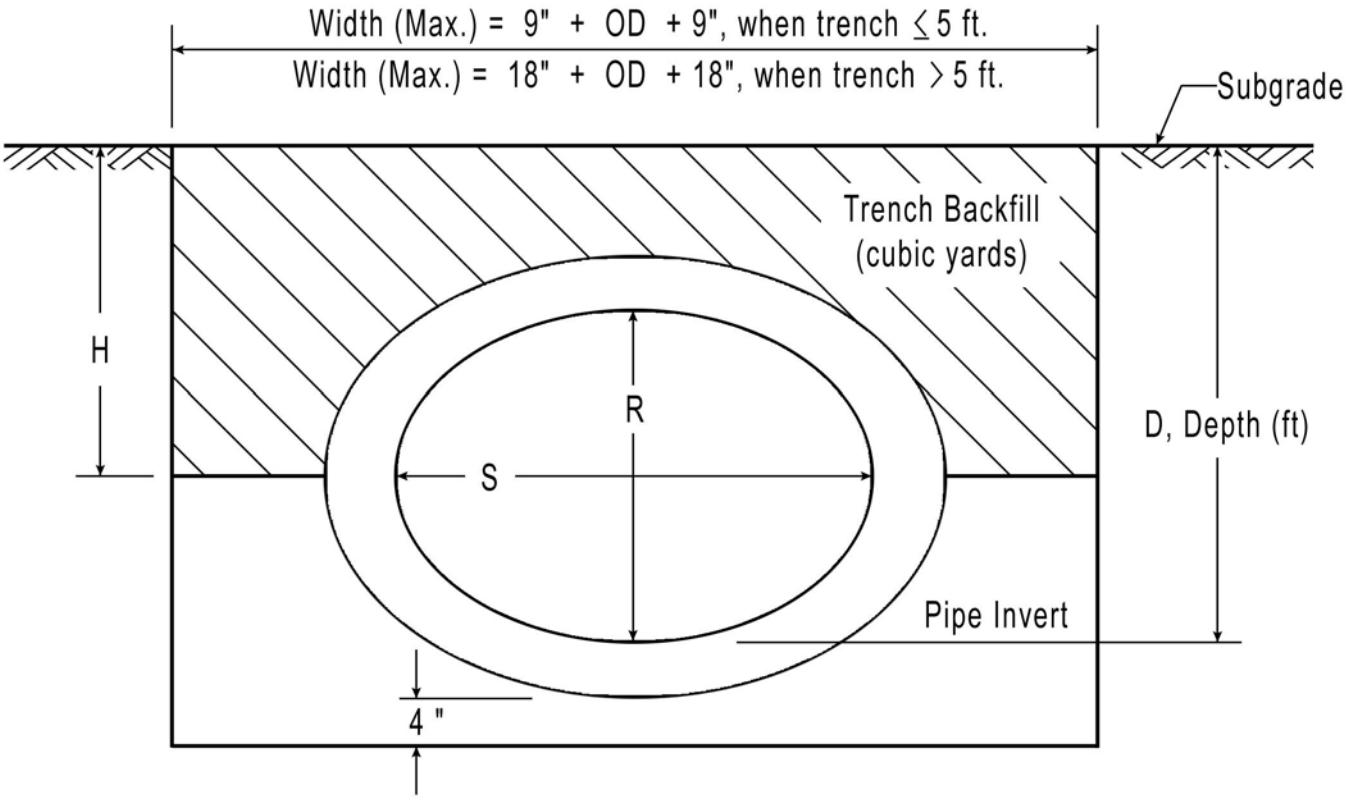
| Inside Diameter<br>Wall thickness | 48”<br>5.00” | 54”<br>5.50” | 60”<br>6.00” | 66”<br>6.50” | 72”<br>7.00” | 78”<br>7.50” |
|---|---|---|---|---|---|---|
| 4.6 | 0.414 | | | | | |
| 4.8 | 0.472 | | | | | |
| 5.0 | 0.530 | 0.430 | | | | |
| 5.2 | 0.588 | 0.492 | | | | |
| 5.4 | 0.646 | 0.555 | | | | |
| 5.6 | 0.704 | 0.617 | 0.509 | | | |
| 5.8 | 0.762 | 0.679 | 0.576 | | | |
| 6.0 | 0.820 | 0.742 | 0.643 | | | |
| 6.2 | 0.878 | 0.804 | 0.709 | 0.594 | | |
| 6.4 | 0.936 | 0.866 | 0.776 | 0.665 | | |
| 6.6 | 0.994 | 0.929 | 0.843 | 0.736 | 0.608 | |
| 6.8 | 1.052 | 0.991 | 0.909 | 0.807 | 0.683 | |
| 7.0 | 1.110 | 1.053 | 0.976 | 0.878 | 0.759 | |
| 7.2 | 1.168 | 1.116 | 1.043 | 0.949 | 0.834 | 0.699 |
| 7.4 | 1.226 | 1.178 | 1.109 | 1.020 | 0.909 | 0.778 |
| 7.6 | 1.284 | 1.240 | 1.176 | 1.091 | 0.985 | 0.858 |
| 7.8 | 1.342 | 1.303 | 1.243 | 1.162 | 1.060 | 0.938 |
| 8.0 | 1.400 | 1.365 | 1.309 | 1.233 | 1.135 | 1.017 |
| 8.2 | 1.458 | 1.428 | 1.376 | 1.304 | 1.211 | 1.097 |
| 8.4 | 1.517 | 1.490 | 1.443 | 1.375 | 1.286 | 1.177 |
| 8.6 | 1.575 | 1.553 | 1.510 | 1.446 | 1.362 | 1.257 |
| 8.8 | 1.633 | 1.615 | 1.576 | 1.517 | 1.437 | 1.336 |
| 9.0 | 1.691 | 1.677 | 1.643 | 1.588 | 1.512 | 1.416 |
| 9.2 | 1.749 | 1.739 | 1.710 | 1.659 | 1.588 | 1.495 |
| 9.4 | 1.807 | 1.802 | 1.776 | 1.730 | 1.663 | 1.575 |
| 9.6 | 1.865 | 1.864 | 1.843 | 1.801 | 1.738 | 1.655 |
| 9.8 | 1.923 | 1.927 | 1.910 | 1.872 | 1.813 | 1.734 |
| 10.0 | 1.981 | 1.989 | 1.977 | 1.943 | 1.889 | 1.814 |
| 10.2 | 2.039 | 2.051 | 2.043 | 2.014 | 1.964 | 1.893 |
| 10.4 | 2.097 | 2.113 | 2.110 | 2.085 | 2.039 | 1.973 |
| 10.6 | 2.155 | 2.176 | 2.177 | 2.156 | 2.115 | 2.053 |
| 10.8 | 2.213 | 2.238 | 2.243 | 2.227 | 2.190 | 2.132 |
| 11.0 | 2.271 | 2.300 | 2.310 | 2.298 | 2.265 | 2.212 |
| 11.2 | 2.329 | 2.363 | 2.377 | 2.369 | 2.341 | 2.292 |
| 11.4 | 2.387 | 2.425 | 2.443 | 2.440 | 2.416 | 2.371 |
| 11.6 | 2.445 | 2.487 | 2.509 | 2.511 | 2.491 | 2.451 |
| 11.8 | 2.503 | 2.550 | 2.576 | 2.582 | 2.566 | 2.531 |
| 12.0 | 2.561 | 2.612 | 2.643 | 2.653 | 2.642 | 2.610 |
| 12.2 | 2.619 | 2.675 | 2.709 | 2.724 | 2.717 | 2.690 |
| 12.4 | 2.677 | 2.738 | 2.776 | 2.795 | 2.792 | 2.770 |
| 12.6 | 2.735 | 2.800 | 2.843 | 2.866 | 2.868 | 2.849 |
| 12.8 | 2.793 | 2.862 | 2.909 | 2.937 | 2.943 | 2.929 |
| 13.0 | 2.852 | 2.925 | 2.976 | 3.008 | 3.018 | 3.008 |
| 13.2 | 2.910 | 2.987 | 3.043 | 3.079 | 3.094 | 3.088 |
| 13.4 | 2.968 | 3.049 | 3.110 | 3.150 | 3.169 | 3.168 |
| 13.6 | 3.026 | 3.111 | 3.176 | 3.221 | 3.244 | 3.247 |
| 13.8 | 3.084 | 3.174 | 3.243 | 3.292 | 3.320 | 3.327 |
| 14.0 | 3.142 | 3.236 | 3.310 | 3.363 | 3.395 | 3.407 |
| 14.2 | 3.200 | 3.298 | 3.376 | 3.434 | 3.470 | 3.486 |
| 14.4 | 3.258 | 3.361 | 3.443 | 3.505 | 3.545 | 3.566 |
| For each additional 0.2’ depth | | | | | | |
| | +0.0580 | +0.0623 | +0.0667 | +0.0710 | +0.0753 | +0.0796 |

D(ft) = Average Depth of Trench from Subgrade to Invert of Pipe

# VOLUME OF TRENCH BACKFILL (CU.YDS.) PER LINEAL FT. OF STORM SEWER

| D(ft) = Average Depth of Trench from Subgrade to Invert of Pipe | Inside Diameter<br>Wall thickness | 84”<br>8.00” | 90”<br>8.50” | 96”<br>9.00” | 102”<br>9.50” | 108”<br>10.00” |
|---|---|---|---|---|---|---|
| | 7.8 | 0.795 | | | | |
| | 8.0 | 0.879 | | | | |
| | 8.2 | 0.963 | | | | |
| | 8.4 | 1.047 | 0.896 | | | |
| | 8.6 | 1.131 | 0.984 | | | |
| | 8.8 | 1.215 | 1.073 | 0.910 | 0.726 | 0.522 |
| | 9.0 | 1.299 | 1.161 | 1.002 | 0.823 | 0.623 |
| | 9.2 | 1.382 | 1.249 | 1.095 | 0.920 | 0.724 |
| | 9.4 | 1.466 | 1.338 | 1.187 | 1.017 | 0.825 |
| | 9.6 | 1.550 | 1.426 | 1.280 | 1.114 | 0.927 |
| | 9.8 | 1.634 | 1.514 | 1.373 | 1.211 | 1.028 |
| | 10.0 | 1.718 | 1.602 | 1.467 | 1.307 | 1.129 |
| | 10.2 | 1.802 | 1.690 | 1.558 | 1.404 | 1.230 |
| | 10.4 | 1.886 | 1.778 | 1.650 | 1.501 | 1.331 |
| | 10.6 | 1.970 | 1.866 | 1.743 | 1.598 | 1.433 |
| | 10.8 | 2.054 | 1.955 | 1.835 | 1.695 | 1.534 |
| | 11.0 | 2.138 | 2.043 | 1.928 | 1.792 | 1.635 |
| | 11.2 | 2.222 | 2.131 | 2.021 | 1.889 | 1.737 |
| | 11.4 | 2.306 | 2.220 | 2.113 | 1.986 | 1.838 |
| | 11.6 | 2.390 | 2.308 | 2.206 | 2.083 | 1.939 |
| | 11.8 | 2.474 | 2.396 | 2.298 | 2.180 | 2.040 |
| | 12.0 | 2.558 | 2.485 | 2.391 | 2.277 | 2.141 |
| | 12.2 | 2.642 | 2.573 | 2.484 | 2.374 | 2.243 |
| | 12.4 | 2.726 | 2.661 | 2.576 | 2.471 | 2.344 |
| | 12.6 | 2.810 | 2.749 | 2.669 | 2.567 | 2.445 |
| | 12.8 | 2.894 | 2.838 | 2.761 | 2.664 | 2.547 |
| | 13.0 | 2.978 | 2.926 | 2.854 | 2.761 | 2.648 |
| | 13.2 | 3.062 | 3.014 | 2.947 | 2.858 | 2.749 |
| | 13.4 | 3.146 | 3.102 | 3.039 | 2.955 | 2.850 |
| | 13.6 | 3.230 | 3.191 | 3.132 | 3.052 | 2.951 |
| | 13.8 | 3.314 | 3.279 | 3.224 | 3.149 | 3.053 |
| | 14.0 | 3.398 | 3.367 | 3.317 | 3.246 | 3.154 |
| | 14.2 | 3.482 | 3.455 | 3.410 | 3.343 | 3.255 |
| | 14.4 | 3.566 | 3.544 | 3.502 | 3.440 | 3.357 |
| | 14.6 | 3.649 | 3.632 | 3.595 | 3.537 | 3.458 |
| | 14.8 | 3.733 | 3.720 | 3.687 | 3.634 | 3.559 |
| | 15.0 | 3.817 | 3.809 | 3.780 | 3.730 | 3.660 |
| | 15.2 | 3.901 | 3.897 | 3.873 | 3.827 | 3.761 |
| | 15.4 | 3.985 | 3.985 | 3.965 | 3.924 | 3.863 |
| | 15.6 | 4.069 | 4.074 | 4.058 | 4.021 | 3.964 |
| | 15.8 | 4.153 | 4.162 | 4.150 | 4.118 | 4.065 |
| | 16.0 | 4.237 | 4.250 | 4.243 | 4.215 | 4.166 |
| | 16.2 | 4.321 | 4.338 | 4.335 | 4.312 | 4.268 |
| | 16.4 | 4.405 | 4.426 | 4.428 | 4.409 | 4.369 |
| | 16.6 | 4.488 | 4.515 | 4.521 | 4.506 | 4.470 |
| | 16.8 | 4.572 | 4.603 | 4.613 | 4.603 | 4.571 |
| | 17.0 | 4.656 | 4.691 | 4.706 | 4.699 | 4.672 |
| | 17.2 | 4.740 | 4.780 | 4.798 | 4.796 | 4.774 |
| | 17.4 | 4.824 | 4.868 | 4.891 | 4.893 | 4.875 |
| | 17.6 | 4.908 | 4.956 | 4.984 | 4.990 | 4.976 |
| | For each additional 0.2’ depth: | | | | | |
| | | +0.0839 | +0.0883 | +0.0926 | +0.0969 | +0.1012 |

# TRENCH BACKFILL TABLE FOR ELLIPTICAL PIPES, ENGLISH




EXAMPLE

Given: Pipe = 38” rise x 60” span, Storm Sewer

Average Depth, D = 4.6 feet

Trench Length = 82.5 feet

Find: Cubic Yards of TRENCH BACKFILL

Solution: From Table, Cubic yard/lin. ft. = 0.645

x Trench length = x 82.5

TRENCH BACKFILL = 53.2 cu. yds.

NOTE: If the field engineer measures a width of trench less than the maximum permitted, the values included herein will be of no value. The actual volume of TRENCH BACKFILL used will therefore have to be calculated using the following formula:

$$\text{Cubic Yards} = \left[(H' x W') - \left(\frac{\textit{Pipe End Area}}{2}\right)\right] x\, L' \times 1/27$$

# VOLUME OF TRENCH BACKFILL (CU. YDS)
# PER LINEAL FOOT OF ELLIPTICAL STORM SEWER PIPE

| Eq. Round Size, in. | 18 | 24 | 27 | 30 | 33 | 36 | 39 | 42 |
|---|---|---|---|---|---|---|---|---|
| Rise, in. | 14 | 19 | 22 | 24 | 27 | 29 | 32 | 34 |
| Span, in. | 23 | 30 | 34 | 38 | 42 | 45 | 49 | 53 |
| Wall Thickness, in. | 2.75 | 3.25 | 3.50 | 3.75 | 3.75 | 4.50 | 4.75 | 5.00 |
| Pipe End Area, sq. ft. | 3.03 | 5.08 | 6.49 | 7.82 | 9.31 | 11.19 | 13.24 | 15.12 |
| 1.4 | 0.061 | | | | | | | |
| 1.6 | 0.090 | | | | | | | |
| 1.8 | 0.118 | | | | | | | |
| 2.0 | 0.147 | 0.109 | | | | | | |
| 2.2 | 0.176 | 0.143 | 0.114 | | | | | |
| 2.4 | 0.205 | 0.177 | 0.150 | 0.130 | | | | |
| 2.6 | 0.233 | 0.210 | 0.186 | 0.169 | 0.135 | | | |
| 2.8 | 0.262 | 0.244 | 0.223 | 0.208 | 0.176 | 0.146 | | |
| 3.0 | 0.291 | 0.277 | 0.259 | 0.247 | 0.218 | 0.191 | | |
| 3.2 | 0.319 | 0.311 | 0.296 | 0.286 | 0.260 | 0.235 | 0.196 | |
| 3.4 | 0.348 | 0.345 | 0.332 | 0.326 | 0.301 | 0.280 | 0.243 | 0.216 |
| 3.6 | 0.377 | 0.378 | 0.369 | 0.365 | 0.343 | 0.324 | 0.290 | 0.266 |
| 3.8 | 0.406 | 0.412 | 0.405 | 0.404 | 0.385 | 0.369 | 0.337 | 0.316 |
| 4.0 | 0.434 | 0.446 | 0.441 | 0.443 | 0.426 | 0.413 | 0.384 | 0.366 |
| 4.2 | 0.463 | 0.479 | 0.478 | 0.482 | 0.468 | 0.458 | 0.432 | 0.416 |
| 4.4 | 0.492 | 0.713 | 0.708 | 0.710 | 0.692 | 0.679 | 0.649 | 0.632 |
| 4.6 | 0.743 | 0.758 | 0.755 | 0.761 | 0.745 | 0.735 | 0.708 | 0.693 |
| 4.8 | 0.783 | 0.803 | 0.803 | 0.811 | 0.797 | 0.790 | 0.766 | 0.754 |
| 5.0 | 0.823 | 0.848 | 0.805 | 0.861 | 0.850 | 0.846 | 0.824 | 0.815 |
| 5.2 | 0.863 | 0.892 | 0.898 | 0.912 | 0.903 | 0.902 | 0.883 | 0.876 |
| 5.4 | 0.903 | 0.937 | 0.945 | 0.962 | 0.956 | 0.957 | 0.941 | 0.937 |
| 5.6 | 0.943 | 0.982 | 0.993 | 1.012 | 1.008 | 1.013 | 0.999 | 0.998 |
| 5.8 | 0.982 | 1.027 | 1.040 | 1.063 | 1.061 | 1.068 | 1.058 | 1.059 |
| 6.0 | 1.022 | 1.071 | 1.088 | 1.113 | 1.114 | 1.124 | 1.116 | 1.120 |
| 6.2 | 1.062 | 1.116 | 1.136 | 1.163 | 1.167 | 1.179 | 1.174 | 1.182 |
| 6.4 | 1.102 | 1.161 | 1.183 | 1.214 | 1.220 | 1.235 | 1.233 | 1.243 |
| 6.6 | 1.142 | 1.206 | 1.231 | 1.264 | 1.272 | 1.290 | 1.291 | 1.304 |
| 6.8 | 1.181 | 1.250 | 1.278 | 1.314 | 1.325 | 1.346 | 1.349 | 1.365 |
| 7.0 | 1.221 | 1.295 | 1.326 | 1.364 | 1.378 | 1.402 | 1.408 | 1.426 |
| 7.2 | 1.261 | 1.340 | 1.373 | 1.415 | 1.431 | 1.457 | 1.466 | 1.487 |
| 7.4 | 1.301 | 1.385 | 1.421 | 1.465 | 1.483 | 1.513 | 1.524 | 1.548 |
| 7.6 | 1.341 | 1.429 | 1.468 | 1.515 | 1.536 | 1.568 | 1.583 | 1.609 |
| 7.8 | 1.381 | 1.474 | 1.516 | 1.566 | 1.589 | 1.624 | 1.641 | 1.670 |
| 8.0 | 1.420 | 1.519 | 1.563 | 1.616 | 1.642 | 1.679 | 1.699 | 1.732 |
| 8.2 | 1.460 | 1.564 | 1.611 | 1.666 | 1.695 | 1.735 | 1.758 | 1.793 |
| 8.4 | 1.500 | 1.608 | 1.658 | 1.717 | 1.747 | 1.790 | 1.816 | 1.854 |
| 8.6 | 1.540 | 1.653 | 1.706 | 1.767 | 1.800 | 1.846 | 1.874 | 1.915 |
| 8.8 | 1.580 | 1.698 | 1.753 | 1.817 | 1.853 | 1.902 | 1.933 | 1.976 |
| 9.0 | 1.619 | 1.743 | 1.801 | 1.868 | 1.906 | 1.957 | 1.991 | 2.037 |
| For each additional 0.2 ft. depth | | | | | | | | |
| | +0.040 | +0.045 | +0.048 | +0.050 | +0.053 | +0.056 | +0.058 | +0.061 |

D(ft) = Average Depth of Trench from Subgrade to Invert of Pipe

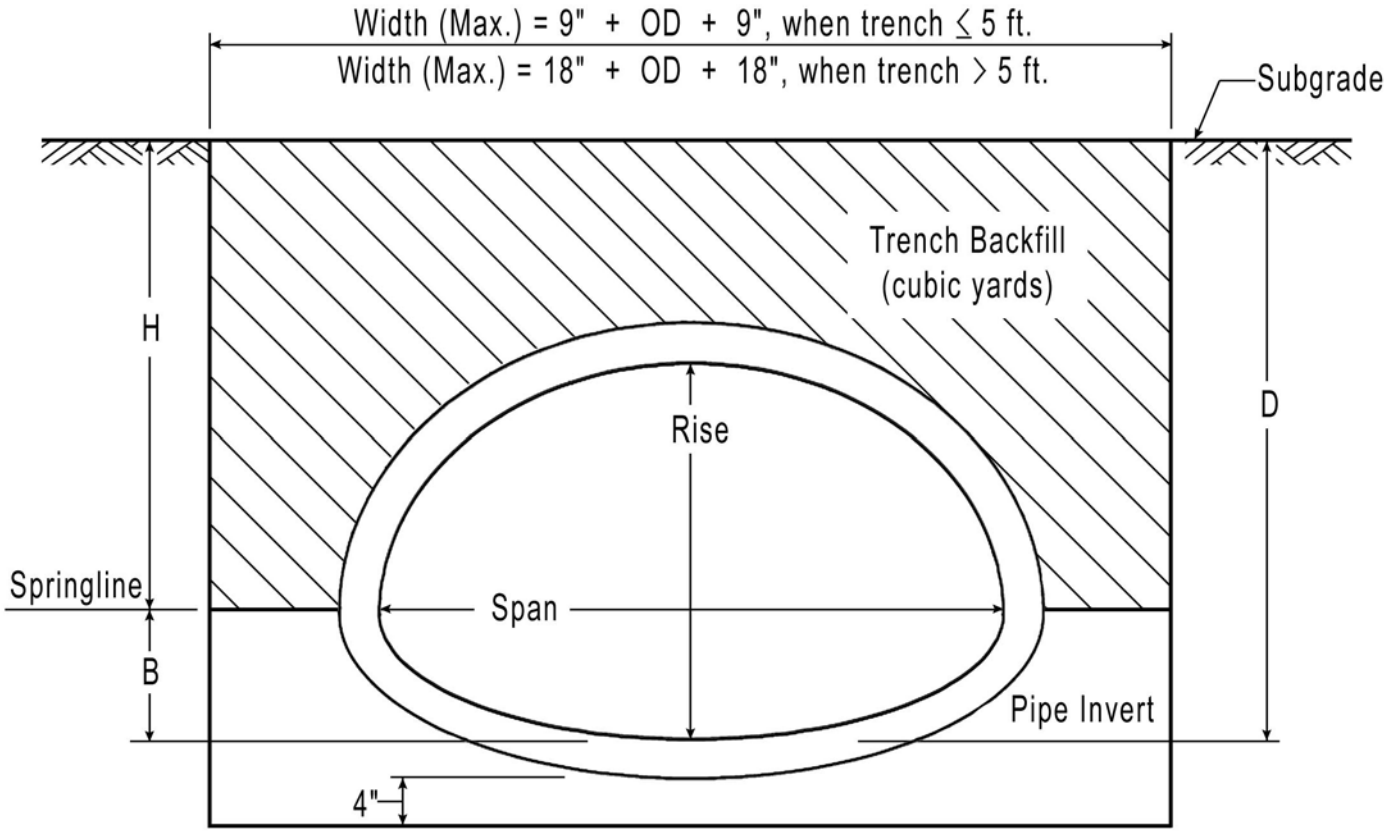
# VOLUME OF TRENCH BACKFILL (CU. YDS)
# PER LINEAL FOOT OF ELLIPTICAL STORM SEWER PIPE

| D(ft) = Average Depth of Trench from Subgrade to Invert of Pipe | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Eq. Round Size, in.** | **48** | **54** | **60** | **66** | **72** | **78** | **84** | **90** |
| Rise, in. | 38 | 43 | 48 | 53 | 58 | 63 | 68 | 72 |
| Span, in. | 60 | 68 | 76 | 83 | 91 | 98 | 106 | 113 |
| Wall Thickness, in. | 5.50 | 6.00 | 6.50 | 7.00 | 7.50 | 8.00 | 8.50 | 9.00 |
| Pipe End Area, sq. ft. | 18.98 | 24.00 | 29.61 | 35.45 | 42.20 | 49.12 | 57.02 | 64.30 |
| 3.8 | 0.258 | | | | | | | |
| 4.0 | 0.312 | | | | | | | |
| 4.2 | 0.367 | 0.418 | | | | | | |
| 4.4 | 0.579 | 0.489 | | | | | | |
| 4.6 | 0.645 | 0.561 | 0.455 | | | | | |
| 4.8 | 0.711 | 0.633 | 0.532 | | | | | |
| 5.0 | 0.777 | 0.704 | 0.609 | 0.490 | | | | |
| 5.2 | 0.843 | 0.776 | 0.686 | 0.572 | | | | |
| 5.4 | 0.909 | 0.847 | 0.763 | 0.654 | | | | |
| 5.6 | 0.975 | 0.919 | 0.841 | 0.736 | 0.614 | | | |
| 5.8 | 1.041 | 0.991 | 0.918 | 0.818 | 0.701 | | | |
| 6.0 | 1.107 | 1.062 | 0.995 | 0.900 | 0.789 | 0.653 | | |
| 6.2 | 1.173 | 1.134 | 1.072 | 0.982 | 0.877 | 0.745 | | |
| 6.4 | 1.239 | 1.205 | 1.149 | 1.064 | 0.964 | 0.838 | 0.694 | |
| 6.6 | 1.305 | 1.277 | 1.226 | 1.146 | 1.052 | 0.931 | 0.792 | |
| 6.8 | 1.371 | 1.349 | 1.304 | 1.228 | 1.140 | 1.023 | 0.891 | 0.768 |
| 7.0 | 1.437 | 1.420 | 1.381 | 1.311 | 1.227 | 1.116 | 0.989 | 0.871 |
| 7.2 | 1.503 | 1.492 | 1.458 | 1.393 | 1.315 | 1.208 | 1.087 | 0.974 |
| 7.4 | 1.570 | 1.564 | 1.535 | 1.475 | 1.402 | 1.301 | 1.185 | 1.077 |
| 7.6 | 1.636 | 1.635 | 1.612 | 1.557 | 1.490 | 1.394 | 1.283 | 1.180 |
| 7.8 | 1.702 | 1.707 | 1.689 | 1.639 | 1.578 | 1.486 | 1.381 | 1.283 |
| 8.0 | 1.768 | 1.778 | 1.766 | 1.721 | 1.665 | 1.579 | 1.480 | 1.386 |
| 8.2 | 1.834 | 1.850 | 1.844 | 1.803 | 1.753 | 1.671 | 1.578 | 1.489 |
| 8.4 | 1.900 | 1.922 | 1.921 | 1.885 | 1.841 | 1.764 | 1.676 | 1.593 |
| 8.6 | 1.966 | 1.993 | 1.998 | 1.967 | 1.928 | 1.857 | 1.774 | 1.696 |
| 8.8 | 2.032 | 2.065 | 2.075 | 2.049 | 2.016 | 1.949 | 1.872 | 1.799 |
| 9.0 | 2.098 | 2.136 | 2.152 | 2.132 | 2.104 | 2.042 | 1.970 | 1.902 |
| 9.2 | 2.164 | 2.208 | 2.229 | 2.214 | 2.191 | 2.134 | 2.068 | 2.005 |
| 6.4 | 2.230 | 2.280 | 2.307 | 2.296 | 2.279 | 2.227 | 2.167 | 2.108 |
| 9.6 | 2.296 | 2.351 | 2.384 | 2.378 | 2.367 | 2.320 | 2.265 | 2.211 |
| 9.8 | 2.362 | 2.423 | 2.461 | 2.460 | 2.454 | 2.412 | 2.363 | 2.314 |
| 10.0 | 2.428 | 2.494 | 2.538 | 2.542 | 2.542 | 2.505 | 2.461 | 2.417 |
| 10.2 | 2.494 | 2.566 | 2.615 | 2.624 | 2.630 | 2.597 | 2.559 | 2.520 |
| 10.4 | 2.560 | 2.638 | 2.692 | 2.706 | 2.717 | 2.690 | 2.657 | 2.623 |
| 10.6 | 2.626 | 2.709 | 2.770 | 2.788 | 2.805 | 2.783 | 2.755 | 2.726 |
| 10.8 | 2.692 | 2.781 | 2.847 | 2.870 | 2.893 | 2.875 | 2.854 | 2.830 |
| 11.0 | 2.758 | 2.852 | 2.924 | 2.953 | 2.980 | 2.968 | 2.952 | 2.933 |
| 11.2 | 2.824 | 2.924 | 3.001 | 3.035 | 3.068 | 3.060 | 3.050 | 3.036 |
| 11.4 | 2.891 | 2.996 | 3.078 | 3.117 | 3.156 | 3.153 | 3.148 | 3.139 |
| For each additional 0.2 ft. depth: | | | | | | | | |
| | +0.066 | +0.072 | +0.077 | +0.082 | +0.088 | +0.093 | +0.098 | +0.103 |

# VOLUME OF TRENCH BACKFILL (CU. YDS)
# PER LINEAL FOOT OF ELLIPTICAL STORM SEWER PIPE

| | Eq. Round Size, in. | 96 | 102 | 108 | 114 | 120 | 132 | 144 |
|---|---|---|---|---|---|---|---|---|
| | Rise, in. | 77 | 82 | 87 | 92 | 97 | 106 | 116 |
| | Span, in. | 121 | 128 | 136 | 143 | 151 | 166 | 180 |
| | Wall Thickness, in. | 9.50 | 9.75 | 10.00 | 10.50 | 11.00 | 12.00 | 13.00 |
| | Pipe End Area, sq. ft. | 73.30 | 81.66 | 91.04 | 101.08 | 112.28 | 134.72 | 159.55 |
| D(ft) = Average Depth of Trench from Subgrade to Invert of Pipe | 7.2 | 0.811 | | | | | | |
| | 7.4 | 0.919 | | | | | | |
| | 7.6 | 1.028 | | | | | | |
| | 7.8 | 1.137 | 0.970 | | | | | |
| | 8.0 | 1.245 | 1.084 | | | | | |
| | 8.2 | 1.354 | 1.197 | 1.025 | | | | |
| | 8.4 | 1.463 | 1.310 | 1.144 | | | | |
| | 8.6 | 1.517 | 1.423 | 1.262 | 1.071 | | | |
| | 8.8 | 1.680 | 1.537 | 1.381 | 1.194 | | | |
| | 9.0 | 1.789 | 1.650 | 1.499 | 1.318 | 1.119 | | |
| | 9.2 | 1.897 | 1.763 | 1.618 | 1.441 | 1.248 | | |
| | 9.4 | 2.006 | 1.877 | 1.736 | 1.564 | 1.377 | | |
| | 9.6 | 2.115 | 1.990 | 1.855 | 1.688 | 1.506 | | |
| | 9.8 | 2.223 | 2.103 | 1.973 | 1.811 | 1.635 | | |
| | 10.0 | 2.332 | 2.216 | 2.092 | 1.935 | 1.764 | 1.400 | |
| | 10.2 | 2.440 | 2.330 | 2.210 | 2.058 | 1.893 | 1.539 | |
| | 10.4 | 2.549 | 2.443 | 2.329 | 2.182 | 2.022 | 1.679 | |
| | 10.6 | 2.658 | 2.556 | 2.447 | 2.305 | 2.151 | 1.818 | |
| | 10.8 | 2.766 | 2.669 | 2.566 | 2.429 | 2.280 | 1.958 | 1.502 |
| | 11.0 | 2.875 | 2.783 | 2.684 | 2.552 | 2.409 | 2.097 | 1.651 |
| | 11.2 | 2.984 | 2.896 | 2.803 | 2.676 | 2.538 | 2.237 | 1.801 |
| | 11.4 | 3.092 | 3.009 | 2.921 | 2.799 | 2.667 | 2.376 | 1.950 |
| | 11.6 | 3.201 | 3.123 | 3.040 | 2.922 | 2.796 | 2.516 | 2.100 |
| | 11.8 | 3.310 | 3.236 | 3.159 | 3.046 | 2.925 | 2.655 | 2.249 |
| | 12.0 | 3.418 | 3.349 | 3.277 | 3.169 | 3.054 | 2.795 | 2.398 |
| | 12.2 | 3.527 | 3.462 | 3.396 | 3.293 | 3.183 | 2.934 | 2.548 |
| | 12.4 | 3.636 | 3.576 | 3.514 | 3.416 | 3.312 | 3.074 | 2.697 |
| | 12.6 | 3.744 | 3.689 | 3.633 | 3.540 | 3.441 | 3.213 | 2.847 |
| | 12.8 | 3.853 | 3.802 | 3.751 | 3.663 | 3.570 | 3.353 | 2.996 |
| | 13.0 | 3.961 | 3.915 | 3.870 | 3.787 | 3.699 | 3.492 | 3.145 |
| | 13.2 | 4.070 | 4.029 | 3.988 | 3.910 | 3.828 | 3.632 | 3.295 |
| | 13.4 | 4.179 | 4.142 | 4.107 | 4.034 | 3.957 | 3.771 | 3.444 |
| | 13.6 | 4.267 | 4.255 | 4.225 | 4.157 | 4.086 | 3.911 | 3.593 |
| | 13.8 | 4.396 | 4.369 | 4.344 | 4.280 | 4.215 | 4.050 | 3.743 |
| | 14.0 | 4.505 | 4.482 | 4.462 | 4.404 | 4.344 | 4.190 | 3.892 |
| | 14.2 | 4.613 | 4.595 | 4.581 | 4.527 | 4.473 | 4.329 | 4.042 |
| | 14.4 | 4.722 | 4.708 | 4.699 | 4.651 | 4.602 | 4.469 | 4.191 |
| | 14.6 | 4.831 | 4.822 | 4.818 | 4.774 | 4.731 | 4.608 | 4.340 |
| | 14.8 | 4.939 | 4.935 | 4.936 | 4.898 | 4.860 | 4.748 | 4.490 |
| For each additional 0.2 ft. depth: | | | | | | | | |
| | | +0.109 | +0.113 | +0.119 | +0.123 | +0.129 | +0.140 | +0.149 |

# TRENCH BACKFILL FOR ARCH PIPE, ENGLISH




W = Width of Trench (ft.)
D = Depth from Subgrade to Pipe Invert (ft.)
H = Height of Trench Backfill Limits (ft) = (D – B)
B = Distance from Pipe Invert to Springline (ft.) (See Table)
L = Length of Trench (ft.)
A = End Area of Pipe above Springline (Sq. ft.) (See Table)

Volume (Cu. Yds.) = [(H x W) – A] x L x 1/27

This formula should be used by the designer or field engineer to determine the volume of TRENCH BACKFILL that should be paid for when backfilling storm sewer trenches utilizing reinforced concrete ARCH PIPE. Maximum trench widths permitted by Article 550.04 of the Standard Specifications are used.

| Equivalent Round Size (in.) | Rise (in.) | Span (in.) | Wall Thickness (in.) | End Area Above Springline (sq. ft.) | B (ft.) |
|---|---|---|---|---|---|
| 15 | 11.00 | 18.00 | 2.25 | 1.08 | 0.39 |
| 18 | 13.50 | 22.00 | 2.50 | 1.42 | 0.50 |
| 21 | 15.50 | 26.00 | 2.75 | 1.94 | 0.52 |
| 24 | 18.00 | 28.50 | 3.00 | 2.77 | 0.49 |
| 27 | 22.50 | 36.25 | 3.50 | 4.20 | 0.64 |
| 30 | 22.50 | 36.25 | 3.50 | 4.20 | 0.64 |
| 36 | 26.63 | 43.75 | 4.00 | 6.04 | 0.71 |
| 42 | 31.31 | 51.13 | 4.50 | 8.20 | 0.84 |
| 48 | 36.00 | 58.50 | 5.00 | 10.67 | 0.97 |
| 54 | 40.00 | 65.00 | 5.50 | 13.07 | 1.08 |
| 60 | 45.00 | 73.00 | 6.00 | 16.34 | 1.22 |
| 66 | 54.00 | 88.00 | 7.00 | 23.76 | 1.42 |
| 72 | 54.00 | 88.00 | 7.00 | 23.76 | 1.42 |
| 84 | 62.00 | 102.00 | 8.00 | 32.10 | 1.55 |
| 90 | 72.00 | 115.00 | 8.50 | 39.65 | 1.98 |
| 96 | 77.25 | 122.00 | 9.00 | 46.07 | 2.03 |
| 108 | 87.13 | 138.00 | 10.00 | 59.07 | 2.24 |
| 120 | 96.88 | 154.00 | 11.00 | 71.05 | 2.61 |
| 132 | 106.50 | 168.75 | 10.00 | 72.95 | 3.79 |

EXAMPLE

Given: Pipe = 30” Round size eq., rise = 22.5”, span = 36.25”

Average Depth, D = 4.7 feet

Trench Length = 82.3 feet

Width, W = 6.6 feet

Find: Cubic Yards of TRENCH BACKFILL

Solution: From Table, End Area, A = 4.20 sq. ft.

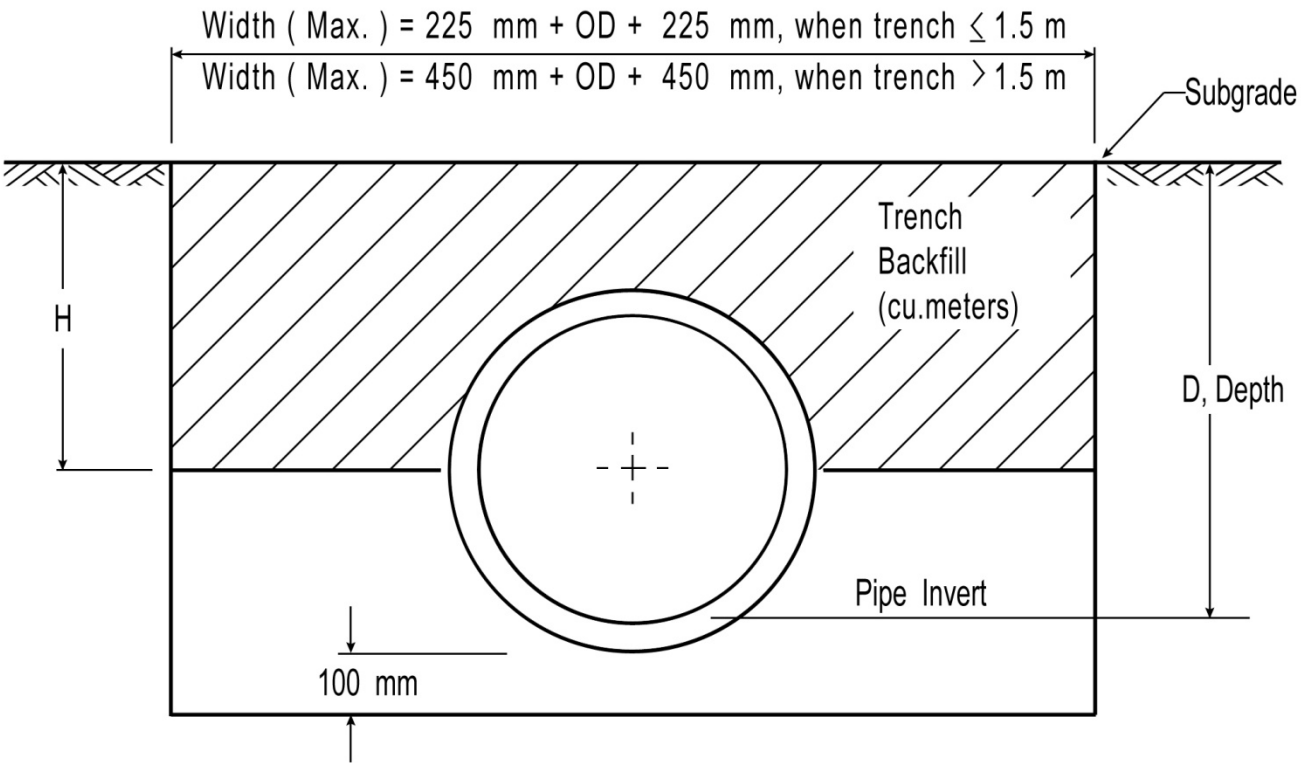
B = 0.64 ft.

Pay Height, H = D – B = 4.70 – 0.64 = 4.06 ft

Volume = [(H x W) – A] x L x 1/27

= [(4.06) (6.6) – 4.20] (82.3) (1/27)

TRENCH BACKFILL = 68.9 cu. yds.




EXAMPLE

| | | |
|---|---|---|
| Given: | Pipe = 1050 mm Storm Sewer | |
| | Average Depth, D = 2.10 m | |
| | Trench Length = 25.8 m | |
| Find: | Cubic Meters of TRENCH BACKFILL | |
| Solution: | From Table, cubic meters/linear meter | 2.937 $m^2$ |
| | x Trench length | x 25.8m |
| | TRENCH BACKFILL VOLUME | = 75.8 $m^3$ |

Note: If the field engineer measures a width of trench less than the maximum permitted, the values included herein will be of no value. The actual volume of TRENCH BACKFILL used will therefore have to be calculated using the following formula:

Cubic Meters = [(H x W) - (Pipe End Area)/2] x L

# VOLUME OF TRENCH BACKFILL (CU. METERS)
# PER LINEAL METER OF CIRCULAR STORM SEWER

Note: The calculated volumes are based on the use of standard English sized pipes that meet the tolerances of the Metric pay items.

| Nominal Diameter (mm) | 200 (8") | 250 (10") | 300 (12") | 375 (15") | 450 (18") | 525 (21") |
|---|---|---|---|---|---|---|
| Wall Thickness (mm) | 42 | 47 | 51 | 57 | 64 | 70 |
| End Area (sq meters) | 0.065 | 0.095 | 0.130 | 0.193 | 0.268 | 0.356 |
| 0.50 | 0.261 | 0.250 | 0.233 | 0.196 | | |
| 0.55 | 0.298 | 0.290 | 0.276 | 0.243 | 0.198 | |
| 0.60 | 0.335 | 0.330 | 0.318 | 0.291 | 0.250 | |
| 0.65 | 0.372 | 0.370 | 0.361 | 0.338 | 0.302 | 0.253 |
| 0.70 | 0.409 | 0.409 | 0.404 | 0.385 | 0.353 | 0.309 |
| 0.75 | 0.446 | 0.449 | 0.447 | 0.433 | 0.405 | 0.365 |
| 0.80 | 0.483 | 0.489 | 0.490 | 0.480 | 0.457 | 0.421 |
| 0.85 | 0.520 | 0.529 | 0.533 | 0.527 | 0.509 | 0.477 |
| 0.90 | 0.557 | 0.569 | 0.575 | 0.574 | 0.560 | 0.533 |
| 0.95 | 0.593 | 0.609 | 0.618 | 0.622 | 0.612 | 0.589 |
| 1.00 | 0.630 | 0.649 | 0.661 | 0.669 | 0.664 | 0.646 |
| 1.05 | 0.667 | 0.688 | 0.704 | 0.716 | 0.715 | 0.702 |
| 1.10 | 0.704 | 0.728 | 0.747 | 0.763 | 0.767 | 0.758 |
| 1.15 | 0.741 | 0.768 | 0.789 | 0.811 | 0.819 | 0.814 |
| 1.20 | 0.778 | 0.808 | 0.832 | 0.858 | 0.871 | 0.870 |
| 1.25 | 0.815 | 0.848 | 0.875 | 0.905 | 0.922 | 0.926 |
| 1.30 | 0.852 | 0.888 | 0.918 | 0.952 | 0.974 | 0.983 |
| 1.35 | 0.889 | 0.928 | 1.619 | 1.637 | 1.642 | 1.635 |
| 1.40 | 1.640 | 1.668 | 1.690 | 1.712 | 1.722 | 1.718 |
| 1.45 | 1.704 | 1.735 | 1.760 | 1.787 | 1.801 | 1.802 |
| 1.50 | 1.768 | 1.802 | 1.830 | 1.862 | 1.880 | 1.886 |
| 1.55 | 1.833 | 1.870 | 1.901 | 1.937 | 1.959 | 1.969 |
| 1.60 | 1.897 | 1.937 | 1.971 | 2.011 | 2.039 | 2.053 |
| 1.65 | 1.962 | 2.004 | 2.041 | 2.086 | 2.118 | 2.136 |
| 1.70 | 2.026 | 2.072 | 2.112 | 2.161 | 2.197 | 2.220 |
| 1.75 | 2.090 | 2.139 | 2.182 | 2.236 | 2.276 | 2.304 |
| 1.80 | 2.155 | 2.206 | 2.252 | 2.310 | 2.355 | 2.387 |
| 1.85 | 2.219 | 2.274 | 2.323 | 2.385 | 2.435 | 2.471 |
| 1.90 | 2.284 | 2.341 | 2.393 | 2.460 | 2.514 | 2.555 |
| 1.95 | 2.348 | 2.409 | 2.463 | 2.535 | 2.593 | 2.638 |
| 2.00 | 2.412 | 2.476 | 2.534 | 2.609 | 2.672 | 2.722 |
| 2.05 | 2.477 | 2.543 | 2.604 | 2.684 | 2.751 | 2.806 |
| 2.10 | 2.541 | 2.611 | 2.674 | 2.759 | 2.831 | 2.889 |
| 2.15 | 2.606 | 2.678 | 2.745 | 2.834 | 2.910 | 2.973 |
| 2.20 | 2.670 | 2.745 | 2.815 | 2.908 | 2.989 | 3.057 |
| 2.25 | 2.734 | 2.813 | 2.885 | 2.983 | 3.068 | 3.140 |
| 2.30 | 2.799 | 2.880 | 2.956 | 3.058 | 3.147 | 3.224 |
| 2.35 | 2.863 | 2.947 | 3.026 | 3.133 | 3.227 | 3.308 |
| 2.40 | 2.927 | 3.015 | 3.096 | 3.208 | 3.306 | 3.391 |
| 2.45 | 2.992 | 3.082 | 3.166 | 3.282 | 3.385 | 3.475 |
| 2.50 | 3.056 | 3.149 | 3.237 | 3.357 | 3.464 | 3.559 |
| 2.55 | 3.121 | 3.217 | 3.307 | 3.432 | 3.544 | 3.642 |
| 2.60 | 3.185 | 3.284 | 3.377 | 3.507 | 3.623 | 3.726 |
| 2.65 | 3.249 | 3.351 | 3.448 | 3.581 | 3.702 | 3.810 |
| 2.70 | 3.314 | 3.419 | 3.518 | 3.656 | 3.781 | 3.893 |
| 2.75 | 3.378 | 3.486 | 3.588 | 3.731 | 3.860 | 3.977 |
| 2.80 | 3.443 | 3.554 | 3.659 | 3.806 | 3.940 | 4.061 |
| 2.85 | 3.507 | 3.621 | 3.729 | 3.880 | 4.019 | 4.144 |
| 2.90 | 3.571 | 3.688 | 3.799 | 3.955 | 4.098 | 4.228 |
| 2.95 | 3.636 | 3.756 | 3.870 | 4.030 | 4.177 | 4.312 |
| 3.00 | 3.700 | 3.823 | 3.940 | 4.105 | 4.256 | 4.395 |
| For each additional 0.05 meter depth: | | | | | | |
| | +0.064 | +0.067 | +0.070 | +0.075 | +0.079 | +0.084 |

**D(m) = Average Depth of Trench from Subgrade to Invert of Pipe**

# VOLUME OF TRENCH BACKFILL (CU. METERS)
# PER LINEAL METER OF CIRCULAR STORM SEWER

Note: The calculated volumes are based on the use of standard English sized pipes that meet the tolerances of the Metric pay items.

| D(m) = Average Depth of Trench from Subgrade to Invert of Pipe | Nominal Dia. (mm) | 600 (24") | 675 (27") | 750 (30") | 825 (33") | 900 (36") | 1050 (42") |
|---|---|---|---|---|---|---|---|
| | Wall Thickness (mm) | 76 | 83 | 89 | 95 | 102 | 114 |
| | End Area (sq meters) | 0.456 | 0.569 | 0.694 | 0.831 | 0.981 | 1.318 |
| | 0.70 | 0.251 | | | | | |
| | 0.75 | 0.312 | | | | | |
| | 0.80 | 0.372 | 0.310 | | | | |
| | 0.85 | 0.433 | 0.375 | | | | |
| | 0.90 | 0.493 | 0.440 | 0.374 | | | |
| | 0.95 | 0.554 | 0.505 | 0.444 | 0.369 | | |
| | 1.00 | 0.615 | 0.570 | 0.513 | 0.443 | | |
| | 1.05 | 0.675 | 0.636 | 0.583 | 0.517 | 0.439 | |
| | 1.10 | 0.736 | 0.701 | 0.652 | 0.591 | 0.517 | |
| | 1.15 | 0.796 | 0.766 | 0.722 | 0.665 | 0.596 | |
| | 1.20 | 0.857 | 0.831 | 0.791 | 0.739 | 0.674 | 0.505 |
| | 1.25 | 0.918 | 0.896 | 0.861 | 0.813 | 0.752 | 0.592 |
| | 1.30 | 0.978 | 0.961 | 0.930 | 0.887 | 1.294 | 1.101 |
| | 1.35 | 1.614 | 1.580 | 1.533 | 1.473 | 1.400 | 1.215 |
| | 1.40 | 1.702 | 1.672 | 1.630 | 1.574 | 1.506 | 1.330 |
| | 1.45 | 1.790 | 1.765 | 1.727 | 1.676 | 1.612 | 1.445 |
| | 1.50 | 1.878 | 1.857 | 1.824 | 1.777 | 1.718 | 1.560 |
| | 1.55 | 1.966 | 1.950 | 1.921 | 1.879 | 1.824 | 1.675 |
| | 1.60 | 2.054 | 2.042 | 2.018 | 1.980 | 1.930 | 1.789 |
| | 1.65 | 2.142 | 2.135 | 2.115 | 2.082 | 2.035 | 1.904 |
| | 1.70 | 2.230 | 2.228 | 2.212 | 2.183 | 2.141 | 2.019 |
| | 1.75 | 2.318 | 2.320 | 2.309 | 2.284 | 2.247 | 2.134 |
| | 1.80 | 2.407 | 2.413 | 2.406 | 2.386 | 2.353 | 2.248 |
| | 1.85 | 2.495 | 2.505 | 2.503 | 2.487 | 2.459 | 2.363 |
| | 1.90 | 2.583 | 2.598 | 2.600 | 2.589 | 2.565 | 2.478 |
| | 1.95 | 2.671 | 2.690 | 2.697 | 2.690 | 2.671 | 2.593 |
| | 2.00 | 2.759 | 2.783 | 2.794 | 2.792 | 2.777 | 2.707 |
| | 2.05 | 2.847 | 2.875 | 2.891 | 2.893 | 2.882 | 2.822 |
| | 2.10 | 2.935 | 2.968 | 2.988 | 2.994 | 2.988 | 2.937 |
| | 2.15 | 3.023 | 3.060 | 3.085 | 3.096 | 3.094 | 3.052 |
| | 2.20 | 3.111 | 3.153 | 3.182 | 3.197 | 3.200 | 3.167 |
| | 2.25 | 3.199 | 3.246 | 3.279 | 3.299 | 3.306 | 3.281 |
| | 2.30 | 3.288 | 3.338 | 3.376 | 3.400 | 3.412 | 3.396 |
| | 2.35 | 3.376 | 3.431 | 3.473 | 3.502 | 3.518 | 3.511 |
| | 2.40 | 3.464 | 3.523 | 3.570 | 3.603 | 3.624 | 3.626 |
| | 2.45 | 3.552 | 3.616 | 3.667 | 3.705 | 3.729 | 3.740 |
| | 2.50 | 3.640 | 3.708 | 3.764 | 3.806 | 3.835 | 3.855 |
| | 2.55 | 3.728 | 3.801 | 3.861 | 3.907 | 3.941 | 3.970 |
| | 2.60 | 3.816 | 3.893 | 3.958 | 4.009 | 4.047 | 4.085 |
| | 2.65 | 3.904 | 3.986 | 4.055 | 4.110 | 4.153 | 4.199 |
| | 2.70 | 3.992 | 4.078 | 4.152 | 4.212 | 4.259 | 4.314 |
| | 2.75 | 4.080 | 4.171 | 4.249 | 4.313 | 4.365 | 4.429 |
| | 2.80 | 4.169 | 4.264 | 4.346 | 4.415 | 4.471 | 4.544 |
| | 2.85 | 4.257 | 4.356 | 4.443 | 4.516 | 4.577 | 4.659 |
| | 2.90 | 4.345 | 4.449 | 4.540 | 4.617 | 4.682 | 4.773 |
| | 2.95 | 4.433 | 4.541 | 4.637 | 4.719 | 4.788 | 4.888 |
| | 3.00 | 4.521 | 4.634 | 4.733 | 4.820 | 4.894 | 5.003 |
| | 3.05 | 4.609 | 4.726 | 4.830 | 4.922 | 5.000 | 5.118 |
| | 3.10 | 4.697 | 4.819 | 4.927 | 5.023 | 5.106 | 5.232 |
| | 3.15 | 4.785 | 4.911 | 5.024 | 5.125 | 5.212 | 5.347 |
| | 3.20 | 4.873 | 5.004 | 5.121 | 5.226 | 5.318 | 5.462 |
| | For each additional 0.05 meter depth: | | | | | | |
| | | +0.088 | +0.093 | +0.097 | +0.101 | +0.106 | +0.115 |

# VOLUME OF TRENCH BACKFILL (CU. METERS)
# PER LINEAL METER OF CIRCULAR STORM SEWER

Note: The calculated volumes are based on the use of standard English sized pipes that meet the tolerances of the Metric pay items.

| Nominal Dia. (mm)<br>Wall Thickness (mm)<br>End Area (sq meters) | 1200 (48")<br>127<br>1.705 | 1350 (54")<br>140<br>2.141 | 1500 (60")<br>152<br>2.627 | 1650 (66)<br>165<br>3.162 | 1800 (72")<br>178<br>3.748 | 1950 (78")<br>191<br>4.383 |
|---|---|---|---|---|---|---|
| 1.35 | 0.979 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1.40 | 1.103 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1.45 | 1.226 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1.50 | 1.350 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1.55 | 1.474 | 1.221 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1.60 | 1.597 | 1.353 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1.65 | 1.721 | 1.486 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1.70 | 1.844 | 1.618 | 1.340 | 0.000 | 0.000 | 0.000 |
| 1.75 | 1.968 | 1.751 | 1.481 | 0.000 | 0.000 | 0.000 |
| 1.80 | 2.092 | 1.883 | 1.623 | 0.000 | 0.000 | 0.000 |
| 1.85 | 2.215 | 2.016 | 1.764 | 1.461 | 0.000 | 0.000 |
| 1.90 | 2.339 | 2.148 | 1.906 | 1.611 | 0.000 | 0.000 |
| 1.95 | 2.463 | 2.281 | 2.047 | 1.762 | 0.000 | 0.000 |
| 2.00 | 2.586 | 2.414 | 2.189 | 1.912 | 0.000 | 0.000 |
| 2.05 | 2.710 | 2.546 | 2.330 | 2.062 | 1.742 | 0.000 |
| 2.10 | 2.834 | 2.679 | 2.472 | 2.213 | 1.902 | 0.000 |
| 2.15 | 2.957 | 2.811 | 2.613 | 2.363 | 2.061 | 0.000 |
| 2.20 | 3.081 | 2.944 | 2.754 | 2.513 | 2.220 | 1.875 |
| 2.25 | 3.205 | 3.076 | 2.896 | 2.664 | 2.379 | 2.043 |
| 2.30 | 3.328 | 3.209 | 3.037 | 2.814 | 2.539 | 2.211 |
| 2.35 | 3.452 | 3.341 | 3.179 | 2.964 | 2.698 | 2.379 |
| 2.40 | 3.576 | 3.474 | 3.320 | 3.115 | 2.857 | 2.547 |
| 2.45 | 3.699 | 3.606 | 3.462 | 3.265 | 3.016 | 2.716 |
| 2.50 | 3.823 | 3.739 | 3.603 | 3.415 | 3.175 | 2.884 |
| 2.55 | 3.947 | 3.872 | 3.745 | 3.566 | 3.335 | 3.052 |
| 2.60 | 4.070 | 4.004 | 3.886 | 3.716 | 3.494 | 3.220 |
| 2.65 | 4.194 | 4.137 | 4.027 | 3.866 | 3.653 | 3.388 |
| 2.70 | 4.318 | 4.269 | 4.169 | 4.017 | 3.812 | 3.556 |
| 2.75 | 4.441 | 4.402 | 4.310 | 4.167 | 3.971 | 3.724 |
| 2.80 | 4.565 | 4.534 | 4.452 | 4.317 | 4.131 | 3.892 |
| 2.85 | 4.689 | 4.667 | 4.593 | 4.467 | 4.290 | 4.060 |
| 2.90 | 4.812 | 4.799 | 4.735 | 4.618 | 4.449 | 4.229 |
| 2.95 | 4.936 | 4.932 | 4.876 | 4.768 | 4.608 | 4.397 |
| 3.00 | 5.060 | 5.065 | 5.017 | 4.918 | 4.768 | 4.565 |
| 3.05 | 5.183 | 5.197 | 5.159 | 5.069 | 4.927 | 4.733 |
| 3.10 | 5.307 | 5.330 | 5.300 | 5.219 | 5.086 | 4.901 |
| 3.15 | 5.431 | 5.462 | 5.442 | 5.369 | 5.245 | 5.069 |
| 3.20 | 5.554 | 5.595 | 5.583 | 5.520 | 5.404 | 5.237 |
| 3.25 | 5.678 | 5.727 | 5.725 | 5.670 | 5.564 | 5.405 |
| 3.30 | 5.802 | 5.860 | 5.866 | 5.820 | 5.723 | 5.573 |
| 3.35 | 5.925 | 5.992 | 6.008 | 5.971 | 5.882 | 5.742 |
| 3.40 | 6.049 | 6.125 | 6.149 | 6.121 | 6.041 | 5.910 |
| 3.45 | 6.173 | 6.257 | 6.290 | 6.271 | 6.201 | 6.078 |
| 3.50 | 6.296 | 6.390 | 6.432 | 6.422 | 6.360 | 6.246 |
| 3.55 | 6.420 | 6.523 | 6.573 | 6.572 | 6.519 | 6.414 |
| 3.60 | 6.544 | 6.655 | 6.715 | 6.722 | 6.678 | 6.582 |
| 3.65 | 6.667 | 6.788 | 6.856 | 6.873 | 6.837 | 6.750 |
| 3.70 | 6.791 | 6.920 | 6.998 | 7.023 | 6.997 | 6.918 |
| 3.75 | 6.915 | 7.053 | 7.139 | 7.173 | 7.156 | 7.086 |
| 3.80 | 7.038 | 7.185 | 7.281 | 7.324 | 7.315 | 7.255 |
| 3.85 | 7.162 | 7.318 | 7.422 | 7.474 | 7.474 | 7.423 |
| For each additional 0.05 meter depth: | | | | | | |
| | +0.124 | +0.133 | +0.141 | +0.150 | +0.159 | +0.168 |

**D(m) = Average Depth of Trench from Subgrade to Invert of Pipe**

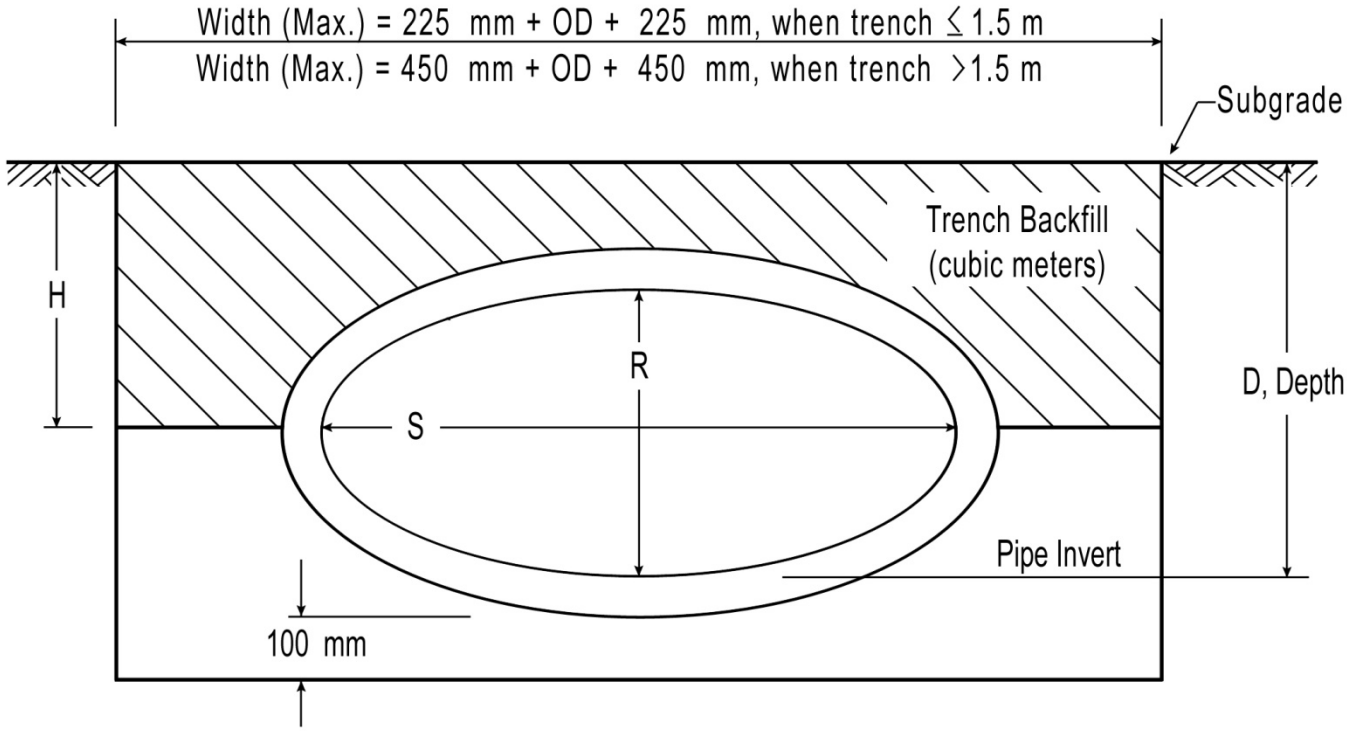
# VOLUME OF TRENCH BACKFILL (CU. METERS)
# PER LINEAL METER OF CIRCULAR STORM SEWER

Note: The calculated volumes are based on the use of standard English sized pipes that meet the tolerances of the Metric pay items.

| Nominal Dia. (mm) | 2100 (84") | 2250 (90") | 2400 (96") | 2550 (102") | 2700 (108") |
|---|---|---|---|---|---|
| Wall Thickness (mm) | 203 | 216 | 229 | 241 | 254 |
| End Area (sq meters) | 5.067 | 5.801 | 6.585 | 7.419 | 8.302 |
| 2.35 | 2.009 | | | | |
| 2.40 | 2.186 | | | | |
| 2.45 | 2.363 | | | | |
| 2.50 | 2.540 | | | | |
| 2.55 | 2.717 | 2.330 | | | |
| 2.60 | 2.894 | 2.516 | | | |
| 2.65 | 3.071 | 2.702 | | | |
| 2.70 | 3.248 | 2.888 | 2.476 | | |
| 2.75 | 3.425 | 3.074 | 2.671 | | |
| 2.80 | 3.602 | 3.260 | 2.866 | | |
| 2.85 | 3.779 | 3.446 | 3.060 | 2.623 | |
| 2.90 | 3.956 | 3.632 | 3.255 | 2.827 | |
| 2.95 | 4.133 | 3.817 | 3.450 | 3.030 | |
| 3.00 | 4.310 | 4.003 | 3.645 | 3.234 | 2.772 |
| 3.05 | 4.487 | 4.189 | 3.839 | 3.438 | 2.984 |
| 3.10 | 4.664 | 4.375 | 4.034 | 3.642 | 3.197 |
| 3.15 | 4.841 | 4.561 | 4.229 | 3.845 | 3.409 |
| 3.20 | 5.018 | 4.747 | 4.424 | 4.049 | 3.622 |
| 3.25 | 5.195 | 4.933 | 4.619 | 4.253 | 3.835 |
| 3.30 | 5.372 | 5.119 | 4.813 | 4.456 | 4.047 |
| 3.35 | 5.549 | 5.305 | 5.008 | 4.660 | 4.260 |
| 3.40 | 5.726 | 5.490 | 5.203 | 4.864 | 4.472 |
| 3.45 | 5.903 | 5.676 | 5.398 | 5.067 | 4.685 |
| 3.50 | 6.080 | 5.862 | 5.592 | 5.271 | 4.897 |
| 3.55 | 6.257 | 6.048 | 5.787 | 5.475 | 5.110 |
| 3.60 | 6.434 | 6.234 | 5.982 | 5.678 | 5.322 |
| 3.65 | 6.611 | 6.420 | 6.177 | 5.882 | 5.535 |
| 3.70 | 6.788 | 6.606 | 6.372 | 6.086 | 5.748 |
| 3.75 | 6.965 | 6.792 | 6.566 | 6.289 | 5.960 |
| 3.80 | 7.142 | 6.978 | 6.761 | 6.493 | 6.173 |
| 3.85 | 7.319 | 7.163 | 6.956 | 6.697 | 6.385 |
| 3.90 | 7.496 | 7.349 | 7.151 | 6.900 | 6.598 |
| 3.95 | 7.673 | 7.535 | 7.346 | 7.104 | 6.810 |
| 4.00 | 7.850 | 7.721 | 7.540 | 7.308 | 7.023 |
| 4.05 | 8.027 | 7.907 | 7.735 | 7.511 | 7.235 |
| 4.10 | 8.204 | 8.093 | 7.930 | 7.715 | 7.448 |
| 4.15 | 8.381 | 8.279 | 8.125 | 7.919 | 7.661 |
| 4.20 | 8.558 | 8.465 | 8.319 | 8.122 | 7.873 |
| 4.25 | 8.735 | 8.651 | 8.514 | 8.326 | 8.086 |
| 4.30 | 8.912 | 8.836 | 8.709 | 8.530 | 8.298 |
| 4.35 | 9.089 | 9.022 | 8.904 | 8.733 | 8.511 |
| 4.40 | 9.266 | 9.208 | 9.099 | 8.937 | 8.723 |
| 4.45 | 9.443 | 9.394 | 9.293 | 9.141 | 8.936 |
| 4.50 | 9.620 | 9.580 | 9.488 | 9.344 | 9.149 |
| 4.55 | 9.797 | 9.766 | 9.683 | 9.548 | 9.361 |
| 4.60 | 9.974 | 9.952 | 9.878 | 9.752 | 9.574 |
| 4.65 | 10.151 | 10.138 | 10.072 | 9.955 | 9.786 |
| 4.70 | 10.328 | 10.324 | 10.267 | 10.159 | 9.999 |
| 4.75 | 10.505 | 10.509 | 10.462 | 10.363 | 10.211 |
| 4.80 | 10.682 | 10.695 | 10.657 | 10.566 | 10.424 |
| 4.85 | 10.859 | 10.881 | 10.852 | 10.770 | 10.636 |
| For each additional 0.05 meter depth: | | | | | |
| | +0.177 | +0.186 | +0.195 | +0.204 | +0.213 |

D(m) = Average Depth of Trench from Subgrade to Invert of Pipe

## TRENCH BACKFILL TABLE FOR ELLIPTICAL PIPE, METRIC




EXAMPLE

| | | |
|---|---|---|
| Given: | Pipe = 950 mm rise x 1500 mm span, Storm Sewer | |
| | Average Depth, D = 1.40m | |
| | Trench Length = 25.1m | |
| Find: | Cubic Meters of TRENCH BACKFILL | |
| Solution: | From Table, cubic meters/linear meter | 1.690 |
| | x Trench length | x 25.1 |
| | TRENCH BACKFILL VOLUME | = **42.4 m$^3$** |

Note: If the Field Engineer measures a width of trench less than the maximum permitted, the values included herein will be of no value. The actual volume of TRENCH BACKFILL used will therefore have to be calculated using the following formula:

Cubic Meters = [(H x W) - (Pipe End Area)/2] x L

# VOLUME OF TRENCH BACKFILL (CU. METERS)
# PER LINEAL METER OF ELLIPTICAL STORM SEWER PIPE

Note: The calculated volumes are based on the use of standard English sized pipes that meet the tolerances of the Metric pay items.

| Eq. Round Size (mm) | 450 (18") | 600 (24") | 675 (27") | 750 (30") | 825 (33") | 900 (36") | 975 (39") | 1050 (42") |
|---|---|---|---|---|---|---|---|---|
| Nominal Rise (mm) | 350 (14") | 475 (19") | 550 (22") | 600 (24") | 675 (27") | 725 (29") | 800 (32") | 850 (34") |
| Nominal Span (mm) | 575 (23") | 750 (30") | 850 (34") | 950 (38") | 1050 (42") | 1125 (45") | 1225 (49") | 1325 (53") |
| Wall Thickness (mm) | 70 | 83 | 89 | 95 | 95 | 114 | 121 | 127 |
| End Area (sq meters) | 0.28 | 0.47 | 0.60 | 0.73 | 0.87 | 1.04 | 1.23 | 1.40 |
| 0.50 | 0.237 | | | | | | | |
| 0.55 | 0.296 | | | | | | | |
| 0.60 | 0.355 | 0.258 | | | | | | |
| 0.65 | 0.414 | 0.327 | 0.251 | | | | | |
| 0.70 | 0.472 | 0.396 | 0.326 | | | | | |
| 0.75 | 0.531 | 0.465 | 0.401 | 0.352 | | | | |
| 0.80 | 0.590 | 0.534 | 0.475 | 0.432 | 0.348 | | | |
| 0.85 | 0.648 | 0.602 | 0.550 | 0.512 | 0.433 | | | |
| 0.90 | 0.707 | 0.671 | 0.624 | 0.593 | 0.518 | 0.449 | | |
| 0.95 | 0.766 | 0.740 | 0.699 | 0.673 | 0.604 | 0.540 | 0.437 | |
| 1.00 | 0.824 | 0.809 | 0.773 | 0.753 | 0.689 | 0.631 | 0.534 | 0.463 |
| 1.05 | 0.883 | 0.878 | 0.848 | 0.833 | 0.775 | 0.722 | 0.631 | 0.565 |
| 1.10 | 0.942 | 0.947 | 0.923 | 0.914 | 0.860 | 0.813 | 0.728 | 0.668 |
| 1.15 | 1.000 | 1.016 | 0.997 | 0.994 | 0.945 | 0.904 | 0.824 | 0.770 |
| 1.20 | 1.059 | 1.084 | 1.072 | 1.074 | 1.031 | 0.995 | 0.921 | 0.873 |
| 1.25 | 1.118 | 1.153 | 1.146 | 1.155 | 1.116 | 1.086 | 1.018 | 0.975 |
| 1.30 | 1.177 | 1.222 | 1.221 | 1.235 | 1.201 | 1.690 | 1.606 | 1.555 |
| 1.35 | 1.880 | 1.901 | 1.884 | 1.890 | 1.841 | 1.808 | 1.731 | 1.685 |
| 1.40 | 1.966 | 1.997 | 1.986 | 1.998 | 1.954 | 1.927 | 1.855 | 1.815 |
| 1.45 | 2.052 | 2.093 | 2.088 | 2.106 | 2.066 | 2.045 | 1.979 | 1.945 |
| 1.50 | 2.139 | 2.190 | 2.190 | 2.213 | 2.179 | 2.164 | 2.104 | 2.075 |
| 1.55 | 2.225 | 2.286 | 2.293 | 2.321 | 2.292 | 2.283 | 2.228 | 2.205 |
| 1.60 | 2.311 | 2.383 | 2.395 | 2.429 | 2.405 | 2.401 | 2.352 | 2.335 |
| 1.65 | 2.397 | 2.479 | 2.497 | 2.537 | 2.518 | 2.520 | 2.476 | 2.465 |
| 1.70 | 2.483 | 2.575 | 2.599 | 2.645 | 2.631 | 2.638 | 2.601 | 2.595 |
| 1.75 | 2.570 | 2.672 | 2.701 | 2.752 | 2.744 | 2.757 | 2.725 | 2.725 |
| 1.80 | 2.656 | 2.768 | 2.803 | 2.860 | 2.856 | 2.876 | 2.849 | 2.855 |
| 1.85 | 2.742 | 2.864 | 2.905 | 2.968 | 2.969 | 2.994 | 2.974 | 2.985 |
| 1.90 | 2.828 | 2.961 | 3.007 | 3.076 | 3.082 | 3.113 | 3.098 | 3.115 |
| 1.95 | 2.914 | 3.057 | 3.109 | 3.183 | 3.195 | 3.231 | 3.222 | 3.245 |
| 2.00 | 3.000 | 3.153 | 3.211 | 3.291 | 3.308 | 3.350 | 3.346 | 3.375 |
| 2.05 | 3.087 | 3.250 | 3.313 | 3.399 | 3.421 | 3.468 | 3.471 | 3.505 |
| 2.10 | 3.173 | 3.346 | 3.415 | 3.507 | 3.534 | 3.587 | 3.595 | 3.635 |
| 2.15 | 3.259 | 3.442 | 3.517 | 3.615 | 3.647 | 3.706 | 3.719 | 3.765 |
| 2.20 | 3.345 | 3.539 | 3.619 | 3.722 | 3.759 | 3.824 | 3.844 | 3.895 |
| 2.25 | 3.431 | 3.635 | 3.722 | 3.830 | 3.872 | 3.943 | 3.968 | 4.025 |
| 2.30 | 3.518 | 3.732 | 3.824 | 3.938 | 3.985 | 4.061 | 4.092 | 4.155 |
| 2.35 | 3.604 | 3.828 | 3.926 | 4.046 | 4.098 | 4.180 | 4.217 | 4.285 |
| 2.40 | 3.690 | 3.924 | 4.028 | 4.154 | 4.211 | 4.298 | 4.341 | 4.415 |
| 2.45 | 3.776 | 4.021 | 4.130 | 4.261 | 4.324 | 4.417 | 4.465 | 4.545 |
| 2.50 | 3.862 | 4.117 | 4.232 | 4.369 | 4.437 | 4.536 | 4.589 | 4.675 |
| 2.55 | 3.949 | 4.213 | 4.334 | 4.477 | 4.549 | 4.654 | 4.714 | 4.805 |
| 2.60 | 4.035 | 4.310 | 4.436 | 4.585 | 4.662 | 4.773 | 4.838 | 4.935 |
| 2.65 | 4.121 | 4.406 | 4.538 | 4.692 | 4.775 | 4.891 | 4.962 | 5.065 |
| 2.70 | 4.207 | 4.502 | 4.640 | 4.800 | 4.888 | 5.010 | 5.087 | 5.195 |
| 2.75 | 4.293 | 4.599 | 4.742 | 4.908 | 5.001 | 5.129 | 5.211 | 5.325 |
| 2.80 | 4.380 | 4.695 | 4.844 | 5.016 | 5.114 | 5.247 | 5.335 | 5.455 |
| 2.85 | 4.466 | 4.791 | 4.946 | 5.124 | 5.227 | 5.366 | 5.459 | 5.586 |
| 2.90 | 4.552 | 4.888 | 5.048 | 5.231 | 5.339 | 5.484 | 5.584 | 5.716 |
| 2.95 | 4.638 | 4.984 | 5.151 | 5.339 | 5.452 | 5.603 | 5.708 | 5.846 |
| 3.00 | 4.724 | 5.080 | 5.253 | 5.447 | 5.565 | 5.721 | 5.832 | 5.976 |
| For each additional 0.05 meter depth: | | | | | | | | |
| | +0.086 | +0.096 | +0.102 | +0.108 | +0.113 | +0.119 | +0.124 | +0.130 |

**D(m) = Average Depth of Trench from Subgrade to Invert of Pipe**

# VOLUME OF TRENCH BACKFILL (CU. METERS)
# PER LINEAL METER OF ELLIPTICAL STORM SEWER PIPE

Note: The calculated volumes are based on the use of standard English sized pipes that meet the tolerances of the Metric pay items.

| Eq. Round Size (mm) | 1200 (48") | 1350 (54") | 1500 (60") | 1650 (66") | 1800 (72") | 1950 (78") | 2100 (84") | 2250 (90") |
|---|---|---|---|---|---|---|---|---|
| Nominal Rise (mm) | 950 (38") | 1075 (43") | 1200 (48") | 1325 (53") | 1450 (58") | 1575 (63") | 1700 (68") | 1800 (72") |
| Nominal Span (mm) | 1500 (60") | 1700 (68") | 1900 (76") | 2075 (83") | 2275 (91") | 2450 (98") | 2650 (106") | 2825 (113") |
| Wall Thickness (mm) | 140 | 152 | 165 | 178 | 191 | 203 | 216 | 229 |
| End Area (sq meters) | 1.76 | 2.23 | 2.75 | 3.29 | 3.92 | 4.56 | 5.30 | 5.97 |
| 1.15 | 0.623 | | | | | | | |
| 1.20 | 0.735 | | | | | | | |
| 1.25 | 0.848 | 1.019 | | | | | | |
| 1.30 | 1.410 | 1.171 | | | | | | |
| 1.35 | 1.550 | 1.323 | | | | | | |
| 1.40 | 1.690 | 1.474 | 1.202 | | | | | |
| 1.45 | 1.831 | 1.626 | 1.365 | | | | | |
| 1.50 | 1.971 | 1.777 | 1.528 | | | | | |
| 1.55 | 2.111 | 1.929 | 1.691 | 1.391 | | | | |
| 1.60 | 2.251 | 2.081 | 1.854 | 1.564 | | | | |
| 1.65 | 2.391 | 2.232 | 2.017 | 1.737 | | | | |
| 1.70 | 2.531 | 2.384 | 2.180 | 1.910 | 1.597 | | | |
| 1.75 | 2.672 | 2.535 | 2.343 | 2.084 | 1.781 | | | |
| 1.80 | 2.812 | 2.687 | 2.506 | 2.257 | 1.966 | | | |
| 1.85 | 2.952 | 2.839 | 2.669 | 2.430 | 2.151 | 1.808 | | |
| 1.90 | 3.092 | 2.990 | 2.832 | 2.603 | 2.335 | 2.003 | | |
| 1.95 | 3.232 | 3.142 | 2.995 | 2.776 | 2.520 | 2.198 | 1.832 | |
| 2.00 | 3.372 | 3.293 | 3.158 | 2.950 | 2.705 | 2.393 | 2.038 | |
| 2.05 | 3.513 | 3.445 | 3.321 | 3.123 | 2.889 | 2.587 | 2.244 | |
| 2.10 | 3.653 | 3.597 | 3.484 | 3.296 | 3.074 | 2.782 | 2.450 | 2.144 |
| 2.15 | 3.793 | 3.748 | 3.647 | 3.469 | 3.258 | 2.977 | 2.657 | 2.360 |
| 2.20 | 3.933 | 3.900 | 3.810 | 3.642 | 3.443 | 3.172 | 2.863 | 2.576 |
| 2.25 | 4.073 | 4.051 | 3.973 | 3.816 | 3.628 | 3.367 | 3.069 | 2.793 |
| 2.30 | 4.213 | 4.203 | 4.136 | 3.989 | 3.812 | 3.561 | 3.275 | 3.009 |
| 2.35 | 4.354 | 4.355 | 4.299 | 4.162 | 3.997 | 3.756 | 3.481 | 3.225 |
| 2.40 | 4.494 | 4.506 | 4.462 | 4.335 | 4.181 | 3.951 | 3.688 | 3.442 |
| 2.45 | 4.634 | 4.658 | 4.625 | 4.508 | 4.366 | 4.146 | 3.894 | 3.658 |
| 2.50 | 4.774 | 4.809 | 4.788 | 4.681 | 4.551 | 4.340 | 4.100 | 3.874 |
| 2.55 | 4.914 | 4.961 | 4.951 | 4.855 | 4.735 | 4.535 | 4.306 | 4.091 |
| 2.60 | 5.055 | 5.113 | 5.114 | 5.028 | 4.920 | 4.730 | 4.512 | 4.307 |
| 2.65 | 5.195 | 5.264 | 5.277 | 5.201 | 5.105 | 4.925 | 4.719 | 4.524 |
| 2.70 | 5.335 | 5.416 | 5.441 | 5.374 | 5.289 | 5.120 | 4.925 | 4.740 |
| 2.75 | 5.475 | 5.567 | 5.604 | 5.547 | 5.474 | 5.314 | 5.131 | 4.956 |
| 2.80 | 5.615 | 5.719 | 5.767 | 5.721 | 5.658 | 5.509 | 5.337 | 5.173 |
| 2.85 | 5.755 | 5.871 | 5.930 | 5.894 | 5.843 | 5.704 | 5.543 | 5.389 |
| 2.90 | 5.896 | 6.022 | 6.093 | 6.067 | 6.028 | 5.899 | 5.750 | 5.605 |
| 2.95 | 6.036 | 6.174 | 6.256 | 6.240 | 6.212 | 6.093 | 5.956 | 5.822 |
| 3.00 | 6.176 | 6.325 | 6.419 | 6.413 | 6.397 | 6.288 | 6.162 | 6.038 |
| 3.05 | 6.316 | 6.477 | 6.582 | 6.587 | 6.582 | 6.483 | 6.368 | 6.255 |
| 3.10 | 6.456 | 6.629 | 6.745 | 6.760 | 6.766 | 6.678 | 6.575 | 6.471 |
| 3.15 | 6.596 | 6.780 | 6.908 | 6.933 | 6.951 | 6.873 | 6.781 | 6.687 |
| 3.20 | 6.737 | 6.932 | 7.071 | 7.106 | 7.135 | 7.067 | 6.987 | 6.904 |
| 3.25 | 6.877 | 7.083 | 7.234 | 7.279 | 7.320 | 7.262 | 7.193 | 7.120 |
| 3.30 | 7.017 | 7.235 | 7.397 | 7.453 | 7.505 | 7.457 | 7.399 | 7.336 |
| 3.35 | 7.157 | 7.387 | 7.560 | 7.626 | 7.689 | 7.652 | 7.606 | 7.553 |
| 3.40 | 7.297 | 7.538 | 7.723 | 7.799 | 7.874 | 7.846 | 7.812 | 7.769 |
| 3.45 | 7.437 | 7.690 | 7.886 | 7.972 | 8.059 | 8.041 | 8.018 | 7.986 |
| 3.50 | 7.578 | 7.841 | 8.049 | 8.145 | 8.243 | 8.236 | 8.224 | 8.202 |
| 3.55 | 7.718 | 7.993 | 8.212 | 8.318 | 8.428 | 8.431 | 8.430 | 8.418 |
| 3.60 | 7.858 | 8.145 | 8.375 | 8.492 | 8.612 | 8.626 | 8.637 | 8.635 |
| 3.65 | 7.998 | 8.296 | 8.538 | 8.665 | 8.797 | 8.820 | 8.843 | 8.851 |
| For each additional 0.05 meter depth: | | | | | | | | |
| | +0.140 | +0.152 | +0.163 | +0.173 | +0.185 | +0.195 | +0.206 | +0.216 |

**D(m) = Average Depth of Trench from Subgrade to Invert of Pipe**

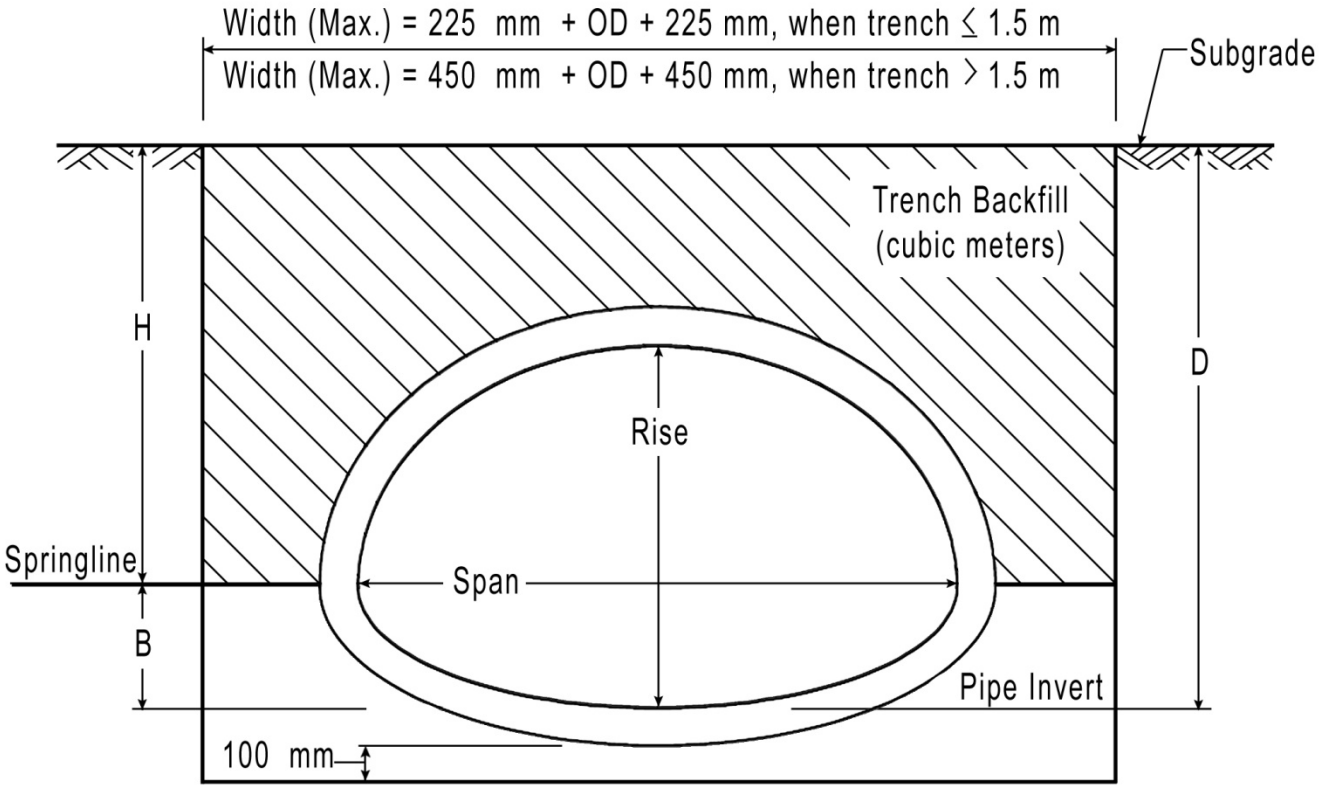
# VOLUME OF TRENCH BACKFILL (CU. METERS)
# PER LINEAL METER OF ELLIPTICAL STORM SEWER PIPE

Note: The calculated volumes are based on the use of standard English sized pipes that meet the tolerances of the Metric pay items.

| Eq. Round Size (mm) | 2400 (96") | 2550 (102") | 2700 (108") | 2850 (114") | 3000 (120") | 3300 (132") | 3600 (144") |
|---|---|---|---|---|---|---|---|
| Nominal Rise (mm) | 1925 (77") | 2050 (82") | 2175 (87") | 2300 (92") | 2425 (97") | 2650 (106") | 2900 (116") |
| Nominal Span (mm) | 3025 (121") | 3200 (128") | 3400 (136") | 3575 (143") | 3775 (151") | 4150 (166") | 4500 (180") |
| Wall Thickness (mm) | 241 | 248 | 254 | 267 | 279 | 305 | 330 |
| End Area (sq meters) | 6.81 | 7.59 | 8.46 | 9.39 | 10.43 | 12.52 | 14.82 |
| 2.20 | 2.163 | | | | | | |
| 2.25 | 2.391 | | | | | | |
| 2.30 | 2.618 | | | | | | |
| 2.35 | 2.846 | 2.418 | | | | | |
| 2.40 | 3.074 | 2.656 | | | | | |
| 2.45 | 3.302 | 2.893 | | | | | |
| 2.50 | 3.530 | 3.130 | 2.694 | | | | |
| 2.55 | 3.757 | 3.368 | 2.942 | | | | |
| 2.60 | 3.985 | 3.605 | 3.190 | | | | |
| 2.65 | 4.213 | 3.842 | 3.438 | 2.958 | | | |
| 2.70 | 4.441 | 4.080 | 3.687 | 3.216 | | | |
| 2.75 | 4.669 | 4.317 | 3.935 | 3.475 | 2.973 | | |
| 2.80 | 4.896 | 4.554 | 4.183 | 3.733 | 3.243 | | |
| 2.85 | 5.124 | 4.791 | 4.431 | 3.991 | 3.513 | | |
| 2.90 | 5.352 | 5.029 | 4.679 | 4.250 | 3.782 | | |
| 2.95 | 5.580 | 5.266 | 4.927 | 4.508 | 4.052 | | |
| 3.00 | 5.808 | 5.503 | 5.175 | 4.766 | 4.322 | 3.377 | |
| 3.05 | 6.035 | 5.741 | 5.423 | 5.024 | 4.591 | 3.669 | |
| 3.10 | 6.263 | 5.978 | 5.672 | 5.283 | 4.861 | 3.960 | |
| 3.15 | 6.491 | 6.215 | 5.920 | 5.541 | 5.131 | 4.251 | |
| 3.20 | 6.719 | 6.453 | 6.168 | 5.799 | 5.401 | 4.542 | |
| 3.25 | 6.947 | 6.690 | 6.416 | 6.058 | 5.670 | 4.834 | |
| 3.30 | 7.174 | 6.927 | 6.664 | 6.316 | 5.940 | 5.125 | 3.974 |
| 3.35 | 7.402 | 7.165 | 6.912 | 6.574 | 6.210 | 5.416 | 4.286 |
| 3.40 | 7.630 | 7.402 | 7.160 | 6.832 | 6.479 | 5.708 | 4.597 |
| 3.45 | 7.858 | 7.639 | 7.408 | 7.091 | 6.749 | 5.999 | 4.909 |
| 3.50 | 8.086 | 7.877 | 7.656 | 7.349 | 7.019 | 6.290 | 5.221 |
| 3.55 | 8.313 | 8.114 | 7.905 | 7.607 | 7.289 | 6.582 | 5.532 |
| 3.60 | 8.541 | 8.351 | 8.153 | 7.866 | 7.558 | 6.873 | 5.844 |
| 3.65 | 8.769 | 8.589 | 8.401 | 8.124 | 7.828 | 7.164 | 6.156 |
| 3.70 | 8.997 | 8.826 | 8.649 | 8.382 | 8.098 | 7.455 | 6.467 |
| 3.75 | 9.225 | 9.063 | 8.897 | 8.640 | 8.367 | 7.747 | 6.779 |
| 3.80 | 9.452 | 9.301 | 9.145 | 8.899 | 8.637 | 8.038 | 7.090 |
| 3.85 | 9.680 | 9.538 | 9.393 | 9.157 | 8.907 | 8.329 | 7.402 |
| 3.90 | 9.908 | 9.775 | 9.641 | 9.415 | 9.176 | 8.621 | 7.714 |
| 3.95 | 10.136 | 10.013 | 9.890 | 9.673 | 9.446 | 8.912 | 8.025 |
| 4.00 | 10.364 | 10.250 | 10.138 | 9.932 | 9.716 | 9.203 | 8.337 |
| 4.05 | 10.591 | 10.487 | 10.386 | 10.190 | 9.986 | 9.495 | 8.649 |
| 4.10 | 10.819 | 10.725 | 10.634 | 10.448 | 10.255 | 9.786 | 8.960 |
| 4.15 | 11.047 | 10.962 | 10.882 | 10.707 | 10.525 | 10.077 | 9.272 |
| 4.20 | 11.275 | 11.199 | 11.130 | 10.965 | 10.795 | 10.368 | 9.583 |
| 4.25 | 11.503 | 11.437 | 11.378 | 11.223 | 11.064 | 10.660 | 9.895 |
| 4.30 | 11.730 | 11.674 | 11.626 | 11.481 | 11.334 | 10.951 | 10.207 |
| 4.35 | 11.958 | 11.911 | 11.875 | 11.740 | 11.604 | 11.242 | 10.518 |
| 4.40 | 12.186 | 12.149 | 12.123 | 11.998 | 11.874 | 11.534 | 10.830 |
| 4.45 | 12.414 | 12.386 | 12.371 | 12.256 | 12.143 | 11.825 | 11.142 |
| 4.50 | 12.642 | 12.623 | 12.619 | 12.515 | 12.413 | 12.116 | 11.453 |
| 4.55 | 12.869 | 12.861 | 12.867 | 12.773 | 12.683 | 12.408 | 11.765 |
| 4.60 | 13.097 | 13.098 | 13.115 | 13.031 | 12.952 | 12.699 | 12.076 |
| 4.65 | 13.325 | 13.335 | 13.363 | 13.289 | 13.222 | 12.990 | 12.388 |
| 4.70 | 13.553 | 13.573 | 13.611 | 13.548 | 13.492 | 13.281 | 12.700 |
| For each additional 0.05 meter depth: | | | | | | | |
| | +0.228 | +0.237 | +0.248 | +0.258 | +0.270 | +0.291 | +0.312 |

D(m) = Average Depth of Trench from Subgrade to Invert of Pipe

# TRENCH BACKFILL FOR ARCH PIPES, METRIC




W = Width of Trench (meters)
D = Depth from Subgrade to Pipe Invert (meters)
H = Height of Trench Backfill Limits (meters) = (D – B)
B = Distance from Pipe Invert to Springline (meters) (See Table)
L = Length of Trench (meters)
A = End Area of Pipe above Springline (square meters) (See Table)

Volume (cubic meters) = [(H x W) – A] x L

This formula should be used by the designer or field engineer to determine the volume of TRENCH BACKFILL that should be paid for when backfilling storm sewer trenches utilizing reinforced concrete ARCH PIPE. Maximum trench widths permitted by Article 550.04 of the Standard Specifications are used.

# Volume of Trench Backfill (cu m) Per Lineal Meter Of Reinforced Concrete Pipe Arch Storm Sewer

| Equivalent Round Size (mm) | | Rise | | Span | | Wall Thickness (mm) | End Area Above Springline (sq m) | B (m) |
|---|---|---|---|---|---|---|---|---|
| | | (mm) | (inch) | (mm) | (inch) | | | |
| 375 | (15 in) | 279 | 11.0 | 457 | 18.0 | 57 | 0.100 | 0.119 |
| 450 | (18 in) | 343 | 13.5 | 559 | 22.0 | 64 | 0.132 | 0.152 |
| 525 | (21 in) | 394 | 15.5 | 660 | 26.0 | 70 | 0.180 | 0.158 |
| 600 | (24 in) | 457 | 18.0 | 724 | 28.5 | 76 | 0.257 | 0.149 |
| 675 | (27 in) | 572 | 22.5 | 921 | 36.3 | 89 | 0.390 | 0.195 |
| 750 | (30 in) | 572 | 22.5 | 921 | 36.3 | 89 | 0.390 | 0.195 |
| 900 | (36 in) | 676 | 26.6 | 1111 | 43.8 | 102 | 0.561 | 0.216 |
| 1050 | (42 in) | 795 | 31.3 | 1299 | 51.1 | 114 | 0.762 | 0.256 |
| 1200 | (48 in) | 914 | 36.0 | 1486 | 58.5 | 127 | 0.991 | 0.296 |
| 1350 | (54 in) | 1016 | 40.0 | 1651 | 65.0 | 140 | 1.214 | 0.329 |
| 1500 | (60 in) | 1143 | 45.0 | 1854 | 73.0 | 152 | 1.518 | 0.372 |
| 1650 | (66 in) | 1372 | 54.0 | 2235 | 88.0 | 178 | 2.207 | 0.433 |
| 1800 | (72 in) | 1372 | 54.0 | 2235 | 88.0 | 178 | 2.207 | 0.433 |
| 2100 | (84 in) | 1575 | 62.0 | 2591 | 102.0 | 203 | 2.146 | 0.472 |
| 2250 | (90 in) | 1829 | 72.0 | 2921 | 115.0 | 216 | 3.684 | 0.604 |
| 2400 | (96 in) | 1962 | 77.3 | 3099 | 122.0 | 229 | 4.280 | 0.619 |
| 2700 | (108 in) | 2213 | 87.1 | 3505 | 138.0 | 254 | 5.488 | 0.683 |
| 3000 | (120 in) | 2461 | 96.9 | 3912 | 154.0 | 279 | 6.601 | 0.796 |
| 3300 | (132 in) | 2705 | 106.5 | 4286 | 168.8 | 254 | 6.777 | 1.155 |

EXAMPLE

Given: Pipe = 750 mm Round size eq., rise = 572 mm, span = 921 mm

Average Depth, D = 1.43 m

Trench Length = 25.1 m

Width, W = 2.01 m

Find: Cubic Meters of TRENCH BACKFILL

Solution: From Table: End Area, A = 0.39 sq. m

B = 0.195 m ≈ 0.20 m

Pay Height, H = D – B = 1.43 - 0.20 = 1.23 m

Volume = [(H x W) - A] x L = [(1.23)(2.01) - 0.39](25.1)

TRENCH BACKFILL VOLUME = 52.3 cu. $m^3$

# Section F

DOCUMENTATION EXAMPLES

**QUANTITY BOOK, PROGRESS AND FINAL DOCUMENTATION**

**The following pages of this Section contain examples for the Quantity Book and typical cross-refrence progress and final documentation.**

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| | |
|---|---|
| **County** | CHAMPAIGN |
| **Section** | (10-33HB)BDR |
| **Route** | FAI 57 |
| **District** | 05 |
| **Contract Number** | 70924 |
| **Job Number** | C-95-031-11 |
| **Project Number** | |
| **Year** | 2016 |

**IF FOUND RETURN TO:**

Illinois Dept. of Transportation

13473 IL Hwy 133

P.O. Box 610

Paris IL 61944-0610

| | |
|---|---|
| **Resident Name** | Sheldon Cooper |
| **Project Phone** | (217) 251-XXXX |
| **Contractor's Name** | Murphy Construction |
| **Contractors Address** | 604 E Green St |
| **Contractor City** | Champaign |
| **Contractor Phone** | (217 ) 891-XXXX |

**All entries made by Resident unless otherwise noted:** Sheldon Cooper SC

*Resident Signature*

Leonard Hoftstadter LH

Raj Koothrappali R.K.

Howard Wolowitz HW

# Diary Entry Example

Wed. MAY 30

Hours Worked: 11.0

Weather: Cloudy, Warm

Temp: 75°f

Controlling Item: Earth Ex

Working Day Charged: 1.0

Kilian: Worked from 12p to 7p placing Bit. on shldr at 17th St. Sawcutting crew worked at Royal Heights Road.

Baxmeyer: Worked on Earth Ex and pipe culverts

Craig: Finished setting forms on floor slab of box culvert

Kilian supplied completed Engrs Field Office TY A on this date, begin payment. J. Smith (SFE) visited job site today. Union Pacific RR provided 2 RR flaggers for 11 hours.

(Traffic Control)

T.C. okay at 7AM and 5PM

Baxmeyer: 6 OP - 5 LAB – 1 TMSTR

Kilian: 7 LAB – 4 OP – 1 TMSTR

Craig (DBE): 2 CAR, 1 LAB

| | | | | | |
|---|---|---|---|---|---|
| **Contract:** | 70924 | **State of Illinois** | **Resident:** | Jason R. Smith |
| **County:** | CHAMPAIGN | **Department of Transportation** | **Supervisor:** | Mike Carnahan |
| **Section:** | (10-33HB)BDR | **ICORS System** | **Field Office Phone:** | (217)251-4749 |
| | | **Diary of Resident Engineer** | **Job Number:** | C-95-031-11 |
| **Route:** | FAI 57 | | **Project:** | N/A |
| **District:** | 05 | | | |

**Date** Thursday, July 12, 2012 **Weekly Report Number** 7

**Controlling Item** Microsilica Overlay

**Persons Working** 6.00 **Hours Worked** 8.00

**Weather** 7am 61 Cloudy 12p 85 Cloudy 3p 88 Cloudy

**Working Days Charged** 0.00 **Workable Days** 1.00

**Weekly Report Paragraph** Oneil removed protective shield and began digging out for Class D patches on the bridge ends

**Additional Paragraphs** Traffic Control inspected by Jason Smith at 7am and no problems found

Contacted Tom Proctor to let him know asphalt could not be vibratory rolled near the bridge deck until the 7 day cure time had lapsed. The patching is not scheduled for Tuesday.

Illinois Department of Transportation

# Weekly Report of Resident

| Contract Number | District | Letting Date |
|---|---|---|
| 70924 | 5 | 01/20/12 |

| Route | County |
|---|---|
| FAI 57 | Champaign |

| Project Number | Job Number |
|---|---|
| N/A | C-95-031-11 |

Section Number: (10-33HB)BDR

| Report Number | Week Ending | % Complete | Contract Price | Estimated Completion Date |
|---|---|---|---|---|
| 7 | 07/14/12 | 46% | $409,252.83 | 08/03/12 |

| Contractor | Contract Completion Date | Contract Working Days | Time Limit Extended to |
|---|---|---|---|
| Oneil Brothers, a Division of MACC of ILL, INC | 08/03/12 | 0.00 | |

| Average Number of Persons Working | Execution | Start | Reports Suspended | Reports Resumed | Significant Completion |
|---|---|---|---|---|---|
| 7 | 02/29/12 | 05/29/12 | | | 08/03/12 |

Resident Name: Jason R. Smith

| Date | Day | Hours Worked | Controlling Item | Working Days Charged | Workable Days | Provide summary of Contractor's and Subcontractor's operations each day. Compare performance with Progress Schedule. A reason must be provided when less than a full working day is charged. |
|---|---|---|---|---|---|---|
| 07/08/12 | Sun | 0 | Microsilica Overlay | 0 | 0 | No work. No workable day due to rain on the jobsite |
| 07/09/12 | Mon | 8 | Microsilica Overlay | 0 | 1 | Oneil wetting the deck and covering in preparation of the microsilica overlay scheduled for the following day |
| 07/10/12 | Tue | 10 | Microsilica Overlay | 0 | 1 | Oneil placed the microsilica overlay on this day |
| 07/11/12 | Wed | 8 | Microsilica Overlay | 0 | 1 | Oneil removed protective shield |
| 07/12/12 | Thu | 8 | Microsilica Overlay | 0 | 1 | Oneil removed protective shield and began digging out for Class D patches on the bridge ends |
| 07/13/12 | Fri | 8 | Microsilica Overlay | 0 | 1 | Oneil removed protective shield and began digging out for Class D patches on the bridge ends. Also placed the polymer concrete over the bridge joints. |
| 07/14/12 | Sat | 0 | Microsilica Overlay | 0 | 1 | No work |
| | | | Total this week | 0 | 6 | |
| | | | Previous Total | | 38 | |
| | | | Total to Date | | 44 | |

Will Contractor complete project on time at present rate of progress? ☒ Yes ☐ No

If No, Why?



Have you discussed rate of progress with Contractor this week? ☒ Yes ☐ No

If No, Why?

Orig. Regional Engineer
c.c. Contractor
Bur. Construction
Project File

| Resident | Field Telephone Number |
|---|---|
| Jason R. Smith | (217) 521-4749 |

NOTE: See reverse side for detailed instructions for preparing Form BC 239. If the Contractor disagrees with the working day charges, detailed reasons must be expressed in writing to the Regional Engineer within 7 days after receipt of the report.

# IDOT QUANTITY BOOK

| | | | |
|---|---|---|---|
| **County** | CHAMPAIGN | | |
| **Section** | (10-33HB)BDR | | |
| **Route** | FAI 57 | | |
| **District** | 05 | | |
| **Contract Number** | 70924 | | |
| **Job Number** | C-95-031-11 | | |
| **Project Number** | | | |
| **Resident's Name** | Sheldon Cooper | | |
| **Field Office Phone** | (217) 251-XXXX | | |
| **Supervisor Name** | Amy Farrah Fowler | | |
| **Contractor Name** | Murphy Construction | | |
| **Contractor Address** | 604 E Green St | | |
| | Champaign | IL | 61820 |
| **Contractor Phone** | (217) 891-XXXX | | |

**If found, please return this to the Resident Engineer or forward it to the District Office address below**

Illinois Dept. of Transportation

13473 IL Hwy 133

P.O. Box 610

Paris IL 61944-0610

# IDOT QUANTITY BOOK

**INDEX OF SHEETS**

| | | | |
|---|---|---|---|
| **COUNTY** | 177 | **DISTRICT** | 02 |
| **SECTION** | 20RS-1 & 20BR | | |
| **ROUTE** | FAP 5 | | |
| **CONTRACT** | 84776 | | |
| **JOB NO** | C-92-072-12 | | |
| **PROJECT** | STPF-BRF-0005/050/000 | | |


| FASID | ITEM NO | PAGE | DESCRIPTION |
|---|---|---|---|
| Q10C01 | 20300100 | 1 | CHANNEL EXCAV |
| | 28100107 | 2 | STONE RIPRAP CL A4 |
| | 28200200 | 3 | FILTER FAB |
| | 50100100 | 4 | REM EXIST STRUCT |
| | 50200100 | 5 | STRUCTURE EXCAVATION |
| | 50300100 | 6 | FLOOR DRAINS |
| | 50300208 | 7 | CONC ENCASE |
| | 50300225 | 8 | CONC STRUCT |
| | 50300255 | 9 | CONC SUP-STR |
| | 50300260 | 10 | BR DECK GROOVING |
| | 50300300 | 11 | PROTECTIVE COAT |
| | 50800205 | 12 | REINF BARS, EPOXY CTD |
| | 50800515 | 13 | BAR SPLICERS |
| | 51200700 | 14 | FUR CONC PILES |
| | 51202305 | 15 | DRIVE CONC PILES |
| | 51204200 | 16 | TEST PILE CONCRETE |
| | 51205200 | 17 | TEMP SHT PILING |
| | 51500100 | 18 | NAME PLATES |
| | 66700205 | 19 | PERM SURV MKRS T1 |
| | 70106500 | 20 | TEMP BR TRAF SIGNALS |
| 3AAL01 | X0322352 | 21 | SEEDING MOBILIZATION |
| | X2500200 | 22 | TEMP SEEDING |
| | 40600645 | 23 | LEV BIN MM, N90 |
| | 40603090 | 24 | HMA BINDER CSE, IL-19.0, N90 |
| | 40603345 | 25 | HMA SURFACE CSE, MIX "D", N90 |
| | Z0013798 | 26 | CONSTRUCTION LAYOUT |
| | Z0028415 | 27 | GEOTECHNICAL REINF |
| | FRC00100 | 28 | CONSTRUCTING TEST STRIP |
| | X9200400 | 29 | TRAF CONT & PROT |

Illinois Department of Transportation

## Quantity Sheet

County 177

Section 20RS-S & 20BR

Route FAP 5

District 02
Contract No. 84776
Job No. C-92-072-12

Project STPF-BRF-0005/050/000

Page 280
Item 44200156
PAVT PATCH T2 13
Fund 33DC01
Plan Quantity 327.800
Unit Measure SQ YD
Contract Unit Price 64.0000

**Authorizations**

| Number | Date App'vd | Add | Deduct | Total |
|---|---|---|---|---|
| 14 | 7/27/16 | 35.4 | | 363.2 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Cnty Const Sfty
177 I000 2A

Quantity
327.800

| Date | Station to Station Location or Description | Quantities Placed | | | Evidence of Material Inspection | Progress Document Source |
|---|---|---|---|---|---|---|
| | | This Date | To Date | Pay Est | | |
| 7/12/16 | STA 69+34 → 84+21 NB | 83.2 | 83.2 | | Plant Rpt. | FB #3, p. 12 |
| 7/13/16 | STA 96+13 → 130+01 NB | 121.4 | 204.6 | | & Tickets | FB #3, p. 12 |
| 7/15/16 | STA 125+16 → 74+95 SB | 95.4 | 300.0 | | & Test | " , p. 16 |
| 7/19/16 | STA 74+51 → 62+49 SB | 63.2 | 363.2 | #3/327.8 | | " , p. 24 |
| | | | | #4/363.2 | | |
| | | | FINAL | | | |
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Source of documentation
for final quantity: FB #3, pp. 8-24 for Qtys & Depths

BC 625 (Rev. 4/98)

For all tonnage items
weighed on platform scales:
Scales checked by
Dept. Of Agriculture
Date on decal 04/05/16
Identification No. 01-2345
Scale Location Sterling, IL

**Inspection Reports**

| Date | Mistic Report No. or Source or Manufacturer | Amount | Total to Date | Transferred to Other Code or Remarks |
|---|---|---|---|---|
| 7/12/16 | MI-305, Daily Plant Output | 65.4 tons | 65.4 | |
| 7/13/16 | ↓ | 90.2 tons | 155.6 | |
| 7/15/16 | ↓ | 70.4 tons | 226.0 | |
| 7/19/16 | ↓ | 47.1 tons | 273.1 | |
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|---|---|---|---|---|---|
| **Contract:** | 76308 | **State of Illinois** | **Resident:** | Brett Schwalb |
| **County:** | MADISON | **Department of Transportation** | **Supervisor:** | Ted Nemsky |
| **Section:** | 60-(4,5)RS-2 | **ICORS System** | **Field Office Phone:** | (618)288-5071 |
| | | **Daily Quantities** | **Job Number:** | C-98-123-10 |
| **Route:** | FAI 270 | | **Project:** | N/A |
| **District:** | 08 | | | |

**DQ Number:** 41 **Date:** 06/16/2016 **Contractor:** Keeley & Sons, Inc

**Pay Item Key:** 44200204-Q050J01-119I0002A-A PAVT PATCH T3 17

**Qty Inspected:** 24.40 SQ YD **Posted** ☑ **Paid on Estimate Nbr:** 2 **Estimate or Final:** Final

**Evidence of Inspection:** Plant Report & Tickets and Test in File

**Location:** I-270 WB Driving lane Station 837+55 to 816+50

**Source of Progress Documentation:** Field book # 3, page 2

| | | | | | |
|---|---|---|---|---|---|
| **Contract:** | **76308** | **State of Illinois** | | **Resident:** | **Brett Schwalb** |
| **County:** | **MADISON** | **Department of Transportation** | | **Supervisor:** | **Ted Nemsky** |
| **Section:** | **60-(4,5)RS-2** | **ICORS System** | | **Field Office Phone:** | **(618)288-5071** |
| | | **Quantity Book** | | **Job Number:** | **C-98-123-10** |
| **Route:** | **FAI 270** | | | **Project:** | **N/A** |

**District:** **08** **PAVT PATCH T3 17**

**Qty Book Page:** **44200204-Q050J01-A** **PAVT PATCH T3 17**

**Pay Item Nbr:** **44200204** **FASID** **Q050J01** **Subjob** **A**

**Units** **SQ YD** **UnitPrice** **$81.6000**

**Quantity Awarded** **67.000** **Adjusted Total Qty:** **83.330**

**Source Of Final Documentation:** **FLD BK #3 PG24**

**Finaled** **Yes**

F-10

**Authorizations:**

| Auth Number | Auth Letter | CCS Code | Date Approved | Added Qty | Deducted Qty |
|---|---|---|---|---|---|
| 4 | | 119I0002A | 07/14/2016 | 16.330 | 0.000 |

**Quantities:**

| CCS Code | DQ Nbr | Date | Qty Inspected | To Date | Evidence of Inspection | Source of Progress Documentation: | Estimate # |
|---|---|---|---|---|---|---|---|
| 119I0002A | 41 | 06/16/2016 | 24.400 | 24.400 | Plant Report & Tickets and Test in File | Fld bk # 3 pg 2 | 2 |
| Location: I-270 WB Driving lane Sta 837+55 to 816+50 | | | | | | | |
| Estimate or Final: Final | | | | | | | |
| 119I0002A | 53 | 06/17/2016 | 42.930 | 67.330 | Plant Report & Tickets & Test in File | fld bk # 3 pg 3 | 2 |
| Location: I-270 WB sta 815+95 to 792+75 | | | | | | | |
| Estimate or Final: Final | | | | | | | |
| 119I0002A | 157 | 06/21/2016 | 16.000 | 83.330 | Plant Report & Tickets & Test in File | FLD BK # 3 pg 4 | 3 |
| Location: I-270 WB DL PATCH # 34 A | | | | | | | |
| Estimate or Final: Final | | | | | | | |

FIELD BOOK # 4 - BRIDGE

IF FOUND PLEASE RETURN TO:

REGIONAL ENGINEER
Name ILLINOIS DEPT. OF TRANSPORTATION
DISTRICT 4
Address 401 MAIN STREET
PEORIA, IL 61202-1111
Phone *(OPTIONAL)*

Knox
5-5HB-2
FA 206
4
12345
C-94-789-12

This book is published on a fine 50% cotton-content ledger paper, specially treated for maximum archival service, and protected by a water resistant surface sizing.

Projects

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| TEST PILE CUT-OFF GRADES | 6-7 |
| FILLET CALCULATIONS | 8-11 |
| DECK DEPTH CHECKS | 12-15 |
| BRIDGE APPR. MEAS. & CALCS | 16 |
| BRIDGE APPR. SHLDR MEAS. & CALCS | 17-18 |

DATE: 6/7/16 BRIDGE BUILDERS CO.

WEATHER: P. CLOUDY & WARM

AIR TEMP - 7:00 AM: 60°
NOON : 70°
3:00 PM: 75°

POUR START TIME: 7:00 AM

POUR END TIME: 2:00 PM

CURING COVER COMPLETE: 4:00 PM

BRIDGE SKEW: 15°

FINISHING MACHINE: BIDWELL

FINISHING MACHINE ORIENTATION: 90°

DRY RUN COMPLETED: 6/4/16

INSPECTORS: EAL, CR

COMMENTS: FINISHING MACHINE

| LOCATION | REBAR DEPTH | CONC. DEPTH |
|---|---|---|
| E. ABUT. | 2 1/4" | 8" |
| 1/4 SPAN 1 | 2 3/8" | 8 1/8" |
| MID-SPAN 1 | 2 1/4" | 8" |
| 3/4 SPAN 1 | 2 1/4" | 8" |
| PIER 1 | 2 1/4" | 8" |
| 1/4 SPAN 2 | 2 3/8" | 8 1/8" |
| MID-SPAN 2 | 2 1/4" | 8 1/8" |
| 3/4 SPAN 2 | 2 1/4" | 8" |
| | 2 1/4" | 8" |

PLAN DEPTH OF REBAR: 2 1/4"
PLAN DECK THICKNESS: 8"

PG. 8

## 42100200 CONT REINF PCC PAVT 9

DATE: 6/7/16 RIVER BLUFF PAVING

WEATHER: CLOUDY INSPECTORS:

68° @ 7:30 AM ZOE HEINZ

75° @ NOON TOM DUNCAN

72° @ 4:30 PM

LOCATION: WB STA 360+00 TO 383+22

LENGTH = 2322' WIDTH = 24'

EQUIPMENT:

*SKI OPERATED CMI SLIPFORM SPREADER

*SKI OPERATED CMI SLIPFORM PAVER

*STRING-GUIDED CMI TINING MACHINE W/ ASTROTURF DRAG

*STRING-GUIDED CMI MEMBRANE SPRAYER

TRUCKS: ALL AGITATING

AVG. HAUL TIME = 20MIN.

SEE TICKETS FOR REV. COUNT

15 MIN BREAKDOWN @ STA 376+00

REINFORCING:

*BAR LAP DETAIL #2 (STD 2225)

*KEYWAY & BARS

*DEPTH: 3 1/2 ±1/2"

Meas. By: ZH, JD 6/7/16

Calc. By: ZH 6/7/16

Ckd. By: JD 6/7/16

* Note: Record only on 1st day.

| STATION | AIR (%) | SLUMP | BEAMS |
|---|---|---|---|
| 360+00 | 5.0 | 1" | |
| 362+50 | 5.2 | | |
| 365+00 | 5.4 | | P-1-A |
| 367+50 | 5.5 | 1 1/4" | P-1-B |
| 370+00 | 5.2 | | |
| 372+50 | 5.2 | | |
| 375+00 | 4.9 | 1 1/2" | |
| 377+50 | 5.3 | | |
| 380+00 | 5.6 | | |
| 382+50 | 5.5 | | |

AREA = 2322' X 24' = 55728 SF

REQ'D VOLUME = $55728 \times \frac{9}{12} \times \frac{1}{27}$ = 1548 CY

DELIVERED (FROM TICKETS) = 1672 CY

YIELD = $\frac{1672 \times 100}{1548}$ = 108%

TYPE 3 MEMBRANE CURING - ILL OK STAMP

REQ'D = $\frac{L \times W \times 2 \text{ APPL}}{250 \text{ SF/GAL}} = \frac{2322'(25.5') \ 2}{250 \text{ GAL/SY}}$ = 474 GAL

(NOTE: WIDTH = 24' + 9/12 + 9/12 = 25.5')

USED 9 BARRELS @ 55 GAL/BAR = 495 GAL √ OK

## 40603085 HMA BINDER CSE IL-19.0 N70

DATE: 6/20/16 HEINZ PAVING

WEATHER: SUNNY INSPECTORS:

65° @ 6:30 AM EMILY DUNCAN

90° @ 2:30 PM MATT PATEL

LOCATION: WB STA 37+20 TO 115+80

LENGTH = 7860'

MAT WIDTH = 12'

MAT THICKNESS = 1.5 "

EQUIPMENT:

PAVER: BARBER-GREENE SA 131

VIB ROLLER: DYNAPAC 42A; TACH=2400 VPM

PNEUMATIC ROLLER: INGRAM

FINISH ROLLER: GALLION 266B; STATIC MODE

MAX SPEED = 2400 VPM = 240 FT/MIN

VIB ROLLER 10 IMPACTS/FT

ROLLING PATTERN:

4 PASSES REQ'D OVER EACH POINT

9 PASSES FOR FULL MAT WIDTH

$$\text{MAX PAVER SPEED} = \frac{240 \text{ FT/MIN} \times 0.9}{9 \text{ PASSES}} = 24 \text{ FT/MIN}$$

Meas. By: ED, MP 6/28/16

Calc. By: ED 6/28/16

Chkd. By: MP 6/28/16

| TEMP | IN TRUCK | BEHIND PAVER |
|---|---|---|
| 8:00 AM | 295° | 280° |
| 10:00 AM | 290° | 270° |
| 12 NOON | 305° | 285° |
| 2:00 PM | 310° | 290° |

YIELD CHECKS:

1. THEORETICAL TRUCK DUMPING DISTANCE, D

$$D = \frac{12 \text{ TONS/TRUCK}(2000 \text{ LBS/TON})(9 \text{ SF/SY})}{12'(112 \text{ LBS/SY-IN})(1.5")} = 107 \text{ FT/TRUCK}$$

2. THEORETICAL TONS PER STATION, $T_S$

$$T_S = \frac{(12' \times 100')(112 \text{ LBS/SY-IN})(1.5")}{(9 \text{ SF/SY})(2000 \text{ LBS/TON})} = 11.2 \text{ TONS}$$

3. DAILY TOTAL YIELD CHECK:

$$\text{THEO.} = \frac{(12' \times 7860')(112 \text{ LBS/SY-IN})(1.5")}{(9 \text{ SF/SY})(2000 \text{ LBS/TON})} = 880.3 \text{ TONS}$$

TONS DELIVERED = 897.9 (SEE TICKET FILE)

$$\text{YIELD} = \frac{\text{DELIVERED}}{\text{THEORETICAL}} = \frac{897.9}{880.3} = 102\%$$

MAT'L INSP: PLANT REPORT, TICKETS & TEST

## 70300100 SHORT TERM PAVT MARKING

WB STA 37+20 TO 115+50

195 SKIP-DASHES x 4' EACH = 780'

Illinois Department of Transportation

**PCC Paving Daily Record**

Date September 7, 2016 Contract No. 90632 Mix Design No. 85PCC6427

Pay Item No. and Description 42000400 PCC PAVEMENT 9"

Resident Matt Young Contractor A1 Construction Company

| Inspectors |
|---|
| Amber Weiser |
| Steve Blakeney |
| Todd Richardson |

| Visitors |
|---|
| Greg Idleman - FE |
| |
| |

**Weather**

| Time | Temp. | Conditions |
|---|---|---|
| 7:00 AM | 70 | Sunny, Dry |
| Noon | 81 | Sunny, Dry |
| 3:00 PM | 85 | Sunny, Dry |

| Start Sta. | End Sta. | Distance | | Width | | | | Sq. Yds. |
|---|---|---|---|---|---|---|---|---|
| 1508+00 | 1516+00 | 800.0 ft | x | 24 ft | x | 1/9 | = | 2133.3 |
| | | | x | | x | 1/9 | = | |
| | | | x | | x | 1/9 | = | |
| | | | x | | x | 1/9 | = | |
| | | | x | | x | 1/9 | = | |
| | | | x | | x | 1/9 | = | |

| Contractor's Paving Equipment | | Trucks | |
|---|---|---|---|
| Spreader | | Non-agitating | ☐ Yes ☐ No |
| Paver | Gomaco GP – 2500 | Agitating | ☒ Yes ☐ No |
| Tining Maching | Gomaco T/C - 600 | Average Haul Time | 20 Min |
| Curing Sprayer | | | |
| | | | |
| | | | |

Rebar Lap Detail _____ Rebar Depth _____

Tie Bar Depth _____

| Daily Yield | | | |
|---|---|---|---|
| Required Volume | $\frac{2133.3 \text{ (Total sq. yds.)} \times .75 \text{ (Thickness in feet)}}{3}$ = | 533.3 | Cu. Yds. |
| Used Volume | 61 No. of batches or truck (x) 9 cu. yds/batch or truck = | 549.0 | Cu. Yds. |
| Surplus | $\left(\frac{549 \text{ (Used)} - 533.3 \text{ (Req'd.)}}{533.3 \text{ (Req'd.)}}\right)$ (x) 100 = | 2.94 | % Surplus |

| Membrane Curing | | | |
|---|---|---|---|
| Type | Type II | Inspection | LA - 15 |
| Required Gallons | $\frac{800 \text{ (L)} \times 24 \text{ (W)} \times 2 \text{ (Applic.)}}{250 \text{ Sq. ft./gal.}}$ = | 153.6 | Gals. |
| Used Gallons | 3 Barrels (x) 55 Gals./Barrel = | 165.0 | Gals. |

BC 2531 (9/01)

| Tests | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | % Air | Slump | Beams/ Cylinders | Conc. Temp. | Air Temp. | Station | % Air | Slump | Beams/ Cylinders | Conc. Temp. | Air Temp. |
| 1508+00 | 06.50 | 2 ¾" | 6 | 76 | 70 | | | | | | |
| 1509+00 | 05.20 | 2 ½" | - - - - - - | 78 | 75 | | | | | | |
| 1509+85 | 05.30 | - - - - - | - - - - - - | 78 | 77 | | | | | | |
| 1510+70 | 05.70 | 3" | - - - - - - | 80 | 79 | | | | | | |
| 1511+55 | 05.90 | 2 ¾" | - - - - - - | 80 | 80 | | | | | | |
| 1512+40 | 06.10 | 3" | 4 | 83 | 80 | | | | | | |
| 1513+25 | 05.90 | - - - - - | - - - - - - | 83 | 81 | | | | | | |
| 1514+15 | 05.90 | 3" | - - - - - - | 84 | 85 | | | | | | |
| 1515+50 | 06.00 | 2 ½" | - - - - - - | 84 | 88 | | | | | | |

| Remarks |
|---|
| Formulas for the yield check |
| station – station = length |
| (length x width x depth) / 27 = cubic yard |
| |
| |
| |
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| |

**Calculations / Measurements / Misc.**

Yield Checks

1) From Sta. 1508+00 - 1510+00 135.0
Actual = 135.0 cuyd 133.3 x 100 = 101.3%
Theo.= 133.3 cuyd

2) From Sta. 1508+00 – 1512+00 270.0
Actual = 270.0 cuyd 266.7 x 100 = 101.2%
Theo.= 266.7 cuyd

3) From Sta. 1508+00 to 1514+00 423.0
Actual = 423.0 cuyd 400.0 x 100 = 105.8%
Theo.= 400.00 cuyd

4) From Sta. 1508+00 to 1516+00 549.0
Actual = 549.0 cuyd 533.3 x 100 = 102.9%
Theo.= 533.3 cuyd

Depth Checks

@1508+25 9" – EOP
9 ¼ " – Lane Line
9 ½ " – EOP(North)

@1510+75 9 1/8 " – EOP
9" – Lane Line
9 3/8" – EOP (North)

@1513+25 9" – EOP
9 3/8 " – Lane Line
9 ½ " – EOP (North)

@1515+75 9 ¼ " – EOP
9" – Lane Line
9 ¼" – EOP (North)

Measured by: AMW Date: 09/07/16
Calculated by: AMW Date: 09/07/16
Checked by: DEM Date: **09/10/16**

BC 2531 (9/01)

Illinois Department of Transportation

**Bituminous Paving Daily Record**

Date June 20, 2016 Contract Number 70812 Mix Design No. 86 BIT 1536

Payment Item No. & Description 40603360 Hot-Mix Asphalt Surface, Mix E, N50

Resident John Preston Contractor Al Construction Company

| Inspectors |
|---|
| John Dough |
| Robert Fell |
| |

| Visitors |
|---|
| Bill Smith, F.E. |
| |
| |

| Weather | Time | Temp. | Conditions |
|---|---|---|---|
| | 6:30AM | 65° F | Sunny |
| | 2:30PM | 90° F | Sunny |
| | | | |

| Start Sta. | End Sta. | Mat Width | Mat Thick |
|---|---|---|---|
| WB 37+20 | 115+80 | 12 ft. | 1.5 inch |
| | | | |
| | | | |
| | | | |

| | |
|---|---|
| Tons Placed Today | 920.6 tons |
| Theo. Tons Today | 901.2 tons |
| +/- Tons Today | +19.4 tons |
| Daily Yield (%) | 102% |
| Cumulative Yield (%) | |

| Contractor's Paving Equipment | | | | | |
|---|---|---|---|---|---|
| Paver | Barber-Greene SA – 131 | Reed Tach | | | |
| Mat'l Transfer Device | RoadTech Shuttlebuggy 2500 | | | | |
| Breakdown Roller | Dynapac CC 42A | Reed Tach | 2400VPM | Amplitude | |
| Vibratory Roller | | Reed Tach | | Amplitude | |
| Pneumatic Roller | Ingram | | | | |
| Finish Roller | Gallion V05 2-66 B, Static Mode | | | | |

Max Vib. Roller Speed: $\frac{2400 \text{ VPM}}{10 \text{ impacts/foot}} = 240$ ft./min

Max. Paver Speed: $\frac{240 \text{ ft/min}}{9 \text{ passes}} \times .9 = 24$ ft/min

| Time of Temp. & Speed | 8:00 AM | 10:00 AM | 12 Noon | 2:00 PM | |
|---|---|---|---|---|---|
| Temp. in Truck | 295° | 290° | 305° | 310° | |
| Temp. Behind Paver | 280° | 270° | 285° | 290° | |
| Paver Speed | 23 ft/min | 20 ft/min | 22 ft/min | 23 ft/min | |

Theo. Truck Dumping Distance: $\frac{(2000 \text{ lb/ton})(9 \text{ sf/sy})(12 \text{ ton/truck})}{(114.7 \text{ lb/in/sy})(1.5 \text{ in})(12 \text{ ft})} = 104.6$ ft/truck

| Rolling Pattern | Daily Total Yield Check (addt'l checks on reverse side) |
|---|---|
| 4 Passes Required over each point therefore 9 Passes for Full Mat Width | Theo: $\frac{(12 \text{ ft} \times 7860 \text{ ft})(2.45 \times 62.4 \times .75)(1.5 \text{ in})}{(9 \text{ sf/sy})(2000 \text{ lb/ton})}$ = 901.2 tons required<br><br>Delivered & placed: 920.6 tons<br><br>Yield = $\frac{920.6}{901.2} \times 100 = 102\%$ |



BC 2529 (Rev. 6/05)

| Total Running Yield Checks | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Starting Station: | | | | | | | | | | | |
| Time | Total Tons Place | Check Station | Length Placed (1) | Theo. Tons (2) | Yield % (3) | Time | Total Tons Placed | Check Station | Length Placed (1) | Theo. Tons (2) | Yield % (3) |
| 10:00 AM | 303.0 | 63+00 | 2580 ft. | 295.8 | 102.4% | | | | | | |
| 12 Noon | 608.7 | 89+20 | 5200 ft. | 596.2 | 102.1% | | | | | | |
| 1:00 PM | 766.8 | 102+70 | 6550 ft. | 751.0 | 102.1% | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

(1) Length Placed = Starting Station – Check Station
(2) Theo. Tons = (Length x Mat Width x Lbs./Sq. Yd. X Mat Thickness) + (9 x 2000)
(3) Yield % = (Total Tons Placed ÷ Theo. Tons) x 100

| Surface Variations | | | |
|---|---|---|---|
| Tested by: RS | Station/Location | Station/Location | Station/Location |
| Check one below: | | | |
| ☒ None found today | | | |
| ☐ Found variations & finish roller was able to correct variations | | | |
| ☐ Found variations that require corrective action or deduction. | | | |

**Short Term Pavt. Mkg. (Item No.** 70300100 **)**

STA. 37+20 to 115+50
Required: 4 ft. every 40 ft.
→Counted 195 skip dashes
at 4 ft. each = 780 ft.

| Remarks |
|---|
| |
| |
| |
| |
| |
| |
| |
| |

**Calculations / Measurements / Misc.**

Measured by: JD, RJ Date: 6/20/16
Calculated by: JD Date: 6/22/16
Checked by: RJ Date: 6/22/16

BC 2529 (Rev. 6/05)

BC 2529 (Rev. 6/05)

PAVEMENT PATCHING
MIX DESIGN NO 71PCC0108
GREENE READY MIX - CHICAGO, IL

| TICKET NO· | BATCH TIME | ARRIVE TIME | DEPART TIME | REVS INITIAL /FINAL | BATCH $YD^3$ |
|---|---|---|---|---|---|
| 83695 | 7:45 AM | 8:05 AM | 8:30 AM | 110/170 | |
| | AIR ENTRAINMAENT ADDED - 8 OZ | | | | |
| 83700 | 8:10 AM | 8:30 AM | 8:45 AM | 120/137 | |
| 83704 | 8:30 AM | 8:50 AM | 9:10 AM | 117/140 | |
| 83707 | 9:15 AM | 9:37 AM | 10:05 AM | 114/159 | |
| 83711 | 9:55 AM | 10:15 AM | 10:45 AM | 119/149 | |

INSPECTORS:
ANNE RUIZ
STEPHEN WRIGHT

DATE: 8/18/16
WEATHER: SUNNY
77° @ 8:00 AM
81° @ 10:00 AM

| QC/QA | QC/QA SLUMP INCHES | QC/QA CONC TEMP | QC/QA CYLINDER SERIES | STA |
|---|---|---|---|---|
| 3·8/3·5 | 2·1/2·3 | NONE TAKEN | NONE TAKEN | 37+05 |
| 4·5/4·7 | 2·8/3·2 | 74/74 | " | |
| 5·0/4·9 | 2·6/2·8 | NONE TAKEN | " | 37+05 |
| NONE TAKEN | NONE TAKEN | " | " | 43+50 |
| NONE TAKEN | NONE TAKEN | " | " | 53+60 |
| 5·2/5·4 | 2·8/3·2 | 80/80 | P1-A / P1-C P1-B / P1-D | 68+10 |

Illinois Department of Transportation

# Agreement on Accuracy of Plan Quantities

E-mail | Reset Form

Contract Number: 61N07 | District: 5 | Letting Date: 07/04/23

Route: | County: Champaign

Project Number: | Job Number:

Section Number:

| Quantity | Unit | Pay Item | Code Number |
|---|---|---|---|
| | Acre | Tree Removal Acres | 20100500 |
| 34,960 | Cu Yd | Earth Excavation | 20200100 |
| | Cu Yd | Channel Excav | 20300100 |
| | Cu Yd | Rock Excav Channel | 20300200 |
| | Cu Yd | Furnished Excavation | 20400800 |
| | Cu Yd | Gran Embank Spec | 20600200 |
| | Cu Yd | Trench Backfill | 20800150 |
| | Sq Yd | Compost Furnish & Place | 211018 |
| | Cu Yd | Topsoil Excavation & Place | 21101505 |
| | Acre | Mowing | 25000750 |
| 11.8 | Acre | Seeding CL 2 | 25000 |
| | Acre | Mulch Method | 25100 |
| | Sq Yd | Erosion Control Blanket | 25100630 |
| | Sq Yd | Processing Modified Soil | 3020 |
| | Cu Yd | Sub Gran Mat A | 31100200 |
| | Sq Yd | Sub Gran Mat A | 31100 |
| | Cu Yd | Sub Gran Mat B | 31101100 |
| | Sq Yd | Sub Gran Mat B | 31101 |
| | Cu Yd | Sub Gran Mat C | 31102000 |
| | Sq Yd | Sub Gran Mat C | 31102 |
| | Sq Yd | Stab Sub-Base 4 | 31200100 |
| | Cu Yd | Agg Base Cse A | 35100110 |
| | Sq Yd | Agg Base Cse A | 3510 |
| | Cu Yd | Agg Base Cse B | 35101500 |
| | Sq Yd | Agg Base Cse B | 3510 |
| | Sq Yd | Proc Soil-Cem BC | 35200 |
| | Sq Yd | Hes PCC Bse Cse | 3530 |
| | Sq Yd | PCC Bse Cse | 35300 |
| | Sq Yd | PCC Bse Cse 16 ½" – 10 ½" | 35300800 |
| | Sq Yd | PCC Base Cse W | 35400 |
| | Sq Yd | Hes PCC Bse Cse W | 3540 |
| | Sq Yd | HMA Base Cse | 3550 |

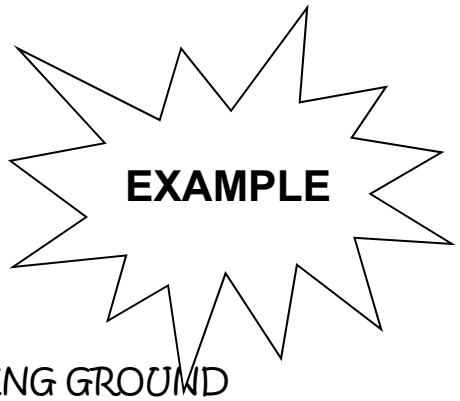
| Quantity | Unit | Pay Item | Code Number |
|---|---|---|---|
| 2,464 | Sq Yd | HMA BC Wid 10 | 35600 |
| | Sq Yd | HMA BC Wid 8 | 35600708 |
| | Sq Yd | Base Cse Wid | 35650 |
| | Sq Yd | Preparation of Base | 35800100 |
| | Cu Yd | Agg Surf Cse A | 40200200 |
| | Sq Yd | Agg Surf Cse | 40200 |
| | Sq Yd | HMA Pavt FD | 4070 |
| | Sq Yd | PCC Pvt | 42000 |
| | Sq Yd | Hes PCC Pvt | 4200 |
| | Sq Yd | Welded Wire Reinf | 42000060 |
| | Sq Yd | Protective Coat (pavement) | 42001300 |
| | Sq Yd | Cont Reinf PCC Pvt | 42100 |
| | Sq Yd | C R Hes PCC Pvt | 42100 |
| | Sq Yd | Pavt Reinforcement | 42100615 |
| | Sq Yd | Pavement Removal | 44000100 |
| | Sq Yd | Driveway Pavement Removal | 44000200 |
| | Cu Yd | Aggregate Shlds A | 48100200 |
| | Sq Yd | Aggregate Shlds A | 4810 |
| | Sq Yd | HMA Shoulders | 4820 |
| | Sq Yd | PC Concrete Shoulder | 48300 |
| | Cu Yd | Structure Excavation | 50200100 |
| | Cu Yd | Conc Struct | 50300225 |
| | Cu Yd | Conc Sup-Str | 50300255 |
| | Cu Yd | Seal Coat Conc | 50300265 |
| | Cu Yd | Concrete Handrail | 50300275 |
| | Cu Yd | Concrete Encasement | 50300280 |
| | Sq Yd | Protective Coat (structures) | 50300300 |
| | Sq Ft | Prec Conc Br Slab | 50400105 |
| | Sq Ft | PP Conc Dk Bm DP (11", 17", 21", 27", 33") | 50400 |
| | Ft | F & E P P Con I-BM (36", 42", 48", 54") | 5040 |
| | Pound | Reinforcement Bars | 50800105 |
| | Pound | Reinf Bars, Epoxy CTD | 50800205 |
| | Sq Yd | Slope Wall | 51100 |
| | Cu Yd | Conc Box Cul | 54003000 |
| | Sq Ft | Membrane Waterproof | 58000100 |

(and the following items, as permitted by the Standard Specifications or contract provisions):

| Quantity | Unit | Pay Item | Code Number |
|---|---|---|---|
| + - ~~383.5~~ | ~~Cu Yd~~ | ~~Conc Strut~~ *GJR 7/10/23* | ~~50300225~~ |

We hereby agree that when the project is constructed essentially to the lines, grades and dimensions shown on the plans, no further measurement will be required for the above items and payment will be made for the quantities shown in the contract except that if errors are discovered after work has been started, appropriate adjustments will be made.

When the plans have been altered or when disagreement exists between the Contractor and the Engineer as to the accuracy of the plan quantities, either party shall, before any work is started which would affect the measurement, have the right to request in writing and thereby cause the quantities involved to be measured as specified.




PLAN QUANTITY CHECK

20200100 EARTH EXCAVATION, PLAN = 34,960 CY

- SPOT CHECKED EXISTING GRADES. SEE FB #1 FOR X-SECTIONS.
- PLAN X-SECTIONS VISUALLY COMPARED TO EXISTING GROUND ⇒ NO SIGN OF RECENT CONSTRUCTION
- DESIGN END-AREA VOLUME CALCS WERE CHECKED

NOTE: UNDERCUT VOLUMES AND LOCATIONS ARE DESIGNATED ON THE PLANS AND WILL BE FINAL MEAS. BY BEFORE & AFTER X-SECS.

∴ ACCEPT PLAN QTY.

25000200 SEEDING CL 2, PLAN = 11.8 ACRE

- STA 1034+20 TO 1108+12 = 7,392 FT., WIDTH = 34 FT.
- SEEDING AREA = $\frac{7{,}392\ ft.\ x\ 34\ ft.}{43{,}560\ sf\ /\ acre}\ x\ 2 sides = 11.5 acres$
- DIFFERENCE = 0.3 ACRE. ROUGH CALC NOT INCLUDED GROUND SLOPE.

∴ ACCEPT PLAN QTY.

35600716 BIT CONC BC WID 10, PLAN = 2,464 SY

PLAN WIDTH = 1.5'

AREA = 2 sides x 1.5' x 7,393' x 1/9 = 2,464 SY ∴ ACCEPT PLAN QTY.

50300225 CONC STRUCT, PLAN = 383.5 CY

CALC. QTY = 378.1 CY (SEE CALC FILE #4)

DIFFERENCE = 5.4 CY @ $425/CY = $2,295 ∴ NOT OK

→ CONTRACTOR NOTIFIED BY LETTER ON 9-7-16

CALC BY: BC 9-7-16

Illinois Department of Transportation

# Inspector's Daily Report

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date 9-21-16

Contractor or Sub. Careful Const.

Weather Hot-Humid 90's

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | JCS | 9-21-16 |
| Measured by: | JCS | 9-21-16 |
| Calculated by: | JCS | 9-21-16 |
| Checked by: | DEM | 9-22-16 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 20200100 | ----- | Earth Excav. | 16 + 20 Lt. | 1709.8CY | N/A | √ |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

This is: √ an estimated progress measurement (item no.: 20200100 )

☐ a final field measurement (item no.: )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

Trailer – (6.9ft X 23.0ft X 3.6ft)/27 = 21.2CY

Tandem – (6.9ft X 14.4ft X 3.6ft)/27 = 13.2CY

80 loads (tandem) X 13.2CY X 80% = 844.8CY

51 loads (trailer) X 21.2CY X 80% = 865.0CY

Total 1709.8CY

Illinois Department of Transportation

**Inspector's Daily Report**

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date 7-26-16

Contractor or Sub. ACME Construction

Weather Clear, 90°

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | RG | 7-26-16 |
| Measured by: | RG | 7-26-16 |
| Calculated by: | RG | 7-26-16 |
| Checked by: | MF | 7/27/16 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 20200100 | | Earth Excavation | 2 + 60 to 17 + 00 | 8372 CY | N/A | √ |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

This is: √ an estimated progress measurement (item no.: 20200100 )

☐ a final field measurement (item no.: _____ )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

By Count: 490 Loads hauled, 70 Loads each

Equipment: 4 Terex's (TR45) & 3 Cats (621G)

TR45: 4 x 70 Loads x 25.6 CY/Load x 80% = 5734 CY

621G: 3 x 70 Loads x 15.7 CY/Loads x 80% = 2638CY

Total = 8372 CY

F - 24

BC 628 (Rev. 8/04)

Illinois Department of Transportation

**Inspector's Daily Report**

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date 8-9-16

Contractor or Sub. Tonka Construction

Weather Sunny 80°

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | TB & AG | 8-9-16 |
| Measured by: | | |
| Calculated by: | TB | 8-9-16 |
| Checked by: | AG | 8/12/16 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 20700220 | | POROUS GRANULAR | STA 124+20 → 126+10 RT | 92.3 CY | Approved Source & Tickets | √ |
| | | EMBANKMENT | 128+70 → 129+50 RT | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Note: Final payment for PGE must be based on before and after measurements and calculations.

F - 25

This is: √ an estimated progress measurement (item no.: 20700220 )

☐ a final field measurement (item no.: _____ )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

20700220

PGE DELIVERED – FROM TICKETS: 153.8 TONS

CONVERSION FACTOR: 1.5 TON/CY (FROM MISTIC PAY ITEM/ MATERIAL CONV. FACTOR REPORT)

PAY 90% FOR ESTIMATED

(153.8 T/1.5 $^{T}/_{CY}$) X 0.90 = 92.3 CY

Illinois Department of Transportation

**Inspector's Daily Report**

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date 7-26-16

Contractor or Sub. No Joke Supply Co.

Weather Hot, Humid, Hazy

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | JCS | 7/26/16 |
| Measured by: | | |
| Calculated by: | JCS | 7/26/16 |
| Checked by: | RLS | 7/28/16 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 50800105 | | Rebar | Sta. 15 + 53 | ~~5886 lb~~ RLS 5851 lb | List + Cert + Mark | √ |
| | | | | | | |
| | | | | | | |
| 50300225 | | Concrete Structures | Sta. 15 + 53 | 38.7 CY | Daily Plant Reports & Tickets & Test | √ |
| | | | | | | |
| | | | | | | |

F - 26

This is: √ an estimated progress measurement (item no.: 50800105, 50300225 )

☐ a final field measurement (item no.: _____ )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

Conc. Struct. – 43 CY delivered x 90% = 38.7 CY √

Rebar Factor – $\frac{60{,}770 \text{ lb}}{402 \text{ CY}}$ = 151.2 lb/CY √

38.7 CY x 151.2 lb/CY = ~~5886 lb~~ RLS 5851 lb

**Note: 60,770 lbs of rebar and 402 CY of concrete are the plan quantities for this structure taken from the Bill of Materials shown on the plans.**

Illinois Department of Transportation

**Inspector's Daily Report**

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date 9-27-16

Contractor or Sub. SUPERIOR

Weather HOT-HUMID 90's

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | GEB | 9-27-16 |
| Measured by: | | |
| Calculated by: | GEB | 9-27-16 |
| Checked by: | RLS | 9-27-16 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 55019500 | | SS 1 RCP CL 4 12 | STA 9+00 TO 9+50 | 45.0 ft. | List & Mark; (Conc. Structures Inc.) | √ |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

F - 27

This is: √ an estimated progress measurement (item no.: 55019500 )

☐ a final field measurement (item no.: _____ )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

7.5 ft per section x 6 sections= 45.0 ft

70100460 TRAF CONT & PROT 701306



| DATE | | | PAY THIS DATE | TOTAL TO DATE |
|---|---|---|---|---|
| 9/20/16 | INITIAL SETUP | | 0.25 | 0.25 |
| 10/7/16 | 18 DAYS / 100 DAYS | x 0.65 = | 0.12 | 0.37 |
| 11/4/16 | 28 DAYS / 100 DAYS | x 0.65 = | 0.18 | 0.55 |
| 12/2/16 | 28 DAYS / 100 DAYS | x 0.65 = | 0.18 | 0.73 |
| 12/15/16 | ALL TC REMOVED PAY BALANCE | | 0.27 | 1.00 |

**NOTE:** The final entry shown includes both the remainder of the prorated 65% (0.65 - 0.12 - 0.18 - 0.18 = 0.17) and the final 10% for the removal of the traffic control.

| CALC'D BY | DATE | CHCK'D BY | DATE | D.O. # |
|---|---|---|---|---|
| MRM | 9/20/16 | JGL | 9/20/16 | 2 |
| " | 10/7/16 | " | 10/7/16 | 29 |
| " | 11/4/16 | FCM | 11/3/16 | 104 |
| " | 12/2/16 | JGL | 12/2/16 | 223 |
| " | 12/15/16 | FCM | 12/15/16 | 247 |

ALL SIGNS & BARRICADES CONFORM TO SPECS

Illinois Department of Transportation

**Inspector's Daily Report**

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date July 18, 2016

Contractor or Sub. ACME Const. Co.

Weather Sunny Low 70's

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | JMS | 7-18-16 |
| Measured by: | JMS & TER | 7-18-16 |
| Calculated by: | TER | 7-18-16 |
| Checked by: | MBA | 7-19-16 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 21101505 | | Top Soil Exc. & Place | Sta. 2+50 To 7+00 | 1449.1 C.Y. | None, topsoil taken from Within R.O.W. | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

This is: ☒ an estimated progress measurement (item no.: 21101505 )

☐ a final field measurement (item no.: _____ )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

End Areas

1.) 80' × 1.5' = 120 S.F.

2.) 85' × 2.0' = 170 S.F.

3.) 125' × 2.0' = 250 S.F.

Volumes

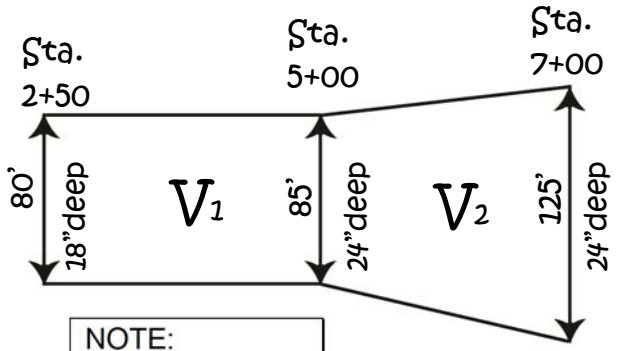
$V_1 = \frac{120+170}{2} \times 250' = 36{,}250$ C.F.

$V_2 = \frac{170+250}{2} \times 200' = 42{,}000$ C.F.

36,250 C.F.
+42,000 C.F.
78,250 C.F. ÷ 27 = 2898.1 C.Y.

2898.1 C.Y. × 0.50 = 1449.1 C.Y.

Will pay remaining 50% upon placement of topsoil later.




NOTE:
Stockpiled @
STA. 2+00 80'L
STA. 6+00 80'R

BC 628 (Rev. 8/04)

F - 29

| Pay Code | Pay Item | Plan QTY | Units |
|---|---|---|---|
| 44200970 | CLASS B PATCHES, TYPE II, 10 INCH | 260.0 | sy |
| 44213200 | SAW CUTS | 1470.0 | ft |

Thickness 10 inches

| | |
|---|---|
| County: | WILLIAMSON |
| Section: | (X1-4)81 Lake Creek |
| Route: | FAI RTE 57 |
| District: | 9 |
| Contract: | 98634 |
| Job No: | C-99-088-06 |
| Project: | |

Notes:

(1) I57: RL - Ramp Lane, PL - Passing Lane, DL - Driving Lane, SB - South bound , NB - North Bound

(2) Average Depth: Pav't is the meas. depth of the exist. pav't, qty used for calculating % change. Patch is the meas. depth of the actual patch if contractor undercuts existing pav't without cause.

(3) The product of the smallest width & length of original or final measurements.

**(See Patching field book for this contract for all original measurements.)**

| | | Original Measurements | | | | | | | Final Measurements | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Lane | Sta | Patch | Width | Length | Marked Quantities (sy) | | | | (2) Average Depth (inches) | | % Change in Thickness | Width | Length | (3) Min. Area | Quan. Adj. | Final Area | Pay Quantities (sy) | | | | Saw Cuts | Dowel Bars | Final Meas. | |
| | | # | (ft) | (ft) | TY I | TY II | TY III | TY IV | Pav't | Patch | % | (ft) | (ft) | (sy) | (%) | (sy) | TYI | TYII | TYIII | TYIV | (ft) | (ea) | By | Date |
| | | Northbound Lanes | | | | | | | | | | | | | | | | | | | | | | |
| NBDL | 193+35 | 17 | 9.0 | 12.0 | | 12.0 | | | 15.00 | 15.00 | 50.0 | 9.1 | 12.0 | 12.0 | 0.20 | 14.4 | | 14.4 | | | 54 | 20 | BWC | 7/12/07 |
| NBPL | 192+33 | 18 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 189+80 | 19 | 8.0 | 12.0 | | 10.7 | | | 16.00 | 16.00 | 60.0 | 8.2 | 12.0 | 10.7 | 0.20 | 12.8 | | 12.8 | | | 52 | 20 | BWC | 7/12/07 |
| NBDL | 188+80 | 20 | 7.0 | 12.0 | | 9.3 | | | 16.00 | 16.00 | 60.0 | 7.0 | 12.0 | 9.3 | 0.20 | 11.2 | | 11.2 | | | 50 | 20 | BWC | 7/12/07 |
| NBDL | 187+80 | 21 | 6.0 | 12.0 | | 8.0 | | | 16.00 | 16.00 | 60.0 | 6.0 | 12.0 | 8.0 | 0.20 | 9.6 | | 9.6 | | | 48 | 20 | BWC | 7/12/07 |
| NBPL | 187+80 | 22 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 187+15 | 23 | 6.0 | 12.0 | | 8.0 | | | 16.00 | 16.00 | 60.0 | 6.1 | 12.0 | 8.0 | 0.20 | 9.6 | | 9.6 | | | 48 | 20 | DHR | 7/12/07 |
| NBPL | 187+15 | 24 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 185+75 | 25 | 6.0 | 12.0 | | 8.0 | | | 16.00 | 16.00 | 60.0 | 6.1 | 12.0 | 8.0 | 0.20 | 9.6 | | 9.6 | | | 48 | 20 | DHR | 7/12/07 |
| NBPL | 185+75 | 26 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 185+38 | 27 | 6.0 | 12.0 | | 8.0 | | | 16.00 | 16.00 | 60.0 | 6.1 | 12.0 | 8.0 | 0.20 | 9.6 | | 9.6 | | | 48 | 20 | DHR | 7/12/07 |
| NBPL | 185+38 | 28 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 182+80 | 29 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBPL | 182+80 | 30 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 181+80 | 31 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBPL | 181+80 | 32 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 181+28 | 33 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 177+15 | 34 | 9.0 | 12.0 | | 12.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 176+21 | 35 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 175+15 | 36 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBPL | 175+15 | 37 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 174+20 | 38 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBPL | 174+20 | 39 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 173+58 | 40 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBPL | 173+58 | 41 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 172+85 | 42 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 172+25 | 43 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 171+25 | 44 | 9.0 | 12.0 | | 12.0 | | | | | | | | | | | | | | | | | | |
| NBPL | 171+25 | 45 | 9.0 | 12.0 | | 12.0 | | | | | | | | | | | | | | | | | | |
| NBDL | 170+20 | 46 | 9.0 | 12.0 | | 12.0 | | | | | | | | | | | | | | | | | | |
| NBPL | 170+20 | 47 | 6.0 | 12.0 | | 8.0 | | | | | | | | | | | | | | | | | | |
| **Totals** | | | | | 0 | 272 | 0 | 0 | | | | | | 64.00 | | 76.80 | 0 | 77 | 0 | 0 | 348 | 140 | | |
| | | | | | 272 | | | | | | | | | | | | 77 | | | | | | | |

**FOR EXAMPLE ONLY!**

The Department does not provide, nor approve, any electronic spreadsheets. It is the responsibility of the Resident to ensure the accuracy of any spreadsheet he/she chooses to use, including any formulas that may be embedded in the spreadsheet. NEVER use any spreadsheet that you have not checked for accuracy.

# Contract 62764 – Hicks Rd

## 50800105 Reinforcement Bars

| Bar | Bar Size | No. of Bars In Place | | Length (ft-in) | Length (ft) | lb/ft * | lb | Subtotals (lb) |
|---|---|---|---|---|---|---|---|---|
| a | 9 | 64 | √ | 16 ft 3 in | 16.25 | 3.400 | 55.25 | 3536.00 lb |
| a1 | 9 | 64 | √ | 6 ft 6 in | 6.5 | 3.400 | 22.10 | 1414.40 lb |
| a2 | 9 | 32 | √ | 12 ft 9 in | 12.75 | 3.400 | 43.35 | 1387.20 lb |
| h | 7 | 70 | √ | 6 ft 8 in | 6.67 | 2.044 | 13.63 | 954.34 lb |
| h1 | 7 | 28 | √ | 6 ft 8 in | 6.67 | 2.044 | 13.63 | 381.74 lb |
| h2 | 6 | 36 | √ | 5 ft 9 in | 5.75 | 1.502 | 8.64 | 310.91 lb |
| h3 | 6 | 10 | √ | 8 ft 9 in | 8.75 | 1.502 | 13.14 | 131.43 lb |
| h4 | 5 | 204 | √ | 3 ft 6 in | 3.5 | 1.043 | 3.65 | 744.70 lb |
| v | 7 | 21 | √ | 10 ft 0 in | 10 | 2.044 | 20.44 | 429.24 lb |
| v1 | 7 | 12 | √ | 8 ft 6 in | 8.5 | 2.044 | 17.37 | 208.49 lb |
| x | 6 | 4 | √ | 3 ft 9 in | 3.75 | 1.502 | 5.63 | 22.53 lb |

** per table (Art 508.07)*

**Total = 9520.98 lb**

Total Weight of Rebar = 9520.98 lb

Theoretical Volume of Concrete = 31.0 cy
(See Calc file 54003000 Concrete Box Culvert)

Rebar/Concrete factor 9520.98lb / 31.0 cy = 307.1 lb/cy

***Example Calculation***

*for a bar*
*Length x lb/ft = lb* *16.25 ft x 3.4 lb = 55.25 lb*

*no. of bars x lb = subtotals (lb)* *64 x 55.25 lb = 3536.00 lb*

**FOR EXAMPLE ONLY!**

**The Department does not provide, nor approve, any electronic spreadsheets. It is the responsibility of the Resident to ensure the accuracy of any spreadsheet he/she chooses to use, including any formulas that may be embedded in the spreadsheet. NEVER use any spreadsheet that you have not checked for accuracy.**

| | Initials | Date |
|---|---|---|
| Prepared by: | BCA | 10/10/16 |
| Checked by: | MRL | 10/10/2016 |

Illinois Department of Transportation

Print Form | Reset Form

# Material Allowance Affidavit

| Contract Number | District | Letting Date |
|---|---|---|
| 94270 | 7 | 07/10/23 |

| Route | County |
|---|---|
| FAI 57 | Jefferson |

| Project Number | Job Number |
|---|---|
| | |

Section Number:

Itemized Material Statement

| | Item of Material | Quantity | Unit Cost | Amount |
|---|---|---|---|---|
| 1. | Mast Arms | 8 | $2,640.00 | $21,120.00 |

| | |
|---|---|
| Subtotal | $21,120.00 |
| Freight on Material | $702.47 |
| Total | $21,822.47 |
| Allowed on Est. No. | |
| Proof of Payment Rec'd | |

I hereby certify that the above material has been received and properly stored.

Resident's Signature | Date

**AFFIDAVIT**

John Smith being first duly sworn, deposes and says that he is the duly authorized representative of the Quality Contracting, Inc. Company and as such has authority to make the following statement:

I hereby, certify that the material herein mentioned has been received and stored in a manner satisfactory to a representative of the Department of Transportation. Further, that said material is to be used for the purposes of constructing the Contract captioned above.

I further certify that the within statement is true and correct and that the purpose of this affidavit is to obtain payment for material in storage.

Contractor Signature | Date | By: John Smith

**Notary Public**

State of Illinois

County Jefferson

Signed (or subscribed or attested) before me on Monday, July 10, 2023 (date) by John Smith (name/s of person/s).

"OFFICIAL SEAL"
MARY JONES
Notary Public, State of Illinois My Commission Expires 07/10/23
(SEAL)

Signature of Notary Public

My commission expires 07/10/23

Illinois Department of Transportation

# Statement of Material Allowances

E-mail | Reset Form

Submit with Resident's Pay Estimate Report

Estimate No. 05

| Contract Number | District | Letting Date |
|---|---|---|
| 94270 | 7 | 07/10/23 |

| Route | County |
|---|---|
| FAI 57 | Jefferson |

| Project Number | Job Number |
|---|---|
| | |

Section Number:

| | | | | Quantity | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 Description of Material(Followed by Pay Items it will be used in.) | 2 Unit | 3 Receipted Bill Due | 4 Receipted Bill Received | 5 Total from Form(s) BC-49 | 6 Paid for in place to date | 7(5-6) Remaining in storage | 8 Contractor's cost/unit | 9(7x8) Value |
| Mast Arms - 87702980 S MAA&P50 | Each | 11/15/16 | | 8 | 0 | 8 | $2,727.81 | $21,822.48 |
| | | | | | | | | |
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Add

Note: 1. Quantity must not exceed the adjusted plan quantity.
2. Once the material is paid on an estimate if may not be used on another project unless it is first completely removed from payment on the previous contract. This may not be possible if there is not sufficient funds in that contract to deduct the material allowance. Guardrail and Aggregate items are particularly vulnerable to being removed to another project without your knowledge and possibly being paid for twice.

Hint: When the contractor invoice consists of several components that make up a pay item such as guardrail, divide the total amount of the invoice by the unit of measurement of the pay item and calculate a unit price.

*Use 70 days from the date you mail the estimate. This allows 10 days for the contractor to receive his or her payment plus 60 days to pay the material supplier.

Total value of material on hand $21,822.48

Original - Bureau of Construction
cc: District File
Resident

☐ By checking this box and typing my name below, I verify this document has been approved by the resident named below.

| Resident Name | Date |
|---|---|
| Sam Cooke | 07/10/23 |

Illinois Department of Transportation

**Quantity Sheet**

County 177 Stephenson

Section 20RS-1 & 20BR

Route FAP 5

District 02
Contract No. 84776
Job No. C-92-072-12

Project STPF-BRF-0005/050/000

Page 235
Item 40603310
HMA SC "C" N50
Fund 33DC01
Plan Quantity 3397.000
Unit Measure TON
Contract Unit Price 77.08

**Authorizations**

| Number | Date App'vd | Add | Deduct | Total |
|---|---|---|---|---|
| 8 | 10/13/16 | 25.0 | | 3,422.0 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Cnty Const Sfty | Quantity |
|---|---|
| 177 I000 2A | 3397.000 |

| Date | Station to Station Location or Description | Quantities Placed | | | Evidence of Material Inspection | Progress Document Source |
|---|---|---|---|---|---|---|
| | | This Date | To Date | Pay Est | | |
| | Per Art. 406.13, the Adjusted Plan Quantity is as follows → | | | | | |
| | Avg. Bulk Specific Gravity from the approved mix design (little d) = 2.34 | | | | | |
| | $\frac{2.34 \times 46.8}{112}$ $\frac{G_{mb} \times 46.8}{U}$ C= = = 0.978 | | | | | |
| | Adj Plan Qty = 0.978(3,397) = 3,322.3 tons | | | | | |
| | | | | | | |
| 9/5/16 | STA 62+03 → 118+27 NB | 865.8 | 865.8 | | Daily Plant Rpt. & Tickets & Test | Tickets |
| 9/6/16 | STA 118+27 → 175+79 NB | 885.5 | 1,751.3 | | " " | |
| 9/7/16 | STA 175+19 → 119+27 SB | 861.0 | 2,612.3 | | " " | |
| 9/8/16 | STA 119+29 → 62+03 SB | 872.7 | 3,485.0 | #5/3397 | " " | |
| 9/12/16 | Deduct for Max Pay | -63.0 | 3,422.0 | #6 | | |
| | | | FINAL | | | |
| | | | | | | |
| | Max. Pay = 3,322.3 tons x 1.03 = 3,422.0 tons → Deduct Pay Qty | | | | | |
| | Quan. Placed 3,485.0 – Max. Pay 3,422.0 = Deduct 63.0 | | | | | |
| | The surface was checked and no variations found. See FB #3, p. 35. | | | | | |
| | | | | | | |

Source of documentation
for final quantity: Tickets

IL 494-0424

BC 625 (Rev. 4/98)

For all tonnage items
weighed on platform scales:
Scales checked by
Dept. Of Agriculture
Date on decal 2016
Identification No. 074346
Scale Location General
Plant 1, Rock Falls

**Inspection Reports**

| Date | Mistic Report No. or Source or Manufacturer | Amount | Total to Date | Transferred to Other Code or Remarks |
|---|---|---|---|---|
| 9/5/16 | MI-305, Daily Bit Plant | 865.8 | 865.8 | |
| 9/6/16 | Output | 887.5 | 1,753.3 | |
| 9/7/16 | | 861.0 | 2,614.3 | |
| 9/8/16 | | 875.5 | 3,489.8 | |
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Illinois Department of Transportation

**Inspector's Daily Report**

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date 9-22-16

Contractor or Sub. B & M Constr.

Weather Sun, 80°

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | JS | 9-22-16 |
| Measured by: | JS & DF | 9-22-16 |
| Calculated by: | JS | 9-22-16 |
| Checked by: | DF | 9-28-16 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 42400100 | 07A001 | PC Conc. Sidewalk 4 | RT 0+00- | 2,500.0 | Plant Report & Tickets & Test | √ |
| | | | RT 5+00 | SF | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

F - 36

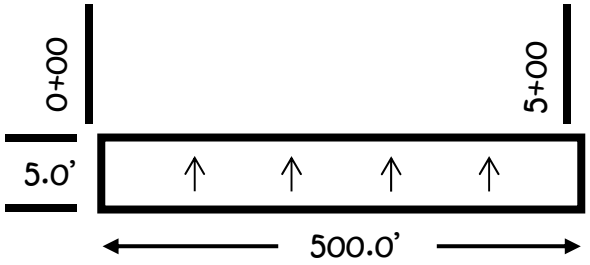
This is: ☐ an estimated progress measurement (item no.: _____ )

√ a final field measurement (item no.: 42400100 )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

## Depth Checks

STA 0+00 = 4.05"
1+00 = 4.10"
2+00 = 4.10"
3+00 = 4.05"
4+00 = 4.00"
5+00 = 5.00"




5.0' × 500.0' = 2,500.0 SF

## Cross-Slope Checks↑

STA 0+00 = 1.9%
1+00 = 2.0%
2+00 = 1.9%
3+00 = 1.9%
4+00 = 1.9%
5+00 = 2.0%

Illinois Department of Transportation

# Truck Tare Weights

Print Form | Reset Form

Date: 07/10/23

Contract Number: 90210 | District: 5 | Letting Date: 07/10/23

Contractor: Trusty Hauling

Route: FAI 57 | County: Champaign

Scale Location: Gravel Group - Rantoul

Project Number: | Job Number:

Material: CA-6

Section Number:

| | Truck or License Number | Name on Truck | Tare Weight | Driver in Truck? |
|---|---|---|---|---|
| 1. | 19 | Peters | 20,000.0000 | ☒ Yes ☐ No |
| 2. | 44 | Peters | 20,500.0000 | ☒ Yes ☐ No |
| 3. | 21 | Peters | 20,800.0000 | ☒ Yes ☐ No |
| 4. | 22 | Peters | 21,000.0000 | ☒ Yes ☐ No |
| 5. | 43 | Peters | 20,000.0000 | ☒ Yes ☐ No |
| 6. | 40 | Peters | | ☐ Yes ☐ No |
| 7. | | | | ☐ Yes ☐ No |
| 8. | | | | ☐ Yes ☐ No |
| 9. | | | | ☐ Yes ☐ No |
| 10. | | | | ☐ Yes ☐ No |
| 11. | | | | ☐ Yes ☐ No |
| 12. | | | | ☐ Yes ☐ No |
| 13. | | | | ☐ Yes ☐ No |
| 14. | | | | ☐ Yes ☐ No |
| 15. | | | | ☐ Yes ☐ No |
| 16. | | | | ☐ Yes ☐ No |
| 17. | | | | ☐ Yes ☐ No |
| 18. | | | | ☐ Yes ☐ No |
| 19. | | | | ☐ Yes ☐ No |
| 20. | | | | ☐ Yes ☐ No |

Add

Note: Tare weights of trucks hauling material to Department of Transportation projects must be established daily when pay quantities are determined by platform scale weights.

Department of Agriculture scale certification information:

Date: 07/10/23 | Inspector: Paul Kliner

Certificate No.: 35044

Resident: Earl T. Jones

Illinois Department of Transportation

# Independent Weight Check

E-mail | Reset Form

Instructions: At random, select a loaded truck and obtain a loaded weight on an independent scale. Allow the truck to unload. Then obtain an empty weight. For additional information see BIC Independent Weight Check Manual.
**ALL FIELDS MUST BE COMPLETED AND ALL WEIGHT TICKETS SUBMITTED WITH FORM.**

☐ Aggregate ☐ Salt ☒ HMA

**Ticket Information**

District: 5 | Maintenance Yard: N/A

Supplier Code/Name/City: 3916-03, CROSS CONST. CO., RANTOUL

Loaded Weight (Gross)*: 73,260 | Local Ticket Number: 047488

Empty Weight (Tare)*: 28,180 | Local Ticket Weight (Net): 45,080

Additional Comments: Scale Decal No. 006151, Decal Year 2016. Contract 90939

**Independent Scale Information**

| | | | |
|---|---|---|---|
| Loaded Weight (Gross) | 73,260 | Company Name | Bunge(Dump 2)Danville |
| Empty Weight (Tare) | 28,080 | City | Danville |
| Calculated Net Weight | 45,180 | Trucking Co | Gilbert |
| | | Truck ID | 456 |

I attest that the independent scale weights reported are true and accurate.

Signature & Date

**Note: The attest signature is only to be used when an independent scale ticket and photograph of scale readout is not available. If attest is signed, attach a photograph of the truck located on the independent scale.**

**Weight Tolerance %**: -0.22%

**Weight Tolerance lbs**: -100

(Ticket Weight - Ind. Wt. Ck. Net Weight) / Ind. Wt. Ck. Net Wt. x 100

| Tolerance: | Aggregate | HMA | Salt |
|---|---|---|---|
| | +/- 0.7% | +/- 0.5% | +/- 600 lbs |

Weight Check Performed By: Matt A. Young

Weight Check Performed on Date: 09/27/16

Use the "Attach Files" button below, attach scale tickets and supporting documentation.

Attach Files

☒ An Independent Weight Check was performed today and passed.
- Within seven (7) calendar days, email the completed IWC Form, BIC 7000, to DOT.ITWC@illinois.gov.

☐ An Independent Weight Check was performed today and failed.
- Within 24 hours, email this completed IWC Form with the subject line "IWC OOT".
- Within seven (7) calendar days, email completed OOT Action Report, BIC 7001, to DOT.ITWC@illinois.gov.

Use the "Save As" button below, name the completed IWC form with the supplier code and date the IWC was performed (ex. 12345-03_040125.pdf) for Aggregate and HMA. For Salt, name the completed IWC form with the maintenance yard and date the IWC was performed (ex. Stevenson_122325.pdf).

Save As

**Upon completion click the "E-mail" button above.**
**Please cc: Appropriate District Staff / Contractor.** If you have any questions or need any assistance, please contact your Construction Quality Engineer. Thank you in advance for your cooperation.

BIC 7000 (Rev. 08/24/26)

Illinois Department of Transportation

# Out of Tolerance Action Report

E-mail | Reset Form

**An Out of Tolerance (OOT) Action Report, BIC 7001, must be completed and submitted within seven (7) calendar days of the failed Independent Weight Check.**

☐ Aggregate ☐ Salt ☒ HMA

| Supplier Code/Name/City | Date of OOT | Phone |
|---|---|---|
| 3916-03, CROSS CONST. CO., RANTOUL | 09/27/16 | (217) 555-1212 |

Report Action Taken to Correct Scale

Completed a second Tare weight, truck was not stationary during initial weighing.

| Action Taken By | Date |
|---|---|
| Joe Dirt, scale operator | 09/27/16 |

If the truck is out of tolerance (OOT) for **Hot Mix Asphalt** or **Aggregate**, the Contractor may request an additional truck to be taken to another independent scale to verify the weights. If the Contractor requests a check on independent scale, please fill out the information below.

**2nd Weight Ticket Information**

District 5 | Maintenance Yard N/A

Supplier Code/Name/City: 3916-03, CROSS CONST. CO., RANTOUL

Loaded Weight (Gross)*: 73,260 | Supplier 2nd Ticket Number: 047489

Empty Weight (Tare)*: 28,080

Local Ticket Weight (Net): 45,180

**2nd Independent Scale Information**

Loaded Weight (Gross): 73,260 | Company Name: Bunge(Dump 2)Danville

Empty Weight (Tare): 28,120 | City: Danville

Calculated Net Weight: 45,140 | Trucking Co: Gilbert

Truck ID: 456

**2nd Weight Tolerance %**: 0.09%

**2nd Weight Tolerance lbs**: 40

(Ticket Weight - Ind. Wt. Ck. Net Weight) / Ind. Wt. Ck. Net Wt. x 100

| | Aggregate | HMA | Salt |
|---|---|---|---|
| Tolerance: | 0.7% | 0.5% | 600 lbs |

| 2nd Weight Check Performed By | 2nd Weight Check Performed on Date |
|---|---|
| Matt A. Young | 09/27/16 |

Use the "Attach Files" button below, attach BIC 7000, scale tickets and supporting documentation.

Attach Files

Use the "Save As" button below, name the completed form with the supplier code and date the out of tolerance action report was performed (ex. 12345-03_040125_OOT.pdf).

Save As

**Upon completion click the "Email" button above.**

Please cc: Appropriate District Staff / Contractor. If you have any questions or need any assistance, please contact your BIC Construction Quality Engineer. Thank you in advance for your cooperation.

THIS PAGE INTENTIONALLY LEFT BLANK

**Ticket Tape Example, Aggregate Base Course, Type A (English)**

8-8-16
35100100
AGG BASE CSE A
STA 1+20 0. C
to 19+00

| | |
|---|---|
| 24,300. | + |
| 23,700. | + |
| 22,300. | + |
| 24,700. | + |
| 23,500. | + |
| 22,900. | + |
| 25,500. | + |
| 23,700. | + |
| 23,800. | + |
| 22,800. | + |
| 24,000. | + |
| 23,100. | + |
| 23,600. | + |
| 24,100. | + |
| 23,800. | + |
| 24,300. | + |
| 23,400. | + |
| 24,300. | + |
| 22,800. | + |
| 25,600. | + |
| 23,200. | + |
| 24,000. | + |
| 23,900. | + |
| 547,300 | * |
| LBS | |
| 547,300. | ÷ |
| 2,000 | = |
| 273.65 | * |
| tons | |

Contract 90002

Calc by: JWS 8-8-16
Check by: RH 8-9-16

Actual Moisture = $\frac{220.9 - 206.1}{206.1}$ = 0.072

Pay Wt. = $\frac{273.65 \times 1.06}{1.072}$ = 270.6 TONS

NOTE: Refer to Small Quantities provision in Section A of doc guide. No moisture correction required if less than 500 tons per day, however IDOT reserves right to perform moisture correction on any amounts delivered.

This is an example of the documentation requirement for granular pay items paid on a tonnage basis.

This adding machine tape is to be securely bound around the truck tickets for each pay item for each day.

Illinois Department of Transportation

# Inspector's Daily Report

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date 7-20-16

Contractor or Sub. ACME Construction

Weather Cloudy, 82°

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | KWH | 7-20-16 |
| Measured by: | | |
| Calculated by: | KWH | 7-20-16 |
| Checked by: | SJM | 7-22-16 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 25000700 | | Agricultural Ground Limestone | Entire Job (20 acres) | 83.5 tons | Tickets from approved aggregate source | √ |
| | | | | | List – Charleston Stone Co. @ | |
| | | | | | Charleston, IL (Coles County) | |
| | | | | | West Pit, see wt. tickets in | |
| | | | | | File #6 (list & tick) | |
| | | | | | | |

This is: ☐ an estimated progress measurement (item no.: _____ )

√ a final field measurement (item no.: 25000700 )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

Plans require 4 Tons/acre to be applied to 20 acres
From "Agricultural Limestone Booklet" at http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Specialty-Lists/Highways/Materials/Materials-&-Physical-Research/Aggregate/2016LimestoneBook.pdf ,
The 4 year conversion factor = 0.85
Total tons required = 4 T/acre x 20 acres x 0.85 = 68.0 Tons
Actual tons delivered = 71.0 Tons (see Tickets)
Pay Qty. = 71.0 tons ÷ 0.85 = 83.5 tons (Max Pay 80 tons x 1.08 = 86.4 Tons)

Illinois Department of Transportation

**Inspector's Daily Report**

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date 9-13-16

Contractor or Sub. Interstate Landscaping

Weather Sunny, 81°

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | KWH, SM | 9-13-16 |
| Measured by: | KWH, Sm | 9-13-16 |
| Calculated by: | KWH | 9-13-16 |
| Checked by: | SM | 9-19-16 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 25000200 | | Seeding, Class 2 | STA. 1 +00 TO | 4.5 ACRE | Certificate of Seed Analysis From | |
| | | | 19 + 00 LT. | | Registered Seed Technologist | |
| 25100105 | | Mulch Method 1 | " " | 4.5 ACRE | Straw – Visual | |
| Application Rates → | Seed | 675 lb. Delivered → | Rate =900LB/4.5AC=200 | LB/ACRE √ | | |
| | Straw | 9.0 Tons Delivered → | Rate = 9.0T/4.5 AC = 2 | Ton/Acre √ | | |
| | | | | | | |

This is: ☐ an estimated progress measurement (item no.: _____ )

√ a final field measurement (item no.: 25000200, 25100105 )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

$\frac{1}{2}$ (109.6 + 112.4) × 646.7 = 71,783.7 s.f.

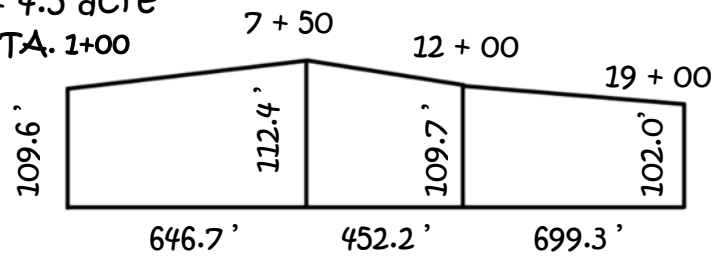
$\frac{1}{2}$ (112.4 + 109.7) × 452.2 = 50,216.8

$\frac{1}{2}$ (109.7 + 102.0) × 699.3 = 74,020.9

196,021.4 s.f.

$196{,}021.4 \text{ s.f.} \times \frac{1 \text{ acre}}{43{,}560 \text{ sf}} = 4.5 \text{ acre}$

NOTE: All Measurements Taken on Slope!




F - 43

BC 628 (Rev. 8/04)

Illinois Department of Transportation

# Traffic Control Surveillance Report

Print Form | Reset Form

| Contractor | Contract Number | Date |
|---|---|---|
| General Contractor, Inc. | 99999 | 09/14/16 |

| Time of Inspection | Signature | Weather | Comments and/or Corrective Action |
|---|---|---|---|
| Midnight | | | |
| 1 A.M. | | | |
| 2 A.M. | Mike Jones | Light Rain, 50F | All Traffic Control good |
| 3 A.M. | | | |
| 4 A.M. | | | |
| 5 A.M. | | | |
| 6 A.M. | Mike Jones | Light Fog, Calm, 50F | All Traffic Control good |
| 7 A.M. | | | |
| 8 A.M. | | | |
| 9 A.M. | | | |
| 10 A.M. | | | CONTRACTOR WORKED 8:00 am – 4:30 PM |
| 11 A.M. | | | PAY: 15.5/24 = 0.65 CAL DAY |
| Noon | | | CALC'D BY: REJ 9-15-16 CK'D BY: JAM 9-15-16 |
| 1 P.M. | | | |
| 2 P.M. | | | |
| 3 P.M. | | | |
| 4 P.M. | | | |
| 5 P.M. | | | |
| 6 P.M. | Jack Hammer | Partly cloudy, 62F | Traffic control ok |
| 7 P.M. | | | |
| 8 P.M. | | | |
| 9 P.M. | | | |
| 10 P.M. | Jack Hammer | Clear and calm, 46F | Moved barricade back in place, Traffic control ok |
| 11 P.M. | | | |

Distribution: Contractor
Resident

Completed forms must be turned in to the Resident the next working day.



Printed 07/11/23

BC 2240 (Rev. 08/20/20)

Illinois Department of Transportation

# Inspector's Daily Report

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date September 6, 2016

Contractor or Sub. Artful Const.

Weather Partly Cloudy, 76°

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | WNP | 9/6/16 |
| Measured by: | WNP & CJ | 9/6/16 |
| Calculated by: | WNP | 9/6/16 |
| Checked by: | JS | 9/12/16 |

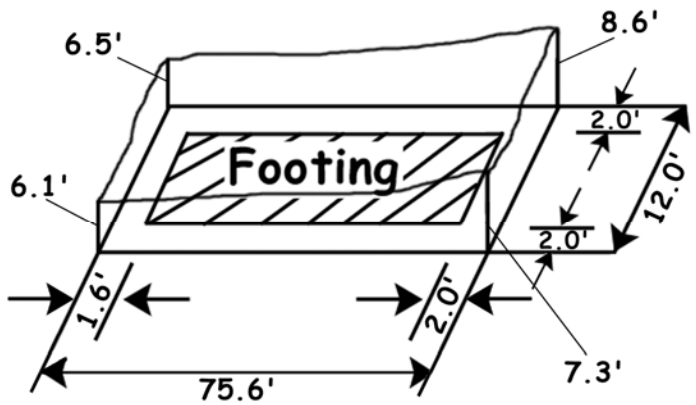
| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 50200100 | | Structure Excav. | Pier #2 @ | 239.4 CY | | √ |
| | | | Sta. 47 + 23.61 | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

F - 45

This is: ☐ an estimated progress measurement (item no.: _____ )

√ a final field measurement (item no.: 50200100 )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.




$$\text{Vol} = \left(\frac{8.6' + 7.3' + 6.1' + 6.5'}{4}\right) \times 75.6' \times 12.0' \times 1/27 = 239.4 \text{ CY}$$

NOTE:
Max allowable pay width = 2.0 ft + ftg. Width + 2.0 ft.
Max allowable pay length = 2.0 ft. + ftg. Length + 2.0 ft.

See FB #3, p. 23 for layout

Illinois Department of Transportation

**Inspector's Daily Report**

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date 8-15-16

Contractor or Sub. Stan's Sewer Co.

Weather Clear, 70's

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | RCW | 8-15-16 |
| Measured by: | RCW & MF | 8-15-16 |
| Calculated by: | RCW | 8-15-16 |
| Checked by: | MF | 8-23-16 |

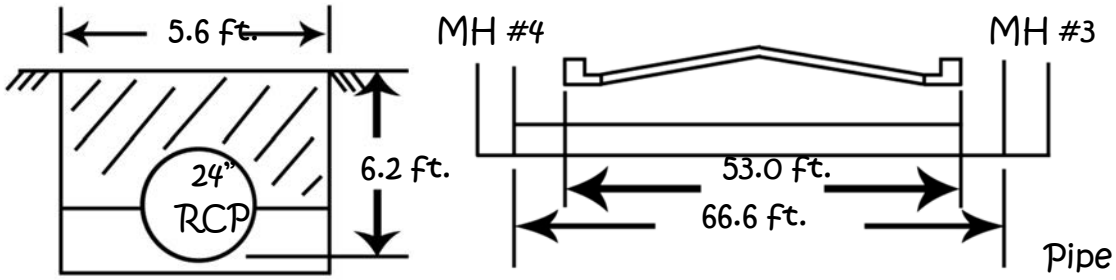
| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 20800150 | | Trench Backfill | MH #3 to MH#4 | 55.2 CY | Approved Srce. & Shipment Ticket | |
| | | | | | (Mid-America S&G) | |
| 55022000 | | SS 2 RCP CL 3 24 | MH# 3 to MH#4 | 66.6 FT | List and Mark (CMCM) | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

F - 46

This is: ☐ an estimated progress measurement (item no.: _____ )

√ a final field measurement (item no.: 20800150, 55022000 )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

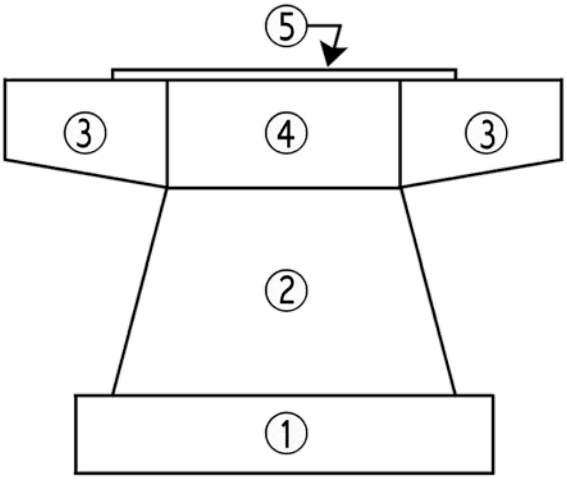



Trench Backfill:
Pay Length = 2' + 53' + 2' = 57.0'
Trench Width > Max Pay Width
Therefore Use Table

$$0.968 \frac{CY}{FT} \times 57.0' = 55.2\ CY$$

Pipe Markings: C-76-III
7-12-16 CMCM

CALC BY: jws 11-8-16
CHECK BY: MLC 11/8/16




50300225

CONCRETE STRUCTURES

1. 8.5' x 2.25' x 18.33' x 1/27 (no deduction for steel H-pile) = 12.98

2. $\frac{12.0 + 16.0}{2}$ x 16.25 ' x 2.5 ' x $\frac{1}{27}$ = 21.06

3. $2(\frac{2.5 + 5.5}{2}) \times 8.00' \times 2.5' \times \frac{1}{27}$ = 5.93

4. 12.00' x 5.50' x 2.50' x 1/27 = 6.11

5. 16.00' x 0.11' x 2.17' x 1/27 = 0.14

Total Conc. Pier 2 46.2 cu yd

50800105

REINFORCEMENT BARS

| Bar | Size | No. | Length Ea. | #5 | #6 | #9 | #11 |
|---|---|---|---|---|---|---|---|
| h9 | 5 | 4 | 27' – 9" | 111.0 | | | |
| h10 | 5 | 4 | 23' – 0" | 92.0 | | | |
| h11 | 5 | 36 | 11' – 9" | 423.0 | | | |
| n | 5 | 36 | 4' – 10" | 174.0 | | | |
| p1 | 11 | 10 | 27' – 9" | | | | 277.5' |
| p2 | 5 | 8 | 9' – 3" | 74.0 | | | |
| s1 | 5 | 56 | 6' – 8" | 373.3 | | | |
| s2 | 5 | 36 | 8' – 8" | 312.0 | | | |
| s3 | 5 | 18 | 9' – 8" | 174.0 | | | |
| t1 | 9 | 22 | 8' – 3" | | | 181.5' | |
| u1 | 6 | 6 | 10' – 3" | | 61.5' | | |
| v7 | 5 | 36 | 20' – 6" | 738.0 | | | |
| w1 | 5 | 8 | 18' – 0" | 144.0 | | | |
| | | Total Length Each Size | | 2615.3' | 61.5' | 181.5' | 277.5' |
| | | x lbs./ft. | | 1.043 | 1.502 | 3.400 | 5.313 |
| | | Total lbs. each size | | 2727.8 | 92.4 | 617.1 | 1474.4 |

Total lbs. rebar pier #2 = 4912 lbs.

SUMMARY OF FIELD COMPUTATIONS

50300225 CONC STRUCT
50300255 CONC SUP-STR
50800105 REINFORCEMENT BARS
50800205 REINF BARS, EPOXY CTD.

County
Section
Route
District
Contract No.
Job No.
Project No.

JOB STAMP

| LOCATION | CALCULATED BY | CHECKED BY | PLAN QTY. | CALC. QTY. | PAY QTY. |
|---|---|---|---|---|---|
| CONCRETE SUPERSTRUCTURES | | | | | |
| DECK | JCS 8-23-16 | BDL 9-1-16 | 257.4 CY | 259.8 CY | 259.8 CY |
| PARAPETS | JCS 8-23-16 | PLAN CHECKS | 23.0 | 23.2 | 23.2 |
| | | TOTAL | 280.4 CY | | 283.0 CY |

ADD ~~2.0~~ CY AUTH #2

2.6

CONCRETE STRUCTURES

| | | | | | |
|---|---|---|---|---|---|
| 2 ABUTMENTS | BDL 8-23-16 | PLAN CHECKS | 77.8 CY | 77.5 CY | 77.5 CY |
| PIERS 1 & 3 | BDL 8-23-16 | PLAN CHECKS | 136.4 | 136.4 | 136.4 |
| PIER 2 | BDL 8-24-16 | JCS 8-24-16 | 79.0 | 74.0 | 74.0 |
| | | TOTAL | 293.2 CY | | 287.9 CY |

DEDUCT 5.3 CY AUTH. #2

REINFORCEMENT BARS, EPOXY COATED

| | | | | | |
|---|---|---|---|---|---|
| DECK | BDL 8-24-16 | jcs 8-24-16 | 52,910 LB | 52,804 | 52,804 LB |
| PARAPETS | jcs 8-23-16 | PLAN CHECKS | 1,840 | 1,844 | 1,844 |
| | | TOTAL | 54,750 LB | | 54,648 LB |

DEDUCT 102 LBS AUTH. #2

REINFORCEMENT BARS

| | | | | | |
|---|---|---|---|---|---|
| 2 ABUTMENTS | JCS 8-30-16 | PLAN CHECKS | 5,760 LB | 5,756 LB | 5,756 LB |
| PIERS 1 & 3 | BDL 9-1-16 | PLAN CHECKS | 8,690 | 8,691 | 8,691 |
| PIER 2 | BDL 8-30-16 | PWR 8/30/16 | 6,030 | 5,912 | 5,912 |
| | | TOTAL | 20,480 LB | | 20,359 LB |

DEDUCT 121 LBS AUTH. #2

Illinois Department of Transportation

# Inspector's Daily Report

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date 10/13/17

Contractor or Sub. COLBERT CONCRETE

Weather PARTLY SUNNY, 62°

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | MRL | 10/13/17 |
| Measured by: | MRL + MN | 10/13/17 |
| Calculated by: | MRL | 10/13/17 |
| Checked by: | MN | 10/13/17 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 60600095 | | CL SI CONC (OUTLET) | NB STA 705+42 | 3.53 C.Y. ✓ | DAILY PLANT REPORT & TICKET & TEST | DQ #61 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

This is: ☐ an estimated progress measurement (item no.: _____ )

☒ a final field measurement (item no.: 60600095 )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

BUILT ACCORDING TO STANDARD 606006-03, "OUTLETS FOR CONCRETE CURB AND GUTTER TY B-6.24"

OUTLET LENGTH (MEASURED FROM END OF RADIUS) = 16.6' ✓

| | | |
|---|---|---|
| SECTION A-A TO E-E | | 2.38 C.Y.(FROM STANDARD) ✓ |
| SECTION F-F | 16.6' X 0.069 C.Y·PER FT | + 1.15 C.Y. ✓ |
| TOTAL | | 3.53 C.Y. ✓ |

## SURFACE VARIATIONS

6/24/16 PG. 39

CLEAR, 83°

ITEM XXX21600 SURF VAR HMA SC 2T

| LANE | WHEEL PATH | STATION |
|---|---|---|
| EB | L | 787+43 |
| | | 788+16 |
| | | +22 |
| | | +25 |
| | | 793+37 |
| | | 798+75 |
| | | 814+43 |
| EB | R | 788+16 |
| | | +22 |
| | | 790+48 |
| | | 793+37 |
| | | 798+72 |
| | | +75 |
| | | 814+43 |
| TOTAL = | | 14 EACH |

Measured By: MD 6/24/16
Calculated By: MD 6/24/16
Checked By: VC 6/24/16

**NOTE:** Per Article 406.11 of the Standard Specifications, the cost of one or two tons of surface mix shall be deducted from the contract for each surface variation measured in the wheel paths. This information would be shown in the explanation on the authorization:

| | | |
|---|---|---|
| Cost of 1 ton of Surface | = | $ 73.43 |
| Cost of 2 tons | = | $146.86 |
| 14 variations @ $146.86 | = | $2,056.04 total deduction |

On the authorization show a negative unit price (-146.86), and a positive quantity (14 Each) which will result in a “negative addition” to the authorization.

Illinois Department of Transportation

## Quantity Sheet

County 117

Section 59-1, 2(I-2); 68-1, 2(I-2)

Route FAI 55

District 06
Contract No. 72B21
Job No. C-96-023-12

Project

Page 16
Item 70100800
TRAF CONT PROT 701401
Fund 07E0A01
Plan Quantity 1.000
Unit Measure L SUM
Contract Unit Price 28000.00

**Authorizations**

| Number | Date App'vd | Add | Deduct | Total |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Cnty Const Sfty
117 I000 2A

Quantity
1.000

| Date | Station to Station Location or Description | Quantities Placed | | | Evidence of Material Inspection | Progress Document Source |
|---|---|---|---|---|---|---|
| | | This Date | To Date | Pay Est | | |
| | From Progress Schedule Total | | | | N/A | - - - - - |
| | Est. Months of Use = 9 | | | | | |
| | | | | | | |
| 3/22/16 | Initial Setup | 0.25 | 0.25 | | | |
| 4/1/16 | 0.5 MO/9 MO. X 65% | 0.04 | 0.29 | #1 | | |
| 4/22/16 | 1 MO/9MO x 65% | 0.07 | 0.36 | #2 | | |
| 5/27/16 | " | 0.07 | 0.43 | #3 | | |
| 6/24/16 | " | 0.07 | 0.50 | #4 | | |
| 7/22/16 | " | 0.07 | 0.57 | #5 | | |
| 8/26/16 | " | 0.07 | 0.64 | #6 | | |
| 9/23/16 | " | 0.07 | 0.71 | #7 | *Note: The Total Value Of Work Items Covered By This Traffic Control Item Increased By 10%. See Calc. On Opposite Page. | |
| 10/21/16 | " | 0.07 | 0.78 | #8 | | |
| 11/18/16 | TRAF CONT. REMOVED | 0.22 | 1.0 | #9 | | |
| | | | FINAL | | | |
| | | | | | | |
| | | | | | | |

Source of documentation for final quantity: - - - - - -



BC 625 (Rev. 4/98)

# XXX03100 T.C. PRICE ADJUSTMENT FOR STD. 701401



| DESCRIPTION | UNIT | UNIT PRICE |
|---|---|---|
| CLA PATCH T2 12 | SQ.YD. | $185.00 |
| CLA PATCH T3 12 | SQ.YD. | $160.00 |
| CLA PATCH T4 12 | SQ.YD. | $155.00 |
| CLA PATCH T2 14 | SQ.YD. | $200.00 |
| CLA PATCH T3 14 | SQ.YD. | $190.00 |
| PATCH REINF. | SQ.YD. | $60.00 |
| SAW CUTS | FT. | $1.00 |
| SUBGRADE REPAIR | DOLLAR | $1.00 |
| CLA PATCH T2 13 | SQ.YD. | $190.00 |
| TIE BARS | EACH | $15.00 |

| PLAN QTY | PLAN COST | FINAL QTY | FINAL COST |
|---|---|---|---|
| 155 | $28,675.00 | 169.6 | $31,376.00 |
| 48 | $7,680.00 | 59.5 | $9,520.00 |
| 31 | $4,805.00 | 30.2 | $4,681.00 |
| 159 | $31,800.00 | 193.1 | $38,620.00 |
| 16 | $3,040.00 | 0.0 | $0.00 |
| 420 | $25,200.00 | 459.1 | $27,546.00 |
| 3059 | $3,059.00 | 3241.4 | $3,241.40 |
| 0 | $0.00 | 852.05 | $852.05 |
| 11 | $2,09000 | 10.6 | $2,014.00 |
| 12 | $180.00 | 10.0 | $150.00 |
| TOTAL | $106,529.00 | | $118,000.45 |

(FINAL COST - PLAN COST) = (118,000.45 - 106,529.00)

PLAN COST 106,529.00

= 10.768% > 10%

THEREFORE - ADJUSTMENT NEEDED

P = 28,000 (BID UNIT PRICE FOR STD. 701401)

$X = \frac{(118,000.45 - 106,529.00)}{106,529}$

ADJ. UNIT PRICE = 0.25P + 0.75P[1 + (X - 0.1)]

= 28,161.36

ADJUSTMENT = $28,161.36 - $28,000 = $161.36

Measured By:

Calculated By: MD 6/24/16

Checked By: VMC 6/24/16

PAY XXX03100 = $161.36

Illinois Department of Transportation

## Quantity Sheet

County 117

Section 59-1, 2(I-2); 68-1, 2(I-2)

Route FAI 55

District 06
Contract No. 72B21
Job No. C-96-023-12

Project

Page 27
Item XXX03100
Traf Cont Price Adj
Fund 07E0A01
Plan Quantity 0
Unit Measure L SUM
Contract Unit Price 161.36

**Authorizations**

| Number | Date App'vd | Add | Deduct | Total |
|---|---|---|---|---|
| 16 | 12/19/16 | 1.0 | | 1.0 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Cnty Const Sfty
117 I000 2A

Quantity
0.000

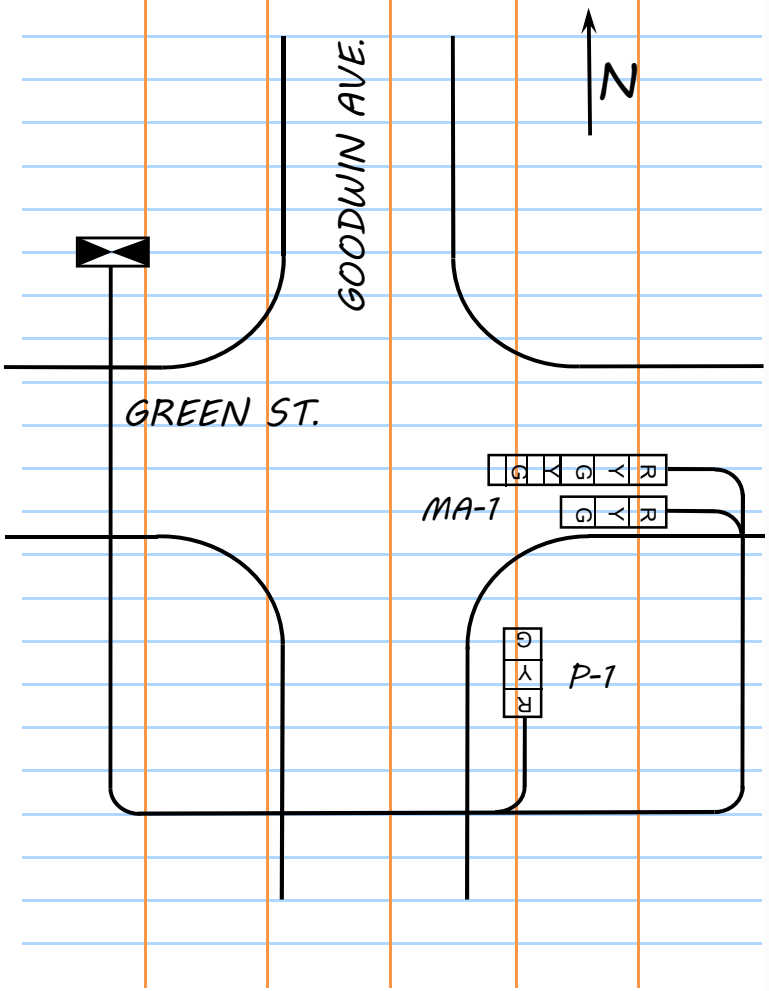
| Date | Station to Station Location or Description | Quantities Placed | | | Evidence of Material Inspection | Progress Document Source |
|---|---|---|---|---|---|---|
| | | This Date | To Date | Pay Est | | |
| 12/12/16 | Price Adjustment | 1.0 | 1.0 | | N/A | See calc file |
| | Of 70100800 Traf. | | FINAL | | | |
| | Cont. & Protection | | | | | |
| | Std 701401 | | | | | |
| | | | | | | |
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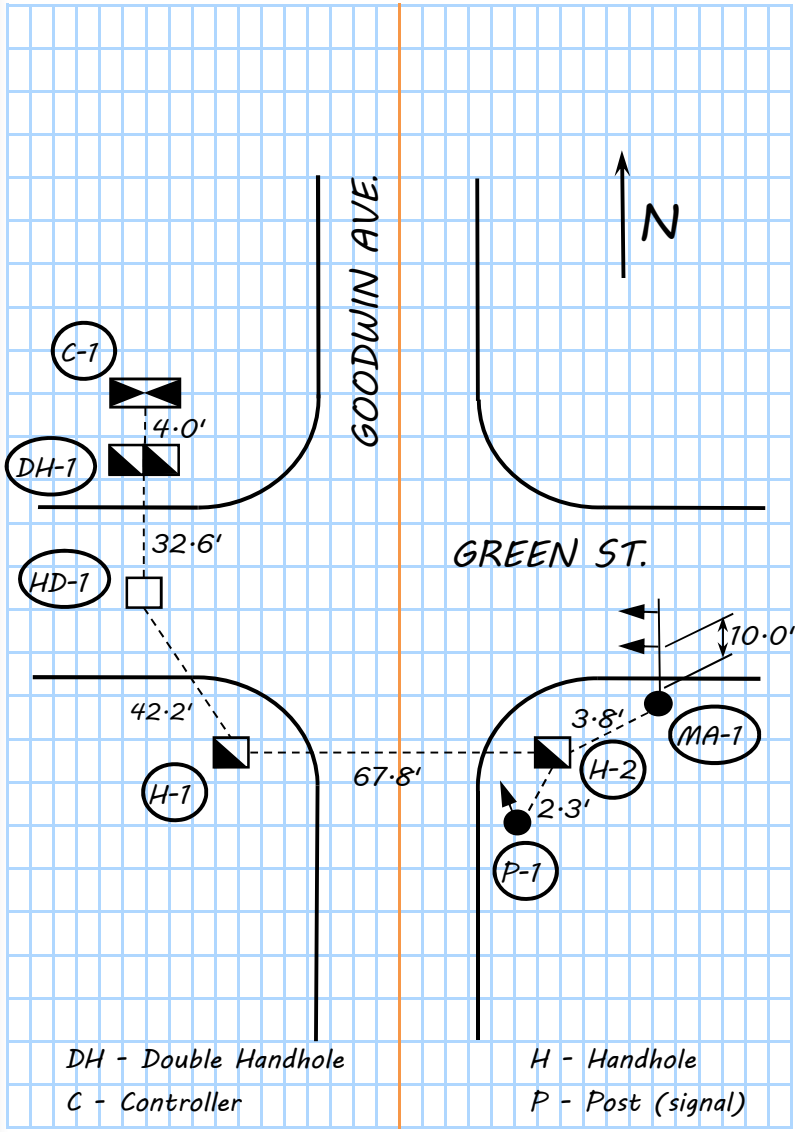
Source of documentation for final quantity: See spreadsheet in calc file



BC 625 (Rev. 4/98)

87301245 ELCBL C SIGNAL 14 5C



# 87301245 ELCBL C SIGNAL 14 5C

| DATE | FROM | TO | LENGTH | SLACK | VERTICAL | RUN TOTAL | TOTAL | NOTES |
|---|---|---|---|---|---|---|---|---|
| 6/21 | C-1 | DH-1 | 4·0′ | 13·0′ | 3·0′ | | | SEE PAGE 43 FOR SCHEMATIC AND MEASUREMENTS |
| | DH-1 | HD-1 | 32·6′ | 6·5′ | | | | |
| | HD-1 | H-1 | 42·2′ | 6·5′ | | | | |
| | H-1 | H-2 | 67·8′ | 6·5′ | | | | |
| "A-1" | SUBTOTAL | | 146·6′ | 32·5′ | 3·0′ | | | |
| | H-2 | P-1 | 2·3′ | | 3·0′ | | | |
| | P-1 | SIGNAL HEAD | | | 13·0′ | 200·4′ | | |
| "A-1" | C-1 | H-2 | 146·6′ | 32·5′ | 3·0′ | | | |
| | H-2 | MA-1 | 3·8′ | | 3·0′ | | | |
| | MA-1 | SIGNAL HEAD | 10·0′ | | 20·0′ | 218·9′ | 419·3′ | |

Final Measurement: 419.3′

Measured By: EAL & CR 6/24/16

Calculated By: EAL 6/24/16

Checked By: CR 6/24/16

## PIPE CULVERT

| ITEM | DESCRIPTION | STA. | DATE INST. |
|---|---|---|---|
| 542A0235 | P CUL CL A 130 | 10+50 | 7/11/16 |
| 〃 | 〃 | 11+90 | 〃 |
| 〃 | 〃 | 13+24 | 7/12/16 |
| 542A0241 | P CUL CL A 136 | 14+18 | 〃 |
| 542A0247 | P CUL CL A 142 | 15+95 | 7/13/16 |
| 542A0235 | P CUL CL A 130 | 18+02 | 〃 |

SUBCONTRACTOR: ROGERS CONSTRUCTION

WEATHER:

| | |
|---|---|
| 7/11/16 | SUNNY, 79° |
| 7/12/16 | SUNNY, 82° |
| 7/13/16 | PARTLY CLOUDY, 75° |

ALL FROM AMER. PIPE CO.
(APPROVED LIST & MARK)

| STAKED LENGTH | MEASURED LENGTH | PAY LENGTH |
|---|---|---|
| 31.0′ | 31.2′ | 31.0′ ✓ |
| 27.0′ | 28.3′ | 27.0′ ✓ |
| 50.0′ | 49.3′ | 49.3′ ✓ |
| 24.0′ | 24.0′ | 24.0′ ✓ |
| 112.0′ * | 112.7′ | 112.0′ ✓ |
| 21.0′ | 21.0′ | 21.0′ ✓ |

* PLAN LENGTH OF 100.0′ IS IN ERROR.

TOTAL PAY LENGTHS:

| | |
|---|---|
| 542A0235 | 128.3′ ✓ |
| 542A0241 | 24.0′ ✓ |
| 542A0247 | 112.0′ ✓ |

STAKED LENGTH CHECKED BY: MD & VC 7/6/16

| | | |
|---|---|---|
| Measured By: | MD & VC | 7/13/16 |
| Calculated By: | MD | 7/13/16 |
| Checked By: | VMC | 7/13/16 |

February 24, 2016

County
Section
Route
Contract No.

Don Doe, Superintendent
ACME Construction
1200 North Easy Street
Anyplace, IL

Dear Mr. Doe:

As specified in Article 512.16 of the Standard Specifications for Road and Bridge Construction, you are hereby being provided this itemized list of authorized lengths of metal pile shells to furnish for the structure for the above route and section.

It has been determined from the test piles driven on February 18, 2016 that the following lengths should be furnished:

| | | | |
|---|---|---|---|
| E Abut | 23 pile @ 24’ | = | 552 lin. ft. |
| Pier 1 | 32 pile @ 30’ | = | 960 lin. ft. |
| W Abut | 23 pile @ 36’ | = | 828 lin. ft. |

Very Truly Yours,

*John Smith*

John Smith
District Engineer

Note:
Final documentation for FURNISHING PILES consists of a copy of the itemized list which was given to the Contractor and field measurements of the delivered piling.

DATE: TUESDAY 6/28/16

WEATHER: MOSTLY SUNNY, 60° AM

PARTLY CLOUDY, 76° PM

CONTRACTOR: NEWMARK (7 AM - 3:30 PM)

PAY ITEMS:

51200956 FURN METAL PILE SHELLS, 12" x 0.179"

51202305 DRIVING PILES

CREW: 1 FOREMAN, 4 CARPENTERS,

2 OPERATORS

EQUIPMENT: 1 CRANE (LINK BELT LS 138H II)

1 HAMMER APE D19-42

4190 LB RAM

$E_{MAX}$ = 47 K · FT @ H = 11.25'

$E_{MIN}$ = 23 K · FT @ H = 5.5'

SINGLE ACTING HAMMER

NOMINAL REQ'D BEARING: 256 KIPS

NUMBER REQ'D: 7, INCLUDING TEST PILE

FURNISHED LENGTH: 50' (SEE LETTER 6/13/16)

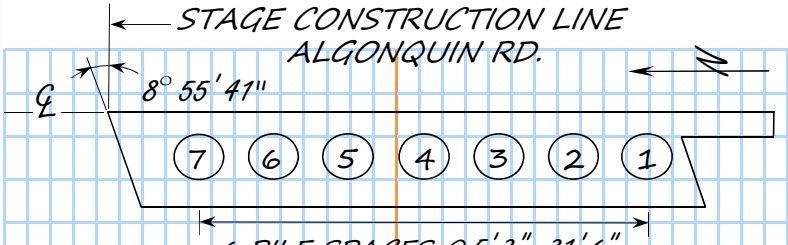
NOMINAL DRIVEN BEARING:

$$R_{NDB} = \frac{6.6 F_{eff} E \ln(10 N_b)}{1000}$$

Measured By: EA & ML 6/28/16

Calculated By: EA 6/28/16

Checked By: MSL 6/28/16




| HEAT NO. | PILE NO. | FURN. LEN. | DEL. LEN. | CUT OFF | DRIVEN LEN. | | BLOW /IN. | FINAL E K · FT |
|---|---|---|---|---|---|---|---|---|
| 615203 | 1 | 50.0' | 50.02' | 1.92' | 48.10' | √ | 3.6 | 23.0 |
| 615203 | 2 | 50.0' | 51.12' | 8.08' | 43.04' | √ | 2.7 | 25.1 |
| 615203 | 3 | 50.0' | 50.00' | 4.92' | 45.08' | √ | 1.7 | 29.3 |
| 615203 | 4 | 50.0' | 50.03' | 6.00' | 44.03' | √ | 2.1 | 27.2 |
| 615203 | 5 | 50.0' | 50.08' | 5.33' | 44.75' | √ | 2.7 | 25.1 |
| 168847 | 6 | 50.0' | 50.04' | 3.42' | 46.62' | √ | 2.1 | 27.1 |
| | 7 | TEST PILE | | | | | | |
| | | 300.0' | √ | | 271.62" | √ | | |

PAY: 51200956 → 300.00' √

51202305 → 271.62' √

| PILE BEARING ACCEPTANCE TABLE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| H | 5.5 | 6.0 | 6.5 | 7.0 | 7.5 | 8.0 | 8.5 | FT. |
| E | 23.0** | 25.1 | 27.2 | 29.3 | 31.4 | 33.5 | 35.6 | K · FT |
| $N_b$ | 3.6 | 2.7 | 2.1 | 1.7 | 1.4 | 1.2 | 1.0* | BLOWS/IN |

* Controlled by IDOT Spec.
** Controlled by hammer limits.

PG. 23

Illinois Department of Transportation

# Test Pile Driving Record

Structure Number 016-2861 | Date Driving Started 6/21/2016 | Date Completed 6/22/2016 | Sheet 1 of 1

Abutment/Pier No. East Abut. (Stage 1) | Calculated by RMW | Route FAP 343

Pile Type & Size Metal Shell 12" dia w/.179" walls | Checked by WMK | Section 70D-Y-B-R & 70HB-R-1

Nominal Required Bearing 372 kips | Estimated Plan Length 69 ft. | County COOK

Pile Cutoff Elevation 873.77 ft. | Authorized Furnished Length 78 ft. | Contract 62897

Ground Surface Elev. At Pile While Driving 840.23 ft.* | Closest Boring(s) B-1 & sb-5 | Driven Bearing Verification Gates

Hammer Make & Model Delmag D30-32 | Hammer Cushion Material & Thickness Conbest , 2" thick

Max. Operating Energy 55,898 ft.-lbs. | Min. Operating Energy 25,383 ft.-lbs. | Pile Helmet Weight 4250 lbs.

| Tip Elevation (Feet) | Distance Below Cut Off | Blows Per (Inch) | Hammer Energy Developed | Nominal Driven Bearing | Tip Elevation (Feet) | Distance Below Cut Off | Blows Per (Inch) | Hammer Energy Developed | Nominal Driven Bearing |
|---|---|---|---|---|---|---|---|---|---|
| 840.23 | 31.54 | | | | 811.23 | 61.54 | 1.1 | 36400 | 248 |
| 839.23 | 32.54 | | | | 810.23 | 62.54 | 1.1 | 34125 | 237 |
| 838.23 | 33.54 | | | | 809.23 | 63.54 | 1.0 | 31850 | 212 |
| 837.23 | 34.54 | | | | 808.23 | 64.54 | 0.9 | 36400 | 219 |
| 836.23 | 35.54 | | | | 807.23 | 65.54 | 1.1 | 36400 | 248 |
| 835.23 | 36.54 | | | | 806.23 | 66.54 | 1.2 | 40650 | 282 |
| 834.23 | 37.54 | <0.5 | <25383 | | 805.23 | 67.54 | 1.1 | 38675 | 258 |
| 833.23 | 38.54 | <0.5 | <25383 | | 804.23 | 68.54 | 1.3 | 40950 | 294 |
| 832.23 | 39.54 | <0.5 | <25383 | | 803.23 | 69.54 | 1.3 | 40950 | 294 |
| 831.23 | 40.54 | <0.5 | <25383 | | 802.23 | 70.54 | 1.3 | 47775 | 326 |
| 830.23 | 41.54 | <0.5 | <25383 | | 801.23 | 71.54 | 1.5 | 45500 | 339 |
| 829.23 | 42.54 | <0.5 | <25383 | | 800.23 | 72.54 | 2.5 | 45500 | 422 |
| 828.23 | 43.54 | <0.5 | <25383 | | 799.23 | 73.54 | 2.2 | 47775 | 413 |
| 827.23 | 44.54 | <0.5 | <25383 | | 798.23 | 75.54 | 2.5 | 43225 | 409 |
| 826.23 | 45.54 | 0.5 | 27300 | 102 | 797.23 | 76.54 | 2.5 | 43225 | 409 |
| 825.23 | 46.54 | 0.5 | 27300 | 102 | 796.23 | 77.54 | 2.5 | 45500 | 422 |
| 824.23 | 47.54 | 0.5 | 31850 | 118 | | | | | |
| 823.23 | 48.54 | 0.7 | 27300 | 144 | | | | | |
| 822.23 | 49.54 | 0.7 | 27300 | 144 | | | | | |
| 821.23 | 50.54 | 0.7 | 27300 | 144 | | | | | |
| 820.23 | 51.54 | 0.6 | 27300 | 125 | | | | | |
| 819.23 | 52.54 | 0.6 | 31850 | 143 | | | | | |
| 818.23 | 53.54 | 0.8 | 29575 | 172 | | | | | |
| 817.23 | 55.54 | 1 | 29575 | 201 | | | | | |
| 816.23 | 56.54 | 1 | 27300 | 189 | | | | | |
| 815.23 | 57.54 | 0.5 | 31850 | 118 | | | | | |
| 814.23 | 58.54 | 0.5 | 31850 | 118 | | | | | |
| 813.23 | 59.54 | 0.5 | 34125 | 126 | | | | | |
| 812.23 | 60.54 | 0.8 | 34125 | 192 | | | | | |

Driving Observations and Comments: Hammer would not fire until 835.23, Could not Read Energy until elevation 825.23

*reflects being driven from bottom of plan specified precored hole elevation

min. test pile driven bearing = 372kips X 1.10 = 409 kips

First consistant Bearing around 73 ft ---- order ~ 78ft. since boring st-5 shows stiffer soil at deeper elevation.

cc: Bureau of Bridges and Structures

Illinois Department of Transportation

## Production Pile Driving Data

Structure Number 016-2861 | Date Driving Started 10/19/2016 | Date Completed 10/22/2016 | Sheet 1 of 1

Abutment/Pier No. East Abut. (Stage 1) | Calculated by RMW | Route FAP 343

Pile Type & Size Metal Shell 12" dia w/.179" walls | Checked by WMK | Section 70D-Y-B-R & 70HB-R-1

Nominal Required Bearing 372 kips | Estimated Plan Length 69 ft. | County COOK

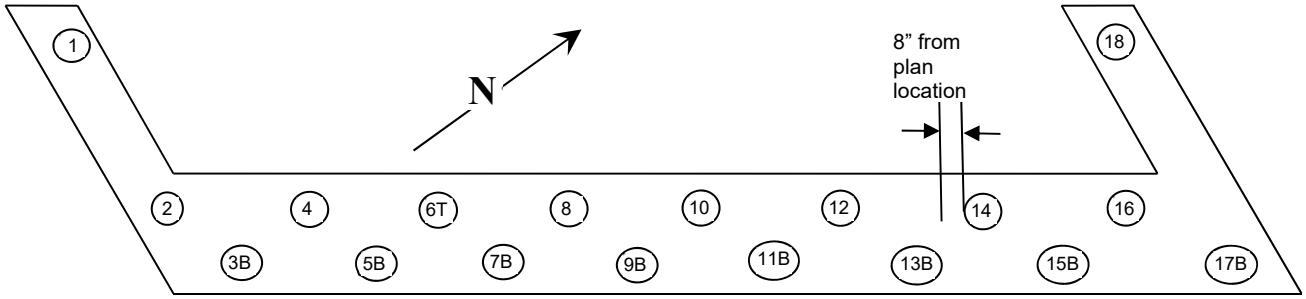
Pile Cutoff Elevation 873.77 ft. | Authorized Furnished Length 78 ft. | Contract 62897

Ground Surface Elev. At Pile While Driving 840.23 ft.* | Closest Boring(s) B-1 & sb-5 | Driven Bearing Verification Gates

Hammer Make & Model Delmag D30-32 | Hammer Cushion Material & Thickness Conbest , 2" thick

Max. Operating Energy 55,898 ft.-lbs. | Min. Operating Energy 25,383 ft.-lbs. | Pile Helmet Weight 4250 lbs.

As driven pile layout sketch with piles numbered, north arrow included, and any significant deviations from plan locations noted




Indicate (B) at battered piles and (T) at test piles

| Pile No. | Delivered Length (Feet) | Added Splice Length | Final Cutoff Length | Paid Driven Length | Paid Furnished Length | Blows Per (Inch) | Hammer Energy Developed | Nominal Driven Bearing | Driving Observations & Comments |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 81.8 | 0 | 3 | 78.8 | 78.8 | 2 | 43225 | 373 | 82 ft piles delivered as two 41 ft. sections |
| 2 | 81.8 | 0 | 10.5 | 71.3 | 78 | 2.5 | 38675 | 381 | |
| 3B | 82 | 0 | 5 | 77 | 78 | 3 | 34125 | 378 | |
| 4 | 82 | 0 | 4 | 78 | 78 | 2 | 43225 | 373 | Bend in Pile 4 occurred 10' prior to bearing, |
| 5B | 82 | 0 | 5 | 80 | 80 | 2.4 | 38675 | 375 | cut out bend and re-splied pile per BBS |
| 6T | ----- | ----- | ------ | ---- | ------ | 2.5 | 45500 | 422 | Test pile driven on 6/22/07 |
| 7B | 82.1 | 0 | 6 | 76.1 | 78 | 3.1 | 36400 | 398 | |
| 8 | 82.1 | 0 | 6 | 76.1 | 78 | 3.5 | 36400 | 416 | |
| 9B | 82.2 | 0 | 5 | 77.2 | 78 | 4 | 36400 | 435 | |
| 10 | 78 | 0 | 1 | 76.6 | 78 | 2.5 | 38675 | 381 | 78 ft. long piles were composed of 20+38+20 |
| 11B | 78.1 | 0 | 1.5 | 76.1 | 78 | 2 | 43225 | 373 | |
| 12 | 78.1 | 0 | 2 | 76.1 | 78 | 2.4 | 38675 | 375 | |
| 13B | 78.1 | 10.5** | 6 | 82.6 | 78 | 3 | 34125 | 378 | |
| 14 | 78.2 | 5** | 1.5 | 81.7 | 78 | 2.5 | 38675 | 381 | Pile hit something at 12' below precore and |
| 15B | 78 | 10 | 5.8 | 82.2 | 88 | 3.5 | 34125 | 399 | moved out of 6" tolerence (ok per BBS) |
| 16 | 78.1 | 10 | 5.8 | 82.2 | 88 | 3 | 36400 | 393 | |
| 17B | 78.1 | 10 | 5.9 | 82.1 | 88 | 3.1 | 34125 | 382 | |
| 18 | 78.1 | 10 | 5.2 | 82.9 | 88 | 3.4 | 31850 | 378 | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | *elevation reflects +/- 30ft. precore specified |
| | | | | | | | | | **Not paid as furnished since obtained from Cut |
| | | | | | | | | | off sections from piles 2 and 3B |

cc: Bureau of Bridges and Structures

BBS 2184 (Rev. 01/21/10)

9-5-07
40600100
BIT MATLS (PRIME COAT)
STA 1 + 20
to 23 + 06

Contract 97311

Calc by: MAN 9-5-07
Check by: JN 9-7-07

| | | |
|---|---|---|
| 0. | C | |
| 13.00 | - | |
| 10.71 | = | |
| 2.29 | * | |
| tons | | |
| 0. | C | |
| 2.29 | x | |
| 2000 | = | |
| 4580.0 | * | |
| lbs. | | |
| 0. | C | |
| 4580.0 | ÷ | |
| 8.328 | ÷ | |
| 0.943 | = | |
| 583 | * | |
| gallons | | |

Pay 583 Gallons

Evidence of Material Inspection : List & Bill of Lading

This is an example of the documentation requirement for bituminous materials prime coat items paid on a gallon basis.

This adding machine tape is to be securely bound around the truck ticket(s) for each pay item for each day.

MACLAIR ASPHALT SALES, LLC
PLANT AND OFFICE
6303 COLLINSVILLE ROAD
COLLINSVILLE, ILLINOIS 62234
PHONE: (618) 271-7470 FAX: (618) 271-0830

SOLD TO: KEELEY & SONS
Job: 713
PARIS AVENUE
CAHOKIA, IL.
CONTRACT NO. 97311
TICKET NO. E 3
713
9/5/07

| Acct. No. | Truck | Tons | Product | Product Description |
|---|---|---|---|---|
| 3600 | EJ16 | 2.29 | 913 | PRIME RC-70 |

Loads: 1 Accum. Amount: 2.29 TONS

GROSS: 13.00 TN Manual Wt.
TARE: 10.71 TN Manual Wt.
NET: 2.29 TN

DAWN B.

583 gals.

Received By: _____
WARNING – HOT BITUMINOUS MIX/HAZARDOUS MATERIAL-MSD SHEET AVAILABLE

STRAIGHT BILL OF LADING
DELIVERY TIME
Shipper's No. 24645
CARRIER E.J. Dougherty
RECEIVED, subject to, the classifications and tariffs in effect on the date of the issue of this bill of lading.
at Hazelwood, Missouri 20 07 CONSIGNOR or from Spirit Asphalt Incorporated

The property described below, in apparent good order except as noted (contents and condition of contents of packages unknown) marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classifications in effect on the date hereof, if this is a rail or rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.
Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, including those on the back thereof, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

Consigned to E.J. Dougherty Oil
1501 Lincoln Ave
E. St. Louis, IL
62204

"FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT CALL CHEMTREC, 1/800-424-9300 DAY OR NIGHT."

Destination Same

WEIGHT LBS INITIAL WEIGHT
11:14 AM 06/08/07
TRUCK ID: 225-178
WEIGHT IN: 30400 lb GROSS

12:01 PM 06/08/07 TARE
TRUCK ID: 225-178
Gross Wt: 77680 lb
Tare Wt: 30400 lb NET
Net Wt: 47280 lb

1 T/L

Delivering Carrier: EJ Dougherty
Customer P.O.:
Description
Product RC-70
Tank No. 45 Gravity 0.943
Lab No. RR 7015 Tank Temp. 160
Gallons 6023 Seal No.
Project No.

Keeley & Sons
RC-70
Job 713
Contract 97311

FREIGHT CHARGES
Subject to Section 7 of conditions of applicable bill of lading, if this shipment is to be delivered to the buyer without recourse on the seller, the seller shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.
Per
(Signature of Seller)
If charges are to be prepaid write or stamp here, "To be Prepaid."
Received $_____ to apply in prepayment of the charges on the property described hereon.
Agent or Cashier
Per
(The signature here acknowledges only the amounts prepaid.)

Illinois Department of Transportation

# Weekly Trainee Report

Print Form | Reset Form

Contractor: ACME Construction Co.

Report Number: 7

Week Ending: 06-24-16

County:

Section:

Route:

District:

Contract No.:

Job No.:

Project:

| (1) Trainee Name and Individual Identification Number | (2) Ethnic Group | (3) FHWA | (4) IDOT MRB | (5) TPG | (6) Work Classification | (7) Status | (8) Hours Worked | | | | | | | (9) Hours this Week | (10) Hours to Date |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jaunita Sanchez, 6155 | H | ☒ | ☐ | ☐ | CM | A | 8 | 8 | 0 | 0 | 10 | 8 | 4 | 38 | 253 |
| | | ☐ | ☐ | ☐ | | | | | | | | | | | |
| Ernest Jackson, 7521 | B | ☒ | ☐ | ☐ | CA | T | 8 | 8 | 0 | 0 | 8 | 8 | 4 | 36 | 247 |
| | | ☐ | ☐ | ☐ | | | | | | | | | | | |
| | | ☐ | ☐ | ☐ | | | | | | | | | | | |
| | | ☐ | ☐ | ☐ | | | | | | | | | | | |
| | | ☐ | ☐ | ☐ | | | | | | | | | | | |
| | | ☐ | ☐ | ☐ | | | | | | | | | | | |
| | | ☐ | ☐ | ☐ | | | | | | | | | | | |
| | | ☐ | ☐ | ☐ | | | | | | | | | | | |

I hereby certify that the hours of training listed above were given to those trainees working on the above designated project.

These hours were checked against the contractor's payroll in addition to visual job site inspection.

Contractor's Representative

State's Representative

For information about IDOTs collection and use of confidential information review the department's Identity Protection Policy

Printed 08/24/26

SBE 1014 (Rev. 03/23/17)

Illinois Department of Transportation

**Inspector's Daily Report**

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date 9-26-16

Contractor or Sub. Wortman-Starwalt Inc.

Weather CLEAR 80 °

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | ALG | 9-26-16 |
| Measured by: | ALG | 9-26-16 |
| Calculated by: | | |
| Checked by: | KPR | 9-26-16 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 50500405 | | F&E STRUCT. STEEL | N. Tri-Level MID Bridge | 3140 lbs | Fabrication Inspector's | √ |
| | | | | | Release (BBS 59) & Cert | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

F - 63

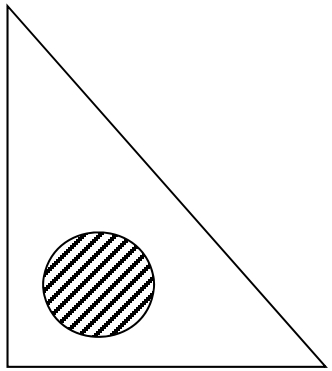
This is: ☐ an estimated progress measurement (item no.: _____ )

√ a final field measurement (item no.: 50500405 )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

Angles weighed on approved scale at Effingham Equity.
Scale No. IL 4201 (9-1-16). See wt. ticket in str. steel file.

Note: Bill of Lading from fabricator indicates
wt of steel = 3200 lb
actual wt = 3140 lb



BC 628 (Rev. 8/04)

Illinois Department of Transportation

**Inspector's Daily Report**

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date 9-23-16

Contractor or Sub. INTERSTATE

Weather SUNNY, 70-75

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | BAB | 9-23-16 |
| Measured by: | BAB, KWN | 9-23-16 |
| Calculated by: | BAB | 9-23-16 |
| Checked by: | SM | 9-23-16 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 25000400 | | NITROGEN FERT NUTR | ENTIRE JOB ( 7.0 acres) | 700 LBS | SEE GUARANTEED ANALYSIS FROM BAG | √ |
| | | | | | IN SEEDING FILE | |
| 25000500 | | PHOSPHORUS FERT NUTR | " | 420 LBS | " | √ |
| | | | | | | |
| 25000600 | | POTASSIUM FERT NUTR | " | 280 LBS | " | √ |
| | | | | | | |

F - 64

This is: ☐ an estimated progress measurement (item no.: _____ )

√ a final field measurement (item no.: 25000400, 25000500, 25000600 )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

Plans Require: N=100 lb/acre Phos = 60 lb/acre Pot = 40 lb/acre

Contractor delivered & used 140 bags of 10-6-4 @ 50 lb ea.

Quantity: Nit = 140 bags x 50 lbs x 10% = 700 lbs (7.0 acre x 100 lb/acre = 700 lbs, yield is good)

Phos = 140 bags x 50 lbs x 6% = 420 lbs (7.0 acre x 60 lb/acre = 420 lbs, yield is good)

Pot = 140 bags x 50 lbs x 4 % = 280 lbs (7.0 acre x 40 lb/acre = 280 lbs, yield is good)

Fertilizer bags were counted & destroyed by Resident.

# PAVEMENT PATCHING 10

10-14-16 Clear, 60's ACE Construction

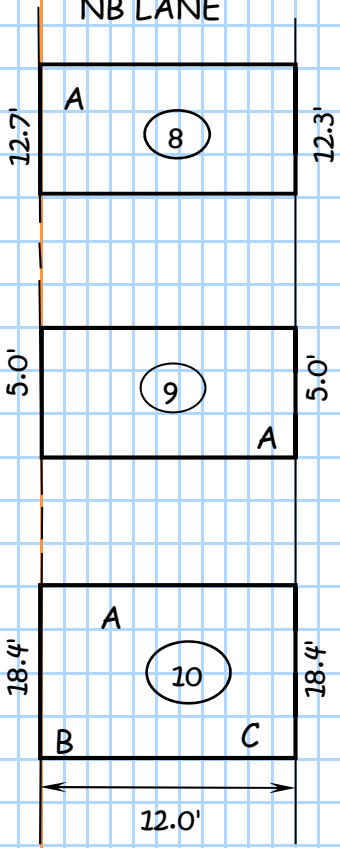
| Patch # | 44200108 TYPE 2 | 44200112 TYPE 3 | CALCULATIONS |
|---|---|---|---|
| (8) 1241+02 | | 16.7 | $\frac{(12.7' + 12.3')}{2} \times 12.0 \times 1/9$ =16.7 S.Y. |
| (9) 1241+98 | 6.7 | | 5.0 X 12.0 X 1/9 = 6.7 S.Y. |
| (10) 1246+00 | | 29.4 | 18.4 X 12.0 X 1/9 = 24.5 S.Y.<br>Patch Depth Increase<br>$= \frac{(14'' - 10'')}{10''} = 40\%$<br>∴ Increase Qty. by 20%<br>∴ Pay = 24.5 X 1.20<br>= 29.4 S.Y. |
| PAGE TOTALS | 6.7 S.Y. | 46.1 S.Y. | |

SB LANE NB LANE

Depth
A=10"

Depth
A = 10"

Depth
A = 14"
B = 13.8"
C = 14.2"
Avg.=14"




Evidence of Mat'l Insp: Plant Report, Tickets & Test

Meas. By: VC, MD 10/14/16
Calc. By: VC 10/14/16

Illinois Department of Transportation

**Inspector's Daily Report**

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date 7-27-16

Contractor or Sub. ACME Construction

Weather Clear, 75°

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | RG, MF | 7-27-16 |
| Measured by: | RG, MF | 7-27-16 |
| Calculated by: | RG | 7-27-16 |
| Checked by: | JR | 7-27-16 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 35400400 | | PCC BASE CSE W 9 | LT 0+25 to 23+50 | | Plant Report & Tickets & Test | |
| | | | RT 0+25 to 10+20 | 1106.7 SY | | |
| | | | | | | |
| | | | | | | |
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| | | | | | | |

**NOTE:**
**Article 109.01 states that the pay width for pavement, base course, etc. shall be the exact horizontal dimension shown on the plans or ordered in writing by the Engineer.**

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This is: ☐ an estimated progress measurement (item no.: _____ )

√ a final field measurement (item no.: 35400400 )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

See Field Book #3
Pg. 12-14 for field
width and
depth checks

LT 0+25 to 23+50
2325' x 3' x 1/9 = 775.0 SY
RT 0+25 to 10+20
995' x 3' x 1/9 = 331.7 SY

Total = 1106.7 SY

BC 628 (Rev. 8/04)

Illinois Department of Transportation

**Inspector's Daily Report**

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date July 7, 2016

Contractor or Sub. ACME Const. Co.

Weather Cloudy, 83°

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | BAB | 7-7-16 |
| Measured by: | BAB & AG | 7-7-16 |
| Calculated by: | BAB | 7-7-16 |
| Checked by: | SVJ | 7-7-16 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection | Posted in Q Book |
|---|---|---|---|---|---|---|
| 51100100 | | Slope wall 4" | South Abut | 74.6 sy | Plant Rpt. & Tickets & Test | √ |
| | | | | | | |
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F-67

This is: ☐ an estimated progress measurement (item no.: _____ )

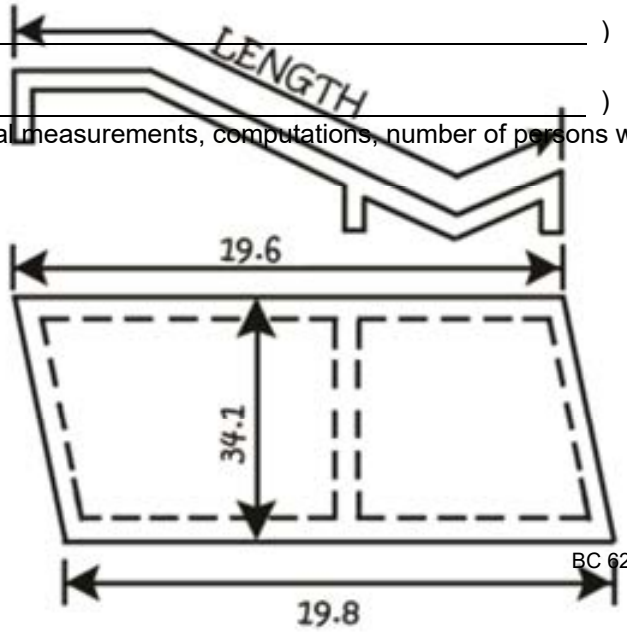
√ a final field measurement (item no.: 51100100 )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

All measurements on upper slope surface of wall

$$\left(\frac{19.6 + 19.8}{2}\right)(34.1) \div 9 \ \frac{\text{sf}}{\text{sy}} = 74.6 \text{ sy}$$

See FB #4, p.12 for depth checks




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Illinois Department of Transportation

**Inspector's Daily Report**

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date 10-5-16

Contractor or Sub. GREENSIDE UP

Weather SUNNY 79°

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | JAJ | 10-5-16 |
| Measured by: | JAJ | 10-5-16 |
| Calculated by: | JAJ | 10-5-16 |
| Checked by: | EF | 10-6-16 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 25200200 | W36U | Supplemental | STA 461+00 TO | 24.5 Units | Potable Source- Danville | √ |
| | | Watering | 493+00 RT | | Municipal water supply | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

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This is: ☐ an estimated progress measurement (item no.: _____ )

√ a final field measurement (item no.: 25200200 )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

Per Art. 252.08, One initial watering of 5 gal/sy and 15 additional waterings at 3 gal/sy were applied, began supplemental watering today at 3 gal/sy over 8167 sy

Truck Plate → 3,500 Gallons/Load; 7 Loads Utilized Today
3500 gal/load x 7 loads = 24,500 Gal ÷ 1000 Gal/Unit = 24.5 Units

Illinois Department of Transportation

**Inspector's Daily Report**

County

Section

Route

District

Contract No.

Job No.

Project

JOB STAMP

Date 5-12-16

Contractor or Sub. GREENSIDE UP

Weather Sunny, 91°

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | GJ | 5-12-16 |
| Measured by: | GJ | 5-12-16 |
| Calculated by: | GJ | 5-12-16 |
| Checked by: | EG | 5-15-16 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 25301800 | W36U | Seedlings | STA 26+50 LT to | 23.5 Units | Letter Of Certification And | DQ# |
| | | | 26+59 LT | | RE Vis (From Rhimes | 150 |
| | | | | | Nursery) | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

This is: ☐ an estimated progress measurement (item no.: _____ )

☒ a final field measurement (item no.: 25301800 )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

Seedlings Tied In Bunches Of 30 Plants
Counted 87 Bunches

$$\text{Final QTY} = \frac{30 \text{ PLANTS/BUNCH} \times 87 \text{ BUNCHES}}{100 \text{ PLANTS/UNIT}} = 26.1 \text{ Units}$$

Pay 90% for planting on this date: 26.1 X 0.90 = 23.5 Units

NOTE: Per Article 253.17 the remaining 10% of the pay quantity will be paid after the period of establishment (253.14) or upon execution and receipt of a third party performance bond.

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BC 628 (Rev. 8/04)

## TREE REMOVAL

| LOCATION | CIRCUM MEAS. | 20100110 6 - 15 | 20100210 > 15 | DATE REMOVED |
|---|---|---|---|---|
| 613+65 | 53" | | 16.9 | 8-18-16 |
| 614+10 | 21 | 6.7 | | " |
| 614+28 | 28 | 8.9 | | " |
| 614+80 | 38 | 12.1 | | " |
| 616+25 | 58 | | 18.5 | " |
| 616+38 | 30 | 9.5 | | " |
| 616+73 | 48 | | 15.3 | " |
| 617+28 | 74 | | 23.6 | 8-19-16 |
| 617+29 | 23 | 7.3 | | " |
| 622+91 | 40 | 12.7 | | " |
| 623+52 | 68 | ~~21.6~~ | 21.6 | " |
| 624+21 | 24 | 7.6 | | " |
| | | 64.8 | 95.9 | |
| | | UNIT DIA. | UNIT DIA. | |

**NOTE:** Must note "Tree tape used" if a direct reading tree tape is used to determine the tree diameter.

SUB-CONTRACTOR: R & W TREE SERVICE

| DATE | 6-15 | >15 | INSP. BY | WEATHER |
|---|---|---|---|---|
| 8/18/16 | 37.2 | 50.7 | EAL | SUNNY, 76° |
| 8/19/16 | 27.6 | 45.2 | EAL | SUNNY, 80° |

Example conversion calculation from circumference measurement in inches to unit diameter:

STA 613+65: 53" ÷ 3.1416 = 16.9 unit diameter

Measured By: MRL 8/16/16
Calculated By: MRL 8/19/16
Checked By: VMC 8/19/16

Contract # 60V20
X4060110
BIT. MATERIALS (PRIME COAT)
IL 173
FROM COUNTY LINE
TO FLAT IRON RD.

Initial(s) Date
Measured by: EAL 10/6/16
Calculated by MSL 10/6/16
Checked by

| | | |
|---|---|---|
| 0.C | * | |
| 31,200.00 | + | .....Weight before application - from prime coat ticket |
| 21,420.00 | - | .....Weight after application - from prime coat weigh-back ticket |
| 9,780.00 | * | .....Net weight of emulsion used on job (includes <u>all</u> added water) |
| 51,880.00 | + | .....Tanker weight of emulsion - shown on the bill of lading |
| 22,234.00 | + | .....Weight of water added to emulsion – shown on bill of lading |
| 74,114.00 | * | .....Total weight of the diluted emulsion mixture |
| 51,880.00 | ÷ | .....Tanker weight of emulsion shown on bill of lading |
| 74,114.00 | = | .....Total weight of the diluted emulsion mixture |
| 0.70 | * | .....70% - percent of emulsion in the pressure distributor |
| 9,780.00 | x | .....Weight of emulsion used on job (includes all added water) |
| 0.70 | = | .....70% - percent of emulsion in the pressure distributor |
| 6,846.00 | * | .....Pounds of emulsion |
| 6,846.00 | x | .....Pounds of emulsion |
| 0.638 | = | .....% of residual asphalt in the emulsion from the bill of lading |
| TOTAL = 4,367.75 | * LBS. | .....***Pounds of residual asphalt – this is what you pay!*** |



# Ticket Tape Calculations for Emulsions with Added Water

Contract # 60V20
X4060110
BIT. MATERIALS (PRIME COAT)
IL 173
FROM COUNTY LINE
TO FLAT IRON RD.

| Initial(s) | Date |
|---|---|
| EAL | 10/6/16 |
| MSL | 10/6/16 |

Measured by:
Calculated by
Checked by

| | | |
|---|---|---|
| | 0.C | * |
| | 31,200.00 | + |
| | 21,420.00 | - |
| | 9,780.00 | * |
| | 9,780.00 | x |
| | 0.638 | = |
| TOTAL = | 6,239.64 | * |
| | LBS. | |



## Ticket Tape Calculations
## for Emulsions with NO Added Water
## and for Cutbacks

*.....Weight before application - From prime coat ticket*
*.....Weight after application - From prime coat weigh-back ticket*
*.....Net weight – Total pounds of cutback or emulsion used on job*

*.....Pounds of cutback or emulsion*
*.....% of residual asphalt from the bill of lading*
*.....**Pounds of residual asphalt – this is what you pay!***

Illinois Department of Transportation

# Inspector's Daily Report

County

Section

Route

District

Contract No. 70X01

Job No.

Project

Date 9/21/2017

Contractor or Sub. ACME Construction

Weather 80's P Cloudy

| | Initial(s) | Date |
|---|---|---|
| Inspected by: | GJR | 9/21/2017 |
| Measured by: | GJR | 9/21/2017 |
| Calculated by: | MLK | 9/21/2017 |
| Checked by: | JMN | 9/22/2017 |

| Item Code # | Fund Code (Opt.) | Item | Location | Quantity and Units | Evidence of Material Inspection (Optional) | Posted in Q Book |
|---|---|---|---|---|---|---|
| 44003100 | | MEDIAN REMOVAL | Sta 59+00 Rt | 229.0 SF | N/A | |
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F-73

This is: ☐ an estimated progress measurement (item no.: _____ )

☒ a final field measurement (item no.: 44003100 )

Remarks: (e.g., instruction to Contractor, special problems, sketches with dimensions for final measurements, computations, number of persons working, hours worked) Use reverse side, if needed.

Used Cogo Area Calculation Tool from Trimble Access Version 2016.03. Area calculated from a list of coordinate points shot around the perimeter.

See attached print out of area calculation (Attachment A1).

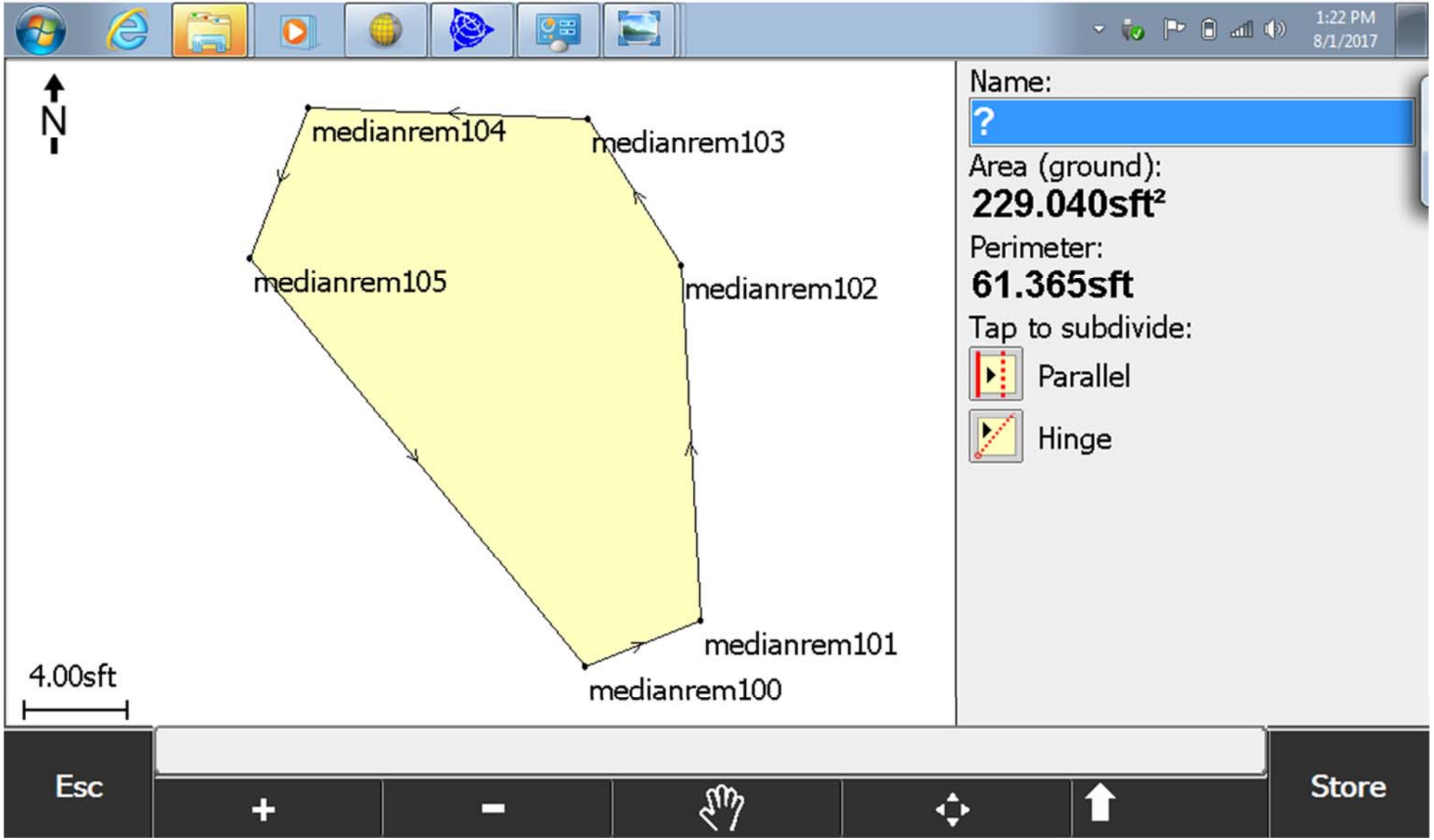
See attached print out of point list: medianrem100 to medianrem105 (Attachment A2). Point selection indicated by a checkmark.

See attached print out of coordinates: medianrem100 to medianrem105 (Attachment A3).

Measured quantity compares to plan quantity of 228.5 SF as shown on Sheet 42 of the plans.

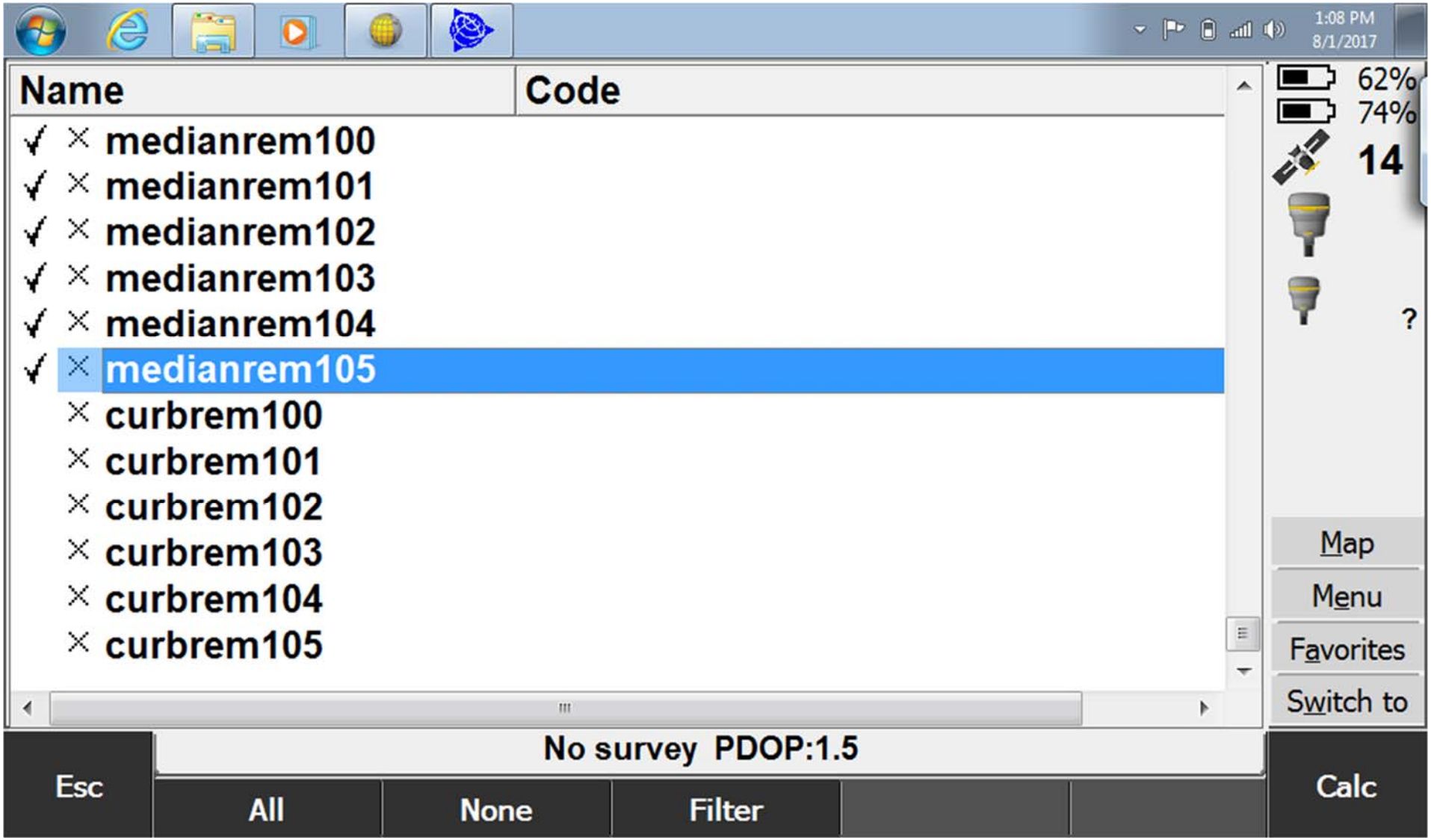
# Field Measurements with Electronic Devices

## Attachment A1 – (See Median Removal IDR on Page F-73)



# Field Measurements with Electronic Devices

Attachment A2 – (See Median Removal IDR on Page F-73)



# Field Measurements with Electronic Devices

Attachment A3 – (See Median Removal IDR on Page F-73)

