FOREST HILLS LIFT STATION REPLACEMENT 2026
WHITEHILLS LIFT STATION BYPASS 2026

MERIDIAN TOWNSHIP

DEPARTMENT OF PUBLIC WORKS & ENGINEERING

INGHAM COUNTY, MICHIGAN

FOREST HILLS LIFT STATION REPLACEMENT 2026
WHITEHILLS LIFT STATION BYPASS 2026

FOR
MERIDIAN TOWNSHIP

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MERIDIAN TOWNSHIP

FOREST HILLS LIFT STATION REPLACEMENT 2026
WHITEHILLS LIFT STATION BYPASS 2026

ADVERTISEMENT FOR BIDS

Sealed proposals will be received by Meridian Township, Ingham County, Michigan, at the Meridian Township Clerk's Office, Municipal Building, 5151 Marsh Road, Okemos, Michigan, 48864-1198, Ph. (517) 853-4000, up to 11:00 a.m., local time on October 2nd, 2025 for the replacement of the Forest Hills Sanitary Lift Station and the installation of a permanent bypass standpipe at the Whitehills Sanitary Lift Station, after which time, proposals will be publicly opened and read aloud.

Bids are solicited on a unit price basis. The work involves the following major bid items:

FOREST HILLS LIFT STATION REPLACEMENT

- Removal of an existing Lift Station including all hardware and plumbing;
- Installation of a new Lift Station including:
  - Wet Well, Valve Vault, Control Panel, Pumps, Generator and all plumbing, conduits, etc;
- Installation of three new 48" Sanitary Manholes;
- Installation and connection of the Pressure Sewer (6") to the Station;
- Installation and connection of the 12" Gravity Sewer to the Station;
- Installation and connection of the proposed 10" and 8" Gravity Sewer to the proposed Sanitary Manholes;
- Bypass Pumping of the Lift Station (156 gpm, peak hourly flow); and,
- Dewatering of the construction zone.

Proposals shall include the furnishing of all labor, material, and equipment to complete the project, except for the following equipment which will be furnished by Meridian Township:

- Two FLYGT Pumps, their lifting assembly, all check and gate valves.
- Control Panel and junction box.
- Generator: Natural Gas Standy Genset.

WHITEHILLS LIFT STATION BYPASS 2026

- Installation of the permanent Bypass Standpipe including a live tap of the 12" force main, 6" resilient seated gate valve, and an 6" bypass standpipe with two 90 degree ductile iron bends, and a 2 ½" male quick connect with dust cap

Work on the project may commence after issuing the Notice to Proceed with the anticipated start of construction being April 1st, 2026. The project shall be substantially completed by May 15th, 2026. Restoration shall be completed by June 1st, 2026. Final completion of the restoration shall be done by June 15th, 2026.

Each proposal shall be accompanied by a certified check or a bid bond by a recognized surety company similar to a U.S. Government Standard form bid bond, in the amount of five percent (5%) of the bid, payable to the Meridian Township, Ingham County, Michigan as security for the acceptance of the Contract.
Insurance and bonds are required from the successful bidder for this project; please see pages GC-2 thru GC-3 for those requirements. *Please note Owner/Contractors Protective Liability is required for all of our contracts*.
The contract documents may be examined at the following location:

- Meridian Township, Dept of Public Works, 5151 Marsh Road, Okemos, MI 48864

To be added to the Township's list of prospective bidders, please make sure to contact the Engineering Office, as described below. PDF copies of the plans and contract documents may be downloaded from the Township here:
https://www.meridian.mi.us/businesses/requests-for-proposals-bids.

Copies of the contract documents for the work may be obtained from the Department of Public Works & Engineering at 5151 Marsh Road, Okemos, Michigan, for a non-refundable fee of ten dollars ($10). There is a five dollar ($5.00) fee for mailing contract documents. Contract documents may be obtained via email free of charge. Questions regarding this contract may be addressed to Meridian Township Department of Public Works & Engineering by phone at (517) 853-4440, or by email at DPW@meridian.mi.us.

The Vendor's agreement to pay prevailing wage rates is one relevant consideration that Meridian Township may make in its determination of which bidder should receive this contract. Meridian Township may thus consider in awarding this contract whether any vendor voluntarily pays employees and sub-contractors, directly upon the site of work, at least the prevailing wages and fringe benefits as determined and published by the United States Department of Labor for the Ingham County area.

In submitting this bid, it is understood that the right is reserved by the Owner to reject any or all bids, to award the Contract to other than the low bidder, to award separate contracts for each project and/or phase, to waive irregularities and/or formalities, and in general, to make award in any manner deemed by it, in its sole discretion, to be in the best interest of the Owner.

INSTRUCTIONS TO BIDDERS

1. PROPOSALS

Proposals must be made upon the forms provided, without modifications or changes, and all other data submitted as required.

The proposal must be enclosed in a sealed envelope marked **"Bid Proposal – Forest Hills Lift Station Replacement 2026 and Whitehills Lift Station Bypass 2026"** clearly indicating the name and address of the bidder, and filed at the place and by the time specified in the Advertisement.

2. BASIS OF PROPOSALS

Proposals may be submitted for any one or all of the projects or phases as may be applicable.

Proposals are solicited on the basis of unit prices for the entire work of the contract.

The right is reserved by the Owner to reject any and all bids, to award the Contract to other than the low bidder, to award separate Contracts for each project and/or phase, to waive irregularities and/or formalities, and in general, to make award in any manner deemed by it, in its sole discretion, to be in the best interest of the Owner.

3. BID DEPOSITS

Each proposal shall be accompanied by a certified check, or bid bond from a recognized surety company, in the amount of five percent (5%) of the total amount of the bid, payable to the order of the Owner, to be forfeited to the Owner in case of failure on the part of the successful bidder to enter into the attached form of Contract to do the work covered by such Proposal at the price and within the time stated therein. The bid deposit of all except the successful bidder will be returned within four weeks after opening of bids. The bid deposit of the successful bidder will be returned within 48 hours after the executed Contract has been finally approved by the Owner.

4. QUALIFICATION OF BIDDERS

It is the intention of the Owner to award the Contract(s) to contractor(s) fully capable, both financially and as regards experience to perform and complete all work in a satisfactory manner. Evidence of such competency must be furnished, including a listing of similar projects which the bidder has satisfactorily undertaken and completed.

5. INTERPRETATION OF DOCUMENTS

If the bidder is in doubt as to the true meaning of any part of the plans, specifications or Contract Documents, he may submit to the Engineer a written request for an interpretation thereof. Any interpretation made in response to such query will be mailed or duly delivered to each prospective bidder. The Owner will not be responsible for any other explanation or interpretation of the Contract Documents.

6. REQUIREMENT OF SIGNING BIDS

Bids which are not signed by the individual making them shall have attached thereto a power of attorney evidencing authority to sign the bid in the name of the person for whom it is signed.

Bids, which are signed by a partnership, shall be signed by all of the partners or by an attorney-in-fact. If signed by an attorney-in-fact, there shall be attached to the bid a power of attorney evidencing authority to sign the bid, executed by the partners.

Bids which are signed for a corporation shall have the correct corporate name thereof and the signature of the president or other authorized officers of the corporation manually written below the corporate name following the word "By". If such a bid is manually signed by an officer other than the president of the corporation, a certified copy of a resolution of the board of directors evidencing the authority of such official to sign the bid shall be attached to it. Such a bid shall also bear the attested signature of the secretary of the corporation and the impression of the corporate seal.

7. EXECUTION OF AGREEMENT

The bidder to whom an award is made will be required to enter into the written contract included herein, within ten (10) calendar days after being notified of the acceptance of his bid and receipt by him of the copies of the documents to be executed. In case of failure to comply with this requirement, he may be considered to have abandoned all his rights and interests in the award and his certified check or amount of bidder's bond may be declared to be forfeited to the Owner and the Contract may be awarded to another bidder.

8. INSURANCE (Ref. General Conditions – GC.2)

The contractor will be required to carry Worker's Compensation Insurance, Bodily Injury and Property Damage, Builder's Risk Insurance and Owner's Protective Liability in the amounts specified in the General Conditions. Certificates of such insurance must be attached to each copy of the executed Contract Documents.

9. BONDS (Ref. General Conditions – GC.1)

The successful bidder will be required to furnish for each set of executed Contract Documents and conformed copies thereof an original completed Performance Bond, and Labor and Material Bond with surety acceptable to the Owner as set forth in the General Conditions.

10. BIDDER'S RESPONSIBILITY FOR EXAMINING PLANS AND SITE

At the time of opening bids, each bidder will be presumed to have made a personal investigation of the site of the work and of existing structures, and to have read and be thoroughly familiar with the plans, specifications and Contract Documents (including all addenda). He shall determine to his own satisfaction the conditions to be encountered, the nature of the ground, difficulties involved in completing the Contract and all factors affecting the work proposed under this Contract.

The bidder to whom this contract is awarded will not be entitled to any additional compensation by reason of his failure to fully acquaint himself with the conditions at the site or by his failure to fully examine the plans, specifications and Contract Documents.

11. NON-DISCRIMINATION IN EMPLOYMENT

The Contractor shall adhere to all applicable Federal, State and local laws, ordinances, rules and regulations prohibiting discrimination with regards to employees and applicants for employment. The contractor and his/her subcontractors shall not discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions or privileges of employment, including a benefit plan or system or a matter directly or indirectly related to employment, because of race, color, religion, national origin, sex, age, height, weight, condition of pregnancy, marital status, physical or mental limitation, disability, source of income, familial status, educational association, sexual orientation, gender identity or expression, or HIV status. Breach of this section shall be regarded as a material breach of this Contract.

PROPOSAL

TO: Meridian Township
5151 Marsh Road
Okemos, MI 48864

RE: FOREST HILLS LIFT STATION REPLACEMENT 2026
WHITEHILLS LIFT STATION BYPASS 2026

Board of Trustees:

The undersigned, as a bidder, hereby declares that these bids are made in good faith, without fraud or collusion with any person or persons bidding on the same Contract, that he has read and examined the Advertisement, Instruction to Bidders, Proposal, Contract, General Conditions, Specifications, Special Provisions and Plans and understands all of the same; that he or his representative has made personal investigation at the site and has informed himself fully with regard to the conditions to be met in the execution of the Contract.

In submitting this bid, it is understood that the right is reserved by the Owner to reject any or all bids, to award the Contract to other than the low bidder, to award separate contracts for each project and/or phase, to waive irregularities and/or formalities, and in general, to make award in any manner deemed by it, in its sole discretion, to be in the best interest of the Owner.

It is further understood and agreed by the undersigned that any qualifying statement or conditions made to this proposal as originally published, as well as any interlineation, erasures, omissions or entered wording obscure as to its meaning, may cause the bid to be declared irregular and may be cause for rejection of the bid.

The undersigned agrees to start work within ten (10) days of issuance of the Notice to Proceed. The undersigned further agrees to complete all work covered by this Proposal to the point of use of the project by the Owner by the completion date stated in the Advertisement or within the number of calendar days stated in the Advertisement; and that for all days thereafter until final acceptance, there will be charged, as liquidated damages, the sum of $1,000.00 per calendar day per project for each and every day thereafter until final acceptance.

The bidder's agreement to pay prevailing wage rates is one relevant consideration that Meridian Township may make in its determination of which bidder should receive this contract. Meridian Township may thus consider in awarding this contract whether any bidder voluntarily pays employees and sub-contractors, directly upon the site of work, at least the prevailing wages and fringe benefits as determined and published by the United States Department of Labor for the Ingham County area.

Will the bidder voluntarily pay its employees and sub-contractors, directly upon the site of work, at least the prevailing wages and fringe benefits as determined and published by the United States Department of Labor for the Ingham County area. Please circle one below:

Yes or **No**

The undersigned hereby proposes to perform everything required to be performed and to furnish all labor, materials, tools, equipment and all utility and transportation services necessary to complete in a workmanlike manner all the work to be done under this Contract, including addenda thereto, for the sums set forth in the following Bidding Schedule:

FOREST HILLS LIFT STATION REPLACEMENT 2026
WHITEHILLS LIFT STATION BYPASS 2026
PROPOSAL

FOREST HILLS LIFT STATION REPLACEMENT

ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
1.	Traffic Control	1	LSum	$_____	$_____
2a.	Pavement Replacement	145	Tons	$_____	$_____
7.	Dewatering	1	LSum	$_____	$_____
8a.	Pump Station, Structures	1	LSum	$_____	$_____
8b.	Pump Station, Mechanical Items	1	LSum	$_____	$_____
8c.	Pump Station, Concrete	1	LSum	$_____	$_____
8d.	Pump Station, Control Panel	1	LSum	$_____	$_____
8e.	Pump Station, Generator	1	LSum	$_____	$_____
8f.	Sanitary Infrastructure, Removal	1	LSum	$_____	$_____
8g.	Helical Piles, Generator Pad	1	LSum	$_____	$_____
8h.	Helical Piles, Wet Well	1	LSum	$_____	$_____
8i.	Helical Piles, Valve Vault	1	LSum	$_____	$_____
10a.	Mobilization	1	LSum	$_____	$_____
10b.	Bypass Pumping	1	LSum	$_____	$_____
10c.	Gas Service	1	LSum	$_____	$_____
10c.	Electric Service	1	LSum	$_____	$_____
10d.	Electrical Permit, Mechanical Permit & Inspection (Township Allowance)	1	LSum	$ 1,000.00	$ 1,000.00
20a.	Sanitary Sewer, 12 inch, Connect to Lift Station Wetwell	1	Ea	$_____	$_____
20b.	Sanitary Sewer, Force Main, Connect to Lift Station	1	Ea	$_____	$_____
20c.	Sanitary Sewer, 6 inch, Force Main	1	LSum	$_____	$_____
20d.	Sanitary Sewer, 8 inch	1	LSum	$_____	$_____
20e.	Sanitary Sewer, 10 inch	1	LSum	$_____	$_____
20f.	Sanitary Sewer, 12 inch	1	LSum	$_____	$_____
21.	Sanitary Manhole, 48 inch	3	Ea	$_____	$_____
53a.	Soil Erosion and Sediment Control	1	LSum	$_____	$_____
54.	Site Restoration	1	LSum	$_____	$_____
54a.	Landscaping	1	LSum	$_____	$_____

WHITEHILLS LIFT STATION BYPASS

8j.	Permanent Bypass, Installation	1	LSum	$_____	$_____
8k.	Live Tap Force Main	1	Lsum	$_____	$_____
10a.	Mobilization	1	LSum	$_____	$_____
54.	Site Restoration	1	LSum	$_____	$_____

TOTAL BID: $_____

Give the name of the Owners and dates of other projects which the Bidder has constructed or has had responsible charge of construction:

NAME	**DATE**

The Bidder acknowledges that his bid is in accordance with the information contained in Addendum No. ____, ____, ____, ____.

The Bidder is hereby reminded that the Pay Items listed under the Bidding Schedule are the only items for which he will receive payment under this Contract. In the event that lesser or greater quantities of specific Pay Items are required to complete the work and place the system in operation, the total amount bid for the specific item will be adjusted by the unit price bid to the actual quantities utilized. In the event that an error is made in extending the unit prices, the Bidder is hereby notified that the unit prices as bid, will govern in determining the Total Base Bid. It is expressly understood and agreed that the Total Base Bid is the basis for establishing the amount of Bid Security on this Proposal and for comparison of bids only and is not to be constructed as a lump sum Proposal.

The undersigned attaches hereto a certified check or bidder's bond in the sum of not less than five percent (5%) of the Total Base Bid as required by the Advertisement and Instructions to Bidders and the undersigned agrees that in case he shall fail to fulfill his obligations under this Proposal and/or shall fail to furnish bonds, as specified, the Owner may, at its option determine that the certified check or amount of said certified check or bidder's bond accompanying this Proposal has been forfeited to the Owner, but otherwise the said certified check or bidder's bond shall be returned to the undersigned upon the execution of the Contract and acceptance of the bond.

The undersigned further agrees that this proposal shall be effective for a period of sixty (60) days from the date established for opening of all bids.

Date _____ Company Name _____

By _____ Address _____
Signature

_____ _____
Printed Name

Title _____ Phone Number _____

FOREST HILLS LIFT STATION REPLACEMENT 2026
WHITEHILLS LIFT STATION BYPASS 2026

THIS CONTRACT, dated _____, by and between _____, hereinafter called the "CONTRACTOR", and Meridian Township, 5151 Marsh Road, Okemos, MI 48864, hereinafter called the "OWNER".

WITNESSETH, that the CONTRACTOR and the OWNER for the consideration herein agree as follows:

ARTICLE I. SCOPE OF WORK.

The CONTRACTOR shall perform everything required to be performed and shall provide and furnish all labor, materials, necessary tools, expendable equipment and all utility and transportation services required to perform and complete in a workmanlike manner all the work required for constructing the project as described in the Advertisement and Proposal and for performing all related work for the OWNER, required by and in strict accordance with the plans and specifications, including any and all addenda, and other Contract Documents mentioned and made a part hereof.

ARTICLE II. THE CONTRACT PRICE.

The OWNER shall pay for constructing the project complete with all labor, materials, equipment, appurtenances, surface restoration and related work in strict accord with the Plans and Specifications, ready for use, the unit prices as listed in the Proposal and herein made a part of this Contract. Payment shall be made to the CONTRACTOR in accordance with and subject to the conditions specified under General Conditions.

ARTICLE III. TIME.

Time is of the essence in the performance of this contract. The CONTRACTOR agrees to start work within ten (10) days of issuance of the Notice to Proceed and to fully complete the work so as to permit use of the project by the OWNER by the completion date stated in the Advertisement or within the number of calendar days listed in the Advertisement.

ARTICLE IV. DELAYS AND DAMAGES.

If the CONTRACTOR refuses or fails to prosecute the work, or any separate part thereof, with such diligence as will insure its substantial completion, ready for use by the OWNER by the completion date stated in the Advertisement or within the number of consecutive calendar days stated in the Advertisement, or any extension thereof, or fails to complete said work within such time, the OWNER may, by written notice to the CONTRACTOR, terminate the CONTRACTOR's right to proceed with the work or such part of the work as to which there has been delay. In such event, the OWNER may take over the work and prosecute the same to completion by contract or otherwise, and the CONTRACTOR and his sureties shall be liable to the OWNER for any excess cost occasioned thereby. If the CONTRACTOR's right to proceed is so terminated, the OWNER will take possession of and utilize in completing work such materials, appliances, and plant as may be on the site of the work and necessary therefore.

If the OWNER does not terminate the right of the CONTRACTOR to proceed, the CONTRACTOR shall continue to work, in which event the actual damages for the delay will be impossible to determine and in lieu thereof the CONTRACTOR shall pay the OWNER the sum of one thousand dollars ($1,000.00) per day as fixed, agreed, and liquidated damages for each calendar day of delay until the work is substantially completed, ready for operation and the CONTRACTOR and his sureties shall be liable for the amount thereof. However, the right of the CONTRACTOR to proceed shall not be terminated or the CONTRACTOR charged with liquidated damages because of any delays in the completion of the work due to unforeseeable causes beyond control and without the fault or negligence of the CONTRACTOR, including, but not restricted to acts of God, or of the public enemy, acts of the OWNER, fires, floods, epidemics, quarantine restrictions, delays of subcontractors due to such causes, if the CONTRACTOR shall, within ten (10) days from the beginning of any such delay (unless the OWNER shall grant a further period of time prior to the date of final settlement of the Contract) notify the OWNER in writing of the cause of delay and extend the time for completing the work when, in OWNER's judgement, the finding of fact justify such an extension and OWNER's findings of fact thereon shall be final and conclusive on the parties thereto. In no event shall bankruptcy or labor disputes, or the like, either of CONTRACTOR or any of its subcontractors or suppliers, be considered as an unforeseeable cause beyond the control and without the fault or negligence of the CONTRACTOR.

ARTICLE V. COMPONENT PARTS OF THIS CONTRACT.

This Contract consists of the following component parts, all of which are as fully a part of the Contract as if herein set out verbatim, or, if not attached:

1. Advertisement
2. Instructions to Bidders
3. Proposal
4. Addenda
5. Contract
6. Bonds and Insurance
7. General Conditions
8. General Specifications
9. Ingham County Road Commission Specifications
10. Standard Specifications
11. Special Provisions
12. Plans
13. Notice of Award
14. Notice to Proceed

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed in three (3) original counterparts the day and year first above written.

_____

CONTRACTOR

WITNESS:

By: _____ _____

Title:

CHARTER TOWNSHIP OF MERIDIAN

OWNER

WITNESS:

By: _____ _____

Scott Hendrickson

Title: Supervisor

Date: _____

NOTICE OF AWARD
FOREST HILLS LIFT STATION REPLACEMENT 2026
WHITEHILLS LIFT STATION BYPASS 2026

Dated: _____

TO: _____

ADDRESS: _____
_____

CONTRACT: **FOREST HILLS LIFT STATION REPLACEMENT 2026**
WHITEHILLS LIFT STATION BYPASS 2026

You are notified that your Bid dated _____ for the above Contract has been considered. You are the apparent Successful Bidder and have been awarded a Contract for **Forest Hills Lift Station Replacement 2026.**

The Contract Price of your Contract is: **$ _____ .**

Three copies of each of the proposed Contract Documents accompany this Notice of Award.

You must comply with the following conditions within 10 days of the date you receive this Notice of Award.

1. Deliver to the OWNER **three** fully executed counterparts of the Contract Documents. (Each of the Contract Documents must bear your signature on page C-3.)

2. Deliver with the executed Contract Documents the Contract security (Bonds and Insurance) as specified in General Conditions (GC).

Failure to comply with these conditions within the time specified will entitle OWNER to consider your Bid in default, to annul this Notice to Award and to declare your Bid security forfeited.

Within ten days after you comply with the above conditions, OWNER will return to you one fully executed counterpart of the Contract Documents.

MERIDIAN TOWNSHIP

By: _____
Dan Opsommer
Deputy Township Manager
Director of Public Works & Engineering

NOTICE TO PROCEED

Dated: _____

TO: _____
_____

ADDRESS: _____
_____

CONTRACT: **FOREST HILLS LIFT STATION REPLACEMENT 2026**
WHITEHILLS LIFT STATION BYPASS 2026

You are notified that the Contract Times under the above Contract will commence to run on **_____, 2026** In accordance with Article III of the Contract, the date of Completion for the project is **June 15th, 2026.**

Deliver to **OWNER** an acknowledged copy of this Notice to Proceed.

MERIDIAN TOWNSHIP

By: _____
Younes Ishraidi, P.E.
Township Engineer/
Deputy Director of Public Works & Engineering

ACKNOWLEDGEMENT OF ACCEPTANCE OF NOTICE TO PROCEED

CONTRACTOR acknowledges acceptance of this Notice to Proceed this _____ day of _____.

By: _____

GENERAL CONDITIONS

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GC.1 CONTRACT SECURITY

The Contractor shall furnish a surety bond, by a duly authorized surety company satisfactory to the Owner, in an amount equal to 100 percent (100%) of the Contract price as security for the faithful performance of this Contract. The Contractor shall also furnish a separate surety bond, by a duly authorized surety company satisfactory to the Owner, in an amount equal to 100 percent (100%) of the Contract price as security for the payment of all persons performing labor and/or furnishing materials.

The surety company writing the bid, performance, labor and material, and maintenance bond shall be: 1) acceptable to the Owner, 2) be listed in the Federal Register as published by the U.S. Department of Treasury under most recently revised Circular 570; 3) have an A.M. Best Company's Insurance reporting rating of no less than A- (Excellent); and 4) authorized to do business in the State of Michigan by the Michigan Department of Licensing & Regulatory Affairs Office of Financial and Insurance Regulations. Upon request, the Contractor shall submit evidence of such insurance.

GC.2 CONTRACTORS' AND SUBCONTRACTORS' INSURANCE

The Contractor shall not commence work under this Contract until he/she has obtained all the insurance required under this section and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on his/her subcontract until all similar insurance required of the subcontractor has been so obtained and approved. Contractors and subcontractors are required to file with the Owner completed certificates of insurance, as evidence that they carry adequate insurance to comply with the requirement of this section. New Certificates of Insurance shall be furnished to the Owner at the renewal date of all policies named on these certificates.

A. <u>Policies, Coverages, and Endorsements</u>

The Contractor agrees to maintain, or to cause its personnel providing services under this Contract to maintain, at its sole cost and expense or the cost and expense of his personnel, the following insurance policies, with the specified coverages and limits, to protect and insure the Owner and Contractor against any claim for damages arising in connection with Contractors responsibilities or the responsibilities of Contractors personnel under this Contract and all extensions and amendments thereto.

1. Commercial General Liability

a.	General Aggregate	$2,000,000
b.	Each Occurrence	$1,000,000

Such insurance shall include, but not be limited to, coverage for:
Comprehensive form, Premises-operations, Explosion and collapse hazard, Underground hazard, Products/completed operations hazard, Contractual insurance, Broad form property damage, Independent contractor, Personal injury

2. Workers' Compensation & Employer' Liability (if applicable)

a.	Medical & Indemnity	Statutory Requirements
b.	Bodily Injury by Accident	$500,000 Each Accident
c.	Bodily Injury by Disease	$500,000 Each Employee
d.	Bodily Injury by Disease	$500,000 Policy Limit
e.	Employers Liability	$500,000

3. Automobile Liability

Including hired and non-owned Automobiles $1,000,000 (Combined Single Limit)
Such insurance shall include, but not be limited to, coverage for:
Comprehensive form, Owned vehicles, Hired vehicles, Non-owned vehicles

GC.2 CONTRACTORS' AND SUBCONTRACTORS' INSURANCE (Cont'd.)

B. Builder's Risk Insurance (Fire and Extended Coverage)

Until the project is completed and accepted by the Owner, the Contractor is required to maintain Builder's Risk Insurance (fire and extended coverage) on a 100 percent completed value basis on the insurable portion of the project for the benefit of the Owner, the Contractor, and subcontractors as their interests may appear.

C. Owner's Protective Liability

The Contractor shall procure and shall maintain during the life of this Contract Owner's/Contractor's Protective Liability Insurance, listing the Owner as the named insured. The minimum limit of liability shall be not less than $1,000,000.00 per occurrence/aggregate.

D. Insured Parties

All policies shall contain a provision naming the Owner, its Board of Trustees, agents, officers, employees, and volunteers as Additional Insured parties on the original policy and all renewals or replacements during the term of this Contract.

E. Acceptable Insurance Companies

All insurance companies required by this section shall be: 1) acceptable to the Owner; 2) authorized to do business in the State of Michigan by the Michigan Department of Licensing & Regulatory Affairs Office of Financial and Insurance Regulations, and 3) have an A.M. Best Company's Insurance reporting rating of no less than A- (Excellent). Upon request, the Contractor shall submit evidence of such insurance.

F. Indemnification and Hold Harmless

The Contractor shall, at its own expense, protect, defend, indemnify and hold harmless the Owner and its elected and appointed officers, employees, and agents from all claims, damages, costs, lawsuits and expenses, including, but not limited to, all costs for administrative proceedings, court costs and attorney fees that they may incur as a result of any acts, omissions, or negligence of the Contractor, its subcontractors, sub-subcontractors or any of their officers, employees, or agents. This includes but is not limited to injury or death to any person or persons, including the contractors employees, and damage to property. The furnishing by the Contractor of any insurance required by this Contract, or the acceptance or approval thereof by the Owner as provided in this Contract, or otherwise, shall not diminish the Contractor's obligation to fully indemnify the Owner, its elected and appointed officers, employees, and agents as required in this section.

The Contractor shall not cancel or reduce the coverage of any insurance required by this section without providing 30-day prior written notice to the Owner. All such insurance must include an endorsement whereby the insurer shall agree to notify the Owner immediately of any reduction by the Contractor. The Contractor shall cease operations on the occurrence of any such cancellation or reduction, and shall not resume operations until new insurance is in force.

GC.3 QUALIFICATION FOR EMPLOYMENT

The Contractor shall employ competent laborers and mechanics for the work under this Contract, and shall comply with all applicable regulations of the United States Department of Labor and any other agencies having jurisdiction.

GC.4 PROGRESS SCHEDULE

The Contractor, if requested by the Owner, immediately after being awarded the Contract, shall prepare and submit to the Owner and its representative an estimated progress schedule for the work in relation to the entire project. This schedule shall indicate the dates for the starting and completion of the various stages of construction.

GC.4 PROGRESS SCHEDULE (Cont'd.)

If the Contractor chooses to work overtime, they will be backcharged for inspection. Overtime is any Township recognized holiday and/or any time other than 8:00 a.m. to 5:00 p.m., local time, Monday through Friday. No work will be allowed at the site prior to 7:00 a.m. or after 7:00 p.m., or dusk, of any working day. No work will be allowed on Sundays with the exception of work necessitated by an emergency.

GC.5 ACCIDENT PREVENTION

Precaution shall be exercised at all times for the protection of persons (including employees) and property, and hazardous conditions shall be guarded against or eliminated. The Contractor is entirely responsible for all aspects of job safety and shall execute the work under this Contract in strictest conformance with all state and local safety codes, rules and regulations.

GC.6 CONTRACT PRICE SCHEDULE

The Contractor, if requested by the Owner, shall submit to the Owner a cost breakdown for the various items of the work. The schedule shall be prepared in a manner acceptable to the Owner as to both form and completeness and supported by data as necessary to substantiate its correctness.

GC.7 PAYMENT TO CONTRACTOR

The Contractor shall submit semi-monthly, or at longer intervals, if he so desires, an invoice covering work previously performed for which he believes payment, under the Contract terms, is due, and shall deliver said invoice to the Owner. Each request for payment shall be accompanied by a statement certifying that all bills for labor and materials have been paid up for all previous pay requests.

Each progress payment request shall be paid within one of the following time periods, whichever is later:

A. Thirty (30) days after the Owner has certified that the work is in place in the portion of the facility covered by the applicable request for payment in accordance with the documents.

B. Fifteen (15) days after the Owner has received the funds with which to make the progress payment from a department or agency of the federal or state government, if any funds for the facility are to come from either of these sources.

To assure proper performance of the Contract by the Contractor, the Owner shall retain ten percent (10%) of the dollar value of all work in place until the work is fifty percent (50%) in place. After the work is fifty percent (50%) in place, additional retainage shall not be withheld unless the Owner determines that the Contractor is not making satisfactory progress, or for other specific cause relating to the Contractor's performance under the Contract. In the event of such a determination the Owner may retain up to but not to exceed ten percent (10%) of the dollar value of the work more than fifty percent (50%) in place.

Any funds retained by the Owner shall not exceed the prorated share of the Owner's matching requirement if the project is funded, in part, with federal or state funds. Any retained funds shall not be commingled with other funds of the Owner and shall be deposited in an interest-bearing account in a regulated financial institution.

At any time after ninety-four percent (94%) of the work under the Contract is in place, and at the request of the Contractor, the Owner shall release the retainage plus interest, only if the Contractor provides to the Owner an irrevocable letter of credit in the amount of the retainage plus interest, issued by a bank authorized to do business in the State of Michigan, containing terms mutually acceptable to the Contractor and Owner.

Retainage shall be released to the Contractor together with the final progress payment.

GC.7 PAYMENT TO CONTRACTOR (Cont'd.)

Owner and Contractor agree that disputes concerning retainage, at the option of the Owner, shall be submitted to the decision of the agent as provided in Section 4 of Act 524 of the Michigan Public Acts of 1980 (MCLA 125.1564; MSA 5.2949 (104)) and that interest earned on retainage shall be released to the Contractor together with the final progress payment except as provided in said Section 4 of 1980 PA 524.

The final progress payment request by the Contractor shall include:

A. A final invoice in a form satisfactory to the Owner.

B. A sworn statement certifying that all bills for labor and materials have been paid by the Contractor.

C. A sworn statement waiving any further claims (other than the final payment, retainage and interest, if any) by the Contractor against the Owner.

D. A certificate from Contractor's bonding company approving issuance of final payment.

All payments shall take due account of additions to or deductions from the Contract price as herein provided.

The acceptance by the Contractor of payment on the final progress payment request shall be conclusive evidence of Contractor's acceptance and approval of estimates, accounting and deductions, and of full payment by the Owner for all work, labor, materials and services done or furnished hereunder, and a full satisfaction, discharge, release and waiver of all claims and demands of or on behalf of the Contractor, its agents or employees against the Owner arising out of this agreement.

GC.8 SUBCONTRACTING

The Contractor shall not award any work to any subcontractor, supplier, manufacturer or fabricator without prior written approval of the Owner, which approval will not be given until the Contractor submits a written statement to the Owner concerning the proposed award to the subcontractor. Said statement shall contain such information as the Owner may require.

The Contractor shall be as fully responsible to the Owner for the acts and omissions of his subcontractors and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by the terms of the General Conditions and other Contract documents insofar as applicable to the work of the subcontractors, and to give the Contractor the same power of terminating any subcontract that the Owner may exercise over the Contractor under any provision of the Contract documents.

Nothing contained in this Contract shall create any contractual relation between any subcontractor and the Owner.

GC.9 ASSIGNMENTS

The Contractor shall not assign the whole or any part of this Contract or any monies due or to become due hereunder without written consent of the Owner. In case the Contractor assigns all or any part of any monies due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to the Contractor shall be subject to prior liens of all persons, firms and corporations for services rendered or materials supplied for the performance of the work called for in this Contract.

GC.10 EXTRAS

Except as otherwise herein provided, no charge for any extra work or materials will be allowed unless the same has been ordered in writing by the Owner and the price stated in such order.

GC.11 CHANGES IN WORK/PAYMENT ADJUSTMENTS

Adjustments, if any, in the amounts to be paid by the Contractor by reason of changes in, additions to, or deductions from the work to be performed or the materials to be furnished under this Contract, shall be made on the basis of the acceptable unit prices or lump sums submitted by the Contractor covering such changes, additions or deductions.

Failing an acceptable lump sum or unit price basis for extra work caused by changes or additions, the Contractor may be directed to proceed with extra work on the basis of actual total cost of:

A. Labor, including foremen (including fringe benefits);

B. Materials entering permanently into the work;

C. The ownership or rental cost of construction plant and equipment during the time of use on the extra work at a rate not to exceed AGC rates;

D. Power and consumable supplies for the operation of power equipment;

E. Insurance;

F. Social Security and unemployment contributions.

To the cost of the six items above, there shall be added a fixed fee, to be agreed upon but not to exceed fifteen percent (15%) of the actual cost of the work. The single fee shall be compensation to both the Contractor and/or subcontractor to cover the cost of supervision, overhead, bond, profit and any other general expenses.

Failing an acceptable lump sum or unit price basis for adjustment for any decrease in work caused by changes or deductions, the amount of such adjustment may be determined on a similar basis to that described for extra work, with the Contractor furnishing all pertinent cost data from his/her books and records that may be available and necessary for determination of the amount of adjustment.

All changes in, additions to, or deductions from the work specified shall be made only by written order by the Owner or by an authorized representative of the Owner. No claim for extra work will be allowed, unless ordered in writing as above stated, and the claim therefore presented in writing by the Contractor on or before the fifth (5th) day of the month following that in which the work was done.

GC.12 TIME OF MAKING CLAIMS

If the Contractor shall claim compensation or extension of time for any losses, damages, or delays sustained by reason of the acts of the Owner or its agents or other causes, he/she shall make a written statement of the nature of the loss, damage, or delay sustained to the Owner, within ten (10) days after the sustaining of such loss, damage, or delay. At the time of delivery and as a part of the Contractor's Declaration as hereinafter provided, the Contractor shall file with the Owner an itemized statement of the details and amounts of the loss, damage, or delay, and unless the statement shall be made as thus required, the Contractor's claim for compensation or extension of time shall be forfeited and invalidated, and he/she shall not be entitled to payment or extension of time on account of any such loss, damage or delay.

GC.13 MATERIALS, SERVICES, AND FACILITIES

It is understood that except as otherwise specifically stated in the Contract documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, superintendence, temporary construction of every nature and all construction facilities whatsoever necessary to execute, complete, and deliver the work within the specified time.

Any work necessary to be performed after regular working hours, or Sundays and legal holidays, shall be performed without additional expense to the Owner.

GC.14 TERMINATION FOR BREACH

In the event that any of the provisions of this Contract are violated by the Contractor or by any of his subcontractors, the Owner may serve written notice upon the Contractor and the Surety of its intention to terminate the Contract, such notice to contain the reasons for terminating the Contract, and unless within ten (10) days after the serving of such notice upon the Contractor, the violation shall cease and satisfactory arrangements for correction be made, the Contract shall cease and terminate. In the event of a termination of the Contract, the Owner shall immediately serve notice thereof upon the Surety and the Contractor, and the Surety shall have the right to take over and perform the Contract.

However, if the Surety does not commence performance thereof within 30 days from the date of mailing said Notice of Termination to such Surety, the Owner may take over the work and prosecute the same to completion by contract for the account and at the expense of the Contractor. The Contractor and his Surety shall be liable to the Owner for any excess cost incurred by the Owner in completing the work, and Owner may take possession of and utilize in completing the work, all materials, appliances and plants as may be on the site of the work and necessary therefore.

GC.15 OWNER'S RIGHT TO WITHHOLD CERTAIN AMOUNTS AND MAKE APPLICATION THEREOF

The Owner may withhold a sufficient amount of any payment otherwise due to the Contractor to cover:

A. Payments that may be past due and payable for just claims for labor, materials, or equipment furnished in and about the performance of the work on the project under this Contract.

B. For defective work not remedied.

C. For failure of the Contractor to make proper payments to his subcontractors.

The Owner shall disburse and shall have the right to act as agent for the Contractor in disbursing such funds as have been withheld pursuant to this paragraph to the party or parties who are entitled to payment therefrom. Any payment so made by the Owner shall be considered as a payment made under the Contract by the Owner to the Contractor. The Owner will render to the Contractor a proper accounting of all funds disbursed in behalf of the Contractor.

GC.16 SUPERINTENDENCE

The Contractor shall give his/her personal superintendence to the work or have a competent foreman or superintendent, satisfactory to the Owner, on the worksite at all times during work progress, with authority to act for the Contractor.

GC.17 NOTICE AND SERVICE THEREOF

Where in any of the Contract documents there is any provision in respect to the giving of any notice, such notice shall be deemed to have been given; as to the Owner, when written notice shall be delivered to the Owner, or shall have been placed in United States mails with first-class postage pre-paid addressed to the chief executive officer of the Owner at the place where the bids or proposals for the Contract were

opened; as to the Contractor, when a written notice shall be delivered to the chief representative of the Contractor, at the site of the project or by mailing such written notice in the United States mails with first-class postage pre-paid addressed to the Contractor at the place stated in the papers prepared by him to accompany his proposal as to the address of his permanent place of businesses; as to the Surety, when a written notice is placed in the United States mails with first-class postage pre-paid addressed to the Surety at the home office of such Surety or to its agent or agents who executed bonds in behalf of such surety.

GC.18 COMPLIANCE WITH LAW, APPLICABLE LAW, AND VENUE

The Contractor shall comply with all applicable Federal, State, County, and Municipal laws, ordinances, rules and regulations.

This contract shall be construed according to the laws of the State of Michigan.

The venue for the bringing of any legal or equitable action under this contract shall be the County of Ingham, of the State of Michigan. In the event that any action is brought under this Contract in Federal Court, the venue for such action shall be the Federal Judicial District of Michigan, Western District, Southern Division.

GC.19 PERMITS

The Township will secure and pay for the Building Permit from the Meridian Township Building Department. All other permits or licenses which may be needed for prosecution of the work are to be obtained by the Contractor at the Contractor's expense.

GC.20 ROYALTIES AND PATENTS

The Contractor shall pay for all royalties and patents, and defend all suits or claims for infringement on any patent right, and shall save and hold harmless the Owner from loss on account thereof.

GC.21 INSPECTIONS

The Owner and its representative shall at all times have access to the work wherever it is in preparation or progress and the Contractor shall provide facilities for such access and for inspection.

The Owner and/or its representative shall have the right to reject materials and workmanship which are defective, or require their correction. Work on the project may be ordered terminated until correction is made. Rejected workmanship shall be satisfactorily corrected, and rejected materials shall be removed from the premises without charge to the Owner. If the Contractor does not correct condemned work and remove rejected materials within a reasonable time, fixed by written notice, the Owner may remove them and charge the expense to the Contractor.

Should it be considered necessary or advisable by the Owner at any time before final acceptance of the entire work to make an examination of work already completed, by removing or tearing out same, the Contractor shall on request promptly furnish all necessary facilities, labor, and materials. If the work is found to be defective in any material respect, due to fault of the Contractor or their subcontractors, they shall defray all the expenses of examination and satisfactory reconstruction. If, however, the work is found to meet the requirements of the Contract, the actual cost of labor and material necessarily involved in the examination and replacement, plus 15 percent (15%) shall be allowed the Contractor.

GC.22 CORRECTION OF WORK AFTER FINAL PAYMENT

Neither the final payment nor any provision in the Contract documents nor partial or entire occupancy of the premises by the Owner shall relieve the Contractor of the responsibility for negligence or faulty materials or workmanship within the extent and period provided by law, and, upon written notice, he/she shall repair any defects due thereto and pay for any damage due to other work resulting

therefrom, which shall appear within **one year** after date of completion and acceptance.

GC.23 PROTECTION OF WORK

The Contractor shall continuously maintain adequate protection of all his/her work from damage and shall protect the Owner's and adjacent property from injury arising in connection with this Contract, and shall be responsible for all damage and/or injury caused by or arising out of his operations.

GC.24 USE OF JOB SITE

The Contractor shall confine his/her equipment apparatus, the storage of materials and operations of his/her workmen to limits indicated by law, ordinances, permits or directions of the Owner and shall not encumber the premises with his materials.

GC.25 "OR EQUAL" CLAUSE

Whenever in any of the Contract documents an article, material or equipment is defined by describing a proprietary product, or by using the name of a manufacturer or vendor, the term "or equal" if not inserted, shall be implied. The specific article, material or equipment mentioned shall be understood as indicating the type, function, minimum standard of design, efficiency, and quality desired and shall not be construed in a manner so as to exclude manufacturer's products of comparable quality, design and efficiency. The Contractor shall comply with the requirement of the Contract documents relative to the Owner's approval of materials and equipment before they are incorporated in the project.

GC.26 PLANS AND SPECIFICATIONS

The Contractor shall keep on the worksite a copy of the drawings and specifications and shall at all times give the Owner access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like affect as if shown or mentioned in both. In case of difference between drawings and specifications the specifications shall govern. In any case of discrepancy in the figures, drawings or specifications, the matter shall be immediately submitted to the Owner, without whose decision said discrepancy shall not be adjusted by the Contractor, save only at his/her own risk and expense.

The Owner shall furnish from time to time such detail drawings and other information as he/she may consider necessary, unless otherwise provided. The Contractor shall keep such drawings at the site of the work.

GC.27 OWNER'S RIGHT TO DO WORK

If the Contractor should neglect to prosecute the work properly or fail to perform any provision of this Contract, the Owner three (3) days after given written notice to the Contractor and his/her Surety may, without prejudice to any other remedy the Owner may have, make good such deficiencies and may deduct the cost thereof from the payment due to the Contractor.

GC.28 CLEANING UP

The Contractor shall at all times keep the premises free from accumulations of waste material or rubbish caused by his/her employees or work, and at the completion of the work he/she shall remove all his/her rubbish from and about the work and all his/her tools, equipment, scaffolding and surplus materials and shall leave his/her work clean and ready for use. In case of dispute, the Owner may remove the rubbish and surplus materials and charge the cost to the several Contractors in proportion to the amounts as shall be determined to be just.

GC.29 REPORTS, RECORDS AND DATA

The Contractor and each of his/her subcontractors shall submit to the Owner such schedules of quantities, costs, progress schedules, payrolls, reports, estimates, records, and other data as the Owner may request concerning work performed or to be performed under this Contract.

GC.30 NON-DISCRIMINATION IN EMPLOYMENT

The Contractor shall adhere to all applicable Federal, State and local laws, ordinances, rules and regulations prohibiting discrimination with regards to employees and applicants for employment. The Contractor, as required by law, shall not discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions or privileges of employment, or a matter directly or indirectly related to employment because of race, color, religion, national origin, age, sex, height, weight, marital status, or handicap that is unrelated to the individual's ability to perform the duties of a particular job or position. Breach of this section shall be regarded as a material breach of this Contract.

GC.31 DEFINITIONS

The following terms as used in these Contract documents are respectively defined as follows:

(a)	"Contractor"	The person, firm or corporation to whom the within Contract is awarded by the Owner and who is subject to the terms hereof.
(b)	"Subcontractor"	A person, firm or corporation other than a Contractor, supplying labor and materials or labor for work at the site of the project.
(c)	"Project"	The total construction proposed by the Owner to be constructed in part or in whole pursuant to the within Contract.
(d)	"Work on the Project"	Work to be performed, including work normally done, at the location of the project.
(e)	"Surety"	Any person, firm or corporation that has executed, as surety, the Contractor's performance and/or labor and material bonds securing the attached Contract.
(f)	"Owner"	The public body or authority for whom the work is to be performed and as identified in the advertisement and proposal.
(g)	"Engineer"	The Director of Public Works and Engineering for the Meridian Township or their authorized representative.

GENERAL SPECIFICATIONS

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GS.1 DEFINITION

The Contractor shall furnish all materials specified herein, shown on the plans, and required to be incorporated in the work of the Contract. They shall furnish all labor, construction equipment, tools, supplies and facilities required to construct the elements designated by the Contract documents and shall construct all of the designated elements complete and in full conformance with the requirements of these documents. They shall comply with all regulatory provisions of the Contract, General Conditions and the Specifications.

GS.2 ELEVATIONS

All the elevations shown on the plans or referred to herein are in feet above mean sea level datum as established by the United States Geological Survey, unless otherwise noted. The Contractor shall verify all the existing structure locations and elevations at points of connection or possible interference between their work and the existing structures and shall report at once to the Engineer any interference's or discrepancies discovered.

GS.3 QUALITY OF MATERIALS AND EQUIPMENT FURNISHED

All materials and equipment furnished by the Contractor hereunder shall be new and conform to specifications herein.

Materials, supplies, and equipment, whether furnished by the Contractor or the Owner, shall be stored at the site of the work in such manner as not to interfere with traffic, convenience to public or other Contractors on the site or in the vicinity. The Contractor shall be responsible for any damage caused to new or existing structures by reason of such storage or handling of materials, supplies, or equipment.

Flammable materials in portable containers are not to be stored overnight on the site. This includes, but is not limited to, gasoline and diesel fuel for use in construction machinery. Portable containers

suitably protected, will be allowed overnight at the site, if confined to permanent tanks which are a normal part of the construction machinery.

GS.3 QUALITY OF MATERIALS AND EQUIPMENT FURNISHED (Cont'd.)

Where the Contractor is required to do work within rights of way under the jurisdiction of governmental bodies, they shall meet the requirements of said governmental bodies for work and storage within their jurisdiction. Such requirements must be met as a minimum requirement, and if the specifications given herein impose further limitation on the work, they shall also be met as the required work standard.

The Contractor's attention is directed to the Ingham County Road Department permit specifications, Section 5. Restoration and Maintenance of Right-Of-Way (e.), for dust control requirements.

GS.4 CARE OF EXISTING STRUCTURES

The Contractor shall be solely responsible for any damage to any existing underground services or structures, or to structures and roadway above ground caused by their operations or those of their subcontractors and suppliers.

GS.5 CARE OF NEW STRUCTURES

The Contractor shall use every reasonable precaution to prevent injury to the new structures being constructed hereunder. They shall be responsible to correct all injury or damage resulting from their operations and/or occurring while the work is under their supervisory control. They shall furnish and install such guards, coverings and other protection as may be needed to insure that the structures remain undamaged prior to completion of the entire work.

In the event damage does occur to the finished portions of the work, or to the work in progress, the Contractor shall take such corrective action and measures as may be necessary to repair the damage to the satisfaction of the Engineer.

GS.6 EXISTING PUBLIC UTILITIES

Existing public utilities and underground structures such as pipelines, electric conduits and sewers are shown on the drawings from available information. The Contractor shall, through Miss Dig and any other reasonable measures, verify the exact location of underground utilities for themselves.

The Contractor shall conduct their operations so as not to damage any existing utility whether or not shown on the plans. The Contractor shall correct, at their own expense, any damage or injury that may be caused by them during their operations or damage or injury caused during the operations of their subcontractors or suppliers.

The Contractor shall be responsible for coordinating relocation or repair of existing public and private utilities with the appropriate utility or owner. No extra payment will be allowed for repairs.

If the Contractor desires, or is required by the utility companies, to relocate any power or telephone poles to facilitate their work, any expense encountered from such relocation shall be borne by the Contractor.

GS.7 PROTECTION OF TREES AND SHRUBS

All trees and shrubs encountered along the route of the project shall be protected from damage by the Contractor and saved from harm resulting from any of their operations or operations of their subcontractors and suppliers. Only those trees and shrubs marked for removal on the plans shall be removed. All others will be saved from damage by tunneling or by slightly adjusting the alignment of the project as directed by the Engineer.

GS.8 SAFETY PRECAUTIONS

During the progress of the work, the Contractor shall maintain adequate facilities for the protection and safety of all persons and property. The Contractor and all their subcontractors and suppliers shall comply with the "Construction Safety and Health Standards" as published by the Michigan Occupational Safety and Health Administration, and to all other local, state and federal laws, ordinances, rules and regulations pertaining to safety of persons or property.

GS.9 SANITARY REQUIREMENTS

The Contractor shall provide adequate sanitary facilities for all persons employed on this Project. The sanitary facilities shall conform in every way to the requirements of the "Construction Health and Safety Standards" as published by the Construction Safety Standards Commission of the State of Michigan.

GS.10 UTILITIES

The Contractor shall make all necessary arrangements for the provision of all utility services required to prosecute the work under this Contract. The Contractor shall pay the costs for such connections and service. Where the Owner has utility service at the site, the Contractor may obtain service by connection to the Owner's service, subject to reasonable regulation of its use and satisfactory agreement as to charges. In the event that the Contractor's use of any or all of the Owner's utility services causes the Owner to have an inadequate supply of such service, the Contractor shall disconnect said service and provide their own separate supply at no cost to the Owner.

All utility services shall be inspected by and meet the requirements of the applicable local codes and governmental bodies.

GS.11 PUMPING AND DRAINAGE

Adequate pumping and drainage facilities shall be provided and water from whatever sources entering the work during any stage of construction shall be removed promptly and disposed of. All pumping and drainage shall be done with no damage to property or structures and without interference with the right of the public, owners of private property, pedestrians, vehicular traffic, or the work of other contractors. Dewatering shall be done in such a manner that the soil under or adjacent to existing structures shall not be disturbed, removed or displaced.

The overloading or obstructing of existing drainage facilities shall not be permitted, and the Contractor shall be solely responsible for damages caused to such existing drainage facilities by their operations. Additionally, sufficient measures shall be utilized to prevent migration of soil from the site due to any pumping or drainage activities.

GS.12 WINTER CONSTRUCTION

The Engineer has authority over approving the prosecution of work which is proposed to be done during the winter months. The Contractor shall provide adequate weather protection, temporary heating and take any other measures which are necessary to ensure that work performed during the winter months is properly installed and protected against damage from freezing.

Reference is made in Division 4 of the Technical Specifications to the requirements for performing concrete construction and masonry construction in cold weather.

GS.13 USE OF FACILITIES BEFORE FINAL COMPLETION

The Owner shall have the right to make use of, during construction, such portions of completed and acceptably tested facilities as it finds practicable. Such use by the Owner shall not relieve the Contractor from responsibility for any defective work which may be subsequently discovered.

GS.14 TEST OF MATERIALS

All laboratory tests, except as otherwise noted, are to be made at the expense of the Contractor as specified in the Technical Specifications. The Contractor shall furnish satisfactory containers for taking and shipping samples. The name of the laboratory making the test must be submitted by the Contractor to the Engineer for approval.

In all cases "laboratory" refers to an independent laboratory of recognized standing. Acceptance of materials tested shall be based upon compliance with the specifications hereinafter stated for the various items. Where no particular tests are specified, the tests shall be those normally made for determination of the fitness of the particular material. Certificates of tests shall be furnished by the testing laboratory or producer, in triplicate, to the Engineer.

The Owner may require, at its own option and expense, additional mill and/or shop inspection by competent parties. The Owner may require, at its own option and expense, additional field inspection by a qualified inspector.

All materials failing to meet the requirements of the specifications, as determined by test or otherwise, shall be rejected and not used in the work. The cost of testing materials which fail to meet requirements shall be paid by the Contractor. All follow-up testing required shall also be paid by the Contractor. Materials, if rejected at the site, shall be immediately removed therefrom and shall not be used in the work.

GS.15 OTHER WORK

The Contractor shall cooperate with other Contractors on the site or adjoining work to the end that the entire Project may proceed with the utmost harmony and with a minimum of delay.

Where the work under this Contract is to involve work completed under other contracts or existing facilities or structures, the Contractor shall investigate the condition of such other work or facility to determine its suitability for incorporation into the work of this Contract. Any defect or discrepancy in other work of facility making it unsuitable for proper execution of this Contract shall be immediately reported to the Owner who shall order such adjustments in the work of the project as necessary for proper completion, and unless such defect or discrepancy is reported promptly, the Contractor shall be solely responsible for any adjustments in the work as shall be found necessary to properly complete the work on this project.

GS.16 LINES AND GRADES

General control lines and grades will be established by the Owner. The Contractor shall notify the Engineer no less than 48 hours prior to requiring such control. The Contractor shall furnish all stakes and labor for driving them and rodmen to assist the Owner in this work. The Contractor shall carefully preserve the general control lines and grades established by the Engineer. The cost of replacement of stakes which are damaged or lost shall be borne by the Contractor.

Construction lines and grade shall be transferred and set by the Contractor from the control lines and grades established by the Engineer, and the Contractor shall furnish necessary instruments and competent personnel for performing such work, and they shall be responsible for the accuracy of the transferred line and grade. The Owner will check the work at intervals, as it deems necessary, and

the Contractor shall make correction of error, if any, at their own expense, as may be required for the proper function and performance of the structure and installed equipment.

GS.17 COMPLETE WORK REQUIRED

It is the intent of the Contract documents to provide that the Project to be constructed under this Contract will be complete and ready for use. Any minor items not specifically called for on the plans or specifications, but which are clearly necessary, are to be included.

GS.18 PROPERTY MARKERS

The Contractor shall take precautions not to move or destroy any monuments or stakes marking the boundaries of property along or near the work. A licensed surveyor shall reestablish property irons in the proper location if disturbed. Buried property irons shall be extended 1/2" diameter rods. The Contractor shall pay for reestablishment.

GS.19 RECORDS AND MEASUREMENTS

The Contractor shall keep careful records showing measured overall length of underground facilities installed and distances of such from any available line as may be designated by the Engineer. Such records shall be turned over to the Engineer as the work progresses and the records must be accurate and complete.

GS.20 GUARANTEE

The Contractor shall guarantee and shall secure from the manufacturer of each item of manufactured equipment used in the project a written guarantee that all materials and equipment furnished by them shall be first class and free from defects, and the guarantor agrees that they will, upon notice and without delay, make good or repair without expense to the Owner the whole or any part of the equipment furnished by them hereunder, which within a year from date of acceptance of that portion of completed work incorporating such equipment shall fail or develop unfitness for the purpose for which it is intended as a result of any defect in design, material, workmanship, erection or construction.

INGHAM COUNTY ROAD DEPARTMENT
SUPPLEMENTARY PERMIT SPECIFICATIONS FOR UTILITY INSTALLATIONS

As referred to herein:
"Board" shall denote the Board of Ingham County Road Commissioners or its duly appointed agents.
"Utility" shall denote any cable, conduit, pipe, structure, or similar facility installed within the road right-of-way.
"Contractor" shall denote an individual or legal entity contracted to perform a proposed utility's installation.

1. GENERAL

a. All proposed utility installations within county road right-of-way shall be reviewed and approved by means of a permit issued by the Board, regardless of the type, size, location, or installation method. The Board shall have absolute authority over any work to be performed within the county road right-of-way and shall exercise said authority at its discretion. The Board reserves the right to impose, at its discretion, cash bond requirements for any permit granted. The cash bond may be used to reimburse the Board for work not performed by the Contractor, restoration of roadways caused by Contractor activities, costs associated with detour signing, and other reasonable expenses incurred by the road commission.

b. The Board shall have the authority to direct any work or stop any work, permitted or not permitted, that in its opinion is not being performed to the Board's satisfaction. All costs for corrective work or work stoppages shall be the responsibility of the Contractor.

c. To issue a utility installation permit, the applicant must provide drawings that illustrate all the work to be performed, the method of installation, and materials to be used. If road or lane closures are proposed, along with the information required below, the approximate start and completion date shall be provided on the permit application.

2. ROAD CROSSINGS

a. All proposed utility crossings of county roads shall be performed using methods other than open cut methods unless otherwise permitted by the Board. The following are general specifications or provisions to be followed when installing utilities using methods other than open cut methods.

1. The methods of utility installation described in this section include, but are not limited to, tunneling, bore and jacking, and directional boring. These methods represent preferred installation methods and are employed to allow installation of utility road crossings without closing the road to through traffic or damaging the existing road pavement. The Board, at its discretion, may require that a particular installation method be employed by the Contractor.

2. When a utility is to be installed by tunneling methods, the tunnel shall be adequately sheeted and shored to prevent the tunnel walls from collapsing and the road pavement from settling or cracking.

3. When a utility is to be installed by bore and jacking methods, a casing pipe will be required with the utility to be installed inside the casing pipe. The annular space between the utility and the casing pipe shall be filled and sealed using pressure grouting or other approved methods.

4. All shafts or pits not sheeted and shored shall be located, at least, 10 feet off the edge of road pavement in rural sections and 6 feet behind the back of curb in urban sections.

5. If any settlement or other changes in grade occur in the vicinity of the utility crossing within one year of the work, upon notification the road shall be immediately reconstructed to the proper grade at the Contractor's expense. In addition, damage to the roadway embankment, shoulder, and pavement shall also be immediately repaired to the Board's satisfaction.

6. Unless otherwise approved by the Board, all utilities shall have a minimum cover of 4 feet below the road surface. Where approved construction plans indicate cover greater that 4 feet, the plan depth shall govern.

7. All costs for maintaining traffic, including flagging operations, shall be the responsibility of the permitted party. Traffic control shall be erected in accordance with the current edition of the Michigan Manual of Uniform Traffic Control Devices (MMUTCD) or as directed by the Board. Modifications to traffic control measures may be ordered by the Board, at its discretion, and the cost of any modifications shall be the responsibility of the Contractor. Once work is completed for the day, traffic control signs which are not appropriate shall be covered or removed so that the motoring public is made aware of the road's condition and how to safely traverse through the work zone.

8. If, in the opinion of the Board, traffic conditions warrant suspension of utility installation operations and restoration of a road's full capacity, the Contractor shall comply immediately. All costs associated with such an action shall be borne by the Contractor.

b. If the Board permits a proposed utility crossing of a county road using open cut methods, the following general specifications or provisions shall be followed:

1. Large projects that involve many utility crossings and or may extend for several months shall be completed in "sections". The intent being, that once a particular crossing, of many, is completed or a 1/4 mile "section" of a multi-mile utility has been installed, the Contractor shall restore the road and right-of-way to the satisfaction of the Board before moving on to the next crossing or section of utility installation.

2. In general, open cut utility crossings will not be allowed during winter months.

3. Open cut utility crossings shall be performed during off-peak traffic hours unless specifically permitted by the Board. Off-peak hours vary, but they are typically between the hours of 9:00 am to 3:00 pm.

4. Unless otherwise approved by the Board, all utilities shall have a minimum cover of 4 feet between the utility and the road surface. Where approved construction plans indicate cover greater that 4 feet, the plan depth shall govern.

5. All costs for maintaining traffic, including flagging operations, shall be the responsibility of the permitted party. For road closures intended to last one or two days, the contractor will submit a deposit with the permit application, the Ingham County Road Department will set up, maintain, and dismantle the road closure, the actual costs incurred will be subtracted from the deposit and the remainder returned to the contractor. If incurred costs exceed the deposit, the contractor will be billed for the overage. For road closures intended to last an extended period of time, the Contractor shall set up, maintain, and dismantle the closure per the approved detour plan. Regardless, traffic control shall be erected in accordance with the current edition of the Michigan Manual of Uniform Traffic Control Devices (MMUTCD) or as directed by the Board. All traffic control schemes are to be approved prior to the beginning of work. Modifications to traffic control measures may be ordered by the Board, at its sole discretion, and the cost of any modifications shall be the responsibility of the Contractor.

6. If a proposed road closure is not permitted, at least one lane of traffic shall be maintained with proper flagging operations in effect throughout the work day. Road cuts shall be backfilled, flush with the driving surface at the end of each working day, appropriately signed, and opened for overnight traffic. Depending on traffic volumes and other conditions, the Board may require the permit applicant to provide by-pass lanes (either paved or unpaved) to maintain traffic.

7. Maintenance of open cut work zones is the responsibility of the Contractor and shall be in effect 24 hours a day for the duration of the work.

3. PAVEMENT AND GRAVEL SURFACE REMOVAL AND REPLACEMENT

a. All proposed open cut utility installations or existing utility installations needing corrective reconstruction shall conform to the following specifications or provisions:

1. All pavement to be removed shall be saw cut, full depth, to its removal limit and carefully removed as to not damage the saw cut edge. All damaged edges shall be subsequently saw cut and removed back to sound pavement. The pavement removal limit shall extend, at least, 1 foot beyond both sides of the open cut trench.

2. Both bituminous and concrete pavement removal shall have a minimum width of 6 feet, be perpendicular to the centerline of the road, and extend the full width of existing lanes. Diagonal pavement removal and replacements will not be allowed unless approved by the Board.

3. Concrete pavement removal limits are to utilize existing joints whenever possible. The minimum distance between a concrete replacement slab and an existing pavement joint shall be 5.5 feet unless approved by the Board. The Contractor shall verify concrete pavement removal limits with the Board prior to pavement replacement.

b. Pavement replacement and gravel road surface restoration shall conform to the following specifications or provisions:

1. Aggregate base material under pavement shall be a minimum of 8-inches thick and meet MDOT 21AA or 22A aggregate specifications, as determined by the Board. The proposed aggregate base material shall conform to the characteristics of the insitu aggregate base material as much as possible. Bituminous pavement replacement shall either match the existing pavement thickness or be 5-inches thick, whichever is greater, and utilize hot mix asphalt materials that meet or exceed MDOT 13A bituminous mix specifications. Concrete pavement replacement shall either match the existing pavement thickness or be 7-inches thick, whichever is greater, and utilize 4500 psi strength concrete that meets or exceeds MDOT specifications. Concrete pavement patch size and geometry shall be determined by the Board and shall be doweled into adjacent concrete pavement. Aggregate surfaced roads and shoulder material shall be a minimum of 6-inches thick and meet MDOT 22A or 23A aggregate specifications. Aggregate base shall be compacted to 95% of its maximum density, hot mix asphalt is to be compacted to 97% of its maximum density, and aggregate shoulder material shall be sufficiently graded and compacted to prevent standing water and erosion problems.

2. The finished driving surface shall be installed to conform to the vertical profile of the existing roadway and not exhibit “dips” or “humps” that are noticeable to the motoring public. “Mounding” over excavations to allow for future settlement will not be permitted. If settling or upheavals occur at pavement replacement locations, the Contractor may be required to remedy the situation. Failure to do so may result in a stoppage of subsequent work or denial of subsequent permits.

3. Bituminous pavements shall not be replaced using lifts that exceed 250 lbs/syd (2 1/4 inches thick). A tack coat emulsion shall be applied between successive lifts of bituminous paving.

4. Replacement concrete pavement shall be doweled into adjacent pavement using 18-inch long by #9 and #5 epoxy coated deformed bars. The dowels shall be drilled, inserted 9-inches, and grouted in accordance with current MDOT specifications. Dowels installed along the pavement edge, parallel to the lane lines (#9), shall be spaced at 18-inches on center. Dowels installed along the pavement edge, perpendicular to the lane lines (#5), shall be spaced at 24-inches on center.

5. Composite pavements, such as asphalt overlaying concrete pavement shall be replaced to match the existing pavement structure using the same provisions described above. If approved by the Board, composite pavements may be replaced with full depth asphalt equal in thickness to the existing pavement structure.

4. BACKFILLING AND COMPACTION

a. All utility trenches, holes, bore pits, and other excavations within the county road right-of-way shall be backfilled with granular material that meets or exceeds MDOT class II material. Excavation backfill shall be placed and compacted to 95% of its maximum density in successive layers that are no more than 12-inches thick. In-place backfill density shall be verified and reported to the Board by an independent testing laboratory. The cost of said verification and reporting shall be the responsibility of the Contractor. The above backfilling and compaction provisions shall apply to that portion of the subgrade that is within the influence of the roadway pavement structure, including the shoulder. Refer to MDOT Trench Detail "B". Failure to meet said backfill and compaction requirements may result in a stoppage of subsequent work, replacement of deficient backfill, and denial of subsequent permits.

b. All under drain systems and similar facilities destroyed or disturbed due to the utility installation shall be rebuilt using similar materials and in a manner that completely restores their function.

5. RESTORATION AND MAINTENANCE OF RIGHT-OF-WAY

a. All drainage courses shall be restored with topsoil, seed, and mulch immediately after completion of utility installations. The Contractor shall employ and maintain soil erosion and sedimentation measures to stabilize all disturbed grounds per the Ingham County Drain Commissioner's (ICDC) standards. Disturbed drainage courses or backslopes that have steep grades, as determined by the Board, shall be stabilized with mulch blanket, rock check dams, or both. The Contractor shall follow ICDC and Michigan Department of Environmental Quality (MDEQ) Best Management Practices (BMS) for soil erosion and sedimentation control.

b. All existing storm sewer, drainage structures, culverts, and similar facilities shall be protected during utility installation. If permitted by the Board and the structure owner, the Contractor may remove and replace said facilities if needed for utility installation. All replacement facilities shall be in accordance with current agency (owner) requirements for materials and construction standards, regardless of existing condition. Any damaged facilities left in place during utility installation shall be fully repaired to the satisfaction of the Board, or be replaced in accordance with current agency (owner) requirements. It is the responsibility of the contractor to research and obtain permission from the appropriate "owner" for the proposed work.

c. All traffic signs requiring replacement or that need to be relocated due to utility installation shall be replaced or relocated by Ingham County Road Department personnel and their costs reimbursed by the Contractor.

d. Encroachments (private installations) within the road right-of-way, such as fences, mailboxes, and hedges that must be removed due to utility installation may be replaced or re-installed, within the right-of-way, upon approval of the Board. In general, removed objects, other than mailboxes, cannot be re-installed within the road right-of-way. Please be aware that the Ingham County Road Department will not become involved with negotiations between the utility owner and property owners relative to encroachment removal and replacement, but the Board will ultimately approve or disapprove whether replacements are allowed, and their subsequent locations.

e. The Contractor shall maintain a safe work area, free from dust and free from dirt and mud being tracked onto the adjacent roadway. The Contractor shall make arrangements to have paved roads swept and gravel roads treated with dust palliative for the duration of installation activities. If requested by the Board, the Contractor shall sweep roads or apply dust palliative within 4 hours of the request. Failure to do so may result in a stoppage of work.

6. MANHOLE CASTING, VALVE, AND FIRE HYDRANT LOCATIONS

a. Permitted utility manhole structures and vaults shall conform to the following specifications or provisions:

1. In general, proposed manhole castings and valve boxes shall be located outside the paved road surface and somewhere other than in the roadside ditch. If approved by the Board, manhole castings and valve boxes installed within a paved surface or parkway shall be located flush with the existing surface, manhole castings and valve boxes installed within the traveled portion of a gravel road shall be located 6-inches below the road's surface, and manhole castings and valve boxes installed in a ditch bottom shall be located, at least 12-inches below the ditch bottom. The contractor may be required to re-route the ditch around manhole castings and valve boxes, at the discretion of the Board.

2. Manhole castings and valve boxes shall not protrude from the backslope of the road or above the normal ground contour by more than 6-inches. The contractor may be required to adjust a manhole casting or regrade the area, to the Board's satisfaction, at their expense.

3. Proposed manhole casting and valve box type shall be approved by the Board prior to the start of installation. If at any future time it is determined that the type of casting or valve box must be changed due to road reconstruction, widening, resurfacing, etc., the utility owner agrees, by performing under permit, to bear all costs for the change

4. Proposed fire hydrant installations shall be approved by the Board prior to the start of installation. If at any future time it is determined that the fire hydrant must be moved due to road reconstruction, widening, resurfacing, etc., the utility owner agrees, by performing under permit, to bear all costs for moving the fire hydrant.

7. TREE REMOVAL, TRIMMING, AND TUNNELING

a. All tree removals, trimming, and tunneling within county road right-of-way shall be reviewed and approved by means of permit by the Board of Ingham County Road Commissioners. Any trees, regardless of their location, that cannot be protected due to utility installation or are in eminent danger of dying as a result of utility installation shall be removed by the Contractor. All stumps shall either be removed or ground flush with the average ground surface in the vicinity of the stump.

b. Proposed tree removals, trimming, and tunneling shall be sufficiently illustrated on construction plans along with the tree's species and size so that a proper review and site visit can be performed.

c. Trees that are located close to proposed utility installations, in the county road right-of-way, and reside within maintained lawn areas shall be protected from above ground and below ground

damage. Any trees, as described above, that are to be removed due to utility installation, shall only be removed after the Contractor has given notice to the adjacent property of the intent to remove the tree(s) and offered replacement trees. In general, the Board will require the Contractor to replace "lawn" trees removed due to utility installation. Replacement trees shall be planted outside the road right-of-way or at locations approved by the Board.

d. All stumps, logs, limbs, and litter shall become the property of the utility installation contractor and be properly disposed of. The adjacent property owners have the right of ownership of wood felled within the right-of-way, therefore the Contractor shall offer to leave the felled wood for the property owners use. Wood requested by the property owner shall be left outside of the county road right-of-way.

8. CONDUCT OF OPERATIONS

a. The Contractor shall control and ensure that trucking operations related to utility installations adhere to the current Michigan Vehicle Code and restrictions imposed by the Board, including spring weight restrictions. Failure to do so will result in the truck operator being ticketed and may also result in a stoppage of work.

b. Contractors, permitted or not permitted, who conduct utility installation operations in a manner detrimental to the Board's statutory obligation to maintain county roads reasonably safe for the public will be required to cease utility installation activities and correct all detrimental conditions immediately. If deemed necessary by the Board, cash deposits to cover the cost of a full-time ICRD inspector to ensure proper operations may have to be submitted to the Board before utility installation continues.

d. Dewatering water disposed of by the Contractor within the county road right-of-way must be approved by the Board in advance of any discharge and conform to Michigan Department of Environmental Quality (MDEQ) Best Management Practices (BMS) for soil erosion and sedimentation control. In general, discharge of water into roadside ditches for more than a couple of hours will not be allowed. If the Board deems it necessary that dewatering activities be modified or discontinued altogether, the Contractor shall comply and devise another method to complete their work. The Contractor, by performing under permit, accepts the responsibility of restoring the road right-of-way and affected drainage system to the satisfaction of the Board and the Ingham County Drain Commissioner after dewatering system removal.

e. The Contractor shall store construction materials as far off the road so that the materials do not pose a hazard nor block the vision of the traveling public and those seeking egress and ingress to private property. Only materials to be installed immediately can be stored within the right-of-way. All other materials and equipment shall be stored outside of the right-of-way.

e. For location of underground utilities, the Contractor shall call Miss Dig at 1-800-482-7171 a minimum of three working days prior to utility installation.

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MERIDIAN TOWNSHIP
TECHNICAL SPECIFICATION

LIFT STATION ELECTRICAL AND CONTROL SPECIFICATIONS

External Enclosures:
The external enclosure shall be a back-to-back pair of dual rated NEMA 12/3R enclosures on legs of 12 inch height.

One side of the enclosure package will contain the pump control equipment and the other side will contain the service entrance components. Interconnections between the enclosures shall be made by means of 2 inch conduits and elbows mounted under the ends of the enclosures, connected through the walls of the leg kits. High voltage wiring shall be carried through one conduit, all 120 VAC and lower wiring shall be connected through the other conduit.

A drip kit that maintains the NEMA rating of the enclosure shall be provided for each of the two enclosures.

Door stop kits shall be installed on all four doors. These kits shall maintain the NEMA rating of the enclosure when installed.

Enclosure width and height shall be 60 inches wide by 42 inches tall. Depth will vary between the control and the service entrance side.

External enclosures shall be equipped with pad-lockable door handles.

Enclosures and hardware shall be from the same manufacturer and shall be Hoffman, Saginaw Controls or equal.

Internal Control Enclosures:
All components mounted inside exterior enclosures shall be in NEMA 1 enclosures or otherwise protected against falling or dripping water.

External Junction Box:
A NEMA 4 external junction box shall be provided to allow connection of all wiring from the wet well, including the motor leads, motor sensor leads and float switches. The cable from the ultrasonic transducer shall be pulled through the junction box without termination. All low voltage signals shall be isolated from the high voltage circuits with a metal barrier separating the intrinsically safe terminals from other terminals. This junction box shall be mounted on the end of the control enclosure ~~nearest the wet well~~ a **minimum** of 34 inches above the ground.

Service Entrance Disconnect:
A main circuit breaker suitable for the voltage and current requirements of the station shall be provided. The load side of this device will feed power to the line side of the manual transfer switch.

The circuit breaker shall be in a NEMA 1 enclosure and shall be suitable for service entrance use.

A solid neutral and ground block shall be provided in the service entrance enclosure.

Automatic Transfer Switch:
The transfer switch shall match the voltage and current requirements of the station. It shall be provided as part of the overall automatic backup generator package and shall be purchased from the same source to ensure compatibility. The switch shall be NEMA 1 rated ~~and shall be provided to the panel builder by the contractor for installation in the service entrance side of the control panels. See Transfer Switch Specifications for details.~~

Generator Interlocks:
The control panel shall be equipped to handle the following functions:

120 VAC Power to the battery charger for the standby system
120 VAC Power to the block heater in the generator
120 VAC Power to a pair of dry contacts in the generator. The first of these contacts will report generator running, the second will report a generator failure. These inputs will be sent back to the SCADA system via radio. ~~See Standby Generator Specification for more detail.~~

Generator Receptacles:
One Crouse Hinds, AR1041-S22 receptacle shall be provided.

Manual Transfer Switches:
Each panel shall be equipped with a 3 position manual transfer switch to allow switching between the main line power, off position, or the generator receptacle.

Square D, non-fusible switches suitable for the voltage and current requirements shall be provided.

Power Distribution Blocks:
Power distribution blocks shall be provided to allow multiple loads to connect to single supply wires. Voltage and current ratings shall be suitable for the station. Two 3-phase blocks and one single phase block are required. Blocks shall be Bussmann, Marathon or approved equal.

Shore Power Monitoring:
The incoming power shall be monitored with a phase monitor circuit picked off the primary power distribution block. The signal from the phase monitor at this location shall be wired to the PLC and transmitted back to the SCADA system where presence or shore power will be annunciated on the station screen. The phase monitor shall be protected with high interrupting capacity fuses with no more than a 2 amp rating such as Bussmann FNQ-R-2, or approved equal.

Motor Circuit Protection:
Motor circuit protection shall be provided by means of a combined overcurrent/overload device such as an Allen-Bradley Bulletin 140M device. This shall provide traditional motor overload protection as well as motor circuit over-current and phase loss or imbalance detection. The device shall have an auxiliary contact that opens if the built-in circuit breaker is tripped but not if it is turned off.

~~**Motor Control Devices:**~~
~~The motors shall be controlled by variable frequency drives (VFDs). The VFDs shall be of the Allen Bradley 400 series with the specific type depending upon horsepower and voltage ratings.~~

Motor Current Sensing:
Motor current shall be sensed in all panels. The motor current shall be read directly from the drive, either by means of an analog output signal or a 1769-SM2 module.

Control Power Transformer:
A dry type transformer shall be used to reduce the incoming line power down to 120 VAC for control and utility usage in the panel. This transformer shall be sized to match the station load, with a minimum rating of 3 KVA. If a large generator is present, the block heater current may require a larger transformer.

Power Panel:
The power from the control transformer shall feed into a 2 pole power distribution block. From there it will be fed into an 8 pole circuit breaker box for primary distribution.

Control Power UPS:
A UPS shall be provided to maintain power on the PLC and alarm system in the event of an alarm failure. The power shall be maintained for a minimum of 10 minutes with the PLC and radio operational and the alarm light active. There is no intent to operate the station in this condition, simply to annunciate the alarm status locally and via the radio back to the SCADA system.

Level Sensing:
The level sensor shall be a Pulsar Black Box transmitter together with an appropriate Pulsar transducer. Typical wells will utilize a DB15 series transducer, however, the range must be verified for every system individually. A suitable Zener diode barrier shall be incorporated in series with the transducer to ensure intrinsic safety.

Primary Level Control:
The primary level control (PLC) for the station shall be an Allen Bradley Micro 1400 processor with dual serial ports. The first port will be utilized to communicate with the station's radio, the second will be used for programming and troubleshooting the system. All set points used in the level control shall be monitored and set from the SCADA system at the Township's Service Center with local storage of the data to allow the station to operate properly in the case of a communication failure.

The PLC shall be an Allen Bradley 1764-LRP mounted in a 1764-24AWA base.

An Allen Bradley 1764-MM1 memory module shall be installed in the PLC and the final operating version of the program shall be copied into the module, with the proper bits set to cause the processor to load from the EEPROM if the PLC's RAM is corrupted.

The PLC shall monitor all signals relevant to proper station operation including but not limited to control power, phase loss, pump 1 and 2 mode selections, pump 1 and 2 status, pump 1 and 2 circuit breaker trip, pump 1 and 2 current, pump 1 and 2 seal leakage, pump 1 and 2 over-temperature, low level float, high level float, the analog signal from the level

transducer and a rain gauge input. A local alarm silence and fault reset button shall be supplied as part of the operators in the control panel's interior door.

The PLC shall provide outputs for operating pump 1 and 2 as well as setting alarms. If the PLC faults, the common station alarm shall be tripped.

Secondary Level Control:
In the event of a PLC failure a secondary relay override connected into the high and low level float systems shall operate the pumps from high to low level.

SCADA Radio:
The radio shall operate in the 900 MHz range and be of the spread spectrum, frequency hopping type. No license shall be required.

~~**Antenna Cable:**~~
~~The antenna cable shall be LMR400 of a length suitable for the location of the antenna relative to the panel and taking into account the height of the tower. A lightning arrestor shall be provided and a three (3) foot superflex cable shall be used to connect between the lightning arrestor and the radio. Suitable connectors shall be provided for use with the cable along with grounding and weatherproofing kits.~~

~~**Antenna Tower:**~~
~~An antenna tower shall be provided to elevate the SCADA system antenna to a suitable level. The tower shall include:~~

- ~~A tilt base to be buried in the ground, anchored in a cement base.~~
- ~~A 10 foot tower section.~~
- ~~A 9 foot top section.~~
- ~~A section of conduit anchored in the top section to elevate the antenna another four or five feet above the tower top.~~

PLC Program and Memory Mapping:
The PLC program and I/O mapping will be set up by IDC in accordance with the Township's current standards.

Quality Control:
The entire control panel assembly shall be UL Listed. The service entrance side shall be listed as a UL508A system, the level control shall be listed as a UL689 control panel.

Drawings and Documentation:
~~Prior to fabrication a complete set of shop drawings shall be submitted to the Township for review. The shop drawings may be submitted via e-mail.~~

Upon completion of the startup process a set of as-built drawings shall be placed in the enclosure and another set submitted to the Township to be placed in their files.

A CD containing all pertinent documentation, including cut sheets on major items used in the panel, shall also be provided to the Township.

A final version of the PLC program shall be placed on the Township's SCADA computer or server for electronic storage.

Configuration files for any additional programmable items such as the submersible level monitor and variable frequency drives shall also be placed on the Township's computer or submitted on CD.

SYSTEM INSTALLATION REQUIREMENTS AND NOTES

Control Panel Supplier:
The control panel shall be supplied by:
IDC Corporation
5100 N. Canal Road
Dimondale, MI 48821

Contact Brandon Kerby or Ken Black for information at 517-646-0358, bkerby@idccorporation.com or KBlack@idccorporation.com.

IDC Corporation will supply the complete control panel, external junction box, and all equipment and wiring inside the control panel ~~except the automatic transfer switch. The contractor shall supply the properly rated switch in a NEMA 1 enclosure to IDC for incorporation into the final control panel. See Transfer Switch Specifications for details.~~

IDC Corporation will also provide the level control and transducer, ~~float switches, radios, antenna, tower, and cables.~~

The contractor is responsible for mounting all power and control equipment, including the transducer and the antenna tower, meter socket, gas lines for generator, interlocks and power wires to and from the generator and all wiring to and from the wet well.

Vented Tray Installation:
The contractor shall supply a vented tray to contain the cables from the well. The conduits from the well shall be stubbed into the bottom of the tray, then seal-off fittings provided with cord grips installed. The cables from the conduits shall then be exposed within the tray, above the seal-off fittings to allow any gases to escape into the vented tray. The tray shall be of a width and depth suitable to contain all conduits and cables but smaller than the base of the junction box into which the wiring will connect. This tray is not part of the control panel equipment.

Conduit:
All conduit used shall be vinyl coated rigid steel conduit ANSI C80.1.

Flexible conduit:
Any flexible conduit required shall be flexible steel conduit with PVC jacket.

MERIDIAN TOWNSHIP
TECHNICAL SPECIFICATION

DEWATERING

1.0 GENERAL

1.1 Description

A. The CONTRACTOR shall furnish all labor, tools, equipment and materials necessary to dewater the sewer trench excavations, in accordance with the requirements of the contract documents.

1.2 Submittals

A. The contractor shall submit a dewatering plan to be reviewed by the Owner prior to the beginning of construction activities requiring dewatering.

1.3 Quality Control

A. It shall be the responsibility of the contractor to control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.

B. All dewatering operations shall be adequate to assure the integrity of the finished product and shall be the responsibility of the contractor.

C. Where any critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement which may develop. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures, roads and other facilities rests solely with the contractor. The costs of repairing any damage to adjacent structures, roads and other facilities shall be the responsibility of the contractor.

2.0 PRODUCTS

2.1 Equipment

A. Dewatering, where required, may include the use of well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, and other means. Standy pumping equipment shall be maintained on the jobsite.

3.0 EXECUTION

3.1 Dewatering

A. The contractor shall provide all equipment necessary for dewatering. The contractor shall have on hand, at all times, sufficient pumping equipment and machinery in good working condition and shall have available, at all times, competent workers for the operation of the pumping equipment. Adequate standby equipment shall be kept available at all times

to insure efficient dewatering and maintenance of dewatering operation during power failure.

B. Dewatering for pipelines shall commence when groundwater is first encountered, and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of this section or other requirements.

C. At all times, site grading shall promote drainage. Surface runoff shall be diverted from excavations. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity from the excavation to maintain a bottom free from standing water.

D. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at the proposed bottom of excavation.

E. The contractor shall maintain the water level below the bottom of excavation in all work areas where groundwater occurs during excavation construction, backfilling, and up to acceptance.

F. Dewatering systems shall be designed and operated so as to prevent removal of natural soils and so that the ground water level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.

G. Flotation shall be prevented by the contractor by maintaining a positive and continuous removal of water. The contractor shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.

H. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sandpacked and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check by the contractor shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.

I. The contractor shall dispose of water from the work in a suitable manner without damage to the environment or adjacent property. The Owner shall be responsible for obtaining any permits that may be necessary to dispose of water. No water shall be drained into work built or under construction without prior consent of the Owner. Water shall be filtered using an approved method to remove sand and fine sized soil particles before disposal into any drainage system.

J. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines and sewers.

K. Dewatering of trenches and other excavations shall be considered as incidental to the construction of the work and all costs thereof shall be included in the various contract prices in the bid forms.

END OF SECTION

MERIDIAN TOWNSHIP TECHNICAL SPECIFICATIONS
DIVISION 1

EARTHWORK

INDEX

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1.01 SCOPE

The Contractor shall furnish all labor, materials, tools and equipment for all excavation and backfilling required for work under this contract, including all sheeting, shoring and bracing, dewatering of excavation, and other work as herein specified. All work shall be done in accordance with the current Michigan Department of Transportation Standard Specifications for Construction, except as stated within this specification.

1.02 CONSTRUCTION METHODS

1. Clearing the Site

The Contractor shall clear the site of all brush and debris which may be present and interfering with construction operations and shall remove and dispose of the same. No trees or shrubs are to be removed unless shown on the plans or permitted by the Engineer. Concrete, asphalt, trees, and shrubs shown on the plans to be removed shall be disposed of at a suitable location off the site of the work.

2. Protection of Trees

All trees which are to be preserved or which, in the opinion of the Engineer, might be subject to damage by the Contractor's operations, shall be adequately protected against damage to the bark by 2-inch thick vertical planking securely wired or tied completely around the tree trunk. Such protection shall not be removed until authorized by the Engineer.

No excavation greater than 1 foot in depth shall be made by machine within 5 feet of any tree. If the excavation cuts within the canopy (dripline) of a tree, the Contractor shall tunnel under roots and protect them from injury throughout the work. All roots greater than 2" shall be cleanly cut, if removed.

Trees which interfere with the work, and the removal of which is permitted, shall be removed by the Contractor in a safe manner and incidental to construction unless otherwise noted on

plans and proposal. No trees are to be removed without the expressed approval of the governmental body or property owner having jurisdiction thereof, and of the Engineer.

1.02 CONSTRUCTION METHODS (CONT'D.)

2. Protection of Trees (Cont'd.)

Trees, trunks, and limbs to be removed that are greater than six inches in diameter shall be trimmed and cut into lengths less than eight feet and piled outside of the right of way for use if the abutting property owner so desires. If the property owner does not desire the timber, the timber becomes the property of the Contractor. All other timber, brush, limbs, and stumps shall be disposed of by the Contractor. Onsite burning will not be allowed.

3. Erosion Control

Erosion Control devices shall be installed as shown on the plans and as needed to eliminate the migration of soil from the worksite. Typical devices include catch basin fabric drops (silt sacks) and silt fence. Additional requirements, as necessary, can be found in the Special Provisions.

Fabric drops shall be designed and constructed for use in the specified structure. Drops shall be installed prior to construction, cleaned and maintained in a working state for the duration of the project, and removed and disposed of upon final completion and restoration of the construction site.

Silt fence shall be a product in accordance with the MDOT 2012 SSC, Section 910.

Grass shall be growing before the erosion control measures are removed. Retainage will not be released until the sediment guards are removed.

4. Excavation

A. General

Trench excavation shall be by open cut, except as otherwise shown or permitted. Excavation may be performed by any practical method consistent with the integrity and protection of the work, adjoining structures, and the protection of workers and the public.

Excavation of trenches for piping shall provide a minimum net clearance of six inches outside the barrel of the pipe and, in all cases, shall be of sufficient width to permit the convenient placing of pipe and making of joints. The bottom of the trench shall be shaped so as to conform as nearly as possible to the outside of the pipe, particular care being taken to recess the bottom of the trench in such a manner as to relieve the bell of all load and to provide continuous soil bedding under the lower quadrant of the pipe.

Excavation for structures shall be extended sufficiently beyond the limits of the structure to provide ample room for practical construction methods to be followed.

If excess excavation is made or the material becomes disturbed so as to require removal beyond the prescribed limits, the resulting space shall be refilled with selected material. It shall be thoroughly tamped into place in not more than six inch layers, to the satisfaction of the

Engineer, before the construction work proceeds. Alternatively it may be filled with Class B Concrete or Flowable Fill.

1.02 CONSTRUCTION METHODS

4. Excavation

A. General (Cont'd.)

Foreign materials such as slabs of wood, boulders, etc. which obstruct the excavation, shall be removed with other excavation; and where such obstructions occur at or near the bottom, requiring excavation below grade for their removal, the excavated area shall be brought back to grade as in the previous paragraph, and incidental to construction. Unnecessary excavation below grade by the Contractor shall be refilled to grade as in previous paragraph, and at the Contractor's expense.

B. Existing Utilities and Structures

The Contractor shall cooperate with all utility firms, in advance, to locate and avoid interference with and damage to existing facilities, insofar as possible. Means for elimination of interference and correction of damage shall be subject to the instruction or approval of the Engineer. Where any apparent conflicts with underground utilities become evident, the Contractor shall excavate the utility in advance of working in the area. The Engineer shall then determine if any conflict exists and, if so, shall determine the action to be taken. Exploration for underground utilities is incidental to the other work performed.

Underground pipes or structures encountered in excavation shall be adequately supported during the Contractor's operations. Before backfilling, the structure shall receive a permanent support of a suitable material approved by the Engineer, extending from the bottom of the excavation to the underside of the pipe or other structure.

The Contractor shall use care not to damage adjoining structures and existing underground utilities. Existing underground pipes and cables are shown on the plans insofar as information is reasonably available. The Contractor shall be responsible to ascertain the locations of all utilities, whether shown on the plans or not.

Work within MDOT and Ingham County Road Department (ICRD) rights of way is done under separate permit from the agency involved. In addition, to these specifications, the Contractor shall adhere to all conditions contained in such permits.

When excavating along paved roads, extreme care shall be taken that the existing pavement and structures will not be damaged or undermined. All sheeting, bracing, and other equipment necessary to prevent damage shall be furnished by the Contractor. Where a trench must be cut through a roadway or driveway, particular care shall be taken not to unnecessarily damage adjoining areas of pavement. Existing pavement shall be sawcut prior to excavation.

Sheeting or other suitable protection, as required, shall be provided wherever excavation is performed adjacent to an existing structure. Any material removed from beneath the foundation of an existing structure shall be replaced with Class B concrete. Sheeting, bracing, and shoring required to support the sides of excavation shall be removed with care after

completion of the work. Any injury to the work or to adjacent property resulting from the removal shall be repaired by the Contractor.

1.02 CONSTRUCTION METHODS

4. Excavation

B. Existing Utilities and Structures (Cont'd.)

The Contractor shall be responsible for any damage caused by their operations to pipes, structures, poles and accessories, and the like above or below ground, whether shown on the plans or not. They shall make good and repair any such damage to the satisfaction of the Engineer. Particular care shall be exercised where excavation or other work is being prosecuted near electric or telephone lines.

C. Ground Water

Excavations shall be kept dry during placing of pipe and initial backfill. The Contractor shall supply stone sumps and pumps as necessary to maintain satisfactory conditions. This work is considered incidental to the pipe cost.

The Contractor shall take all necessary precautions to prevent the accumulation of water to such a level as might cause damaging uplift pressure to partially completed structures. The Contractor shall be responsible for any damage to partially completed structures because of inadequate or improper protection from uplift pressure, and shall repair or remove and replace at their own expense, to the satisfaction of the Engineer, all work so damaged.

D. Wells/Well Points

The Engineer may direct the installation of wells/well points if they deem it necessary to lower the adjacent water table. This is a pay item which includes all costs to furnish and operate the system, including down-time and remobilization. This method will be used only when normal methods, outlined in above paragraph (4C), prove to be insufficient.

5. Backfilling and Rough Grading

A. Bedding and Initial Backfill

The backfilling and bedding of utilities shall not incorporate frozen materials. Trench backfill shall be carefully placed such that pipeline and grade are not disturbed. Bedding and initial backfill shall be as specified for ductile iron, plastic, and concrete pipe in Division 2 and for ductile iron pipe in Division 3 of the Technical Specifications.

B. Final Backfill Outside Right of Way

The remainder of the trench, if not in a roadway, may be backfilled with excavated material unless it contains peat, muck, cinders, stones larger than 6" in diameter, or other undesirable material as determined by the Engineer. This undesirable material shall, upon written order

of the Engineer, be removed and replaced with Extra Sand Backfill or material approved by the Engineer.

1.02 CONSTRUCTION METHODS

5. Backfilling and Rough Grading

B. Final Backfill Outside Right of Way (Cont'd.)

In a field, above a point 12-inches over the pipe, water main trenches may be backfilled completely with loose material and compacted from the top of the trench. Sewer trenches shall be backfilled and compacted in layers of 3'. In lawn areas the layers in each case shall not exceed 12".

Excavated material, above a point 12-inches over the top of the pipe, shall be compacted by running the wheel or track of excavation equipment along the trench or by methods and equipment approved by the Engineer. At least 30" cover over the top of pipe is required for wheeled or tracked vehicles and 48" cover for machine mounted compactors. Temporary mounding of excess material over the trench will be allowed only until such time as lawn repairs are completed.

C. Backfill within Roadway Zone of Influence

Where excavation cuts through a road, drive, or sidewalk, or is in the zone of influence of a pavement, the trench shall be backfilled with granular material and compacted in accordance with MDOT or ICRD specifications, whichever is applicable. Road crossings are incidental to pipe installation. Longitudinal trenches will be paid as the bid item Extra Sand Backfill, unless otherwise specified.

D. Rough Grading

At the end of each working day, all excavations shall be completely backfilled up to existing grade with all excess excavated material being removed from the site. The excavation at the point where pipe installation is to start on the next working day need not be backfilled if it is greater than 6 feet deep, adequately protected, fenced, and lighted. However, in all cases, roadways and driveways should be made accessible overnight.

Excessive soil settlement and any resulting damage which occurs within one year of final approval shall be repaired by the Contractor at no cost to the owner.

6. Extra Sand Backfill

When the Engineer deems the native backfill material above the pipe to be unsuitable (such as rocks, peat or landfill outside the right of way or clay within the right of way) they may order extra sand backfill.

The unsuitable material shall be removed from the site and replaced with an approved granular material. This granular material shall be compacted as previously specified for excavated material.

Sand used under paved driveways, for road crossings, for pavement sub-base or for pipe bedding and backfill to a point 12" over the pipe is considered incidental to the project and does not qualify as Extra Sand Backfill, unless it is the result of a plan change.

1.02 CONSTRUCTION METHODS (Cont'd.)

7. Extra Stone Bedding

This item is used, as directed by the Engineer, to replace any unsuitable earth foundation, (such as muck, landfill or rubble), below the pipe bedding or trench bottom. The unsuitable material shall be removed from the site and replaced with one-inch crushed stone.

Stone used for dewatering purposes and for pipe bedding and backfill is considered incidental to the project and does not qualify as Extra Stone Bedding.

8. Restoration & Clean-Up

As construction operations proceed, the Contractor shall follow their operations with a general clean-up which shall include rough grading, removal of debris, temporary replacement of mailboxes, temporary restoration of driveways, etc. The general clean-up shall follow construction such that no more than 1000 feet shall remain uncompleted at any time. Access to individual homes and parcels shall remain uninterrupted during construction operations with all driveways temporarily restored to use at the end of each working day. Temporary driveways and roads shall be maintained by the Contractor during the period of construction.

After all construction has been completed, the Contractor shall finish, grade and rake all areas disturbed by construction. Topsoil shall then be spread on the prepared areas to a depth of 3-inches. All stones and lumps larger than 1-inch diameter plus all roots, litter and other foreign material shall be raked out prior to seeding or sodding.

Lawn areas and vacant land shall be repaired with seeding, fertilizer and mulch. 12-12-12 fertilizer shall be evenly applied at a rate of 200 lbs./acre. Seed shall be MDOT "THM" mixture and shall be sown following or in conjunction with the fertilizer and while topsoil is in a friable condition. Seed shall be evenly sown at a rate of 220 pounds per acre and shall not be sown through mulch. Mulch blankets shall be installed immediately after seeding and shall be pinned in place, unless otherwise specified.

If called for, lawn areas shall be repaired with first-quality commercial lawn sod. The existing sod in the excavated areas shall be cut, trimmed and removed as necessary to accept a minimum 12-inch width of new sod without overlapping new sod onto the existing or without leaving gaps between the new sod and existing. Watering of new sod shall be the responsibility of individual property owners.

Driveways and approaches shall be repaired with material of the same quality, width and thickness as that which existed prior to construction, but shall not be less than the following:

A. Concrete shall be 6-sack, transit-mixed; formed, jointed and finished to match existing. Slabs less than 24-inches wide shall be removed and replaced with new concrete – see Division 4 of the Technical Specifications for additional requirements.

1.02 CONSTRUCTION METHODS

8. Restoration & Clean-Up (Cont'd.)

B. Asphalt shall be MDOT HMA 13A, three inches compacted thickness and rolled to a uniform, dense surface. Prior to placing of new asphalt, the existing asphalt shall be trimmed with a concrete saw to straight edges which are parallel with the adjoining roadway. Overlays shall be preceded by an asphalt primer. Thicknesses greater than two inches shall be placed in two layers that have cooled between courses.

It is the intent that upon completion of the work all surfaces will be returned to the standard of profile and conditions that existed prior to this work. All gravel, top soil, seeding, sodding, surface restoration, paving, etc., shall be performed under this contract. Surface restoration shall include replacement of mailboxes, posts, fences, signs, culverts, ditches and other miscellaneous improvements. No deviations from existing conditions will be allowed without the written permission of both the Engineer and the affected property owner.

MERIDIAN TOWNSHIP TECHNICAL SPECIFICATIONS
DIVISION 2

SANITARY SEWER COLLECTION SYSTEM

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2.01 SCOPE

The Contractor shall furnish all labor, equipment and materials to completely construct, test and place in operation the sanitary sewer systems as shown on the plans and specified herein.

2.02 PIPE MATERIALS

A. Sanitary Service Pipe

The pipe used for risers and house services shall be constructed of the following material:

1. House Service
   4-inch pipe shall be one of the following:
   a) PVC conforming to ASTM D 2665 with 0.237-inch wall thickness (Schedule 40).
   b) ABS conforming to ASTM D 2751 with 0.180-inch wall thickness (SDR 23.5).

2. Stubs, Risers, and House Services
   6-inch pipe shall be one of the following:
   a) PVC conforming to ASTM D 3033 or D 3034 with 0.180-inch wall thickness (SDR-35) or ASTM D2729 with a 0.280" wall thickness (schedule 40).
   b) ABS conforming to ASTM D 2751 with 0.180-inch wall thickness (SDR-35).

Joints for PVC and ABS shall be either glued or bell and spigot with a rubber gasket. Glue shall be as recommended by the manufacturer of the pipe.

B. Sanitary Main Pipe

1. Polyvinyl Chloride (PVC) Pipe

   a) Pipe and Fittings – All PVC sewer pipe and fittings shall be manufactured in accordance with one of the following Standard Specifications:
      i. ASTM D3034, "Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings"
      ii. ASTM F679, "Standard Specification for Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings"

      All fittings shall be compatible with the pipe to which they are attached.

   b) Joints – All PVC pipe joints shall be gasketed, bell-and-spigot, push-on type conforming to ASTM D3212, "Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals." Since each pipe manufacturer has a different design for push-on joints, gaskets shall be part of a complete pipe section and purchased as such. Gaskets may be factory installed or field installed as recommended by the pipe manufacturer. Lubricant shall be as recommended by the pipe manufacturer.

   c) Pipe Stiffness – All PVC sewer pipe shall have a minimum pipe stiffness that equals or exceeds 46 lbs / in-in.

   d) Acceptance – Pipe or fittings may be rejected for failure to comply with any requirement of this specification.

2. Reinforced Concrete Pipe

Sewers 15" and larger shall be reinforced concrete, of a class heavy enough to withstand live

and dead loads imposed. This class shall be as shown on the plans.

2.02 PIPE MATERIALS (Cont'd.)

2. Reinforced Concrete Pipe (Cont'd.)

All reinforced concrete pipe used in this work shall be made by or under the direct supervision of some well-known and reputable manufacturer, whose type of pipe has been used for at least three years. It shall be furnished in sections not less than eight feet in length.

All reinforced concrete pipe shall conform to ASTM C76 or latest revision of Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

The joints for reinforced concrete sewer pipe shall be of the rubber gasket type meeting the requirements of ASTM C443, latest revision.

3. Ductile Iron (DI) Pipe

Ductile iron pipe used for sanitary sewers shall be equal to the following:
General - All pipe used shall meet the requirements of ANSI/AWWA C151/A21.51 except as stated below.

a) Joints - The bell of each length of pipe shall provide for the seating of a single rubber gasket, suitable for use with sanitary sewage. The gasket shall be self-centering when the plain end of a pipe enters the bell. Sufficient lubricant shall be furnished to provide a coating on each plain end of pipe. The lubricant shall be non-toxic and have no deleterious effect on the rubber gasket. The lubricant shall be of a consistency that can be easily applied to the pipe in any weather and shall adhere to either wet or dry pipe.

b) Cement Mortar Lining - Cement mortar lining of pipe shall conform to ANSI/AWWA C151/A21.4, except for the following items. The minimum thickness of lining shall be 3/21-inch. Care shall be taken to insure that no mortar remains in the joint surface of the bell. If mortar is found in the joint surface or lining of greater thickness than allowed, the pipe will be returned.

c) Length of Pipe - Because of the need to provide uniform spacing of any piling, all pipe furnished shall have a nominal laying length of 18 feet.

d) Pipe Class - The pipe shall be Class 54. Tolerances will be as allowed in ANSI/AWWA C151/A21.51.

e) Coating - The inside and outside of the pipe shall be coated with a bituminous coating of either coal-tar or asphalt base one mil thick.

f) Independent Tests - The supplier shall furnish reports of all tests and inspections as required in ANSI/AWWA C151/A21.51.

g) Polyethylene Encasement - All ductile iron pipe shall be encased with an eight mil thick polyethylene tube conforming to ANSI/AWWA C105/A21.5. Installation shall be in accordance with manufacturers recommendations. Closures and damaged areas shall be

sealed with 1-1/2" by 12 mil polyethylene adhesive tape.

2.03 INSTALLATION OF MAINS

A. **Trenching** (Ref sec 1.02)

The trench shall be dry during the pipe laying operation. The trench bottom shall be prepared as stated in Division 1 and as hereinafter specified. Bell holes shall be excavated so that after placement, the barrel of the pipe will have full bearing on the trench bottom.

The installation, handling, and storage of all pipe shall be in accordance with manufacturer's recommendations. Pipe shall be protected at all times against impact shocks and free fall. Stock piling of pipe at the job site shall be in such a location as to minimize handling.

Trenches shall be excavated so that there will be a minimum clearance of six inches on each side of the barrel of the pipe and a maximum width of trench at the top of the pipe of not more than sixteen inches greater than the O.D. of pipe thirty inch I.D. or smaller and not more than twenty-four inches greater than the O.D. of pipe thirty inch I.D. or larger. They shall be at all times of sufficient width to permit the pipe to be laid and to permit first-class construction methods to be used. Sufficient space shall be provided in the trench to permit the joint to be properly made.

The trench bottom shall be undercut four inches below the final location of the pipe barrel and the trench then filled with sharp sand, fine gravel, or crushed stone bedding compacted with hand tampers to provide a cushion for bedding the pipe. The Contractor shall provide sand, gravel, or stone from off the site, except when the trench passes through well-defined strata of sand, gravel, or both.

Excavation for structures shall be extended sufficiently beyond the limits of the structure to provide ample room for other construction as necessary.

In case unsuitable material, in the opinion of the Engineer, is encountered in the bottom of a sewer trench or underneath a structure, the Engineer may order the removal of this material and its replacement as stated in Division 1 (Earthwork).

B. **Installation of Pipes**

The laying of the pipe shall commence at the outlet and proceed upgrade with spigot ends pointing in the direction of flow.

The socket of the pipe last laid shall be wiped clean and the spigot end of the pipe to be laid shall then be centered and pushed home against the base of the socket. The pipe shall be centered so that they will form a sewer with a uniform invert.

Joints shall be made in accordance with the manufacturer's requirements. All surfaces of the joint shall be clean and dry before the lubricant is applied. Care shall be taken in laying, that the pipe does not shift and it must remain in a home position after assembling.

All pipe shall be laid to the line and grade called for on the plans, utilizing an in-line laser beam system for vertical and horizontal control. Each pipe, as laid, shall be checked by the Contractor with a suitable target to insure that this result is obtained. Vertical and horizontal alignment shall,

at any point, be within 0.04 foot (½-inch) of plan location.

2.03 INSTALLATION OF MAINS (Cont'd.)

B. **Installation of Pipes** (Cont'd.)

After the pipe is laid, sharp sand, fine gravel, or crushed stone shall be placed the entire width of the trench up to the springline of the pipe. Backfill shall be carefully tamped under the haunches of the pipe. Care shall be taken during backfilling and tamping so that the line and grade of the pipe are not disturbed. If concrete is being laid, additional fill shall then be placed until the entire width of the trench is not less than one foot above the top of the pipe. If sand is used for backfill around and over the pipe, it shall be thoroughly compacted with a vibratory compactor; hand compaction will not be acceptable.

If concrete pipe is being laid, fine excavated material free of large stones or lumps may be used for backfill above the springline. The remainder of the backfilling may be done as previously specified in Division 1 (Earthwork).

All pipe shall be so laid that the center of the pipe shall not depart from a straight line from manhole to manhole, by more than twelve inches, or one half the diameter of the pipe, whichever is the smaller.

Main sewer line stubs for future connections shall be furnished and placed by the Contractor according to details shown on the drawings and as directed by the Engineer.

The end of the stub for future connections shall be properly supported on crushed stone and braced when not resting on original ground so that any settlement will not disturb the connection. The end of the main sewer line stub shall be witnessed and marked in the manner described for sanitary sewer leads.

2.04 BUILDING SERVICES

A. **Stub or Service Connections**

Stub is defined as that portion of the service between the main and the property line. Stubs to the property line fitted with suitable stoppers shall be provided at such points as are shown on the plans or as directed by the Engineer. The connection shall be made using standard "Y" or "T" fittings as shown on the plans. On vacant lots, the stub connections will generally be located at approximately the mid-point of the front lot line, unless the Owner requests another location.

In order to properly record the locations, the Contractor shall make accurate measurements of all "Y" or "T" fittings before the sewer trench is completely backfilled.

The measurements shall indicate the distance from each "Y" or "T" to the center of the nearest downstream manhole. The Contractor shall furnish the Engineer with a copy of these measurements immediately upon the completion of any block of sewer.

In addition to measurements, the Contractor shall furnish and place a two inch by four inch (2x4) marking stick at each stub of such length that it will reach from the pipe up to a minimum of six

inches above the ground surface. Each marker shall be set in a vertical position and held vertical while backfilling the trench.

2.04 BUILDING SERVICES (Cont'd.)

B. **Riser Pipe**

Where shown on the plans or where directed by the Engineer, the Contractor shall put in 6-inch pipe risers extending from the stub connection in the sewer up to within 9 feet of the ground surface or to a depth adequate to serve the house service elevation shown at the property line. These pipes shall be laid up with a joint as specified and the top pipe shall be closed with a stopper. All risers shall be laid up and held securely in place and the backfill shall be carefully placed around them so as not to disturb them. Crushed stone or concrete six inches thick shall be placed under and around the T or Y fitting and over it to a height of six inches above the sewer main to furnish an adequate support for the riser pipe.

The top of each riser pipe shall be measured and marked by the Contractor in the same manner as specified in paragraph (A) above.

C. **House Service Line**

House services shall be installed at the locations and elevations as are shown on the plans or as directed by the Engineer. The house services shall connect to the 6-inch stub or riser and generally extend to the house. Fernco® style flexible couplings shall be used when extending a house service from the stub.

Clean-outs shall be installed in a straight run of pipe at a maximum spacing of 90 feet and at all pre-formed bends. Standard wyes must be used to construct clean-outs. Clean-outs must extend to within six inches of finish grade and be securely capped. Clean-outs shall be marked with a minimum 36" length of ½" diameter steel pipe or reinforcing rod or shall have a cast iron cap.

In order to properly mark the location of every house service, the Contractor shall make accurate measurements of each installation. The measurements shall indicate the distance from each house service to the side property line and to two fixed reference points, i.e. power poles, fire hydrants, manholes, or buildings. The Contractor shall furnish the Engineer with a copy of these measurements immediately upon the completion of each street.

D. **Tapping Existing Mains**

Where existing main sewer lines are to be tapped, the Contractor shall use a preformed saddle approved by the Engineer. A hole shall be cut to the proper size in the main line and all rough edges smoothed to prevent obstructions. The exterior of the main line pipe shall be thoroughly cleaned in order to provide a prepared surface for gluing the saddle onto the main line. Glue shall meet manufacturer requirements. The Contractor shall clean the main line of all debris which may have entered during their tapping operation.

The Contractor shall notify the Township Engineer prior to making any connection to the main line and shall not backfill the connection prior to approval of the Township Engineer. If the pipe becomes covered with water or backfill material, the Contractor shall remove the water or

material to facilitate the inspection.

2.04 BUILDING SERVICES (Cont'd.)

E. **Guarantee**

The Contractor shall be responsible indefinitely for the correct elevation and measurements of stub connections and house services. If a stub connection or house service cannot be found, is not at the correct elevation, or has not been installed properly, the Contractor will be notified of the situation. They will then be required to pay for finding the stub connection or house service and fixing or reinstalling, as necessary.

2.05 MANHOLES

A. **Precast Sections**

Manholes shall be constructed of circular precast concrete units with circular reinforcement and shall conform to the requirements of the current Specifications for Precast Reinforced Concrete Manhole Risers and Tops ASTM C478, with the following exceptions and additions:

Standard cylinders for compression tests will be required during the manufacturing of the manhole sections. Tests results from the cylinders will be the basis for determining the strength requirements of that days' output of manhole sections and depending on the results, may lead to additional testing of manhole sections.

Marking of the sections shall be done within six days after manufacture.

Cone sections shall be the eccentric type.

Joints between sections shall use a rubber O-ring gasket and a layer of one (1) inch butyl rope. The interior and exterior of the joints shall be treated with a non-shrink cement mortar with a smooth brushed finish. Additionally, the exterior of the joints shall be sealed with a product such as Boa Tape™, Infi-Shield®, EZ WRAP, or approved equal.

Pipe connections into manholes shall be made with an integrally-cast seal boot such as "Kor-N-Seal", "Lock-Joint Flexible Manhole Sleeve" or an approved equal.

B. **Manhole Steps**

Manhole steps shall be plastic-coated steel. They shall be placed sixteen inches apart unless otherwise shown and shall be cast in the manhole walls. It will not be acceptable to grout more than one step in place after the manhole section is poured.

Plastic-coated steel steps shall consist of a 3/8-inch diameter deformed steel reinforcing rod covered with a copolymer polypropylene plastic. The steel rod shall be grade 60 and conform to ASTM-615. The plastic shall conform to ASTM 2146-68, Type II, Grade 49108. The steps shall also conform to ASTM C478.

2.05 MANHOLES (Cont'd.)

C. **Castings**

1. The joints between the casting and cone shall be treated as shown on the Meridian Township Sanitary Sewer Detail Sheet.

2. Bolt-down covers and frames are required when not in a pavement surface. They shall be Neenah R-1916-F or East Jordan Iron Works 1045-ZPT. Covers shall have "Sanitary" cast into the surface and shall be equipped with (4) stainless steel cap screws. Base flange shall be furnished with (4) anchor bolt holes.

3. Standard frames and cover shall be East Jordan Iron Works 1045 or approved equal with solid, gasketed, self-sealing cover with concealed pick holes. Covers shall have "Meridian Sanitary Sewer" with the tree logo cast into the surface.

4. Top of casting shall be set as follows:
   (a) Flush with paved or grass surfaces
   (b) 6-inches below gravel road surface
   (c) 6-inches above ditch grade

D. **Mortar Castings**

Mortar for block and brick work in manholes and other appurtenances shall be mixed in the proportion of one part Portland Cement to three parts sand. Hydrated lime may be added in proportions not to exceed 10 percent of the volume of the cement.

Mortars mixed by hand shall be prepared in a suitable clean water tight box. The ingredients, except water, shall first be thoroughly mixed dry until of uniform color; then water added and the mixing continued until mortar of proper consistency and uniform texture is produced.

No re-tempered mortar or mortar that has been mixed for more than thirty minutes shall be used in the work. No cement mortar shall be mixed when temperature is below 32 degrees Fahrenheit without properly heating the sand and water. New placed mortar shall be protected from freezing for the first 72 hours.

E. **Adjusting Rings**

Casting adjustment shall be accomplished with pre-cast concrete grade rings conforming to ASTM C478. Each ring shall have an ID not less than 24-inches nor greater than 25-inches, a minimum thickness of 2-inches and a minimum OD of 40-inches. A 1" butyl rope gasket shall be used between all rings and the top ring & casting. Total ring adjustment shall not exceed 12". Longer cone sections shall be used if more than a 12" adjustment is needed.

F. **Concrete**

Class A concrete used in manhole flow line construction shall be transit-mixed with a minimum 28-day compressive strength of 3,500 psi. The approximate proportions of the mix shall be 1 part cement, 2 parts fine aggregate and 3 parts coarse aggregate. The mix shall contain six sacks of cement per cubic yard with a maximum allowable slump of 3 ½ inches.

2.05 MANHOLES (Cont'd.)

G. **Installation**

Sanitary sewer manholes are to be constructed as shown on the detailed drawings. Precast concrete manhole sections shall be installed in a plumb position.

All manholes shall be finished so that all visible leakage is repaired. The interior and exterior joints between manhole sections and adjusting rings shall be plastered with at least 1/2 inch thick mortar. All plastered areas shall have a brushed finish. All lift holes shall be mortared and finished. The bottom of the manhole, the flow line of the sewer and the steps shall be clean of all mortar, concrete, dirt and other debris.

The flow channels shall be constructed with a minimum depth of one-half the pipe diameter. The flow channel and manhole bottom shall be sloped to prevent accumulation of sewage and shall have a brushed finish.

No sanitary sewer services shall be connected to a sanitary manhole, unless specified on the plans. Standard sanitary sewer services shall connect to the main sewer line.

Where shown on the plans, new sewers shall be connected into existing manholes. In such cases, new channels shall be constructed using concrete. Where required, existing manholes shall be demolished. This work is incidental to the project, unless a separate pay item is explicitly detailed.

2.06 CLEANING AND TESTING

A. **Cleaning**

Before the sewer may be tested, the Contractor shall clean the sewer with a hydraulic system consisting of a high pressure pump feeding water to a nozzle which directs the water against the walls and flowline of the pipe, dislodging the debris and flushing it toward a manhole. All debris shall be removed at the nearest downstream manhole.

B. **Testing**

The Contractor shall furnish all equipment and personnel to conduct an acceptance test using low pressure air. The test shall be conducted under the supervision of the Engineer.

All house services shall be securely plugged with suitable stoppers that will withstand the internal test pressures. The section of line being tested shall also be securely plugged at each manhole. All stoppers shall be adequately braced.

Air shall be slowly supplied to the plugged pipe line until the internal air pressure reaches 4.0

pounds per square inch greater than the average back pressure of any ground water that may submerge the pipe. At least two minutes shall be allowed for temperature stabilization before proceeding further.

The rate of air loss shall be determined by measuring the time interval for the 1.0 psi pressure drop is not less than the holding time as specified in ASTM F1417 (PVC) or ASTM C924 (DI).

2.06 CLEANING AND TESTING

B. **Testing** (Cont'd.)

If the sewer installation fails to meet these requirements the Contractor shall determine the source or sources of the leakage and they shall repair or replace all defective materials or workmanship. The completed sewer installation shall meet the requirement of this test.

For plastic sewer main, the Contractor shall test the pipe for deflection by pulling a mandrel through the sewer after all backfill has been placed and compacted over the pipe. The maximum allowable deflection shall not exceed 5% of the pipe's inside diameter. The outside diameter of the test mandrel shall be equal to the inside diameter of the pipe less 5%. The initial test shall be performed at least 30 days after pipe installation. A second test shall be performed after 10 months of pipe installation or just before line's intended use.

Inspection and testing of the sanitary system shall also include video inspection by CCTV method of sanitary main, air testing of sanitary main, and vacuum testing of sanitary manholes. All inspections and testing shall be performed in the presence of Township inspectors.

MERIDIAN TOWNSHIP TECHNICAL SPECIFICATIONS
DIVISION 4

CONCRETE WORK

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4.04 TESTING

4.01 SCOPE

This work shall consist of furnishing all labor, materials and equipment necessary for the proper mixture and placement of concrete. The current MDOT Standard Specifications for Construction (SSC) shall be followed, unless otherwise specified.

4.02 MATERIALS

1. Supplier

The use of transit-mix concrete is required. The Contractor shall notify the Engineer who the supplier will be prior to beginning work. The Engineer must approve the concrete supplier and the mixer trucks used to transport the concrete.

2. Concrete Mixture

Batching and mixing operations shall conform to ASTM C94. Water shall not be added to the mix after the trucks leave the batching plant. The mix for sidewalk shall be MDOT P1 with approximated proportions of one part cement; two parts fine aggregate, and three parts coarse aggregate. The mix shall contain 6 sacks of cement per cubic yard, with a maximum allowable slump of 3½" (three and one-half inches).

Coarse aggregate shall conform to MDOT 6AA. Fine aggregate shall conform to MDOT 2NS. Cement shall be Type 1A air-entraining Portland cement conforming to ASTM Specification C150 or Type 1 with an air entrainment admixture. Air shall be 6% plus or minus 1%.

The compressive strength of Class A concrete shall not be less than 3,500 pounds per square inch (psi) after 28 days. The compressive strength of Class B concrete shall not be less than

3,000 psi after 28 days.

4.02 MATERIALS

2. Concrete Mixture (Cont'd.)

Water shall be clean and free from deleterious substances such as oil, alkali and organic matter. Potable water shall be used from sources approved by the Engineer.

No admixtures will be used unless approval is received from the Engineer, or is specified. Admixtures, if approved, shall be used in strict accordance with manufacturer's directions and shall conform with applicable ASTM Standards.

3. Reinforcing

Concrete slabs, walls and footings shall be reinforced with steel bars or mesh as shown on the plans. Bars shall be rust-free, new deformed billet-steel conforming to ASTM A615, Grade 60 and mesh shall conform to ASTM A1064.

The Contractor shall prepare and submit to the Engineer shop drawings showing bending and assembly diagrams, splicing, laps of bars, shapes, dimensions and details of bars. Scaled dimensions from drawings shall not be used in determining the lengths of reinforcing bars.

4.03 CONSTRUCTION METHODS

1. Subgrade Preparation

The earthgrade shall be prepared by removing the topsoil, vegetative cover and root mat. The base shall then be prepared by excavating and/or placing of embankment material to achieve the grade and cross-section required. All soft and yielding material shall be removed and replaced with acceptable material.

When a pathway is benched into cut or fill slopes, grading shall be done in accordance with the MDOT SSC, Section 205, Roadway Earthworks. Subgrade density shall be not less that 95% of Maximum Unit Weight in fills. In cuts, the Engineer will visually inspect the grade and may order additional compaction to achieve the desired subgrade density.

A minimum of three (3) inches of Class II granular material shall be used under all pathway construction. The base shall be smoothed, trimmed and compacted prior to placement of forms. The Engineer may order additional compaction to achieve the desired subgrade density after visual inspection.

2. Formwork

All concrete work shall be accurately formed to the lines and grade shown on the plans. Forms shall extend to the full depth and width of the specified concrete surface. Forms shall be shored and braced from the outside to maintain ¼" tolerance in thickness, line and grade. All formwork shall be oiled with an approved non-staining form oil before placing concrete. Formwork shall be left in place until the concrete is sufficiently hard so as to not be damaged upon removal.

Construct all formwork to provide continuous, straight, smooth surfaces and edges. Exposed edges to have ½" chamfer. Curved walks shall be formed on a radius with flexible forms.

4.03 CONSTRUCTION METHODS (Cont'd.)

3. Placement

All formwork and reinforcement placement shall be inspected by the Engineer prior to placement of concrete. The Contractor shall give ample notice and time so that such inspection can be made.

No concrete shall be deposited until the area has been dewatered and not until after the Contractor has made satisfactory provisions to eliminate all possibility of water entering or flowing through the concrete while it is being poured or is curing.

Subgrades shall be wetted and forms shall be oiled prior to concrete placement. All debris shall be removed from forms and reinforcement.

Time Between Charging Mixer and Placing Concrete (minutes)			
Type of Unit	Concrete Temperature (ASTM C1064)		
	<60°F	60°F – 85°F	>85°F
Truck Mixers	90	60	45
Truck Mixers with Concrete containing Water-Reducing Retarding Admixture	120	90	70

Exposed concrete shall not be poured when the atmospheric temperature is below 40°F or when the concrete temperature is below 55°F as placed. Concrete shall not be poured on frozen ground. Concrete shall not be cast if the temperature of the concrete is above 90°F.

Tickets shall be prepared in accordance with the MDOT SSC, Section 1001, Concrete Production Equipment and Facilities.

When placement of concrete is started, it shall be carried on as a continuous operation until the placement of the section is completed. Concrete in walls shall be placed in 24-inch lifts keeping surface of concrete level throughout. Concrete shall be deposited to the full depth of the forms in one pour. Drops of greater than 5' shall use tubes.

Reinforced concrete greater than six inches in finished thickness shall be compacted by high frequency internal vibrators. The concrete shall be thoroughly worked around the reinforcement and into the corners of the forms, using procedures which minimize air pockets and honeycombs. Care shall be taken in vibrating concrete so as not to move reinforcement out of place.

Concrete less than six inches in finished depth shall be compacted by spading along all edges and joints and by alternately tamping and striking off the surface until all voids are removed.

4. Finishing

Horizontal, exposed surfaces shall be floated and troweled just enough to produce a smooth, dense surface, free from irregularities. All joints and edges shall be rounded to a radius of one-

quarter inch by the use of an approved edging tool. After completion of floating and finishing, a fine brush shall be drawn across the finished surface to remove tool marks, and provide a non-slip surface.

4.03 CONSTRUCTION METHODS

4. Finishing (Cont'd.)

Formwork panels are intended to provide a satisfactory finish for vertical, exposed surfaces. Finishing shall be limited to minor rubbing, removal of fins and patching of honeycombed areas. Unexposed surfaces need not be finished except for patching of honeycombed areas.

All concrete sidewalk and driveway approaches shall be legibly stamped with the name of the Contractor and the year, with figures 1½" to 2½" tall. The stamps shall be used at the ends of each segment, each truck load, and at intervals no greater than 100 feet in length.

5. Joints

1. Construction cold joints not indicated on the plans shall be so made and located so as to least impair the strength of the structure. The location of all construction joints shall be approved by the Engineer. Slabs shall have a cold joint at the end of each truck load.

2. Transverse expansion joints ½" thick shall be placed in sidewalk at approximately 100 foot intervals. ½" thick expansion joints shall be placed anywhere that the walk meets the back of curb, and where the walk meets the edge of concrete driveways or building walls.

Expansion joints material shall be pre-molded of bitumen filled fiber placed at right angles to the line of the walk, perpendicular to the surface and shall extend from ¼" below the surface of the walk to the subgrade.

3. Contraction (plane of weakness) joints shall be placed at a minimum distance equal to the width of the sidewalk. Contraction joints for bicycle pathways (7-foot width) shall be spaced approximately nine feet apart. The joint shall be sawed to a width of $^{1}/_{8}$" and to a depth of ¼ of the slab thickness.

Sawing must be accomplished as soon as the concrete has hardened such that no excess raveling or spalling occurs, but before any random cracks develop. Joints shall be at right angles to the line of the walk, and perpendicular to its surface. Tooled joints are not allowed.

6. Curing and Protection

Sidewalks and other slabs on grade shall be treated with a curing compound conforming to the requirements of ASTM C309. The compound shall be sprayed or rolled on to provide a continuous film over the entire surface of the walk after completion of finishing, and as soon as all free water has left the surface. Compound shall be applied at the rate of not less than one gallon per 200 square feet. Immediately upon removing sidewalk forms, the exposed concrete edge shall be sprayed with curing compounds or backfilled with earth. The final grading of topsoil will be such that the mature sod will be ½" below the concrete.

All concrete shall be protected from vehicles for the first 72 hours after placing. The period of protection will increase to 7 days as the temperature decreases to 40°F. Any concrete found to be defective or damaged due to weather, vandalism, or other causes shall be removed and replaced, at the Contractor's expense. Damaged sections of sidewalk and curb and gutter shall be removed back to the nearest joint or as indicated by the Engineer.

Freshly placed concrete shall be protected from rain by covering with polyethylene film.

4.03 CONSTRUCTION METHODS

6. Curing and Protection (Cont'd.)

Concrete shall not be allowed to freeze for 72 hours. Protection must be provided when there is a forecast for freezing.

Barricades shall be placed at the areas under repair from the time the damaged section is removed until it is ready for use. Lighted barricades will be required for intersection areas left under repair overnight.

4.04 TESTING

The Contractor shall make arrangements for and coordinate various concrete tests as ordered by the Engineer. The testing company will be selected by the Township and the Township will pay for the tests. The Contractor will be charged for any waiting time suffered by the testing company. All tests will be done according to ASTM standards.

MERIDIAN TOWNSHIP TECHNICAL SPECIFICATIONS
DIVISION 7

PAY ITEMS, METHOD OF MEASUREMENT & BASIS OF PAYMENT

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7.03 TRENCH PAY ITEMS (SCHEMATIC)

7.04 RAMP PAY ITEMS (SCHEMATIC)

7.01 SCOPE

It is intended that payment for all work done under the Contract Documents including the furnishing of all labor, equipment and materials and the performing of all operations in connection with the construction of the project, will be made under the following pay items. Other work for which there is not a specific pay item will be considered included in the Contract Unit Price for the various specified pay items and no additional compensation will be allowed.

The Owner reserves the right to alter the plans, extend or shorten the improvement and increase or decrease the quantities of work to be performed to accord with such changes, including the deduction or cancellation of any one or more of the Pay Items. Such changes shall not be considered as a waiver of any conditions of the Contract nor to invalidate any of the provisions thereof. A supplemental agreement between the Contractor and the Owner will be required when such changes involve a net increase or decrease in the total amount of the original contract of more than 25 percent. For a net increase or decrease of less than 25 percent, the Contractor will accept payment according to contract prices for such items of work as appear in the original contract.

The work will be done in compliance with the Contract Documents and paid for under the Pay Items or Contract Items herein listed. The Contractor shall take no advantage of any apparent error or omission in the plans or specifications, and the Engineer shall be permitted to make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the Contract.

7.02 SPECIFIC PAY ITEMS

1-19 GENERAL

1. Traffic Control

A. Description: The Contract Unit Price on this item includes labor, equipment, and material necessary to complete traffic control for this project in accordance with the Michigan Manual of Uniform Traffic Control Devices and, as applicable, Michigan Department of Transportation (MDOT) or Ingham County Road Department (ICRD) requirements.

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price on the following basis: after first use of traffic control measures, 25% will be paid; once 50% of the original contract price is completed, 50% will be paid; once 75% of the original contract price is completed, 75% will be paid; once the contract work is complete, 100% will be paid.

2. Road Repair

A. Description: The Contract Unit Price on this item includes restoration of all public roads to at least their conditions as existed prior to the start of construction. Specific examples are furnishing and placing of subbase, gravel or asphalt base and gravel, asphalt or concrete surface plus all other miscellaneous work associated with the complete restoration of all public roads including shoulders. All work shall be done in accordance with the plans and specifications.

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price when all public roads have been restored to their original condition.

7.02 SPECIFIC PAY ITEMS

1-19 GENERAL (Cont'd.)

3. Extra Sand Backfill [Ref. Sec. 1.02 (E)]

A. Description: When the Engineer deems the native backfill material above the pipe to be unsuitable (such as rocks, peat or landfill outside the right of way and clay within the right of way) the Engineer may order extra sand backfill. It includes the excavation and disposal of the unsuitable material. Fill material shall be Class II granular material and placed at the direction of and to the satisfaction of the Engineer.

Sand used under paved driveways, for pavement subbase at road crossings, or for pipe bedding and initial backfill is considered incidental to sewers or water main and will not be paid for under this item.

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price for the total volume actually furnished and placed. Volume will be determined compacted-in-place (CIP) by measurements obtained at the site unless otherwise stated.

4. Extra Stone Bedding [Ref. Sec. 1.02 (F)]

A. Description: The Contract Unit Price on this item includes the furnishing and placing of crushed stone bedding material to replace unsuitable subgrade material under the pipe. This work shall be done at the direction of, and to the satisfaction of, the Engineer.

Stone used for dewatering purposes or to stabilize water sand is considered incidental to sewers or water main and will not be paid for under this item.

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price for the total volume actually furnished and placed. Volume will be determined in place by measurements obtained at the site unless otherwise stated.

5. Road and Railroad Crossing

A. Description: The Contract Unit Price on this item includes all extra work over and above that described under Sewers, Site Restoration, and Road Repair herein. Specific work includes furnishing and installing the steel casing pipe (by methods other than open cut), placing crushed stone around the carrier pipe, sealing the casing ends plus all miscellaneous related work.

B. Method of Measurement & Basis of Payment: This item will be paid for the Contract Unit Price after the work is completed. The lineal footage of pipe installed inside the casing will be paid for under the pay item sewer or water main in addition to this item.

6. Abandonment

A. Description: The Contract Unit Price on this item includes everything necessary to abandon the structure or facility as described in the contract.

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price per pile set for the actual number placed and incorporated into the finished work.

7. Dewatering [Ref. Sec. 1.02 (4.D)]

A. Description: The Contract Unit Price on this item includes the furnishing, installation, operation and removal of all materials and equipment to lower the groundwater level adjacent to the construction area to expedite the excavation for and installation of the work.

7.02 SPECIFIC PAY ITEMS

1-19 GENERAL

7. Dewatering (Cont'd.) [Ref. Sec. 1.02 (4.D)]

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price per lineal foot of excavation actually dewatered or as lump sum. Measurement will be along the centerline of the pipeline.

8. Special Structure

A. Description: The Contract Unit Price on this item includes the furnishing and installation of labor and materials to complete the structure as shown on the plans, including excavation, backfilling, access openings and covers, floor drains and associated piping, pre-cast concrete sections, poured-in-place concrete, waterproofing, vent piping, removal of surplus excavated material and restoration of surface to within three inches of finished grade.

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price for each special structure as actually installed.

9. Pavement Removal

A. Description: The Contract Unit Price on this item includes all labor, equipment, and material necessary to remove and dispose of existing concrete or asphalt as marked in the field by the Engineer and as described herein. The Contractor shall **SAWCUT** the existing pavement to the full depth to ensure clean and proper removal. Any additional sawcutting, removal, and replacement necessitated by damage caused by the Contractor shall be incidental.

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price as measured in the field.

10. Miscellaneous Items

A. Description: This item includes the complete labor, equipment, and materials for constructing and/or placing in service a bid item not found elsewhere in this division.

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price.

20-29 SANITARY

20. Sewer Mains

A. Description: The Contract Unit Price on this item includes clearing the work site of all trees, brush, structures and other objects which interfere with the placement of the sewer under construction, all excavation, the furnishing and placing of sewer pipe complete including wyes or tees, bedding material, backfilling, removal of surplus excavated material, testing, concrete work, protection and replacement or repair of existing utilities, and restoration of the surface to within three inches of original grade or to bottom of pavement base course. All work shall be done in accordance with the plans and specifications.

20. Sewer Mains

B. Method of Measurement & Basis of Payment: The length of sewers to be paid for at the Contract Unit Price will be determined by measurement along the centerline of the various diameters, classes and depths of pipe as actually furnished and installed. Diameters, classes and depths shall be as shown on the proposal. Measurements shall be from center to center of adjacent manholes with no deduction for manhole diameter. Depth shall be determined by measuring the distance

from sewer invert to existing grade at each manhole plus at a point midway between manholes; the average of the three measurements shall be the average depth of the sewer.

7.02 SPECIFIC PAY ITEMS

20-29 SANITARY (Cont'd.)

21. Manholes

A. Description: The Contract Unit Price on this item includes all excavation, the furnishing and placing of precast sections and cast iron frame and cover, concrete work, drop pipes, connection of existing and new pipes, backfilling, removal of surplus excavated material, and restoration of surface to within three inches of original grade. All work shall be in accordance with the plans and specifications.

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price per manhole for the various depths as actually installed. The depth shall be determined by measuring the distance from sewer invert to top of casting.

22. Sewer Services

A. Description: The Contract Unit Price on this item includes all the work and materials (~~excepting wyes and tees but~~ including necessary bends) as described in sewer main above.

B. Method of Measurement & Basis of Payment: The length of sewers to be paid for at the Contract Unit Price will be determined by measurement along the centerline of the pipe including risers as actually furnished and installed. Measurement shall be from end of tee or wye to end of service.

23. Bypass Pumping

A. Description: The Contract Unit Price on this item includes everything necessary to provide bypass pumping sufficient to complete the contract work.

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price.

30-39 WATER

30. Ductile Iron Water Mains

A. Description: The Contract Unit Price on this item includes clearing the work site of all trees, brush, structures and other objects which interfere with the placement of the water main under construction, all excavation, the furnishing and placing of water main testing, concrete work, disinfecting, backfilling and the removal of surplus excavated material, protection and replacement or repair of existing utilities, and restoration of the surface to within three inches of original grade or to bottom of pavement base course. All work shall be done in accordance with the plans and/or specifications.

B. Method of Measurement & Basis of Payment: The length of water mains will be paid for on a lineal foot basis for pipe measured along the centerline of the various diameters and classes of pipe actually furnished and installed. There will be no deductions for fitting lengths. Unit price includes all labor and materials and related work described above.

31. Water Main Fittings

A. Description: The contract unit price includes the furnishing and installation of the fittings delineated in the proposal.

B. Method of Measurement & Basis of Payment: Fittings will be paid for at the Contract Unit Price for each piece, complete with restraints, thrust block, and required appurtenances.

7.02 SPECIFIC PAY ITEMS

30-39 WATER (Cont'd.)

32. Water Valves and Boxes

A. Description: The Contract Unit Price on this item includes the furnishing and installation of valves and valve boxes. All work shall be done in accordance with the Plans and/or Specifications and result in an operating valve.

B. Method of Measurement & Basis of Payment: This work will be paid for at the Contract Unit Price per valve specified by size of valve on the proposal, which price includes all labor, materials, and related work as described above.

33. Fire Hydrants

A. Description: The Contract Unit Price on this item will consist of furnishing and installing fire hydrants. It shall also include the furnishing and installation of the tee, auxiliary valve, valve box, connecting piping, thrust block, drainage pit, and miscellaneous appurtenances. All work shall be done in accordance with the plans and/or specifications and result in an operating hydrant.

B. Method of Measurement & Basis of Payment: Fire hydrants will be paid for at the Contract Unit Price per complete Fire Hydrant assembly, which payment includes the furnishing and placing of all materials, the labor, and all related work necessary to complete the work as described above.

34. Live Tap

A. Description: The Contract Unit Price on this item will consist of furnishing and installing tapping sleeves and valves on existing mains without loss of pressure in the existing main. It shall also include the installation of a valve box and a thrust block. All work shall be done in accordance with the plans and/or specifications.

B. Method of Measurement & Basis of Payment: This work will be paid for at the Contract Unit Price per live tap as specified on the proposal, which price includes all labor, materials, and related work as described above.

35. Water Services

A. Description: The Contract Unit Price on this item includes the furnishing and installation of corporation stops, curb stops, curb boxes and service pipe in accordance with the plans and or specifications. Work includes all excavation, backfill, furnishing and replacement of sand backfill, tapping of main, and removal of surplus excavated material. Long side service leads includes crossing of roads. Short side service leads are those which do not cross roads.

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price for each service lead completely installed.

40-49 PAVEMENT

40. Concrete Sidewalk

A. Description: The Contract Unit Price on this item includes furnishing all labor, equipment, and materials required in connection with forming, placing, and curing of the concrete sidewalk to the lines and grade shown on the plans or as directed. All work shall be done in accordance with the plans and specifications.

7.02 SPECIFIC PAY ITEMS

40-49 PAVEMENT

40. Concrete Sidewalk (Cont'd.)

B. Method of Measurement: Concrete sidewalk will be measured and paid for in square feet, determined by multiplying the actual length as measured along the centerline of the surface of the pathway, by the actual width. The area of fillets and odd shaped sidewalk will be computed separately. Deductions will be made for structures, crossroads, sidewalk ramps, and other discontinuities in the sidewalk. Sidewalk ramps and other appurtenances included in the contract as pay items will be paid for separately.

41. Sidewalk Ramps

A. Description: Sidewalk Ramps consist of several different pay items, the combination of which include all labor, equipment, and material necessary to construct an ADA compliant curb ramp, in accordance with MDOT Special Detail R-28. The ramp pay items are depicted below in **7.04 RAMP PAY ITEMS**. All work shall be done in accordance with the plans and specifications.

B. Method of Measurement & Basis of Payment: The ramp components will be measured and paid for at each Contract Unit Price.

42. Bituminous Construction

A. Description: The Contract Unit Price on this item includes all labor, equipment, and material necessary for the construction of a bituminous surface, on a prepared foundation, at the specified application rate. If the bituminous mixture is not specified, the type used shall meet the approval of the Engineer. Construction methods shall conform to the latest edition of the MDOT Standard Specifications for Construction (SSC). All work shall be done in accordance with the plans and specifications.

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price as verified at the site through load tickets from the supplier or by field measurements.

43. Embankment

A. Description: The Contract Unit Price on this item includes all labor, equipment, and materials required in connection with delivery and placement of granular embankment material. Embankment includes areas requiring fill as called for on the plans and the 3" of base for concrete sidewalk. All work shall be done in accordance with the plans and specifications. Granular material as noted shall mean Class II material per the MDOT 2020 SSC, Section 902.

B. Method of Measurement & Basis of Payment: Embankment material shall be as measured in the vehicle transporting the material to the site. Load tickets from the supplier are required to verify the delivered amount.

44. Aggregate Base or Surface Course

A. Description: The Contract Unit Price for this item includes all labor, equipment, and materials required in connection with the delivery and placement of the material. This work includes the required shaping, grading, and compacting of the material for the foundation of the asphalt ramps and driveway approaches.

The material shall be 21AA or 22A aggregate per the MDOT 2020 SSC, Section 902, unless otherwise specified. All work shall be done in accordance with the plans and specifications.

B. Method of Measurement & Basis of Payment: Aggregate Surface Course shall be as measured in the vehicle transporting the material to the site. Load tickets from the supplier are required to verify the delivered amount.

7.02 SPECIFIC PAY ITEMS

40-49 PAVEMENT (Cont'd.)

45. Curb and Gutter

A. Description: The Contract Unit Price on this item includes furnishing all labor, equipment, and materials required for forming, placing, and curing of the concrete curb and gutter to the line and grade as shown on the plans, including excavation, backfill, reinforcing steel, removal of existing curb and gutter, and all joints and joint materials. All work shall be done in accordance with the plans and specifications.

B. Method of Measurement & Basis of Payment: The length of curb and gutter to be paid for at the Contract Unit Price will be determined by measurement along the face of the curb as actually installed, with no deductions in length for catch basins, inlet castings or gutters through concrete driveway openings.

46. Subgrade Preparation

A. Description: The work of subgrade preparation includes furnishing all labor, equipment, and material necessary for clearing and grubbing, including all tree and bush removal, tree trimming, topsoil stripping, grading to shape the earth to develop the typical cross section shown on the plans, and any additional excavation required to construct the pavement to the grade shown on the plans.

B. Method of Measurement & Basis of Payment: This item will be paid on a basis of lineal feet of pathway for work completed according to the specifications.

50-59 LANDSCAPE

50. Retaining Wall

A. Description: The Contract Unit Price for this item includes all labor, equipment, and materials required in connection with the construction of a retaining wall, as shown on the plans. All work shall be done in accordance with the plans and specifications.

B. Method of Measurement & Basis of Payment: Retaining walls will be measured by the square foot of the exposed face, above the pathway/sidewalk.

51. Fence

A. Description: The Contract Unit Price for this item includes all labor, equipment, and materials required in connection with the construction of a fence, as shown on the plans. All work shall be done in accordance with the plans and specifications.

B. Method of Measurement & Basis of Payment: The fence will be measured along the centerline of the fence, from centerline to centerline of the end posts.

52. Ditching

A. Description: The Contract Unit Price on this item includes all excavation, and grading to develop the cross sections such that upon completion of site restoration the final grade shall be within plus or minus 0.1 foot of the required lines and grade. This item will also include clearing the

work site of all trees, brush, structures and other objects which interfere with the performance of the work. All work shall be done in accordance with the plans and specifications. Final restoration will be paid for separately.

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price when the required cross section has been obtained. Measurement will be made along the centerline of the ditch. Payment for any final trimming of the subgrade required prior to site restoration is included in this pay item.

7.02 SPECIFIC PAY ITEMS

50-59 LANDSCAPE (Cont'd.)

53. Erosion Control

A. Description: The Contract Unit Price on these items includes all labor, equipment, and material necessary to install and maintain the specified erosion control device(s).

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price for each erosion control item used.

54. Site Restoration

A. Description: The Contract Unit Price on this item includes restoration of the ground surface to at least its preconstruction state. Specific examples are final grading of the top three inches of ground surface, furnishing and installation of seed and mulch, driveway and parking area repair, culvert replacement, sidewalk repair, replacement of signs, mailboxes, and fences, plus all other miscellaneous work associated with the complete restoration of the project site. The slope between new sidewalks and a lawn shall not exceed 1:3. All work shall be done in accordance with the plans and specifications.

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price when the complete project site has been restored to its original condition.

55. Drainage Pipe

A. Description: The Contract Unit Price on these items includes all labor, equipment, and material necessary to install drainage pipe of the type and size specified, as shown on the plans.

B. Method of Measurement & Basis of Payment: This item will be paid for at the Contract Unit Price for the length installed, as measured along the ground surface.

FOREST HILLS LIFT STATION REPLACEMENT 2026
WHITE HILLS LIFT STATION BYPASS 2026

SPECIAL PROVISIONS

These Special Provisions are in addition to those in the General and Technical Specifications, and supersede the General and Technical Specifications in the event of a conflict.

GENERAL

NOTIFICATION – The Contractor shall notify homeowners to mark private utilities seven (7) days prior to work in front of their property. If access to a resident's drive is to be disrupted as much notice as possible is to be given to the resident with a minimum of 24 hour notice being provided.

TESTING – The Contractor will be responsible for scheduling concrete and compaction testing. Testing will be done by Soil and Materials Engineers, Inc. (SME), (517) 887-9181. The cost will be paid by Meridian Township, except for any wait time. Concrete testing will be required for the first load of the job, and thereafter only at the direction of the Engineer.

ROAD RIGHT-OF-WAY – All work in the right-of-way is done under permit and approval of the Ingham County Road Department (ICRD) and Michigan Department of Transportation (MDOT). The Contractor shall secure the necessary permit(s).

BARRICADING – All excavation left open overnight shall be completely encircled with snow fence and include lighted barricades.

PAVEMENT REMOVAL – Any pavement removal is incidental to the contract.

MAINTAINING ACCESS – Access must be maintained to residences at all times during construction, unless excavation is occurring immediately in front of the drive. This includes, at a minimum, a gravel-type road surface using either new aggregate or existing road material.

ASSOCIATED SUPPLIERS – These companies are providing the major equipment for this project. A point of contact is listed below for coordination during installation of each component.

- Control Panel - IDC Corporation
  - Brandon Kerby or Ken Black at 517-646-0358
  - bkerby@idccorporation.com or KBlack@idccorporation.com
- Pumps & Valves – Kennedy Industries
  - Rick Alvarez, ralvarez@kennedyind.com
- Natural Gas Standby Genset - Cummins Inc.
  - Breanna M. OKopski, breanna.okopski@cummins.com
- Natural Gas Service – Consumers Energy
  - Trisha White, 517-219-2607 or trisha.white@cmsenergy.com

STATION START UP – A representative from Cummins, Kennedy and IDC shall be coordinated with to check the installation of the station, and check and adjust the controls and equipment for actual operating conditions. The representatives will be present to place the station in initial operation and instruct the regular operating personnel in the proper care and maintenance, at no additional cost to the Owner. The Owner may elect to have a representative return within 90 days to readjust the operations of the station at no cost to the Owner.

FOREST HILLS LIFT STATION REPLACEMENT PAY ITEMS

1. **TRAFFIC CONTROL** – This pay item includes all labor, equipment, and material necessary to provide and maintain traffic control as described herein, in accordance with the Michigan Manual of Uniform Traffic Control Devices and ICRD permit requirements. All barrels remaining in the road overnight must be lighted. All traffic control must be accomplished under permit from ICRD. All necessary traffic control devices are included. See Appendix C for general traffic control details.

Traffic Control shall be paid for at the Contract Unit Price on the following basis: after first use of traffic control measures, 50% of Traffic Control will be paid; once all traffic control measures have been removed from the jobsite, 100% of Traffic Control will be paid.

2a. **PAVEMENT REPLACEMENT** – This pay item includes all labor, equipment, and material necessary to sawcut, remove, and replace all pavement that has been disturbed or damaged as part of the contract work. The disturbed or damaged roadway shall be restored to the original 6" aggregate base with 5" HMA placed on top.

7. **DEWATERING** – This pay item includes all labor, equipment, and material necessary to design, install, operate, maintain and remove an adequate dewatering system. The contractor shall provide all dewatering necessary to keep the construction and work areas dry. The system shall be of sufficient size and capacity to maintain a dry condition without delays to construction operations. The dewatering system must include adequate filtration to prevent sediment from contaminating the nearby lake. The Contractor shall submit a detailed dewatering plan for review and approval prior to starting dewatering activities. See Appendix A - "Geotechnical Report" for soil boring information and dewatering guidance.

A suggested discharge point is at the existing ditch on the east side of Northview Drive as shown on the Plans. To ensure that the discharged water is clean before leaving, the Dewatering detail on the SESC Notes and Details Plan shall be followed. The linear dewatering area shall be cleaned of all sediment, jute, geotextile fabric and any disturbed areas restored to their original state after dewatering has been completed.

Dewatering shall be paid for at the Contract Unit Price on the following basis: after installation of Dewatering hardware, 25% of dewatering will be paid; once 50% of the original contract price is completed, 50% of Dewatering will be paid; once 75% of the original contract price is completed, 75% of Dewatering will be paid; once the contract work is complete and all dewatering items have been removed from the jobsite, 100% of Dewatering will be paid.

8a. **PUMP STATION, STRUCTURES** – This pay item includes all labor, material and equipment necessary to install an eight (8) foot diameter concrete Wetwell and eight (8) foot diameter concrete Valve Vault as shown on the plans and as detailed herein. The Contractor shall submit copies of the shop drawings to the Township Engineer for review and approval. The Township Engineer retains the final approval of all material submitted. It will be paid for at the Contract Unit Price after both structures are successfully installed.

The Wetwell and Valve Vault shall house all pumps, valves, piping, and other equipment and shall be constructed of 4,000 psi concrete, and shall be pre-cast complying with ASTM C478. The Wetwell's concrete walls shall be H_2S gas corrosion resistant by means of admix similar to "ConShield" or approved

equal, as determined by Meridian Township. The base of the Wetwell and Valve Vault will be integral to the bottom section.

Joints between sections must use a rubber O-ring gasket, and be sealed internally and externally using non-shrink, cementitious mortar. A product such as BoaTape™, Infi-Shield®, EZ WRAP or an approved equal will be applied on top of the exterior mortar. Lifting holes shall be filled with Portland cement mortar and pre-formed concrete plugs. Discharge pipes and electrical conduit shall be cemented in place using non-shrink grout.

This pay item includes all shoring necessary to install the pump station structures to the elevations shown on the plans. A 12 inch layer of 1-to 3-inch crushed stone shall be placed beneath the wet well with a layer of geotextile separator placed on top of the stone. Backfill around and under the structures shall be class II granular material as defined and described in the MDOT 2020 Standard Specifications for Construction, Section 902. Fill material under the generator pad shall be placed in a maximum of 8-inch-thick loose lifts and must be compacted to at least 98% maximum density. If a vibratory roller is used for compaction, the loose lift thickness may be increased to 12 inches. Density testing will be performed by SME and will be paid for by the Township. The stone, granular material and geotextile are incidental to this pay item. The granular material used underneath the Valve Vault may be substituted for millings drawn from the Township stockpile located at 2100 Gaylord C. Smith, East Lansing, 48823. The contractor is responsible for all loading and transportation of said millings.

Roof slabs for both chambers shall be constructed of pre-cast concrete to the dimensions shown on the plans. Thickness and reinforcing shall be as shown on the shop drawings and approved by the Township Engineer. Access door frames and vent pipe openings shall be cast-in-place; they shall not be added after the roof slab is poured. The roof slab of the valve vault shall be cored in place for the bypass pipe and for access to the gate valve. A valve box shall be installed to allow access to the gate valve. The lifting hooks shall be cast into the side of the roof section; no lifting hooks will be allowed in the top of the slab. The top of the roof slab shall be brushed smooth and all exposed edges shall be rounded to a 1/4-inch radius with an edging tool.

Access Doors:

The access door to the Wetwell shall be a Bilco Type JD-1AL, or approved equal, with safe grate of aluminum construction, and designed for a minimum live load of 300 pounds per square foot. The access door to the Valve Vault shall be a Bilco Type J-3AL, or approved equal. Door and frame shall have mill finish with bituminous coating on the frame exterior. Doors shall be hinged and equipped with torsion bars, and shall open to 90 degrees or more, locking automatically in the open position. The doors shall be equipped with a snap lock, removable exterior handle and permanently mounted inside handle. Hardware shall be stainless steel. The access door to the Valve Vault shall be positioned above the Check valves and two Gate valves so that they may be operated from the surface.

8b. **PUMP STATION, MECHANICAL ITEMS -** This pay item includes all labor, material and some equipment necessary to install all mechanical components and fittings of the lift station as described herein. It will be paid for at the Contract Unit Price after all items are successfully installed. The submersible pumps and all of the associated parts shall be installed with the following items, purchased by Meridian Township and provided by Kennedy Industries:

(2) FLYGT EXPLOSION PROOF, SUBMERSIBLE SEWAGE CONCERTOR PUMPS, MODEL NP6020.091 - DP N100 WITH HIGH CHROME IMPELLER AND INSERT RINGS. RATED FOR 600 GPM @ 27' TDH, 7.5 HP, 3 PHASE, 230 VOLT WITH 4" DISCHARGE AND 50 FT. MOTOR AND SENSOR CABLES. PUMPS EQUIPPED WITH SEAL FAIL/HIGH TEMP SHIELDED CABLES.
(2) GUIDE RAIL SYSTEMS WITH 4" DISCHARGE ELBOWS, STAINLESS STEEL GUIDE RAILS, UPPER BRACKETS, LIFTING CHAIN AND QUICK LINKS. (20' LENGTHS)

(2) 6" APCO SWING CHECK VALVE WITH FLANGED END CONNECTION AND LEVER / WEIGHT OPERATOR.
(3) 6" EJ GATE VALVE WITH FLANGED END CONNECTION AND 2" NUT OPERATOR.
(2) CONCERTOR PUMP MODULE TO BE INSTALLED IN EXISTING CONTROL PANEL BY IDC CORPORATION
(2) 10" TOUCHSCREEN HMI TO BE INSTALLED IN EXISTING CONTROL PANEL IDC CORPORATION

Pump Assembly:
Pumping units shall include complete lift-out cables and guide-rail system to allow pump removal and replacement without the need for personnel to enter the pump chamber. Moreover, no nuts, bolts, or other fasteners shall be required to connect the pump to the discharge piping.

Pumping units shall be designed to automatically connect to the discharge piping when lowered into place. A self-centering mechanism shall be provided to facilitate this connection. A sliding guide bracket shall be an integral part of the pumping unit and the pump casting shall have a machined connecting flange to connect with the discharge connection, which shall be bolted to the floor of the sump and so designed as to receive the pump connecting flange without the need of any bolts or nuts. Sealing of the pumping unit to the discharge connection shall be accomplished by a simple linear downward motion of the pump.

The lifting cable shall be capable of raising the pump and be of stainless steel (S.S.) with S.S. 3-inch rings connected to the cables with S.S. clamps at 8-foot intervals to raise the pumps. Guide-rails shall be Schedule 80 galvanized, welded joints, steel pipe with smooth butt weld joints, or equal, and shall be supported at intervals not to exceed 12 feet. Supports shall be constructed of stainless steel. The upper guide-rail holder shall be attached to the access door frame and the lower guide-rail holder shall be integral with the discharge fittings.

Valves & Fittings:
The gate and check valves shall be located as shown on the plans. The gate valves shall be six (6) inch and shall be right-hand close. The check valves shall be six (6) inch flanged, swing check valves with outside lever and weight. A hole shall be cored above the gate valve leading to the Bypass Assembly and a valve riser box securely installed such that this gate valve can be manipulated without entering the valve vault. All valve box tops shall be manufactured with the word “SEWER” on the top.

The bypass assembly will be positioned as shown on the plans. It will include a 1” tap and corporation stop inside the valve vault as well as a 2½ inch male quick connect coupler with dust cap on the external portion of the assembly.

Fittings and valves within the Wetwell and valve vault shall be ductile iron in accordance with ANSI A21.10 or ANSI B16.1. Fittings shall be rated for 250 psi water working pressure. Fittings outside the pumping chamber and valve vault shall be mechanical joints with retainer glands.

Pipes:
All of the piping in and around the lift station shall be installed as shown on the plans and specified herein. All pipe and pump openings and passages shall be large enough to permit the passage of a sphere 3 inches in diameter and any trash or stringy material which can pass through a 6-inch house collection system. All ductile iron piping shall have an H_2S resistant interior lining. Piping beyond the valve vault shall be D.I. Class 350 pipe.

Flange faces shall be coated with a rust inhibitor immediately after drilling. Flanges shall be firmly bolted with machine, stud or tap bolts of the proper size and number meeting the requirements of ASTM A 307, Grade B. Joints made with bolts or bolt studs shall have a nut on each side. Bolt projection through nuts shall be equal, and where studs are used, bolt projection on each side of the flange shall be equal. All nuts and bolts shall be cadmium plated or hot-dip galvanized except on

stainless steel flanges shall be 316L stainless steel. Pipe shall be in accordance with the ANSI A21.51 and flanges shall be 125 pounds in accordance with ANSI B16.1. Gaskets shall be asbestos composition and shall be of the full-face design.

Pipe within the wet well and the valve vault shall be coated with two coats of a coal-tar epoxy finish at 8.0 to 10.0 dry mils per coat. Spray application is necessary to obtain required film thickness. Spray application shall be made in crosshatches to achieve required dry film thickness. Brush or roller application will require additional coats to obtain the required film thickness at no additional expense to OWNER. Additional coats to meet the dry film thickness requirements must be applied within 24 hours of application of first coat of coal-tar epoxy. CONTRACTOR shall provide adequate protection of adjacent areas to protect against overspray.

Ductile iron pipe and fittings to be ground-buried shall be coated by manufacturer on the outside with an asphaltic coating, 1 mil thick, in accordance with AWWA C151 and C110 (ANSI A 21.51) and cement-lined, standard thickness, in accordance with AWWA C104/ANSI 21.4. The pipe shall be supplied with and wrapped in polyethylene encasement in accordance with AWWA C105 (ANSI 21.5) and shall be installed following Method "A".

Discharge pipes through the wall shall be installed after the hole has been re-cored, if necessary, to allow installation of a watertight wall sleeve, boot and/or link seal. The wall sleeve shall be of the same material as the pipe. All loose rust, scale, grease, or oil shall be removed prior to pouring of the concrete. Rubber link seals shall be identical rubber links interconnected with bolts and elongated nuts and washers. The sealing element shall be made of synthetic rubber material especially compounded to resist aging, ozone, sunlight, and chemical action. Bolts and metal parts shall be made of galvanized or cadmium-plated steel to resist corrosion. Rubber link seal joints shall be submitted to Township Engineer for approval.

8c. **PUMP STATION, CONCRETE -** This pay item includes all labor, equipment, and materials necessary to install the 7 inch concrete pad as shown on the plans. If construction occurs during cold weather, take necessary precautions to ensure a proper temperature is maintained during the curing process. It will be paid for at the Contract Unit Price after being successfully installed.

8d. **PUMP STATION, CONTROL PANEL -** This pay item includes all labor, materials, and some equipment necessary to install a new control panel as depicted and described in the contract. The Control Panel and External Junction Box (Terminal Box) has been purchased by Meridian Township and fabricated by IDC Corporation. It will be paid for at the Contract Unit Price after being successfully installed and tested.

Transportation of the Control Panel and Junction Box from IDC Corporation to the Project Site will be the responsibility of the contractor. Follow all manufacturer specifications and guidance during transport and installation of the Control Panel. Installation of conduit and wiring to the Generator, Wetwell and Pumps is included in this item. See the "Lift Station Electrical and Control Specifications" Technical Specification and Appendix D for control panel details and address of IDC Corporation.

The contractor shall furnish and install two (2) mercury float switches at the elevations shown on the Plans. The float switches shall be Conery 2900-B1S1C1 types of the appropriate length.

Electrical Wiring:
All wiring shall be done in accordance with the National Electrical Code. Conduit shall be full size, vinyl-coated, rigid, galvanized steel and sized according to the NEC, unless larger sizes are shown on the plans.

All wire shall be plastic-coated, solid copper. Conduit ends inside the pump chamber and control panel shall be sealed to exclude gases formed in the chamber.
Conduit and wiring between the meter and pumps shall be sized for the pump motors. Leads to the pump motors shall be factory-installed, flexible cable to allow removal of the pumps.

Level Controls:
The wiring channel shall provide cord grip holders for the pump and pump cords and the control cords. The channel box shall have a removable cover for easy adjustment of cords to pumping and alarm levels shown in the plans. All cords shall extend from one end of the box and be taken through conduit to the outside control panel. No splices shall be made in the wiring channel. Continuous cords must be used from the control panel to the pumps and floats. Wiring channel shall mount on supports fastened to the access frame.

8e. **PUMP STATION, GENERATOR -** This pay item includes all labor, materials and some equipment necessary to install a new concrete pad and standby generator as shown on the plans. The generator will be a C40N6, 40kW, 60Hz, Standby, Natural Gas/Propane Genset manufactured by Cummins and provided by the Township. See Appendix B for specific dimensions and requirements. The Contractor is responsible for loading and transport of the Genset from the Township Service Center (2100 Gaylord C. Smith, East Lansing, 48823) to the Lift Station. Follow all manufacturer specifications and guidance during transport and installation of the pad and generator. If construction occurs during cold weather, take necessary precautions to ensure a proper temperature is maintained during the concrete curing process.

Fill material under the generator pad shall be placed in a maximum of 8-inch-thick loose lifts and must be compacted to at least 98% maximum density. If a vibratory roller is used for compaction, the loose lift thickness may be increased to 12 inches. Density testing will be performed by SME and will be paid for by the Township.

The Contractor is to coordinate the gas service with Consumers Energy, whose crews will be responsible for installing the meter and natural gas service line. The Contractor shall install the underground gas service from the back-side of the meter to the new generator. The Contractor shall also install two (2) 3" galvanized posts with end caps as described and located on the plans, near the fuel-inlet, for Consumers Energy to mount the meter. It will be paid for at the Contract Unit Price after being successfully installed and tested.

The genset and its installation and on-site testing shall conform to the requirements of the following codes and standards:

A. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
B. CSA 282, 1989 Emergency Electrical Power Supply for Buildings.
C. IEC 8528 Part 4. Control Systems for Generator Sets.
D. IEEE 446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
E. NEMA ICS10-1993 – AC Generator sets.
F. NFPA 70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance with Article 700, 701, and 702.
G. NFPA 110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.

H. UL 2200. The genset shall be listed to UL 2200 or submit to an independent third party certification process to verify compliance as installed.

Installation

A. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.
B. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.
C. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.
D. Equipment shall be initially started and operated by representatives of the manufacturer.
E. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to final testing of the system.

On-Site Acceptance Test

A. The complete installation shall be tested for compliance with specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by the Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests.
B. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a four hour full load test, and a one-step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary.
C. Perform a NFPA 110 Level 1 test and fill out the appropriate forms.

8f. **SANITARY INFRASTRUCTURE, REMOVAL -** This pay item includes all labor, equipment, and materials necessary to excavate and remove the existing sanitary sewer pump station, sanitary manholes, and sanitary pipes as described herein. Remove and properly dispose of all of the concrete around the top of the existing pump station, including the wet well, dry vault, bypass chamber and pump station flat tops. Remove any trees or shrubs interfering with the excavation. This item will be paid for at the Contract Unit Price after removal of the existing concrete structures.

8g. **HELICAL PILES, GENERATOR PAD** – This pay item includes all labor, equipment, and materials necessary to install four helical piles underneath the generator pad. The approximate weight of the generator and pad is 16,000 lbs. For bidding purposes the contractor should assume that the helical piles will be advanced 30 feet below the existing site grade. The Contractor is responsible for providing the specific piling design, certified by a Professional Engineer licensed in the State of Michigan. The piling design shall include the connection of the piles to the generator pad. Install helical piles in accordance with the Special Provision, Helical Piles (SP2).

8h. **HELICAL PILES, WET WELL** – This pay item includes all labor, equipment, and materials necessary to install four helical piles underneath the wet well. The approximate weight of the wet well, pumps, and sewage is 80,000 lbs. For bidding purposes the contractor should assume that the helical piles will be advanced 30 feet below the existing site grade. The Contractor is responsible for providing the specific piling design, certified by a Professional Engineer licensed in the State of Michigan. The

piling design shall include the connection of the piles to the wet well. Install helical piles in accordance with the Special Provision, Helical Piles (SP2).

8i. **HELICAL PILES, VALVE VAULT** – This pay item includes all labor, equipment, and materials necessary to install four helical piles underneath the valve vault. The approximate weight of the valve vault is 43,000 lbs. For bidding purposes the contractor should assume that the helical piles will be advanced 30 feet below the existing site grade. The Contractor is responsible for providing the specific piling design, certified by a Professional Engineer licensed in the State of Michigan. The piling design shall include the connection of the piles to the valve vault. Install helical piles in accordance with the Special Provision, Helical Piles (SP2).

10a. **MOBILIZATION** – The Contract Unit Price for this pay item includes all labor, equipment, and materials necessary for the Contractor to mobilize for the specified lift station replacements in accordance with the MDOT 2020 Standard Specifications for Construction (SSC), Section 110. Payment for this item will be made according to said Section 110.

10b. **BYPASS PUMPING** – The Contract Unit Price for this pay items include all labor, equipment, and material necessary to bypass pump sewage around the work area, as necessary. The bypass pumps and bypass lines shall be sufficiently sized for peak flow conditions. The Contractor shall have adequate standby equipment available and ready for immediate operation and use including an extra pump and generator. The maximum effluent level in the influent sewer cannot exceed the crown of the influent sewer. Generators used to provide the electrical service shall be housed in sound attenuating enclosures with critical-area-type silencers. An automatic call box is required for all overnight bypass pumping. Additionally, a backup generator must be provided. The backup generator must be installed and ready for immediate use, including all cabling, disconnect panels, and switch gear. The Contractor shall submit a detailed bypass procedure for review and approval by the Township prior to construction. The following flows reflect measured or estimated flows and capacities:

The estimated peak hourly flow for this pump station is 156 gallons per minute.

A suggested bypass procedure is described below. See Bypass Plans.

1. BYPASS FROM MANHOLE 22-132 TO THE EXISTING WET WELL. THIS IS REFERRED TO AS BYPASS 1 ON THE PLANS.
2. REMOVE MANHOLE 22-131 AND INSTALL THE MANHOLE WHICH IS REFERRED TO AS MH-1 ON THE PLANS.
3. BYPASS FROM MANHOLE 22-130 TO MH-1. BYPASS FROM MH-1 TO MANHOLE 22-113 WHICH IS LOCATED IN THE GREENBELT ON THE EAST SIDE OF OAKWOOD DRIVE. THE BYPASS ROUTE IS APPROXIMATELY 830 FEET AND IS REFERRED TO AS BYPASS 2 ON THE PLANS.
4. DEMOLISH EXISTING LIFT STATION AND INSTALL LIFT STATION REPLACEMENT
    - KEEP BYPASS 2 IN PLACE
5. INSTALL MH-2 AND THE 10” PIPE FROM MH-1 AND MH-2. INSTALL THE 12” PIPE FROM MH-2 INTO THE WETWELL
    - KEEP BYPASS 2 IN PLACE
6. BYPASS FLOW FROM MANHOLE 22-141 TO 22-113. INSTALL BYPASS IN MANHOLE 22-141 AND TIE INTO BYPASS 2. THIS REFERRED TO ON THE PLANS AS BYPASS 3.
    - KEEP BYPASS 2 IN PLACE

7. INSTALL MH-3 AND THE 8" PIPE BETWEEN MH-3 AND MH-2.
    - KEEP BYPASS 2 AND 3 IN PLACE
    - SPEAK WITH RESIDENTS AT 1548, 1558, AND 1568 HILLSIDE DRIVE ABOUT LIMITING USE OF WATER WHILE BYPASS 3 IS IN PLACE.
8. BYPASS MH 3 TO MH 1. THE BYPASS ROUTE IS APPROXIMATELY 30 FEET AND IS REFERRED TO AS BYPASS 4 ON THE PLANS.
    - KEEP BYPASS 2 IN PLACE
    - REMOVE BYPASS 3
9. BYPASS MANHOLE 22-128 TO MH 1. THE BYPASS ROUTE IS APPROXIMATELY 245 FEET AND IS REFERRED TO AS BYPASS 5 ON THE PLANS.
    - MODIFY BYPASS 2 TO REMOVE THE BYPASSING FROM MH 22-130
    - KEEP BYPASS 4 IN PLACE
    - SPEAK WITH RESIDENT AT 1580 HILLSIDE DRIVE ABOUT LIMITING USE OF WATER WHILE BYPASS 5 IS IN PLACE.
10. REMOVE MANHOLE 22-130 AND INSTALL THE 8" PIPE FROM MH-3 TO THE EXISTING 8" PIPE THAT PREVIOUSLY TIED INTO MANHOLE 22-130.
    - ONCE INSTALLED REMOVE BYPASS 5
    - KEEP BYPASS 2 AND 4 IN PLACE
11. BRING LIFT STATION ONLINE AFTER TESTING.
    - REMOVE BYPASS 2 AND 4

Several driveways and roadways will need to be crossed with the bypass piping, ramps shall be installed to protect the bypass piping at driveway and roadway crossings. Restoration of any disturbed surfaces to their original state is included in this contract. Bypass Pumping shall be paid for at the Contract Unit Price on the following basis: upon successful startup of the bypass system 50% of Bypass Pumping will be paid; after the successful return of the lift station to service 100% of Bypass Pumping will be paid.

10c. **ELECTRIC SERVICE –** These pay items are to cover the cost of installing a new electric service from the meter to the control panel. The existing electric service from the utility pole to the meter will be left intact during construction. The contractor will be responsible for installing new conduit and conductor between the meter and the new control panel.

10d. **ELECTRICAL PERMIT, MECHANICAL PERMIT, AND INSPECTIONS (Township Allowance) –** This pay item is to cover the cost of the electrical and mechanical permitting and inspections through Meridian Township (MT) and East Lansing (EL). Contact the MT Building Department at 517-853-4500. The Contractor shall coordinate all of the necessary electrical and mechanical work with MT building personnel. This allowance is only to pay for the electrical permit and inspection fees through MT and EL, excluding any extra charges incurred by the Contractor. Any additional costs incurred, including, but not limited to, the Contractor's time and travel expenses, are considered incidental. Additionally, the amounts listed in the Proposal section of this contract are estimates. The Contractor will be reimbursed for the actual amounts paid to MT and EL, upon verification.

20a. **SANITARY SEWER, 12 INCH, CONNECT TO LIFT STATION WETWELL** – The Contract Unit Price on this pay item includes all labor, equipment, and material necessary to core into the proposed 8 foot diameter Lift Station Wetwell and connect it to the proposed 12" gravity line, as shown on the plans, in accordance with Technical Specification 2, "Sanitary Sewer Collection System", and as described

herein. A Kor-N-Seal style device, or an approved equal, shall be used at the pipe penetration into the Wetwell. A Fernco ® style flexible coupling, or an approved equal, shall be used at the sewer connection. It will be paid for at the Contract Unit Price after the connection is successfully made.

20b. **SANITARY SEWER, FORCE MAIN, CONNECT TO LIFT STATION** – The Contract Unit Price on this pay item includes all labor, equipment, and material necessary to attach the new Force Main sewer to the effluent connection of the Lift Station as shown on the plans and in accordance with Technical Specification 2, "Sanitary Sewer Collection System". It will be paid for at the Contract Unit Price after the connection is successfully made.

20c. **SANITARY SEWER, 6 INCH, FORCE MAIN -** This pay item includes all labor, equipment, and material necessary to install approximately 30 feet of 6" HDPE DR 11 DIPs or 6" Class 52 DIP pressure sewer as shown on the plans, in accordance with Technical Specification 2, "Sanitary Sewer Collection System", relevant AWWA Standards, and as described herein. If HDPE pipe is used then this pay item shall include the installation of tracer wire (gauge 10 single strand), adapters, and transition mechanical joints. If ductile iron pipe is used then it will need to have a H2S resistant liner. The piping and its appurtenances shall be able to withstand the water hammer pressure and associated cyclical reversal of stresses associated with the operation of a wastewater lift station.

Before the forcemain is backfilled it needs to be observed while the pump station is running to ensure there are no leaks. The forcemain shall be observed by the Engineer. If any leakage should exist the Contractor shall make the necessary repairs and another observation test of the forcemain shall be performed. The Engineer shall be present for the observation test. The Contractor shall notify the Engineer in advance of the testing a minimum of 48 hours.

20d. **SANITARY SEWER, 8 INCH** – The Contract Unit Price on this pay item includes all labor, equipment, and material necessary to install the proposed 8" gravity pipe between the existing and proposed manholes as shown on the plans and in accordance with Technical Specification 2, "Sanitary Sewer Collection System". It will be paid for at the Contract Unit Price after the pipe is successfully installed.

20e. **SANITARY SEWER, 10 INCH** – The Contract Unit Price on this pay item includes all labor, equipment, and material necessary to install the proposed 10" gravity pipe between the existing and proposed manholes and in accordance with Technical Specification 2, "Sanitary Sewer Collection System". It will be paid for at the Contract Unit Price after the pipe is successfully installed.

20f. **SANITARY SEWER, 12 INCH** – The Contract Unit Price on this pay item includes all labor, equipment, and material necessary to install the proposed 12" gravity pipe between the proposed manhole and lift station as shown on the plans and in accordance with Technical Specification 2, "Sanitary Sewer Collection System". It will be paid for at the Contract Unit Price after the pipe is successfully installed.

21. **SANITARY MANHOLE, 48 INCH** – This pay item includes all labor, equipment, and materials necessary to install three new 48 inch diameter, precast sanitary sewer manholes as described in Technical Specification 2, "Sanitary Sewer Collection System". The manhole's concrete walls shall be H_2S gas corrosion resistant by means of admix similar to "ConShield" or approved equal, as determined by Meridian Township. Pipe connections into manholes shall be cored in place after the inverts and angles have been verified in the field. Pipe connections into manholes shall be made with an integrally-cast seal boot such as "Kor-N-Seal", "Lock-Joint Flexible Manhole Sleeve" or an approved equal. Connection of the existing and proposed pipes to the proposed manhole shall be included in this item. It will be paid for at the Contract Unit Price for each Manhole successfully installed.

53a. **SOIL EROSION AND SEDIMENT CONTROL** – This pay item includes all labor, equipment, and material required to install, maintain, and remove the specified soil erosion and sediment control measures in accordance with the MDOT 2020 SSC, Section 208. Silt Fencing will be used as a perimeter control downstream of the project to prevent soil from leaving the site. Inlet protection shall be used on the inlets in the vicinity of the project as shown on the plans. All soil erosion measures shall be removed prior to the release of the contract retainage.

Soil Erosion and Sediment Control will be paid for at the Contract Unit Price on the following basis: after first use of control measures 50% of Soil Erosion and Sediment Control will be paid; once the contract work is complete, 100% of Soil Erosion and Sediment Control will be paid.

54. **SITE RESTORATION** – This pay item includes all labor, equipment, and material necessary to restore disturbed areas in accordance with the MDOT 2020 Standard Specifications for Construction (SSC), Section 816, and as described herein. The disturbed areas shall be restored to grade with three (3) inches of screened topsoil. Seed and mulch shall be secured either through the use of mulch anchoring (including hydro-seeding) or mulch blankets. Use mulch anchoring on slopes less than 1:3; use mulch blankets on all slopes greater than 1:3.

Any areas of settlement or washout shall be repaired promptly after discovery. Such spot repairs are incidental to this pay item. If the seeded turf is not well established at the end of the first growing season, the Contractor is responsible to re-seed until the turf is well established and approved by the Engineer.

54a. **LANDSCAPING** – This pay item includes all labor, equipment, and materials necessary to install eleven Baby Giant Thuja trees and a mulch bed as shown on the plans. The trees and mulching shall be planted/installed in accordance with what is stated on the Landscape Plan.

WHITEHILLS BYPASS PAY ITEMS

8j. **PERMANENT BYPASS, INSTALLATION** –This pay item includes all labor, material and equipment necessary to install all mechanical components and fittings for the permanent bypass as described herein. The contractor shall install a 6" bypass standpipe with two 90 degree ductile iron bends, and a 2 ½" male quick connect with dust cap as shown on the plans and in accordance with Technical Specification 2, "Sanitary Sewer Collection System". It will be paid for at the Contract Unit Price after all items are successfully installed.

8k. **LIVE TAP FORCE MAIN** –This pay item includes all labor, material and equipment necessary to install all mechanical components and fittings and perform the live tap of the forcemain as described herein. The contractor shall secure the 12x6" tap sleeve to the 12" forcemain. The 6" resilient seated gate valve shall be installed on tapping sleeve. The contractor shall perform the live tap of the force main. It will be paid for at the Contract Unit Price after all items are successfully installed.

10a. **MOBILIZATION** – The Contract Unit Price for this pay item includes all labor, equipment, and materials necessary for the Contractor to mobilize for the specified lift station replacements in accordance with the MDOT 2020 Standard Specifications for Construction (SSC), Section 110. Payment for this item will be made according to said Section 110.

54. **SITE RESTORATION** – This pay item includes all labor, equipment, and material necessary to restore disturbed areas in accordance with the MDOT 2020 Standard Specifications for Construction (SSC), Section 816, and as described herein. The disturbed areas shall be restored to grade with three (3) inches of screened topsoil. Seed and mulch shall be secured either through the use of mulch

anchoring (including hydro-seeding) or mulch blankets. Use mulch anchoring on slopes less than 1:3; use mulch blankets on all slopes greater than 1:3.

Any areas of settlement or washout shall be repaired promptly after discovery. Such spot repairs are incidental to this pay item. If the seeded turf is not well established at the end of the first growing season, the Contractor is responsible to re-seed until the turf is well established and approved by the Engineer.

NOTE: *The pay items detailed in this contract are intended to provide for the complete scope of work as depicted on the plans. Any and all work not covered under a specific pay item, but necessary to complete the project, is considered incidental.*

MERIDIAN CHARTER TOWNSHIP

SPECIAL PROVISION
FOR
HELICAL PILES

CAH 7-25-2025

a. Description. This work consists of designing, furnishing, and installing helical piles and bracket assemblies in accordance with the project plans, industry standard design methodology, the standard specifications, and this special provision. Install each helical pile to the elevation, spacing, and load capacities shown on the plans.

The following definitions apply when used herein and on the plans:

Allowable Pile Capacity. Ultimate pile capacity divided by a factor of safety as designated on the plans. If the factor of safety is not designated on the plans, then the factor of safety will be 2.0.

Brackets. Cap plate or other termination device that is bolted, slipped over, or welded to the end of a helical pile after completion of installation to facilitate attachments to structures or embedment in cast-in-place structures.

Designer. A Professional Engineer, licensed in the State of Michigan, who is retained by the Contractor and is responsible for the design and working drawings required herein.

Extension Section. Helical pile section(s) which follow the lead section into the ground and extend the helical lead to the appropriate depth. Extension section(s) consist of a central shaft and may have helical bearing plates affixed to the shaft.

Helical Pile. Manufactured steel foundation element, with one or more helical bearing plates, that is rotated into the ground to support structures. The element consists of a lead or starter section, extension section(s), brackets, and a pile cap.

Installation Torque. The resistance generated by a helical pile when installed into soil. The installation resistance is a function of the soil type and the size and shape of the various components of the helical pile.

Lead Section. The first section of a helical pile to enter the ground, lead sections consist of a central shaft with a tapered end and one or more helical bearing plates affixed to the shaft.

Manufacturer. The individual or legal entity that performs part of the work required through a contract agreement with the Contractor. This includes an individual or legal entity that owns the patent, product trademark, product copyright, or product name for the approved helical pile system.

Shop Drawings. A submittal consisting of drawings and calculations related to the design and installation of the helical pile system by the Contractor.

Torque Strength Rating. The maximum torque energy that can be applied to the helical pile foundation during installation in soil, i.e., allowable or safe torque.

Unsupported Length. Unsupported shaft lengths shall include the length of the shaft in air, water, or in fluid soils.

b. Materials. Unless noted otherwise, it is the responsibility of the Contractor to select the appropriate type and design strength of helical plates, shaft connections, shafts, brackets, and the overall helical pile system to support the load capacities and criteria specified on the project plans. Materials used for helical piles must meet the requirements of ICC-ES AC358. In addition, all helical piles must be manufactured to the following criteria:

1. Central Steel Shaft. The central shaft must consist of high strength structural steel tube, pipe, or solid steel bars meeting the requirements of ASTM A 36, A 252 Grade 3, A 500 Grade C, or A 576 Grade 1045 or Grade 1530.

2. Helix Bearing Plate. The bearing plate material must conform to ASTM A 572 Grade 50 or A 1018 Grade 55.

3. Bolts, Nuts, and Washers. Must meet the material and hot-dip galvanizing requirements of subsection 906.07 of the MDOT 2020 Standard Specification for Construction.

4. Brackets. Bracket must conform to ASTM A 36, A 572 Grade 50, or A 958 Grade SC 1045.

5. Couplings. Couplings, if applicable, must conform to ASTM A 958.

6. Corrosion Protection. At minimum, all helical piles and hardware must have corrosion protection consisting of hot-dip galvanization in conformance with ASTM A 153 and A 123, as applicable.

c. Construction. Furnish, design, and install the helical piles in accordance with the project plans, this special provision, and the approved shop drawings.

1. Pile Design Load. Design load shall be determined by the design Engineer as specified in section 2.C. Ultimate Pile Capacity shall be two times the Pile Design Load.

2. Qualifications.

A. Manufacturer. The manufacturer must be a company specializing in the manufacturing and distribution of these products. Manufacturer's qualifications are to be submitted to the Engineer in accordance with subsection c.2.A of this special provision. The submittal must include:

(1) A product catalog and evidence showing the manufacturer has at least 10 years of experience in the design and manufacture of helical piles.

(2) Current ICC-ES product evaluation report or complete description of product testing and engineering calculations used to assess product capacity.

B. Contractor. The Contractor performing the work described in the contract must be a company specializing in the installation of helical piles. The submittal must include:

(1) Evidence the Contractor has completed training in the proper methods for installation of helical piles and brackets.

(2) Documentation that the Contractor's fulltime onsite supervisor and drillers performing the work have completed at least 10 projects and have 3 years of experience installing similar types of helical piles in similar subsurface conditions to this project. Documentation must, at minimum, include project name, description, dates, number and type of helical piles, project location, and client contact information.

(3) List of installation equipment and detailed description of proposed method of installation.

C. Designer. The design of the helical piles must be done by a licensed design professional specialized in the engineering and design of helical piles. The designer must have the following qualifications:

(1) A Professional Engineer licensed in the State of Michigan.

(2) Documentation indicating the designer has designed at least five projects utilizing helical piles. Documentation must, at minimum, include project name, description, dates, number and type of helical piles, project location, and client contact information.

3. Submittals.

A. Qualifications. Submit manufacturer, Contractor, and designer qualifications in accordance with subsections c.2.A, c.2.B, and c.2.C.

Submit to the Engineer three copies of the project reference list and a personnel list at least 30 calendar days before the planned start of helical pile construction. Provide a summary of each individual's experience in the personnel list and be complete enough for the Engineer to determine whether each individual satisfies the required qualifications. The Engineer will approve or reject the Contractor's and manufacturer's qualifications within 15 calendar days after receipt of a complete submission. Additional time required due to incomplete or unacceptable submittals will not be justification for time extension, impact, or delay claims. All such costs associated with incomplete or unacceptable submittals will be borne by the Contractor.

Work is not to be started, nor materials ordered, until the Engineer's written approval of the Contractor's, manufacturer's, and designer's experience and personnel qualifications is given. The Engineer may suspend the work if the Contactor uses non-approved personnel, manufacturer, or designer. If work is suspended, the Contractor is fully liable for all resulting costs, and no adjustment in contract time will accrue due to the suspension.

B. Shop Drawings. Prepare and submit to the Engineer shop drawings for the helical piles intended for use on the project at least 30 calendar days prior to start of installation. The shop drawings must include the following:

(1) Overall plan drawing showing helical pile location, number, and product identification number(s).

(2) Maximum allowable mechanical compression and tensile strength of the helical piles. Include the Torque Strength Rating.

(3) Helical piles respective design capacities from the drawings.

(4) Planned installation depth and cut-off elevation and the number and type of lead and extension sections.

(5) Designer's recommended allowable pile capacity to installation torque ratio and minimum final installation torque(s) for the helical piles.

(6) Product identification numbers and designations for all the brackets and number and size of connection bolts or couplers. Details illustrating helical pile attachment to structure relative to grade beam, column pad, pile cap, etc.

(7) Corrosion protection coating on helical piles and bracket assemblies.

C. Design Calculations. The designer is to prepare and submit detailed design calculations to the Engineer for the helical piles intended for use on the project. Design must be in accordance with the current AASHTO *LRFD Bridge Construction Specifications* and other published design methodologies as approved by the Engineer. All submittals must be sealed and stamped by the designer and submitted at least 30 calendar days prior to the start of installation. The analysis must take into account the notes and design details from the plans and must include, but is not limited to, the following items:

(1) Reduction in the dimensions of the structural elements based on anticipated corrosion loss over the design life for the subsurface and environmental conditions encountered at the project site.

(2) Ultimate and allowable pile capacities. Consider effects from down-drag, buckling, and expansive soils.

(3) Anticipated minimum installation depth to reach bearing stratum and to achieve pullout capacity, if applicable.

(4) One hand calculation for a typical helical anchor location, which illustrates conformance of the computer programs utilized to design the axial pile capacity.

(5) Lateral resistance of the shaft, if applicable.

(6) Estimated pile head movement at the allowable pile capacities.

D. Calibration Reports. Submit to the Engineer calibration information certified by an independent testing agency for the torque measurement device. Calibration information must have been tested within 30 days of the start of helical pile installation. Calibration information must include, but is not limited to, the name of the testing agency, identification number or serial number of device calibrated, calibration data, and the date of calibration.

E. Installation Record. Submit to the Engineer a Daily Inspection Log during helical pile installation. This log must contain the following information for each helical pile:

(1) Name of project and Contractor.

(2) Name of Contractor's supervisor during installation.

(3) Date and time of installation.

(4) Name and model of installation equipment and type of torque indicator used.

(5) Location of helical pile by grid location or assigned identification number.

(6) Type and configuration of Lead Section with length of shaft and number and size of helical bearing plates.

(7) Type and configuration of extension sections, with length and number and size of helical bearing plates, if any.

(8) Installation duration and observations.

(9) Total length installed.

(10) Final elevation of top of shaft and cut-off length, if any.

(11) Final plumb-ness or inclination of shaft.

(12) Installation torque at minimum 3-foot depth intervals.

(13) Final installation torque.

(14) Comments pertaining to interruptions, obstructions, or other relevant information.

(15) Verified allowable pile axial load capacity.

4. Subsurface Data. Review the available soil boring logs from the subsurface investigation(s). If during construction, the Contractor determines the actual subsurface conditions differ substantially from those reported on the boring logs, notify the Engineer in writing within 48 hours of such determination.

The data indicated on the available boring logs are not intended as representation or warranties of continuity of such conditions. It is expressly understood that the Owner will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. Additional soil test borings and other exploratory procedures may be performed by the Contractor at no additional cost to the Owner.

5. Installation Equipment. The equipment must be capable of applying adequate down pressure (crowd) and torque simultaneously to ensure normal advancement of the helical piles to the ultimate pile capacities as shown on the plans. The equipment must be capable of continuous position adjustment to maintain proper alignment and position.

A. Torque Motor. Helical piles are to be installed with high torque, low RPM torque motors, which allow the helical plates to advance with minimal soil disturbance. The torque motor must be hydraulically powered with clockwise and counter-clockwise rotation capability. The torque motor must be adjustable with respect to revolutions per minute during installation. Percussion drilling equipment is prohibited. The torque motor must have a minimum torque capacity 15% greater than the torsional strength rating of the central steel shaft to be installed for the project. The connection between the torque motor and the installation rig must have no more than two pivot hinges oriented 90° from each other.

B. Drive Tool. The connection between the torque motor and the helical pile must be in–line, straight, and rigid, and must consist of a hexagonal, square, or round Kelly bar adapter and helical shaft socket. To ensure proper fit, the drive tool must be manufactured by the helical pile manufacturer and used in accordance with the manufacturer's installation instructions.

C. Connection Pins. Attach the central shaft of the helical pile to the drive tool by smooth tapered pins matching the number and diameter of the specified shaft connection bolts. Maintain the connection pins in good condition allowing safe operations at all times. Inspect the pins regularly for wear and deformation. Replace pins with identical pins when worn or damaged.

D. Torque Indicator. Ensure the torque indicator is capable of providing continuous installation torque measurement during installation. Ensure the torque indicator is capable of torque measurements of 500 ft-lbs or less. Calibrate torque indicators that are mounted in-line with the installation tooling either on-site or at an appropriately equipped test facility. Re-calibrate indicators that measure torque as a function of hydraulic pressure following any maintenance performed on the torque motor. Re-calibrate torque indicators if, in the opinion of the Engineer, reasonable doubt exists as to the accuracy of the torque measurements. If recalibration is directed by the Engineer in writing and the calibration is off by less than 500 ft-lbs, the recalibration will be paid for as extra work. Otherwise, recalibrations will be paid for by the Contractor at no cost to the Owner.

6. Installation Procedures. The helical pile installation technique is to be determined by the Contractor such that it is consistent with the geotechnical, logistical, environmental, and load carrying conditions of the project.

A. Position the lead sections at the location depicted on the working drawings. Battered helical piles can be positioned perpendicular to the ground to assist in initial advancement into the soil before the required batter angle is established. The equipment must be capable of continuous position adjustment to maintain proper helical pile alignment. Apply constant axial force (crowd) while rotating helical piles into the ground. Apply sufficient crowd to ensure the helical pile advances into the ground a distance equal to at least 80% of the blade pitch per revolution during normal advancement.

B. Advance the helical pile sections into the soil in a smooth, continuous manner at a rate of rotation between 5 RPM's and 40 RPM's. Adjust the rate of rotation and magnitude of down pressure for different soil conditions and depths.

C. Provide extension sections to obtain the required installation torque as shown on the shop drawings. Use coupling bolt(s) and nuts torqued in accordance to the manufacturer's guidelines to connect sections together.

D. Do not exceed the manufacturer's Torque Strength Rating of the helical pile during installation.

E. The Contractor must adjust the elevation of the top end of the shaft to the elevation shown on the shop drawings or as required. This adjustment may consist of cutting off the top of the shaft and drilling new holes to facilitate installation of brackets to the orientation shown on the shop drawings. Alternatively, installation may continue until the final elevation and orientation of the pre-drilled bolt holes are in alignment. Do not reverse the direction of torque and back-out the helical pile to obtain the final elevation.

F. Install brackets in accordance with helical pile manufacturer's details or as shown on the shop drawings.

G. Ensure all helical pile components, including the shaft and bracket, are isolated from making a direct electrical contact with any concrete reinforcing bars or other non-galvanized metal objects since these contacts may alter corrosion rates.

H. Obstructions. Terminate the installation and remove the pile if the helical pile encounters refusal or is deflected by a subsurface obstruction. Install the helical pile at an adjacent location, subject to review and approval by the Engineer.

7. Production Helical Piles.

A. Advance production helical piles until the allowable pile capacity is verified by achieving the required Installation Torque. The required Installation Torque shall be as certified by the designer. The maximum rotational speed must not exceed 12 RPM when torque is monitored.

B. If the final Installation Torque is not achieved at the estimated length shown on the shop drawings, the Contractor has the following options:

(1) Install the helical pile deeper using additional extension sections until the required Installation Torque is obtained.

(2) Remove the helical pile and install a new one with additional and/or larger diameter helical bearing plates.

(3) Submit other options to the Engineer in writing for review and approval.

(4) Additional materials and work necessary to reach the required helical pile capacity, including engineering analysis and redesign, is to be furnished without cost to the Owner and without an extension of the completion dates for the project.

C. The helical pile must be sized to reach the allowable pile capacity. No additional compensation for changes in the helical pile will be allowed unless differing site conditions are determined by the Engineer.

8. Construction Tolerances.

A. Horizontal Alignment. Ensure the helical pile actual centerlines are within 2 inches of plan centerlines at the plan elevation for the top of the shaft. Tolerances for bracket assembly placement are ±1 inch in both directions perpendicular to the shaft and ±¼ inch in a direction parallel with the shaft, unless otherwise specified.

B. Plumb. Tolerances for departure from the design orientation angles is ±5°.

C. Top of Pile Elevation. Ensure helical pile is cut off at the design cut-off elevation.

D. Submit a plan for remedial action to the engineer for approval, for helical piles not constructed within the required tolerances which are considered unacceptable. The Contractor is responsible for correcting all unacceptable piles to the satisfaction of the Engineer. Materials and work necessary to complete corrections for out-of-tolerance helical piles, including engineering analysis and redesign, must be furnished without cost to the Owner and without extension of the completion dates for the project. Do not begin repair operations until receiving the Engineer's approval of the remedial action plan.

d. Measurement and Payment. The complete work as measured will be paid for at the contract unit price for the following contract pay item and includes all material, equipment, and labor to complete these items.

Pay Item	Pay Unit
HELICAL PILES, VALVE VAULT	**Lump Sum**
HELICAL PILES, WET WELL	**Lump Sum**
HELICAL PILES, GENERATOR PAD	**Lump Sum**

The above mentioned pay items include all labor, furnishing, operating, and removing the equipment for construction and installation of piles, designing, shop drawings, and materials to install as shown on the plans and in this special provision.

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

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January 13, 2025 *via electronic mail*

Ms. Caycee Hart, P.E., Project Engineer
MERIDIAN TOWNSHIP DEPARTMENT OF PUBLIC WORKS
5151 Marsh Road
Okemos, Michigan 48864

Re: Geotechnical Report
Forest Hills Lift Station Replacement
1568 Hillside Drive, Meridian Township, Michigan
Driesenga & Associates, Inc. Project No 2441058.3A

Dear Ms. Hart:

Driesenga & Associates, Inc. is pleased to submit the attached report of subsurface exploration performed for the above-referenced project. The report presents the exploration procedures, subsurface conditions encountered, and our recommendations for development of the site with respect to proposed earthwork, foundation construction, and pavement design. As the project nears construction you can contact Beni Traore at 517-505-0220 (benit@driesenga.com) in our local office to provide a quote for construction materials testing and survey needs.

Proper execution of our recommendations will affect the design, construction and performance of the structure and related facilities, and the potential associated risks involved. Therefore, the issues and recommendations presented in this report should be discussed with the project team, including Driesenga & Associates, Inc. This will increase the likelihood that the issues are understood and our recommendations are applied in a manner consistent with the project budget, tolerance of risk, and expectations for performance and maintenance.

We appreciate the opportunity to be of service to you. If you have any questions concerning this report, or if we can be of further service as design and construction progresses, please contact our office.

Sincerely,
DRIESENGA & ASSOCIATES, INC.

Michael Stork
Senior Project Geologist

Musana Nabil
Senior Project Engineer

Randy Pail, P.E
Director of Geotechnical Engineering

GEOTECHNICAL REPORT

SITE:

FOREST HILLS LIFT STATION REPLACEMENT
1568 HILLSIDE DRIVE
MERIDIAN TOWNSHIP, MICHIGAN

JANUARY 13, 2025
PROJECT NO. 2441058.3A

PREPARED FOR:

MERIDIAN TOWNSHIP DEPARTMENT OF PUBLIC WORKS
5151 MARSH ROAD
OKEMOS, MICHIGAN 48864

Prepared by:

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

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APPENDICES

APPENDIX A	Figure 1 – Site Location
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1.0 INTRODUCTION

1.1 LOCATION

This report presents the results of the geotechnical investigation completed for the proposed Forest Hills Lift Station Replacement. The site is located at 1568 Hillside Drive, Meridian Township, Michigan, as shown on Figure 1 – Site Location (Appendix A). The property is situated on the northeast corner of Hillsdale Drive and Northview Drive.

1.2 PURPOSE

The purpose of this investigation was to determine the subsurface profile, the engineering characteristics of the subsurface soils, and to provide recommendations in regard to the proposed design and construction based on our interpretation of the test results. This report was prepared in general accordance with our proposal dated November 26, 2024, as authorized by Mr. Dan Opsommer of Meridian Township on December 3, 2024.

1.3 SCOPE

The field exploration to estimate engineering characteristics of the site soils included performing a site reconnaissance, advancing the soil borings, performing standard penetration tests, and recovering split-spoon samples. Soil boring locations were determined in the field by measuring from existing site features. Existing ground surface elevations were not provided and obtaining them was beyond the scope of this investigation.

One (1) soil boring, designated SB-1, was advanced in the vicinity of the proposed lift station on December 27, 2024, at the approximate locations shown on Figure 2 - Boring Locations (Appendix A). The soil boring was advanced with hollow-stem augers to a depth of twenty-five (25) feet below the ground surface. During drilling, soil samples were collected from split-spoon sampling

via standard penetration testing (ASTM method D 1586) at intervals of 2.5 feet to a depth of 10 feet, and intervals of 5 feet from a depth of 10 feet to the end of each boring. The soil boring log are contained in Appendix B. The field and laboratory procedures are described in Appendix C.

1.4 DESIGN INFORMATION

The station is comprised of a wet well and a separate dry well that houses the pumps and both structures have an internal diameter of 7'. Both existing wells have an approximate depth of 17' below grade. The existing lift station will be removed entirely and replaced with new structures. The proposed replacement will consist of a wet well and a valve vault with an estimated internal diameter of 8'. The depth of the wet well will is subject to final design but is anticipated to have a depth between 18'-22' feet below existing grade. The valve vault is also subject to final design but is anticipated to have a depth between 9'-12' feet below existing grade. The location of the lift station replacement will generally be in the same location as the existing station.

Structural load information was not available as of the time of this report, but should be provided to Driesenga & Associates, Inc. for review in light of the recommendations contained herein as soon as available. For calculation purposes, we have assumed the maximum load at the base of the lift station will be 2,000 pounds per square foot or less.

We have assumed maximum tolerable settlements of 1 inch total and ½ inch differential. We do not anticipate any significate cuts or fills will be required to establish site grades. Any significant deviation from these assumptions should be brought to the attention of Driesenga & Associates, Inc. as soon as possible.

2.0 SITE CONDITIONS

2.1 GENERAL

The stratification of the soils, as shown on the soil boring log in Appendix B, represents the soil conditions at the actual soil boring locations. Variations may occur away from or between the soil borings. Stratigraphic lines shown on the soil boring log represent the approximate boundary between the soil types, but the transition may be gradual. They are not intended to show exact depths of change from one soil type to another. In addition, changes in soil type may occur between the sample intervals that are consequently not observed by the driller.

The soil boring log in Appendix B include the drilling method, materials encountered, penetration resistances, and pertinent field observations made during the drilling operations along with the results of the laboratory testing.

2.2 SURFACE CONDITIONS

The area of the new lift station is currently maintained lawn and is adjacent to an existing residential structure. This area is relatively flat. The area is surrounded by maintained lawn and asphalt driveway areas associated with residential uses.

2.3 DESCRIPTION OF SUBSURFACE SOILS

Soils/surface materials encountered at the site generally consist of 5 inches of topsoil underlain by very loose to loose, brown, clayey sand fill to a depth of 6 feet. A 2 feet thick layer of peat was encountered beneath the fill. Medium stiff to very stiff, brown to gray, clay was encountered beneath the peat layer to a depth of at least 18 feet. Loose to medium dense, brown, sand was encountered below the clay and extended to the explored depth of the soil boring.

Hand Penetrometer tests were performed on representative portions of cohesive soil samples to obtain an indication of the unconfined compressive strength of the material. As indicated on the soil boring log, the estimated unconfined compressive strength ranged from 0.75 to 2.75 tons per square foot (tsf).

The estimated group symbol, according to the USCS, is shown in the USCS column just before the textural description of the various strata on the soil boring log in Appendix B.

2.4 GROUNDWATER OBSERVATIONS

Groundwater was initially encountered at a depth of 18.5 feet below the existing ground surface. Upon completion of the boring, groundwater was measured at a depth of 10 feet. Hydrostatic groundwater levels and the elevations and volumes of groundwater should be expected to fluctuate throughout the year, based on variations in precipitation, evaporation, run-off, and other factors. The groundwater levels indicated by the soil boring and presented in this section represent conditions at the time the readings were taken. The actual groundwater levels at the time of construction may vary.

Groundwater measurements were collected during drilling and attempted shortly after completion of the drilling operations. After drilling and collection of groundwater readings, the borehole was backfilled with auger cuttings and the surface was repaired approximating previous conditions. Since the boreholes were backfilled shortly after drilling, long-term groundwater level information is not available from the soil boring. To obtain long-term groundwater levels, groundwater observation wells would be required.

2.5 LIMITATIONS

Soil and groundwater conditions have been observed and interpreted at the soil boring location only. This information has been used as the basis for our analyses and the recommendations that follow. Although we have allowed for minor variations in subsurface conditions in the development of our recommendations, conditions can vary away from the soil boring location. Should this become evident during construction, we should be contacted to review our recommendations. This geotechnical evaluation and report were prepared for geotechnical purposes only. We did not perform environmental related borings or analytical tests.

3.0 RECOMMENDATIONS

3.1 SITE PREPARATION

To increase the likelihood that the recommended allowable soil bearing capacities are achieved and tolerable settlements are not exceeded, the recommendations contained herein should be followed. Within the construction footprint and any areas to receive fill, all existing building material, topsoil, old fill, peat and other organic-containing material, frozen soil and other unsuitable material should be removed to the lift station, anticipated to be on the order of 18 to 22 feet below grade. The clearing should extend a safe distance laterally or temporary shoring should be utilized.

It is strongly recommended that the lift station bearing subgrade areas for the proposed structure be evaluated by Driesenga & Associates, Inc. after the area has been cleared and stripped to identify any areas of soft subgrade soil. Where soft subgrade soils are encountered, remedial actions as recommended by the geotechnical engineer will be required.

We understand portions or all of the existing lift station and sanitary sewer infrastructure may be demolished as part of the project. Any existing foundations, floor slabs, utilities, and other below-grade structures from previous construction should be completely removed from the footprint of the proposed new development, unless structurally accounted for in the new design. In proposed pavement areas, existing utilities and other below-grade structures should be removed to at least 2.5 feet below the final subgrade level. Depressions or excavations from the demolition and removal operations should be backfilled with granular structural fill meeting the requirements of MDOT Class II sand compacted in accordance with the recommendations below.

Existing fill was encountered in the soil boring and extended about 6 feet below the existing ground surface, and could affect new surface structures such as slabs on grade. Without documentation of the placement of the fill, we consider it to be “uncontrolled fill.” If documentation of the existing fill is available, we would be pleased to review it to determine its

suitability of slab and/or structural fill support. Additionally, the old fill was underlain by 2 feet of peat. Where the peat is left in place beneath slabs on grade, premature distress, cracking and uneven settlement should be expected.

Deeper and/or looser uncontrolled fill may be encountered at the site, particularly adjacent to existing or former structures, or in the vicinity of existing utilities. The existing fill ***may*** be suitable for support of slabs, and/or structural fill after additional evaluation and special preparation and only where it is not underlain by buried topsoil or other organic, deleterious or otherwise unsuitable soils and the owner accepts the risks in doing so. Existing fill with excessive organics (over 4%), voids or debris should be removed and replaced with structural fill. Test pits should be performed to identify unsuitable fill. The test pits could be performed prior to construction. However, suitability of the existing fill will need to be determined on a case-by-case basis during construction. The remaining fill, after removing unsuitable fill, is anticipated to be suitable to support floor slabs, and structural fill, provided an increased risk of unsatisfactory performance is acceptable. We believe the risk of unsatisfactory performance such as cracking and settlement associated with the construction of slabs-on-grade and pavements on or above the existing fill is relatively low after preparation.

Ultimately, if the risk of poor slab performance is not acceptable, complete removal of the existing fill and peat, and replacement with structural fill should be performed. Based on the soil borings, the existing fill could extend 8 feet or more below the existing ground surface. If performed, the removal of the existing fill should extend a minimum of 5 feet beyond the edges of the proposed structure, or laterally on a two vertical to one horizontal slope from the bottom outside edge of the foundation, whichever is greater. This action should reduce the amount and depth of undercutting during foundation construction since the unsuitable fill and any unsuitable soils directly beneath fill would be removed. For this case, the test pit evaluation would not be necessary. However, a test pit evaluation could be performed to provide a better estimate of the nature, depth and extent of the existing fill.

In all general fill areas, the exposed soil surface should be scarified to a depth of 12 inches and recompacted to a minimum of 95% of Modified Proctor maximum dry density (MDD) per ASTM D 1557 method, or 98% of MDD as determined by the Michigan Cone Method. In any areas of backfill below the groundwater elevations, the use of a clean (less than 7% passing the No. 200 sieve), 1-inch to 3-inch open-graded crushed aggregate is recommended.

The contractor should remove standing water from the subgrade and prevent surface water from reaching the footing excavations and the prepared subgrade. In addition, construction traffic should use haul roads and should not haphazardly traffic the site. Subgrade soils that become disturbed should be removed and replaced with structural fill or crushed aggregate. Under wet weather conditions, the subgrade may be protected by placing crushed aggregate on the exposed subgrade.

It is recommended that any fill materials be placed in or near horizontal maximum 8-inch-thick loose lifts and compacted to a minimum of 95% of Modified Proctor MDD, or 98% of Michigan Cone MDD. If a vibratory roller is used for compaction, the loose lift thickness may be increased to 12 inches. Soils used for structural fill should consist of clean sand meeting SW or SP classification in accordance with USCS criteria. Care should be taken not to disturb or undermine the existing foundations.

3.2 FOUNDATIONS

Considering the subsurface conditions on this site and the assumed proposed construction, it is acceptable for the proposed lift station to be supported on a mat type foundation at a depth of approximately 18 to 22 feet below grade. The mat foundation may bear on newly placed structural fill placed over suitable native soils or directly on the native sand, and may be designed for a maximum net allowable soil bearing pressure of 2,500 psf. The structure should be safely protected against buoyant forces.

The native sand soils may be in relatively loose condition and not suitable for support of foundations at the recommended design soil bearing pressure. In addition, these soils may become loosened below the bottom of footing level from the excavation activities or from construction traffic, especially if allowed to dry out. Therefore, the excavated footing bearing surfaces should be compacted to a minimum of 95% of Modified Proctor MDD, or 98% of MDD as determined by the Michigan Cone Method, just prior to concrete placement. A hand-operated plate compactor may be used for loose or disturbed soil that is less than 6 inches in thickness. For deeper compaction, we recommend using a hoe-pac mounted on a backhoe. Water may need to be added to achieve the desired compaction for the allowable bearing capacity.

In regard to any surface structures, all perimeter footings and footings in unheated areas should bear at least 42 inches below finished grade for protection from frost action. The placement of footing concrete should be done as soon as footing excavations have been completed and approved to reduce the potential for disturbance or freezing of the footing subgrade.

Excavation for new lift station foundations should not extend below the existing old lift station structure / foundation where it is left in place and repurposed, or other nearby structures without first properly underpinning or shoring the existing foundations.

Prior to concrete placement, the bearing surface should be free of loose soil and standing water. The contractor should avoid stockpiling excavated materials immediately adjacent to the excavation walls. It is recommended that stockpiled materials be kept back from the excavation a minimum distance equal to half the excavation depth to prevent surcharging the excavation walls.

Total and differential settlement of foundations properly designed and constructed based on our recommendations are not expected to exceed 1 inch and ½ inch, respectively.

3.3 SURFACE SLABS ON GRADE

The soil below any new surface slabs-on-grade should be prepared in accordance with the recommendations in Section 3.1. A noncohesive soils mat such as MDOT Class II sand should be provided directly below the floor slabs. The mat should be a minimum of 8 inches in thickness and compacted to a minimum of 95% of Modified Proctor MDD.

The slabs-on-grade should be suitably reinforced and proper joints should be provided at the junctions of the slab and foundation system so that a small amount of independent movement can occur without causing damage. A modulus of subgrade reaction of 200 pci should be used in the design of slabs-on-grade.

3.4 GROUNDWATER CONTROL

Groundwater was encountered at 18.5 feet below existing ground surface elevation and was observed to be at 10 feet below the ground level after completion. We anticipate excavation for the new lift station will be 10 to 22 feet below grade. In order to facilitate construction, a well point dewatering system will be necessary to lower the groundwater to several feet below bottom of planned excavation depth. Upon removal of any trapped water, the soils should be reviewed by a geotechnical engineer and any soft areas replaced with structural fill per Section 3.1, as necessary.

3.5 BELOW GRADE WALLS

Pressures on below grade walls will depend on the properties of the backfill and yielding of the wall. Assuming imported fill sand meeting the recommendations of Section 3.1 is used as backfill, a soil density of 115 pcf and a coefficient of active pressure (Ka) of 0.33 may be used for design in the active condition (i.e., the wall is allowed to move slightly such as a cantilevered retaining wall). An “at rest” coefficient of lateral pressure (Ko) of 0.5 should be used if the wall will be fixed or not allowed to move, as in the case of a basement wall. An equivalent fluid pressure of 35 pcf would

be appropriate for non-submerged conditions in the active condition and 58 pcf in the "at rest" condition. For the undrained condition, an equivalent fluid earth and groundwater pressure of 95 pcf should be used for the active condition and 120 pcf for the at-rest condition. In no case should cohesive soils be used as backfill against walls, as excessive creep could increase lateral pressures significantly above assumed design values over time.

The coefficient of passive pressure (Kp) to resist sliding will depend on the type of soil on the "low side" (i.e., side of the wall opposite the "high side" or backfill). For the native sandy soils and assuming level backfill behind the wall, a Kp of 3.2 should be used. For the native clayey soils at this site, a Kp of 2.2 should be used.

Assuming a concrete wall foundation (rough concrete surface), an ultimate friction factor of 0.50 between the concrete and soil should be used to calculate sliding resistance for the native sands or imported sand fill as described in section 3.1. An ultimate friction factor of 0.35 should be used if the wall foundation will bear on native clays. Design calculations should use a minimum factor of safety of 1.5 to resist sliding (including friction and passive earth pressure forces), and a minimum factor of safety of 1.5 should also be used to resist overturning of the wall.

The recommended earth pressures stated above do not account for surcharge loading on the wall system caused by, for example, stockpiled materials, sloping backfills, or excessive temporary loads. These conditions would increase design pressures and should be properly distributed in the earth pressure analyses. Earth pressures on non-yielding walls can be much higher if backfill is placed with heavy equipment operating immediately behind the wall. To reduce this potential, we recommend that only hand compaction equipment and methods be used for backfilling within 5 feet of the wall.

It is recommended that a perimeter drain be located around the exterior foundation to reduce the buildup of hydrostatic pressure against the walls. The drains must outlet to a positive drain by gravity or to a sump equipped with an automatic properly sized pump. Slotted PVC pipe wrapped

in filter fabric and covered with MDOT 6AA or pea stone should be used. Final exterior grades should slope away from below-grade walls to divert surface water.

3.6 TEMPORARY EXCAVATION STABILITY

Due to depth of excavations anticipated (24 feet) for the proposed structure and/or utilities, shoring and bracing or flattening (laying back) of the slopes will be required to obtain a safe working environment. Excavations should be sloped or shored in accordance with local, state and federal regulations, including OSHA (CFR Part 1926) excavation trench safety standards. We recommend that all excavated soils be placed away from the edges of the excavation at a distance equaling or exceeding the depth of the excavation. In addition, surface runoff water should be diverted away from the crest of the excavated slopes to prevent erosion and sloughing.

Localized areas of soft or unsuitable soils not detected by our borings or in unexplored areas may be encountered once construction begins. Vertical cuts in these soils may be unstable and may present a significant hazard because they can fail without warning. Therefore, temporary construction slopes greater than 5 feet high should not be steeper than one horizontal to one vertical (1H: 1V) and excavated material should not be placed within 10 feet of the crest of any excavated slope.

Unbraced excavations may experience some minor localized instability (i.e., sloughing). To reduce potential sloughing, excavated slopes should be covered with plastic for protection from rainfall and moisture changes. It should be emphasized that continuous observations by personnel from our office are important during trenching or excavation operations at the site.

4.0 GENERAL COMMENTS

If significant changes are made in the plans and specifications or location of the proposed lift station, a consultation should be arranged to review such changes with respect to the prevailing soil conditions. It may then be necessary to submit supplementary recommendations. If deviations from the noted subsurface conditions are encountered during construction, they should also be brought to the attention of Driesenga & Associates, Inc.

Driesenga & Associates, Inc. should be afforded the opportunity to review the project design drawings and specifications to verify the factors affecting subgrade and foundation performance comply with our recommendations.

It is recommended that the services of Driesenga & Associates, Inc. be engaged to observe excavation for the footings and to test and evaluate the soils in the footing excavations prior to placement of foundations in order to determine that the soils have the required bearing capacities. Monitoring and testing should also be performed to verify that suitable materials are used for controlled fills and that they are properly placed and compacted.

This report and any future reports or addenda performed for this site should be supplied to potential bidders prior to them submitting their proposals. We also recommend the construction contract include provisions for dealing with differing conditions. Contingency funds should be reserved for potential problems during earthwork and foundation construction.

This report was for geotechnical purposes only. We did not sample for environmental purposes or perform any analytical testing. However, the contractor should be prepared to handle environmental conditions encountered at this site that may affect the excavation, removal, or disposal of soil; dewatering of excavations; and health and safety of workers. Any Environmental Assessment reports prepared for this property should be made available for review by bidders and the successful contractor.

This report has been prepared solely for the use of the client for the project specifically described in this report. This report cannot be relied upon by other parties not involved in this project, unless written permission is granted by Driesenga & Associates, Inc. If this report or any of its contents are utilized by parties other than our original client and the project team members, Driesenga & Associates, Inc. can not be held responsible for the suitability of the field exploration, scope of services, or recommendations made for the new project. Driesenga & Associates, Inc. also is not responsible for the interpretation of our soil boring log and the recommendations provided herein by other parties.

Driesenga & Associates, Inc. will evaluate this report for other parties and developments at this site, provided our original Client agrees to release this information in writing. However, before this report can be relied upon by other parties. Driesenga & Associates, Inc. must review the proposed development since the new project will likely require additional field exploration, laboratory tests, analysis, and modifications to our recommendations to adequately address the needs of the new project.

APPENDIX A

·FIGURE NUMBER 1 – SITE LOCATION·

·FIGURE NUMBER 2 – BORING LOCATIONS·

Figure Number: 1
Site Location

Project Name
Forest Hills Lift Station Replacement

Project Number
2441058.3A

Project Location
Northview Drive and Hillsdale Drive
Meridian Township, Michigan



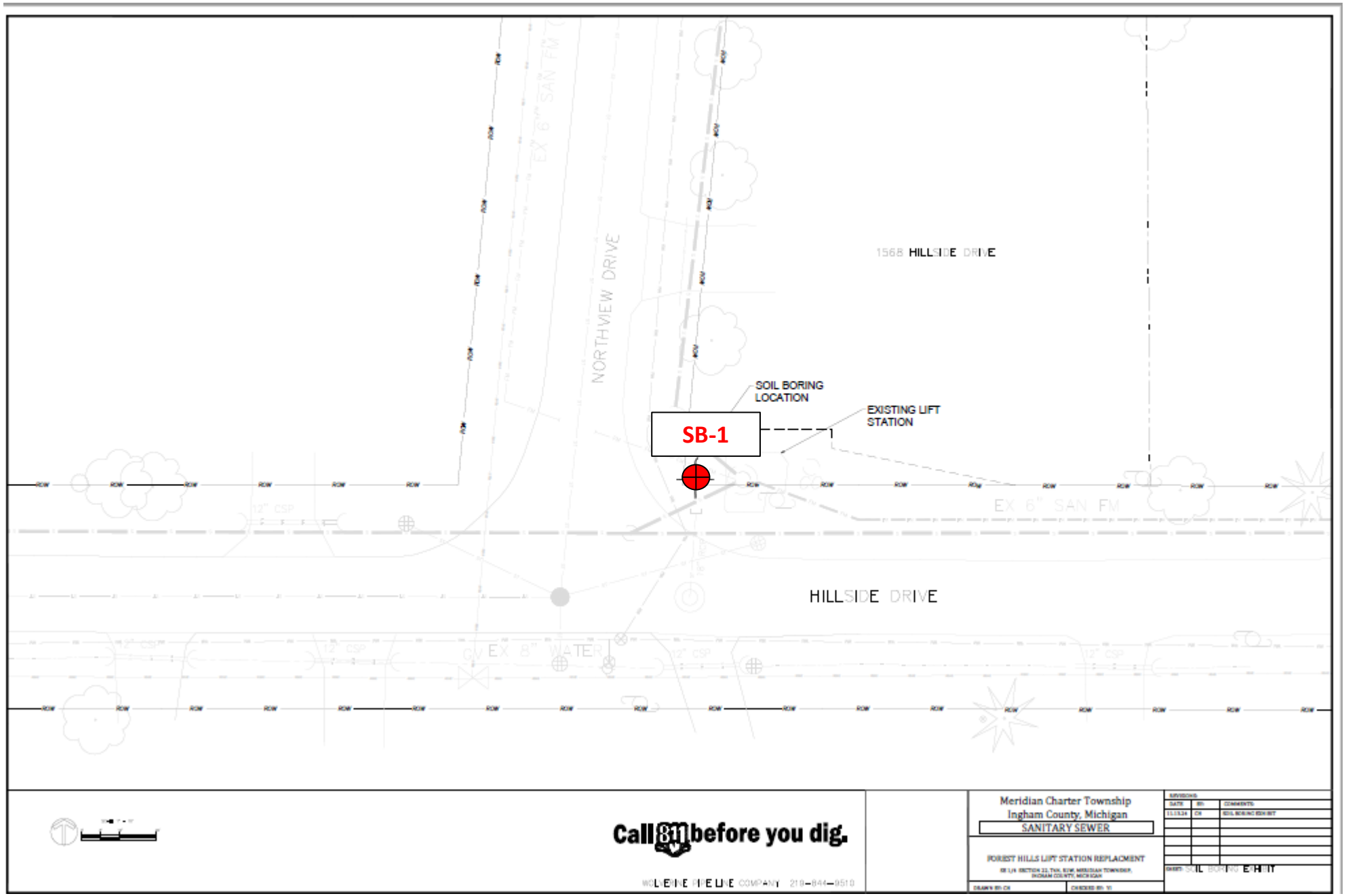
DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

Figure Number: 2
Boring Locations

Project Name
Forest Hills Lift Station Replacement

Project Number
2441058.3A

Project Location
Northview Drive and Hillsdale Drive
Meridian Township, Michigan



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APPENDIX B

·SOIL BORING LOG·

DRIESENGA & ASSOCIATES, INC.
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SB-1

Project Name: Forest Hills Lift Station
1568 Hillside Drive
Meridian Township, Michigan

Project No. 2441058.3A

Client Name: Meridian Township

Date Started	: December 27, 2024	Drilling Company	: Midwest Envirotech
Date Completed	: December 27, 2024	Field Sampling	: J. Spaans
Hole Diameter	: 6-inches	Reviewed By	: S. Ellison
Drilling Method	: Hollow-Stem Auger	GW Encountered	: 18.5'
Sampling Method	: Split-Spoon Sampler	GW Completed	: 10'

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				TOPSOIL - 5 inches						
		SC/Fill		Fill - Clayey SAND, very loose to loose, brown, trace gravel, moist.	1	2 3 2	5			
					2	2 1 2	3			
5		PT/Fill		Fill - PEAT - 24 inches, trace organic material, moist.	3	2 4 4	8			
		CL		Sandy CLAY,very stiff, brown to gray, trace gravel, trace silt, moist.	4	3 4 4	8	2.75	▽	
10		CL		Silty Sandy CLAY, medium stiff, gray, moist.	5	2 2 2	4	0.75		
15		SW		SAND, loose to medium dense, brown, fine to medium grained, trace gravel, moist to wet.	6	4 3 4	7		▼	
20					7	3 4 5	9			
25										

APPENDIX C

·FIELD AND LABORATORY PROCEDURES·

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

Per ASTM D 2487—00
(Based on Unified Soil Classification System)

Soil Description: Secondary Soil Type BASIC SOIL TYPE, Consistency/Relative Density, Color, Supplemental Soil Type, Moisture, Miscellaneous comments.

Ex. Silty SAND, loose, brown, fine to medium, trace gravel, moist.

Secondary Soil Type – adjective for the BASIC SOIL TYPE describing material making up greater than 12% but less than 50% of the primary soil type by weight. For sands this also includes a description of grain size (fine, medium or coarse).

BASIC SOIL TYPE – primary constituent of sample; material making up greater than 50% of the sample by weight. Material is classified by grain size and material properties.

Consistency/Relative Density – a measurement of in-situ consistency or density of cohesive or cohesionless soils, respectively, based upon Standard Penetration Testing blow counts (N) per ASTM D 1586.

Color – visual inspection of soil appearance.

Supplementary Soil Type – a description of any other material that may be mixed with the BASIC SOIL TYPE. Qualifying terms are based on the percentage of the supplementary soil type in the sample by weight.

Moisture – description of the in-situ moisture content of the sample (dry, moist or wet).

Miscellaneous Comments – anything observed in the sample or in the field that does not fit into the above categories but should be noted (odor, etc.).

CALIBRATED AUTO HAMMER CONSISTENCY/RELATIVE DENSITY				
COHESIONLESS SOILS		COHESIVE SOILS		
SPT N-VALUES	IN-SITU RELATIVE DENSITY	SPT N-VALUES	SHEAR STRENGTH (PSF)	IN-SITU CONSISTENCY
0-3	VERY LOOSE	0-1	BELOW 250	VERY SOFT
4-8	LOOSE	2-3	250 - 500	SOFT
9-23	MEDIUM DENSE	4-6	500 - 1,000	MEDIUM STIFF
24-38	DENSE	7-12	1,000 - 2,000	STIFF
>38	VERY DENSE	13-25	2,000 - 4,000	VERY STIFF
		>26	OVER 4,000	HARD

STANDARD HAMMER CONSISTENCY/RELATIVE DENSITY				
COHESIONLESS SOILS		COHESIVE SOILS		
SPT N-VALUES	IN-SITU RELATIVE DENSITY	SPT N-VALUES	SHEAR STRENGTH (PSF)	IN-SITU CONSISTENCY
0-4	VERY LOOSE	0-2	BELOW 250	VERY SOFT
5-10	LOOSE	3-4	250 - 500	SOFT
11-30	MEDIUM DENSE	5-8	500 - 1,000	MEDIUM STIFF
31-50	DENSE	9-16	1,000 - 2,000	STIFF
>50	VERY DENSE	17-32	2,000 - 4,000	VERY STIFF
		>32	OVER 4,000	HARD

SUPPLEMENTAL TEXTURE QUALIFYING TERMS	
DESCRIPTOR	PERCENTAGE BY WEIGHT
TRACE	1-10%
LITTLE	10-20%
SOME	20-35%
AND	35-50%

SOIL CLASSIFICATION CHART (Per ASTM D2487)

Criteria for Assigning Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name
COHESIONLESS SOILS More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 Sieve	Clean Gravels Less than 5% fines[C]	Cu ≥ 4 and 1 ≤ Cc ≤ 3[E]	GW	Well-graded gravel[F]
			Cu < 4 and/or 1 > Cc > 3[E]	GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands More than 50% of coarse fraction retained on No. 4 Sieve	Clean Sands Less than 5% fines[D]	Cu ≥ 6 and 1 ≤ Cc ≤ 3[E]	SW	Well-graded sand[F]
			Cu < 6 and/or 1 > Cc > 3[E]	SP	Poorly graded sand[F]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,I]
			Fines classify as CL or CH	SC	Clayey sand[G,H,I]
COHESIVE SOILS 50% or more passes the No. 200 Sieve	Silts and Clays Liquid limit less than 50	Inorganic	PI ≥ 7 and plots on or above 'A' line[J]	CL	Lean clay[K,L,M]
			PI < 4 or plots below 'A' line[J]	ML	Silt[K,L,M]
		Organic	Liquid limit - oven dried < 0.75	OL	Organic clay[K,L,M,N]
			Liquid limit - not dried < 0.75		Organic silt[K,L,M,0]
	Silts and Clays Liquid limit 50 or more	Inorganic	PI plots on or above 'A' line	CH	Fat clay[K,L,M]
			PI plots below 'A' line	MH	Elastic Silt[K,L,M]
		Organic	Liquid limit - oven dried < 0.75	OH	Organic Clay[K,L,M,P]
			Liquid limit - not dried < 0.75		Organic silt[K,L,M,0]
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor			PT	Peat

A Based on the material passing the 3-in. sieve

B If field sample contained cobbles or builders, or both, add "with cobbles or boulders or both" to group name

C Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

D Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

E $Cu = D_{60}/D_{10}$ $Cc = (D_{30})^2/(D_{10}*D_{60})$

F If soil contains ≥ 15% sand, add "with sand" to group name.

G If fines classify as CL-ML, use dual symbol GC-GM or SC-SM

H If fines are organic, add "with organic fines" to group name.

I If soil contains ≥ 15% gravel, add "with gravel" to group name.

J If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel" whichever is predominant

L If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.

M If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name

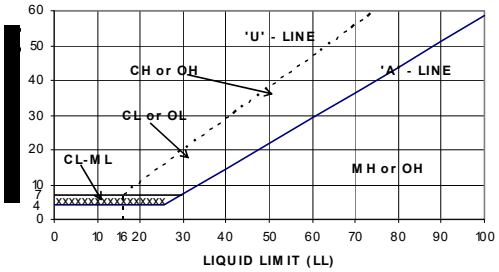
N PI ≥ 4 and plots on or above 'A' line.

O PI < 4 or plots below 'A' line.

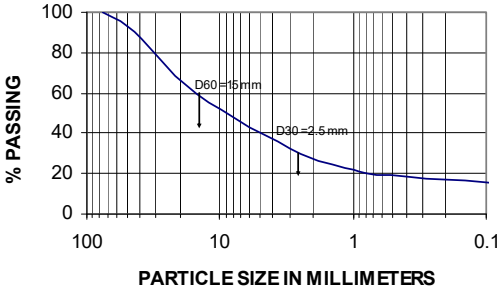
P PI plots on or above 'A' line.

Q PI plots below 'A' line.

For classification of fine-grained soils and fine-grained fraction of coarse-grained soils



SIEVE ANALYSIS



FIELD PROCEDURES

The soil borings were performed using a truck-mounted drill rig equipped with an auto-hammer. Split-barrel samples were obtained in the soil below the bottom of the augers in general accordance with the Standard Method for Penetration and Split-Barrel Sampling of Soils. Samples were collected at 2.5 feet intervals to 10 feet below grade, and every 5 feet thereafter. After recovery, the samples were removed from the split-spoon sampler, visually reviewed and classified, placed in glass jars and transported to our laboratory for additional review.

Soil samples stored for extended periods are susceptible to moisture loss and are no longer indicative of the conditions originally encountered in the soil borings. Therefore, soil samples are usually stored in our laboratory for a period of 60 days, unless instructed otherwise.

The soil boring log was prepared based on field notes and visual classification of the samples in the laboratory. Indicated on the soil boring log is the description of each stratum observed, the approximate depth and/or elevation of each stratum change observed, Standard Penetration Test resistance values, and the observed groundwater levels. The soil boring log are presented in Appendix B.

LABORATORY PROCEDURES

The laboratory testing program included supplementary visual classification of the samples in general accordance with the Unified Soil Classification System. The following two pages describe the soils classification procedure.

RECORD ONLY SUBMITTAL PACKAGE



Meridian Forest Hills LS

Prepared for:

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THIS SUBMITTAL IS BEING PREPARED FOR RECORD PURPOSES ONLY

7/24/2025 Rev _

Salesforce O# 695855
BMS # 461360
Customer PO# Signed Quote - 1

Serving Cummins Customers

Cummins power solutions are supported by the largest and best-trained worldwide-certified sales/distributor network in the industry. This network will help you select and install the critical power solution to meet the requirements of your specific application. This same network provides experts with advanced technology to make your life easier while providing a seamless support experience.

IMPORTANT: *The critical power solution information and specifications included in this pdf can be used by the site contractor(s) and/or engineer(s) to assist with planning for and accomplishing the overall power solution installation. Please forward this document to the appropriate personnel, as necessary.*

It is the obligation of the electrical contractor and reviewing engineer to determine that the item quantities and accuracy of this submittal is correct as required for the job. Any inaccuracies or deviations must be addressed with Cummins Inc. before release to manufacturing. Any releases of material to manufacturing by the above parties constitute an acceptance of the accuracy of the submittal. Any changes after release will be viewed as a change order, subject to pricing changes. Please take the time to review this package for accuracy to prevent any after-shipment problems that could cause delay in energization.

Cummins certifies that these drawings, material lists, specification and datasheets have been checked prior to submittal and they:

- *accurately depict the proposed equipment*
- *provide current information to the date of the submittal and*
- *present true and accurate equipment information.*

This Approval Drawing Package is submitted as our interpretation of the project requirements and/or the specifications for this job. Please note that issuance of these submittals shall not be deemed or interpreted as performance nor acceptance of your purchase order terms and conditions.

For questions or comments regarding this submittal, please contact the Cummins Project Manager listed on the title page.

Sales and Service

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SECTION 1
PROJECT INFORMATION

Item	Description	Qty
GEN	**C40N6, 40kW, 60Hz, Standby, Natural Gas/Propane Genset, 1800rpm engine**	1
	U.S. EPA, Stationary Emergency Application	
	C40N6, 40kW, 60Hz, Standby, Natural Gas/Propane Genset, 1800rpm engine	
	Duty Rating - Standby Power (ESP)	
	Emissions Certification - SI, EPA, Emergency, Stationary, 40CFR60	
	Listing - UL 2200	
	NFPA 110 Type 10 Level 1 Capable	
	Exciter/Regulator - Permanent Magnet Generator, 3 Phase Sensor	
	Voltage - 120/240, 3 Phase, Wye, 4 Wire	
	Alternator - 60Hz, 12L, 240/120V, 105C, 40C Ambient, Increased Motor Starting (IMS)	
	Alternator Heater, 120 Volt AC	
	Aluminum Sound Attenuated Level 2 Enclosure, with Exhaust System	
	Enclosure Color - Green, Aluminum	
	Enclosure - Wind Load 180 MPH, ASCE7-10	
	Larger Battery Rack	
	Skidbase - Housing Ready	
	Control Mounting - Right Facing	
	PowerCommand 1.1 Controller	
	Load Connection - Single	
	Gauge - Oil Pressure	
	Stop Switch - Emergency	
	Relays - Auxiliary, Qty 2, 25A - 15V DC/10A - 30V DC	
	Control Display Language - English	
	Circuit Breaker, Location A, 60A, 3P, 600 Volts AC, 80%, UL	
	Engine Governor - Electronic, Isochronous	
	Single Gas Fuel - NG or LP Vapor	
	Engine Starter - 12 Volt DC Motor	
	Engine Air Cleaner - Normal Duty	

Battery Charging Alternator
Battery Charger - 6 Amp, Regulated
Engine Cooling - Radiator, High Ambient Air Temperature, Ship Fitted
Shutdown - Low Coolant Level
Extension - Coolant Drain
Engine Coolant - 50% Antifreeze, 50% Water Mixture
Coolant Heater, Extreme Cold Ambient
Engine Oil
Genset Warranty - 2 Years Base

ATS **OTECA, OTEC Transfer Switch-Electronic Control: 70A** 1

OTEC70, Transfer Switch-Electronic Control, 70 Amp
Listing - UL 1008/CSA Certification
Application - Utility to Genset
Cabinet - Type 1
Load Phase Power Monitoring
Poles - 3 (Solid Neutral)
Frequency - 60 Hz
System - 3 Phase, 3 or 4 Wire
Voltage - 240 Volts AC
Genset Starting Battery - 12V DC
PC40 Control
Aux Relay - Emergency Position - 12 Volts DC
Interface - Communications Network, MODBUS RTU Module
Transfer Switch Warranty - 2 Year Comprehensive

12VDC Engine Starting Battery - 700CCA

Generator Remote Emergency Stop Station

Fuel Strainer-Natural Gas, 3/4"NPT Inlet/Outlet

Delivery of Equipment to Jobsite

Service - Start Up Labor with 2-Hr Load Bank Testing and Personnel Training

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GAS SUPPLY DESIGN BEST PRACTICES

Required:

1. The required fuel pressure and volume **must** be available under **all** operating conditions at the generator set gas inlet (see Location A on Figure 1 for measurement point).

2. The generator must have a dedicated pipe run from the meter, not teed off from other equipment supply pipes.

3. Braided flex piping and dry gas filters are required elements of the piping design, but if improperly sized can be highly restrictive to flow. These components and other restrictive portions of the piping system (valves, elbows, etc.) can, and often should be sized larger than the genset fuel connection.

4. A 'pilot' style regulator should never be used, as they are slow to respond to changes in demand from the generator set.

Recommended:

1. Long pipe runs increase pressure drop, so shorter is better. Elbows & valves increase restriction to flow, piping should be designed with as few of these as possible.

2. It is important to have the final pressure regulator as close to the generator inlet as practical. This allows for higher pressure in the line, as well as helps keep a steady draw on the line during operation.

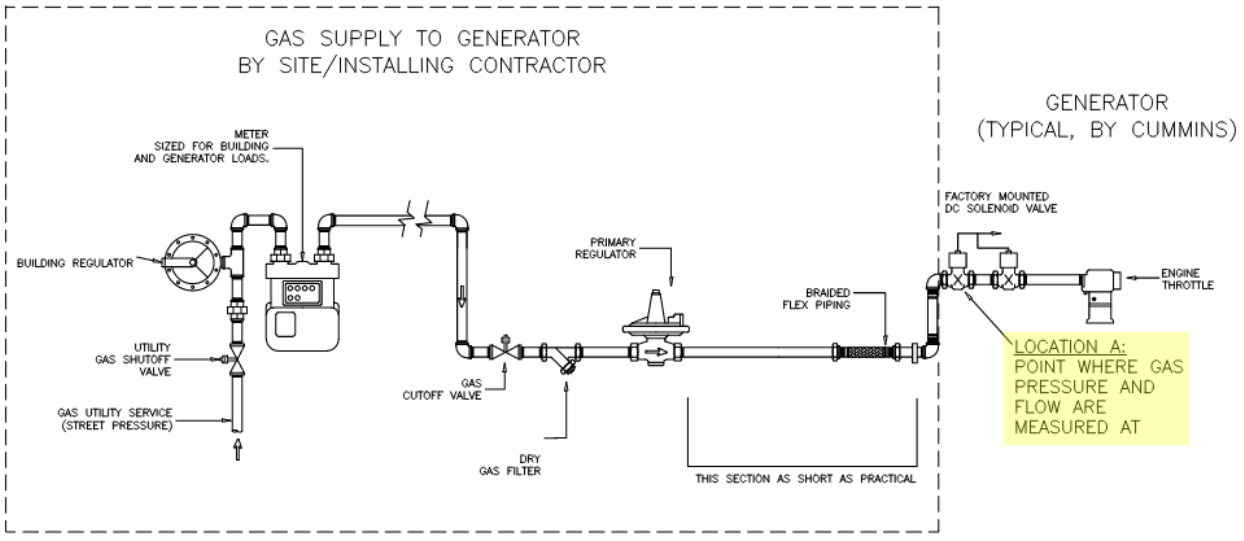


Figure 1. Typical site design

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All gas supply piping must be designed by the appropriate engineer and installed by a qualified contractor. Refer to **NFPA 54** for gas pipe sizing information and any related local jurisdiction documents for code compliance on fuel piping installation.

Gas Fuel supply requirements for this generator set:

Fuel source: Natural Gas (NG) or Propane Vapor (PV)

	NG	PV	
Fuel consumption at 100% load:	590		**SCFH**
Required Operating fuel pressure:	6-13		**in H_2O**

Pressure is measured at the engine inlet solenoid, after the final regulator

Please note: The pressure listed is not a static pressure. If the above pressure is not maintained while the generator set is operating up to full load, the system will not function as required and the fuel delivery system will need to be corrected to provide operating pressure as listed.

All generators must be installed with a flexible fuel line and fuel strainer prior to the engine connection **(installation by others)**:

	Provided by Cummins	*Provided by others*
Flexible fuel line:	✔	☐
Fuel strainer:	✔	☐
Pressure regulator:	✔	☐

If provided by Cummins, see drawings in submittal for flex line and strainer sizing

Contact your Cummins representative for technical assistance.

SECTION 2
GENERATOR SPECIFICATIONS

Specification sheet

Spark-ignited generator set

20-40 kW Standby

EPA emissions



Description

Cummins® generator sets are fully integrated power generation systems providing optimum performance, reliability and versatility for stationary Standby applications.

Features

Gas engine - Rugged 4-cycle Cummins QSJ2.4 spark-ignited engine delivers reliable power. The electronic air/fuel ratio control provides optimum engine performance and fast response to load changes.

Alternator - Several alternator sizes offer selectable motor starting capability with low reactance 2/3 pitch windings, low waveform distortion with non-linear loads and fault clearing short-circuit capability.

Control system - The PowerCommand® 1.1 electronic control is standard equipment and provides total generator set system integration including automatic remote starting/stopping, precise frequency and voltage regulation, alarm and status message display, output metering, auto-shutdown at fault detection and NFPA 110 Level 1 compliance.

Cooling system - Standard cooling package provides reliable running at up to 50° C (122° F) ambient temperature.

Enclosures - The aesthetically appealing enclosure incorporates special designs that deliver one of the quietest generators of its kind. Aluminium material plus durable powder coat paint provides the best anti-corrosion performance. The generator set enclosure has been evaluated to withstand 180 MPH wind loads in accordance with ASCE7-10. The intelligent design has removable panels and service doors to provide easy access for service and maintenance.

NFPA - The generator set accepts full rated load in a single step in accordance with NFPA 110 for Level 1 systems.

Warranty and service - Backed by a comprehensive warranty and worldwide distributor network.

	Natural gas		Propane		
	Standby 60 Hz		Standby 60 Hz		Data sheets
Model	**kW**	**kVA**	**kW**	**kVA**	**60 Hz**
C20 N6	20	25	20	25	NAD-5693-EN
C25 N6	25	31	25	31	NAD-5695-EN
C30 N6	30	38	30	38	NAD-5696-EN
C36 N6	36	45	36	45	NAD-5697-EN
C40 N6	40	50	40	50	NAD-5698-EN

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Generator set specifications

Governor regulation class	ISO8528 Part 1 Class G3*
Voltage regulation, no load to full load	± 1.0%
Random voltage variation	± 1.0%
Frequency regulation	Isochronous
Random frequency variation	± 0.25% @ 60 Hz
Radio frequency emissions compliance	Meets requirements of most industrial and commercial applications

* C36 N6 and C40 N6 are Class G2

Engine specifications

Aspiration	Naturally Aspirated (25kW), Turbocharged (30kW), Turbocharged and Aftercooled (36kW/40kW)
Bore	86.5 mm (3.4 in.)
Stroke	100.0 mm (3.94 in.)
Displacement	2.4 L (143.5 in^3)
Cylinder block	Cast iron, in-line 4 cylinder
Battery capacity	550 amps at ambient temperature of 0° F to 32° F (-18° C to 0° C)
Battery charging alternator	50 amps
Starting voltage	12 volt, negative ground
Lube oil filter type(s)	Spin-on with relief valve
Standard cooling system	50° C (122° F) ambient cooling system
Rated speed	1800 rpm

Alternator specifications

Design	Brushless, 4 pole, drip proof, revolving field
Stator	2/3 pitch
Rotor	Direct coupled, flexible disc
Insulation system	Class H per NEMA MG1-1.65
Standard temperature rise	120º C (248° F) Standby
Exciter type	Torque match (shunt) with EBS as option
Alternator cooling	Direct drive centrifugal blower
AC waveform Total Harmonic Distortion (THDV)	< 5% no load to full linear load, < 3% for any single harmonic
Telephone Influence Factor (TIF)	< 50 per NEMA MG1-22.43
Telephone Harmonic Factor (THF)	< 3%

Available voltages

1-phanse	3-phase			
• 120/240	• 120/208	• 120/240 delta	• 277/480	• 347/600

Generator set options

Fuel system

- Single fuel - natural gas or propane vapor, field selectable
- Dual fuel – natural gas and propane vapor auto changeover
- Low fuel gas pressure warning

Engine

- Engine air cleaner – normal or heavy duty
- Shut down – low oil pressure
- Extension – oil drain

Alternator

- 120° C (248° F) temperature rise alternator
- 105° C (221° F) temperature rise alternator
- PMG available on 36 kW and 40 kW
- Alternator heater, 120 V

Control

- AC output analog meters (bargraph)
- Stop switch – emergency
- Auxiliary output relays (2)
- Auxiliary configurable signal inputs (8) and relay outputs (8)

Electrical

- Single circuit breaker
- Dual circuit breakers
- 80% rated circuit breakers
- 100% rated circuit breakers

Enclosure

- Aluminium enclosure Sound Level 1 or Level 2, with muffler installed, sandstone or green color
- Open set

Cooling system

- Shutdown – low coolant level
- Warning – low coolant level
- Extension – coolant drain
- Cold weather options:
  - < 4° C (40° F) – cold weather
  - < -17° C (0° F) – extreme cold weather

Exhaust system

- Exhaust connector NPT

Generator set application

- Base barrier – elevated generator set
- Battery rack, larger battery
- Radiator outlet duct adapter

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Generator set options (continued)

Warranty

- Base warranty – 2 year, 1000 hour, Standby
- Standby, 3 year, 1500 hour, parts
- Standby, 5 year, 2500 hour, parts
- Standby, 3 year, 1500 hour, parts and labor
- Standby, 5 year, 2500 hour, parts and labor
- Standby, 3 year, 1500 hour, parts, labor and travel
- Standby, 5 year, 2500 hour, parts, labor and travel

Note: Some options may not be available on all models - consult factory for availability.

Generator set accessories

- Extreme cold weather kit
- Battery rack, larger battery
- Battery heater kit
- HMI211RS in-home display, including pre-configured 12-inch harness
- HMI211 remote display, including pre-configured 12-inch harness
- HMI220 remote display
- Auxiliary output relays (2)
- Auxiliary configurable signal inputs (8) and relay outputs (8)
- Annunciator – RS485
- Remote monitoring device – Acumen®
- Battery charger – stand-alone, 12 V
- Circuit breakers
- Enclosure Sound Level 1 to Sound Level 2 upgrade kit
- Enclosure paint touch up kit
- Base barrier – elevated generator set
- Mufflers – industrial, residential or critical
- PMG available on 36 kW and 40 kW
- Alternator heater
- Maintenance and service kit
- Engine lift kit

Control system PowerCommand 1.1



PowerCommand control is an integrated generator set control system providing voltage regulation, engine protection, operator interface and isochronous governing (optional). Major features include:

- Battery monitoring and testing features and smart starting control system.
- Standard PCCNet interface to devices such as remote annunciator for NFPA 110 applications.
- Control boards potted for environmental protection.
- Control suitable for operation in ambient temperatures from -40 °C to +70 °C (-40 °F to +158 °F) and altitudes to 5000 meters (13,000 feet).
- Prototype tested; UL, CSA, and CE compliant.
- InPower™ PC-based service tool available for detailed diagnostics.

Operator/display panel

- Manual off switch
- Alpha-numeric display with pushbutton access for viewing engine and alternator data and providing setup, controls and adjustments (English or international symbols)
- LED lamps indicating generator set running, not in auto, common warning, common shutdown, manual run mode and remote start
- Suitable for operation in ambient temperatures from -40 °C to +70 °C
- Bargraph display (optional)

AC protection

- Over current warning and shutdown
- Over and under voltage shutdown
- Over and under frequency shutdown
- Over excitation (loss of sensing) fault
- Field overload

Engine protection

- Overspeed shutdown
- Low oil pressure warning and shutdown
- High coolant temperature warning and shutdown
- Low coolant level warning or shutdown
- Low coolant temperature warning
- High, low and weak battery voltage warning
- Fail to start (overcrank) shutdown
- Fail to crank shutdown
- Redundant start disconnect
- Cranking lockout
- Sensor failure indication
- Low fuel level warning or shutdown

Alternator data

- Line-to-Line and Line-to-Neutral AC volts
- 3-phase AC current
- Frequency
- Total kVa

Engine data

- DC voltage
- Lube oil pressure
- Coolant temperature
- Engine speed

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Other data

- Generator set model data
- Start attempts, starts, running hours
- Fault history
- RS485 Modbus® interface
- Data logging and fault simulation (requires InPower service tool)

Digital governing (optional)

- Integrated digital electronic isochronous governor
- Temperature dynamic governing

Digital voltage regulation

- Integrated digital electronic voltage regulator
- 2-phase Line-to-Line sensing
- Configurable torque matching

Control functions

- Time delay start and cooldown
- Cycle cranking
- PCCNet interface
- (2) Configurable inputs
- (2) Configurable outputs
- Remote emergency stop
- Automatic Transfer Switch (ATS) control
- Generator set exercise, field adjustable

Options

- Auxiliary output relays (2)
- Remote annunciator with (3) configurable inputs and (4) configurable outputs
- PMG alternator excitation available on 36 kW and 40 kW
- Acumen® telematics for remote monitoring and control via Cummins PowerCommand Cloud
- Auxiliary, configurable signal inputs (8) and configurable relay outputs (8)
- Digital governing
- AC output analog meters (bargraph)
  - Color-coded graphical display of:
    - 3-phase AC voltage
    - 3-phase current
    - Frequency
    - kVa
- Remote operator panel

Ratings definitions

Emergency Standby Power (ESP):

Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Limited-Time Running Power (LTP):

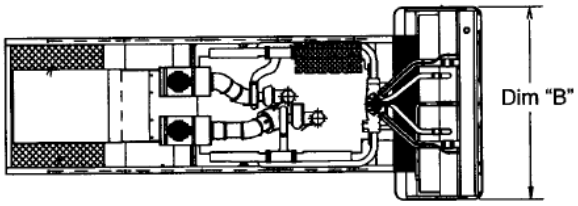
Applicable for supplying power to a constant electrical load for limited hours. Limited-Time Running Power (LTP) is in accordance with ISO 8528.

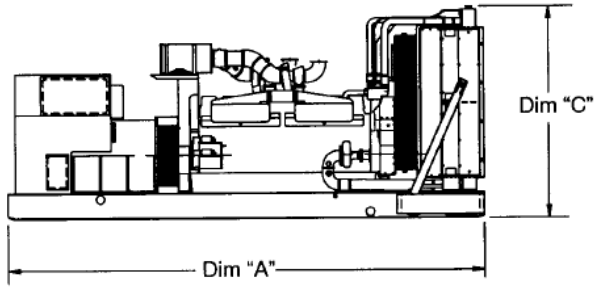
Prime Power (PRP):

Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Base Load (Continuous) Power (COP):

Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.





This outline drawing is for reference only. See respective model data sheet for specific model outline drawing number.

Do not use for installation design

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Model	Dim “A” mm (in.)	Dim “B” mm (in.)	Dim “C” mm (in.)	Set weight* dry kg (lbs)	Set weight* wet kg (lbs)
Open set					
C20 N6	1669 (65.7)	864 (34)	1123 (44.2)	423 (933)	440 (969)
C25 N6	1669 (65.7)	864 (34)	1123 (44.2)	441 (972)	457 (1008)
C30 N6	2225 (87.6)	864 (34)	1123 (44.2)	491 (1083)	508 (1119)
C36 N6	2225 (87.6)	864 (34)	1123 (44.2)	520 (1146)	536 (1182)
C40 N6	2225 (87.6)	864 (34)	1123 (44.2)	548 (1208)	564 (1244)
Sound attenuated enclosure Level 1					
C20 N6	1829 (72	Refer to the drawings for specific weights and dimensions.		34)	485 (1070)
C25 N6	1829 (72			73)	503 (1109)
C30 N6	2388 (94)	864 (34)	1156 (45.5)	542 (1195)	558 (1231)
C36 N6	2388 (94)	864 (34)	1156 (45.5)	571 (1258)	587 (1294)
C40 N6	2388 (94)	864 (34)	1156 (45.5)	599 (1320)	615 (1356)
Sound attenuated enclosure Level 2					
C20 N6	2073 (81.6)	864 (34)	1156 (45.5)	474 (1045)	490 (1081)
C25 N6	2073 (81.6)	864 (34)	1156 (45.5)	492 (1084)	508 (1120)
C30 N6	2626 (103.4)	864 (34)	1156 (45.5)	547 (1206)	563 (1242)
C36 N6	2626 (103.4)	864 (34)	1156 (45.5)	576 (1269)	592 (1305)
C40 N6	2626 (103.4)	864 (34)	1156 (45.5)	604 (1331)	620 (1367)

* Weights based on 1-phase generator set. Weights may vary with a different configuration.

Codes and standards

Codes or standards compliance may not be available with all model configurations – consult factory for availability.

ISO 9001 ISO 14001 ISO 45001	This product was manufactured in a facility whose quality management system is certified to ISO 9001 and its Health Safety Environmental Management Systems certified to ISO 14001 and ISO 45001.	UL LISTED	This product is listed to UL 2200, Stationary Engine Generator Assemblies
PTS	The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design. Cummins products bearing the PTS symbol meet the prototype test requirements of NFPA 110 for Level 1 systems.	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY	Engine certified to U.S. EPA SI Stationary Emission Regulation 40 CFR, Part 60. U.S. applications must be applied per this EPA regulation.
CSA	All low voltage models are CSA certified to product class 4215-01 and available with CSA B149.1 fuel train.	IBC INTERNATIONAL BUILDING CODE	The generator set package is available certified for seismic application in accordance with International Building Code.

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building’s electrical system except through an approved device or after building main switch is open.

For more information contact your local Cummins distributor or visit power.cummins.com

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Generator set data sheet

Model:	**C40 N6**
kW rating:	**40.0 natural gas Standby** **40.0 propane Standby**
Frequency:	**60 Hz**
Fuel type:	**Natural gas/propane**
Emissions level:	**EPA emissions**

Fuel consumption

	Natural gas				Propane			
	Standby				Standby			
	kW (kVA)				kW (kVA)			
Ratings	40.0 (50.0)				40.0 (50.0)			
Load	**1/4**	**1/2**	**3/4**	**Full**	**1/4**	**1/2**	**3/4**	**Full**
scfh	209.5	304.7	409.5	519.0	83.0	121.7	166.0	193.6
m^3/hr	5.93	8.63	11.60	14.70	2.35	3.45	4.70	5.48

Engine

	Natural gas	Propane
	Standby rating	Standby rating
Engine model	QSJ2.4	
Configuration	Cast iron, in-line 4 cylinder	
Aspiration	Turbo with after cooler	
Gross engine power output, kW_m (bhp)	52 (70)	52 (70)
Bore, mm (in.)	86.5 (3.41)	
Stroke, mm (in.)	100.0 (3.94)	
Rated speed, rpm	1800	
Compression ratio	9.5:1	
Lube oil capacity, L (qt)	4 (4.54)	
Overspeed limit, rpm	2250	

Fuel supply pressure

Minimum operating pressure, kPa (in H_2O)	1.5 (6.0)
Maximum operating pressure, kPa (in H_2O)	3.2 (13.0)

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Air	Natural gas Standby rating	Propane Standby rating
Combustion air, m^3/min (scfm)	2.2 (77.3)	2.0 (71.2)
Maximum air cleaner restriction, kPa (in H_2O)	1.49 (6.0)	
Alternator cooling air, m^3/min (scfm)	N/A	

Exhaust

Exhaust flow at rated load, m^3/min (cfm)	8.4 (299.2)	7.3 (259.8)
Exhaust temperature, °C (°F)	638 (1180)	647 (1197)
Exhaust back pressure (maximum allowable at engine), kPa (in H_2O)	5.0 (20)	5.0 (20)
Exhaust back pressure (actual with factory fitted muffler), kPa (in H_2O)	1.95 (7.8)	

Standard set-mounted radiator cooling

Ambient design, °C (°F)	50 (122)
Fan load, kW (HP)	2.2 (3.0)
Coolant capacity (with radiator), L (US gal)	10 (2.7)
Cooling system air flow, m^3/min (scfm)	144.2 (5150)
Maximum cooling air flow static restriction, kPa (in H_2O)	0.12 (0.5)

Weights[2]

Unit dry weight kgs (lbs)	596 (1315)
Unit wet weight kgs (lbs)	612 (1351)

Notes:
[1]For non-standard remote installations contact your local Cummins representative.
[2]Weights represent a set with 1-phase with sound level 1 enclosure.

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Alternator data

Standard alternators		Natural gas/ propane single phase table	Natural gas/propane three phase table			
Maximum temperature rise above 40 °C ambient		120 °C	120 °C	120 °C	120 °C	120 °C
Feature code		B949-2	B986-2	B946-2	B943-2	B952-2
Alternator data sheet number		ADS-580	ADS-579	ADS-579	ADS-579	ADS-579
Voltage ranges		120/240	120/240	120/208	277/480	347/600
Voltage feature code		R104-2	R106-2	R098-2	R002-2	R114-2
Surge kW		41.5/41.5	43.4/43.4	43.4/43.4	43.4/43.4	43.4/43.4
Motor starting kVA (at 90% sustained voltage)	Shunt	76	95	95	95	95
	PMG	120	N/A	N/A	N/A	N/A
	EBS	N/A	150	150	150	150
Full load current amps at Standby rating		167	120	139	60	48

Optional alternators for improved motor starting capability		Natural gas/ propane single phase table	Natural gas/propane three phase table			
Maximum temperature rise above 40 °C ambient			105 °C	105 °C	105 °C	105 °C
Feature code			BB94-2	BB93-2	BB95-2	BB92-2
Alternator data sheet number			ADS-581	ADS-581	ADS-581	ADS-581
Voltage ranges			120/240	120/208	277/480	347/600
Voltage feature code			R106-2	R098-2	R002-2	R114-2
Surge kW			43.0/43.0	43.0/43.0	43.0/43.0	43.0/43.0
Motor starting kVA (at 90% sustained voltage)	Shunt		119	119	119	119
	PMG		181	181	181	181
Full load current amps at Standby rating			120	139	60	48

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Derating factors

Natural gas/propane

Standby	Engine power available up to 114 m (375 ft) at ambient temperatures up to 40 °C (104 °F). Above these elevations derate at 4% per 305 m (1000 ft) and 2% per 10 °C above 40 °C (104 °F).

Ratings definitions

Emergency Standby Power (ESP):	**Limited-Time Running Power (LTP):**	**Prime Power (PRP):**	**Base Load (Continuous) Power (COP):**
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power to a constant electrical load for limited hours. Limited-Time Running Power (LTP) is in accordance with ISO 8528.	Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) is in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.

Formulas for calculating full load currents:

Three phase output

$$\frac{\text{kW} \times 1000}{\text{Voltage} \times 1.73 \times 0.8}$$

Single phase output

$$\frac{\text{kW} \times \text{SinglePhaseFactor} \times 1000}{\text{Voltage}}$$

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

For more information contact your local Cummins distributor or visit power.cummins.com

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NAD-5698-EN (10/17)

Specification Sheet

PowerCommand® 1.1 Control System



Description

The PowerCommand control system is a microprocessor-based generator set monitoring, metering and control system designed to meet the demands of today's engine driven generator sets. The integration of all control functions into a single control system provides enhanced reliability and performance compared to conventional generator set control systems. These control systems have been designed and tested to meet the harsh environment in which gensets are typically applied.

Features

Easy to view: HMI 211RS for residential use. 128 x 64 pixel graphic LED backlight LCD.

Easy to use: Tactile buttons for generator set start/stop. Residential Standby display for convenient use.

Modbus® interface: Eliminates need for MODLON.

Progressive protective functions: Advanced Overcurrent Protection – Generator set monitoring & protection.

Digital voltage regulation: Single phase full wave SCR type regulator compatible with either shunt or PMSG systems.

Digital engine speed governing: Provides isochronous frequency regulation.

12 and 24 VDC battery operation.

Automatic mains failure: Smooth & automatic transfer and re-transfer of load from utility to generator set & vice-versa.

Exerciser clock: Runs generator set exerciser routines for dependability of operation.

Warranty and service: Backed by a comprehensive warranty and worldwide distributor service network.

Certification: Suitable for us on generator sets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC Mil Std., CE, UKCA and CSA standards.

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PowerCommand Digital Generator Set Control PCC 1302



Description

The PowerCommand generator set control is suitable for use on a wide range of generator sets in non-paralleling applications. The PowerCommand control is compatible with shunt or PMG excitation style. It is suitable for use with reconnectable or non-reconnectable generators, and it can be configured for any frequency, voltage and power connection from 120-600 VAC Line-to-Line.

Power for this control system is derived from the generator set starting batteries. The control functions over a voltage range from 8 VDC to 30 VDC.

Features

- 12 and 24 VDC battery operation.
- Digital voltage regulation.
- Digital engine speed governing (where applicable) - Provides isochronous frequency regulation.
- Full authority engine communications (where applicable) - Provides communication and control with the Engine Control Module (ECM).
- Common harnessing - with higher feature Cummins controls allows for easy field upgrades.
- Generator set monitoring - Monitors status of all critical engine and alternator functions.
- Digital genset metering (AC and DC).
- Genset battery monitoring system - to sense and warn against a weak battery condition.
- Engine starting - Includes relay drivers for starter, fuel shut off (FSO), glow plug/spark ignition power and switch B+ applications.
- Generator set protection - Protects engine and alternator.
- Advanced serviceability - using InPower™, a PC-based software service tool.
- Environmental protection - The control system is designed for reliable operation in harsh environments. The main control board is a fully encapsulated module that is protected from the elements.
- Exerciser function – Routine exercising of generator set.
- Supports dual fuel control.
- Automatic Mains Failure function built in generator set controller. Modbus interface - for interconnecting to customer equipment.
- Configurable inputs and outputs - Four discrete inputs and two dry contact relay outputs.
- Warranty and service - Backed by a comprehensive warranty and worldwide distributor service network.
- Certifications - Suitable for use on generator sets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std., CE, UKCA and CSA standards.

Base Control Functions

HMI capability

Operator adjustments - The HMI includes provisions for many set up and adjustment functions.

Generator set hardware data - Access to the control and software part number, generator set rating in kVA and generator set model number is provided from the HMI or InPower™.

Data logs - Includes engine run time, controller on time, number of start attempts.

Fault history - Provides a record of the most recent fault conditions with control hours time stamp. Up to 10 events are stored in the control non-volatile memory.

Alternator data

- Voltage (single or three phase Line-to-Line and Line-to-Neutral)
- Current (single or three phase)
- kVA (three phase and total)
- Frequency
- Engine data
- Starting battery voltage
- Engine speed
- Engine temperature
- Engine oil pressure
- Partial Full Authority Engine (FAE) data (where applicable)
- Service adjustments - The HMI includes provisions for adjustment and calibration of generator set control functions. Adjustments are protected by a password. Functions include:
- Engine speed governor adjustments
- Voltage regulation adjustments
- Cycle cranking
- Configurable fault set up
- Configurable output set up
- Meter calibration
- Units of measurement

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Engine control

SAE-J1939 CAN interface to full authority ECMs (where applicable) - Provides data swapping between genset and engine controller for control, metering and diagnostics.

12 VDC/24 VDC battery operations - PowerCommand will operate either on 12 VDC or 24 VDC batteries.

Isochronous governing (where applicable) - Capable of controlling engine speed within +/-0.25% for any steady state load from no load to full load. Frequency drift will not exceed +/-0.5% for a 33 °C (60 °F) change in ambient temperature over an 8 hour period.

Temperature dependent governing dynamics (with electronic governing) - Modifies the engine governing control parameters as a function of engine temperature. This allows the engine to be more responsive when warm and more stable when operating at lower temperature levels.

Remote start mode - Accepts a ground signal from remote devices to automatically start the generator set and immediately accelerate to rated speed and voltage. The remote start signal will also wake up the control from sleep mode. The control can incorporate a time delay start and stop.

Remote and local Emergency stop - The control accepts a ground signal from a local (genset mounted) or remote (facility mounted) Emergency stop switch to cause the generator set to immediately shut down. The generator set is prevented from running or cranking with the switch engaged. If in sleep mode, activation of either Emergency stop switch will wake up the control.

Sleep mode - The control includes a configurable low current draw state to minimize starting battery current draw when the genset is not operating. The control can also be configured to go into a low current state while in auto for Prime applications or applications without a battery charger.

Engine starting - The control system supports automatic engine starting. Primary and backup start disconnects are achieved by one of three methods: magnetic pickup, battery charging alternator feedback or main alternator output frequency. The control also supports configurable glow plug control when applicable.

Cycle cranking - Configurable for the number of starting cycles (1 to 7) and duration of crank and rest periods. Control includes starter protection algorithms to prevent the operator from specifying a starting sequence that might be damaging.

Time delay start and stop (cooldown) - Configurable for time delay of 0-300 seconds prior to starting after receiving a remote start signal and for time delay of 0-600 seconds prior to shut down after signal to stop in normal operation modes. Default for both time delay periods is 0 seconds.

Alternator control

The control includes an integrated line-to-line sensing voltage regulation system that is compatible with shunt or PMG excitation systems. The voltage regulation system is full wave rectified and has an SCR output for good motor starting capability. Major system features include:

Digital output voltage regulation - Capable of regulating output voltage to within +/-1.0% for any loads between no load and full load. Voltage drift will not exceed +/-1.5% for a 40 ºC (104 ºF) change in temperature in an eight hour period. On engine starting or sudden load acceptance, voltage is controlled to a maximum of 5% overshoot over nominal level.

The automatic voltage regulator feature can be disabled to allow the use of an external voltage regulator.

Torque-matched V/Hz overload control - The voltage roll-off set point and rate of decay (i.e. the slope of the V/Hz curve) is adjustable in the control.

Protective Functions

On operation of a protective function the control will indicate a fault by illuminating the appropriate status LED on the HMI, as well as display the fault code and fault description on the LCD. The nature of the fault and time of occurrence are logged in the control. The service manual and InPower service tool provide service keys and procedures based on the service codes provided. Protective functions include:

Battle short mode

When enabled and the battle short switch is active, the control will allow some shutdown faults to be bypassed. If a bypassed shutdown fault occurs, the fault code and description will still be annunciated, but the genset will not shutdown. This will be followed by a fail to shutdown fault. Emergency stop shutdowns and others that are critical for proper operation are not bypassed. Please refer to the Control Application Guide or Manual for list of these faults.

Configurable alarm and status inputs

The control accepts up to four alarm or status inputs (configurable contact closed to ground or open) to indicate a configurable (customer-specified) condition. The control is programmable for warning, shutdown or status indication and for labelling the input.

Emergency stop

Annunciated whenever either Emergency stop signal is received from external switch.

General engine protection

Low and high battery voltage warning - Indicates status of battery charging system (failure) by continuously monitoring battery voltage.

Weak battery warning - The control system will test the battery each time the generator set is signaled to start and indicate a warning if the battery indicates impending failure.

Fail to start (overcrank) shutdown - The control system will indicate a fault if the generator set fails to start by the completion of the engine crack sequence.

Fail to crank shutdown - Control has signaled starter to crank engine but engine does not rotate.

Cranking lockout - The control will not allow the starter to attempt to engage or to crank the engine when the engine is rotating.

Hydro mechanical fuel system engine protection

Overspeed shutdown - Default setting is 115% of nominal.

Low lube oil pressure warning/shutdown - Level is pre-set (configurable with InPower) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

High lube oil temperature warning/shutdown - Level is pre-set (configurable with InPower) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

High engine temperature warning/shutdown - Level is pre-set (configurable with InPower) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

Low coolant temperature warning - Indicates that engine temperature may not be high enough for a 10 second start or proper load acceptance.

Sensor failure indication - Logic is provided on the base control to detect analog sensor or interconnecting wiring failures.

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Full authority electronic engine protection

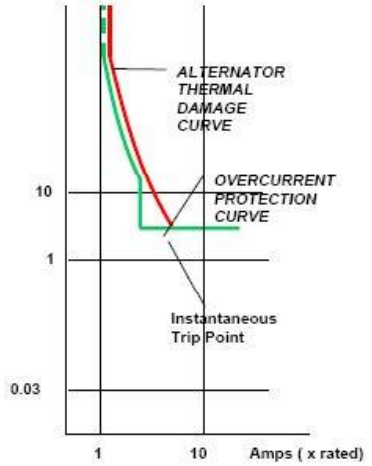
Engine fault detection is handled inside the engine ECM. Fault information is communicated via the SAE-J1939 data link for annunciation in the HMI

Alternator protection

High AC voltage shutdown (59) - Output voltage on any phase exceeds pre-set values. Time to trip is inversely proportional to amount above threshold. Values adjustable from 105-130% of nominal voltage, with time delay adjustable from 0.1-10 seconds. Default value is 110% for 10 seconds.

Low AC voltage shutdown (27) - Voltage on any phase has dropped below a pre-set value. Adjustable over a range of 50-95% of reference voltage, time delay 2-20 seconds. Default value is 85% for 10 seconds.

Overcurrent warning/shutdown - Implementation of the thermal damage curve with instantaneous trip level calculated based on current transformer ratio and application power rating.



-

Under frequency shutdown (81 u) - Generator set output frequency cannot be maintained. Settings are adjustable from 2-10 Hz below nominal governor set point, for a 5-20 second time delay. Default: 6 Hz, 10 seconds.

Over frequency shutdown/warning (81o) - Generator set is operating at a potentially damaging frequency level. Settings are adjustable from 2-10 Hz above nominal governor set point for a 1-20 second time delay. Default: 6 Hz, 10 seconds, enabled.

Loss of sensing voltage shutdown - Shutdown of generator set will occur on loss of voltage sensing inputs to the control.

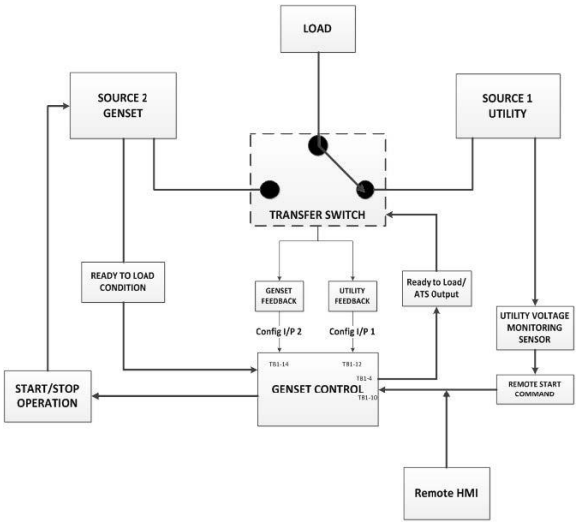
Field overload shutdown - Uses field voltage to shutdown generator set when a field overload condition occurs.

Advanced Functions

Automatic mains failure*

The built in AMF feature provides the automatic transfer and re-transfer of the load from utility to generator set and vice-versa.

- Automatically starts-stops the generator set in the event of utility failure.
- Annunciates faults.



-

* A utility voltage monitoring sensor (as shown in the AMF diagram above) must be connected in order to use the AMF feature on the 1302 control. Use Schneider Electric Relay RSB1A120U7 and Socket RSZE1S35M.

Exerciser clock

The exerciser clock runs the generator set exerciser routines for dependability of operation.

Field Control Interface

Input signals to the base control include:

- Remote start
- Local and Emergency stop
- Configurable inputs: Control includes (4) input signals from customer discrete devices that are configurable for warning, shutdown or status indication, as well as message displayed.

Output signals from the PowerCommand control include:

- Configurable relay outputs: Control includes (2) relay output contacts rated at 2 A. These outputs can be configured to activate on any control warning or shutdown fault as well as ready to load, not in auto, common alarm, common warning and common shutdown.
- Ready to load (generator set running) signal: Operates when the generator set has reached 90% of rated speed and voltage and latches until generator set is switched to off or idle mode.

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PowerCommand Human Machine Interface HMI211



Description

This control system includes an intuitive operator interface panel that allows for complete genset control as well as system metering, fault annunciation, configuration and diagnostics. The interface includes five generator set status LED lamps with both internationally accepted symbols and English text to comply with customer needs. The interface also includes an LED backlit LCD display with tactile feel soft-switches for easy operation and screen navigation. It is configurable for units of measurement and has adjustable screen contrast and brightness.

The *run/off/auto* switch function is integrated into the interface panel.

All data on the control can be viewed by scrolling through screens with the navigation keys. The control displays the current active fault and a time-ordered history of the five previous faults.

Features

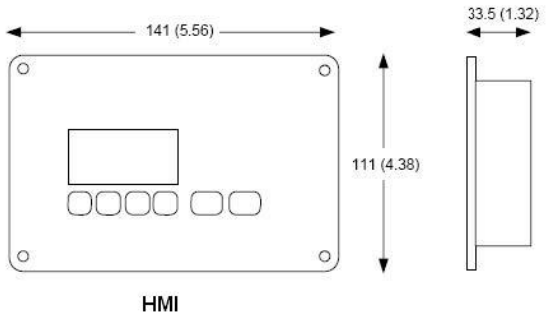
- LED indicating lamps:
  - Remote start
  - Not in auto
  - Shutdown
  - Warning
  - Auto
  - Run
- 128 x 64 pixels graphic LED backlight LCD.
- Four tactile feel membrane switches for LCD defined operation. The functions of these switches are defined dynamically on the LCD.
- Two tactile feel membrane switches dedicated for off and back.
- Allows for complete genset control setup.
- Certifications: Suitable for use on generator sets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std., CE, UKCA and CSA standards.
- HMI 211RS provides convenience for residential use.

Communications Connections

PC tool interface - This RS-485 communication port allows the HMI to communicate with a personal computer running InPower.

This RS-485 communication port allows the HMI to communicate with the main control board.

Mechanical Drawing



Dimensions: mm (inches)

Software

InPower (beyond 6.0 version) is a PC-based software service tool that is designed to directly communicate to PowerCommand generator sets and transfer switches, to facilitate service and monitoring of these products.

Environment

The control is designed for proper operation without recalibration in ambient temperatures from -40 ºC (-40 ºF) to +70º C (158 ºF), and for storage from -55 ºC (-67 ºF) to +80 ºC (176 ºF). Control will operate with humidity up to 95%, non-condensing.

The HMI is designed for proper operation in ambient temperatures from -40 ºC* (-40 ºF) to +70 ºC (158 ºF), and for storage from -40 ºC* (-40 ºF) to +80 ºC (176 ºF).

The control board is fully encapsulated to provide superior resistance to dust and moisture. Display panel has a single membrane surface, which is impervious to effects of dust, moisture, oil and exhaust fumes. This panel uses a sealed membrane to provide long reliable service life in harsh environments.

The control system is specifically designed and tested for resistance to RFI/EMI and to resist effects of vibration to provide a long reliable life when mounted on a generator set. The control includes transient voltage surge suppression to provide compliance to referenced standards.

* Heater accessory (pn: A040H853) is available for enhanced operation below -20 ºC

Certifications

PowerCommand meets or exceeds the requirements of the following codes and standards:

- NFPA 110 for level 1 and 2 systems.
- ISO 8528-4: 1993 compliance, controls and switchgear.
- CE and UKCA marking: The control system is suitable for use on generator sets to be CE and UKCA-marked.
- EN 50081-1,2 residential/light industrial emissions or industrial emissions.
- EN 50082-1,2 residential/light industrial or industrial susceptibility.
- ISO 7637-2, level 2; DC supply surge voltage test.
- Mil Std. 202C, Method 101 and ASTM B117: Salt fog test.
- PowerCommand control systems and generator sets are designed and manufactured in ISO 9001 certified facilities.
- UL 6200 recognized and suitable for use on UL 2200 Listed generator sets.
- CSA C282-M1999 compliance.
- CSA 22.2 No. 14 M91 industrial controls.

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Warranty

All components and subsystems are covered by an express limited one year warranty. Other optional and extended factory warranties and local distributor maintenance agreements are available

Accessories

1301-1302 Upgrade Kit (HM)	0541-1431
PowerCommand 500 (LAN)	A040X126
Remote HMI 211	0541-1394
Remote HMI 211RS	A046K103
I/O Expansion (Aux 101)	0541-1291
HMI Heater Accessory Kit	A040H853

Parts Ordering Information

1302 Control Board	0327-1617-02
1302 control Board – Arrow	A043W505
Aux 104 (Governor Control)	0327-1507
HMI 211 Without Heater	0300-6014
HMI 211 with Heater	A026G237

Additional Resources

Resource	Where to find
1302 Service Manual	QSOL
Accessories Catalog	cumminspower.com
Additional Controls Information	PowerSuite Library

PCCNet COMPATIBLE

For more information contact your local Cummins distributor or visit power.cummins.com

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Alternator data sheet

Frame size: CA125-J14

Characteristics

No of bearings:		1	
Weights:	**Stator assembly**:	309 lb	140 kg
	Rotor assembly:	176 lb	80 kg
	Complete assembly:	485 lb	220 kg
Maximum speed:		2250 rpm	
Insulation system:	Class H throughout		

		60 Hz (winding no)				
		208 (311)	480 (41)	600 (17)	240 (311)	
Excitation current:	Full load	2.04	2.10	2.16	2.04	
Excitation current:	No load	0.50	0.55	0.59	0.50	
3 Ø Ratings	(0.8 power factor)	208 (311)	480 (41)	600 (17)	240 (311)	
(Based on specific temperature rise at 40 °C ambient temperature)						
120 °C Rise peak Standby ratings	kW	50	50	50	50	
	kVA	62.5	62.5	62.5	62.5	
105 °C Rise peak Standby ratings	kW	45.8	45.8	45.8	45.8	
	kVA	57.25	57.25	57.25	57.25	
Reactances	(per unit ± 30%)	208 (311)	480 (41)	600 (17)	240 (311)	
(Based on full load at 105 °C rise rating)						
Synchronous		2.02	2.06	2.08	2.02	
Transient		0.16	0.17	0.17	0.16	
Subtransient		0.11	0.11	0.11	0.11	
Negative sequence		0.17	0.18	0.18	0.17	
Zero sequence		0.10	0.10	0.10	0.10	
Motor starting		208 (311)	480 (41)	600 (17)	240 (311)	
Maximum kVA	(90% Sustained voltage)					
(At 20°C nominal generator & ambient temperature)	(PMG)	181	181	181	181	
	(Shunt)	119	119	119	119	
Time constants	(sec)	208 (311)	480 (41)	600 (17)	240 (311)	
Transient		0.037	0.037	0.037	0.037	
Subtransient		0.006	0.006	0.006	0.006	
Open circuit		0.65	0.65	0.65	0.65	
DC		0.007	0.008	0.008	0.007	
Windings	(@ 20° C)	208 (311)	480 (41)	600 (17)	240 (311)	
Stator resistance	(Ohms per phase)	0.188	0.244	0.384	0.188	
Rotor resistance	(Ohms)	0.640	0.640	0.640	0.640	
Number of leads		12	12	12	12	

Sound pressure level @ 7 meters, dB(A)

See notes 1-6 listed below

Configuration		Position (note 1)								8 position average
		1	2	3	4	5	6	7	8	
F217-2 – sound attenuated level 2	Mounted	66.2	65.9	63.9	66	65.8	66.5	63	64.8	65.4
F231-2 – sound attenuated level 1	Mounted	71.8	68.5	65.6	66	65.9	66.6	63.9	69.1	67.8
Standard – unhoused	Infinite exhaust	79.4	79.9	76.3	78.0	75.6	77.7	76.7	77.5	77.9

Sound power level, dB(A)

See notes 2-4, 7, 8 listed below

Configuration		Octave band center frequency (Hz)								Overall sound power level
		31.5	63	125	250	500	1000	2000	4000	8000	
F217-2 – sound attenuated level 2	Mounted	49.1	75.7	77.7	87.8	89.8	85.1	83.5	81	81.1	93.9
F231-2 – sound attenuated level 1	Mounted	49.6	77.3	76.4	87.9	91.2	86.9	84.5	83.5	83.3	95.2

Exhaust sound power level, dB(A)

See notes 2, 9 listed below

Open exhaust (no muffler) @ rated load	Octave band center frequency (Hz)									Overall sound power level
	31.5	63	125	250	500	1000	2000	4000	8000	
	39.8	80.9	93.3	104.4	101.4	104.5	106.8	103.1	101.5	112.0

Note:

1. Position 1 faces the generator front per ISO 8528-10. The positions proceed around the generator set in a counter-clockwise direction in 45° increments. All position are at 7 m (23 ft) from surface of the generator set and 1.2 m (48 in.) from floor level.
2. Sound levels are subject to instrumentation, measurement, installation and manufacturing variability.
3. Data based on full rated load.
4. Sound data with generator sets with infinite exhaust do not include exhaust noise.
5. Sound pressure levels are measured per ANSI S1.13 and ANSI S12.18, as applicable.
6. Reference sound pressure is 20 µPa.
7. Sound power levels per ISO 3744 and ISO 8528-10, as applicable.
8. Reference power = 1 pw (10^{-12} W).
9. Exhaust sound power levels are per ISO 6798, as applicable.

High ambient air temperature radiator cooling system

	Fuel type	Duty	Rating (Kw)	Max cooling @ air flow static restriction, unhoused (inches water/mm water)					Housed in free air, no air discharge restriction	
				0.0/0.0	0.25/6.4	0.5/12.7	0.75/19.1	1.0/25.4	F231	F217
				Maximum allowable ambient temperature, degree C						
60 Hz	Natural Gas	Standby	40	55	55	55	N/A	N/A	55	55

High ambient air temperature radiator cooling system

	Fuel type	Duty	Rating (Kw)	Max cooling @ air flow static restriction, unhoused (inches water/mm water)					Housed in free air, no air discharge restriction	
				0.0/0.0	0.25/6.4	0.5/12.7	0.75/19.1	1.0/25.4	F231	F217
				Maximum allowable ambient temperature, degree C						
60 Hz	Propane	Standby	40	55	55	55	N/A	N/A	55	55

Notes:

1. Data shown are anticipated cooling performance for typical generator set.
2. Cooling data is based on 1000 ft (305 m) site test location.
3. Generator set power output may need to be reduced at high ambient conditions. Refer generator set data sheet for derate schedules.
4. Cooling performance may be reduced due to several factors including but not limited to: Incorrect installation, improper operation, fouling of the cooling system, and other site installation variables.

2025 EPA Exhaust Emission Compliance Statement
C40 N6
Standby
60 Hz Spark Ignited Generator Set

Compliance Information:

The engine used in this generator set complies with U.S. EPA emissions regulations under the provisions of 40 CFR Part 60, Stationary Emergency Spark-Ignited emissions limits when tested on 6 mode cycle of Part 90.

Engine Manufacturer:	Cummins Inc.
EPA Certificate Number:	SCEXB02.4AAA-009
Effective Date:	11/7/2024
Date Issued:	11/7/2024
EPA Engine Family (Cummins Emissions Family):	SCEXB02.4AAA

Engine Information:

Model:	QSJ2.4	Bore:	3.41 in. (86 mm)
Engine Nameplate HP:	70	Stroke:	3.94 in. (100 mm)
Type:	4 Cycle, In-Line, 4 Cylinder	Displacement:	146.5 cu. in. (2 liters)
Aspiration:	Turbocharged Aftercooled	Compression Ratio:	9.5:1
Emission Control Device:	Electronic Air/Fuel Ratio Control and Closed-Loop Breather System		

U.S. Environmental Protection Agency Station Emergency SI Emission Limits

	Grams per BHP-hr		Grams per kW_m-hr	
Natural Gas	**NOx + NMHC**	**CO**	**NOx + NMHC**	**CO**
EPA Emissions Limit	10.0	387	13.4	519

	Grams per BHP-hr		Grams per kWm-hr	
Propane (LP)	**NOx + THC**	**CO**	**NOx + THC**	**CO**
EPA Emissions Limit	10.0	387	13.4	519

Tests conducted using alternate methods, instrumentation, fuel or reference conditions can yield different results.

Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.

Exhaust emission data sheet
C40 N6
60 Hz Spark ignited generator set
EPA emissions

Engine information:			
Model:	QSJ2.4	Bore:	3.41 in. (86.5 mm)
Type:	4 cycle, in-line, 4 cylinder	Stroke:	3.94 in. (100 mm)
Aspiration:	Turbocharged after-cooled	Displacement:	146.46 cu. in. (2.4 liters)
Compression ratio:	9.5:1		
Emission control device:	Electronic air/fuel ratio control, and closed-loop breather system.		

	Natural gas	Propane
Performance data	**Standby**	**Standby**
BHP @ 1800 RPM (60 Hz)	70	70
Fuel consumption (SCFH)	519.0	193.6
Air to fuel ratio	16.4	14.6
Exhaust gas flow (CFM)	299.2	259.8
Exhaust gas temperature (°F)	1400	1475
Exhaust emission data		
HC (Total unburned hydrocarbons)*	43	466
NOx (Oxides of nitrogen as NO2)	1400	1320
CO (Carbon monoxide)	11080	19619
		Values are ppmvd
HC (Total unburned hydrocarbons)*	0.07	0.58
NOx (Oxides of nitrogen as NO2)	5.65	4.49
CO (Carbon monoxide)	31.44	47.14
		Values are Grams per HP-Hour

*HC includes all NMHC, VOC, POC, and ROC constituents (Non-Methane HC, Volatile Organic Compounds, Precursor Organic Compounds, and Reactive Organic Compounds).

Test conditions

Data was recorded during steady-state rated engine speed (± 25 RPM) with full load (± 2%). Pressures, temperatures, and emission rates were stabilized.

Fuel specification:	
Natural gas	Dry gas as received from Supplier (1000 BTU/SCF).
Propane	Meets the requirements for Commercial Grade Propane under the ASTM D1835 Standard Specification for Liquefied Gases
Fuel temperature	60 ± 9 °F at Flow Transmitter
Fuel pressure	14.73 PSIA ± 0.5 PSIA at Flow Transmitter
Intake air temperature:	77 ± 9 °F at inlet
Barometric pressure:	29.92 in. Hg ± 1 in. Hg
Humidity:	NOx measurement corrected to 75 grains H2O/lb dry air

The NOx, HC, and CO emission data tabulated here were from a single engine under the test conditions shown above. These data are subjected to instrumentation and engine-to-engine variability. Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures and instrumentation. Engine operation with excessive air intake or exhaust restriction beyond published maximum limit, or with improper maintenance, may results in elevated emission levels.

Prototype Test Support (PTS)
60 Hz test summary

Generator set models

C20 N6, C22 N6, C25 N6, C30 N6, C36 N6, C40 N6, C30 N6H, C36 N6H, C40 N6H, C45 N6H, C50 N6H, C60 N6H

Representative prototype

Model: C40 N6H
Alternator: CA115-T12
Engine: QSJ2.4

The following summarizes prototype testing conducted on the designated representative prototype of the specified models. This testing is conducted to verify the complete generator set electrical and mechanical design integrity. Prototype testing is conducted only on generator sets not sold as new equipment.

Maximum surge power: 52.3 kW

The generator set was evaluated to determine the stated maximum surge power.

Maximum motor starting: 76 kVA

The generator set was tested to simulate motor starting by applying the specified kVA load at low lagging power factor (0.4 or lower). With this load applied, the generator set recovered to a minimum of 90% rated voltage.

Alternator temperature rise:

The highest rated temperature rise (120 °C) test results are reported as follows to verify that worst case temperature rises do not exceed allowable NEMA MG1 limits for class H insulation. Tests were conducted per IEEE 115, rise by resistance and embedded detector, with the rated voltages. Only the highest temperatures are reported.

Location	Maximum rise (ºC)
Alternator stator	103
Alternator rotor	101
Exciter stator	53
Exciter rotor	65

Torsional analysis and testing:

The generator set was tested to verify that the design is not subjected to harmful torsional stresses. A spectrum analysis of the transducer output was conducted over the speed range of 1650 to 1950 RPM.

Cooling system: 50 °C ambient
0.5 in. H_2O restriction

The cooling system was tested to determine ambient temperature and static restriction capabilities. The test was performed at full rated load in elevated ambient temperature under static restriction conditions.

Durability:

The generator set was subjected to a minimum 1000 hour endurance test operating at variable load up to the Standby rating based upon MIL-STD-705 to verify structural soundness and durability of the design.

Electrical and mechanical strength:

The generator set was tested to several single phase and three phase faults to verify that the generator can safely withstand the forces associated with short circuit conditions. The generator set was capable of producing full rated output at the conclusion of the testing.

Steady state performance:

The generator set was tested to verify steady state operating performance was within the specified maximum limits.

Voltage regulation:	± 1%
Random voltage variation:	± 1%
Frequency regulation:	± 0.25%
Random frequency variation:	± 0.25%

Transient performance:

The generator set was tested to verify single step loading capability as required by NFPA 110 and verify acceptable voltage and frequency response on load addition or rejection. The following results were recorded at 0.8 power factor :

Full load acceptance:

Voltage dip:	14.4%
Recovery time:	2.6 seconds
Frequency dip:	4.6%
Recovery time:	2.7 seconds

Full load rejection:

Voltage rise:	11.5%
Recovery time:	3.4 seconds
Frequency rise:	5.6%
Recovery time:	3.4 seconds

Harmonic analysis:

(per MIL-STD-705B, method 601.4)

	Line to Line		Line to Neutral	
Harmonic	No load	Full load	No load	Full load
3	0.3	3.5	0.3	3.2
5	1.1	1.0	0.9	0.9
7	0.7	0.4	0.7	0.3
9	0.0	0.5	0.0	0.4
11	0.2	0.1	0.1	0.1
13	0.1	0.1	0.0	0.0
15	0.0	0.1	0.0	0.1

SECTION 3
GENERATOR ACCESSORIES

Data Sheet

Circuit Breakers

Description

This Data sheet provides circuit breaker manufacturer part numbers and specifications. The Circuit breaker box description is the rating of that breaker box installation on a Cummins Generator. Please refer to the website of the circuit breaker manufacturer for breaker specific ratings and technical information.

Applicable Models

Engine	Models					
Kubota	C10D6	C15D6	C20D6			
QSJ2.4	C20N6	C25N6	C30N6	C30N6H	C36N6	C36N6H
	C40N6	C40N6H	C50N6H	C60N6H		
B3.3	C25D6	C30D6	C35D6	C40D6	C50D6	C60D6
QSJ5.9G	C45N6	C50N6	C60N6	C70N6	C80N6	C100N6
QSJ8.9G	C125N6	C150N6	C175N6B	C200N6B		
QSB5	DSFAC	DSFAD	DSFAE	C50D6C	C60D6C	C80D6C
	C100D6C	C125D6C				
QSB7	DSGAA	DSGAB	DSGAC	DSGAD	DSGAE	
		C125D6D	C150D6D	C175D6D	C200D6D	
QSL9	DSHAD	DQDAA	DQDAB	DQDAC		
QSM11	DQHAB					
QSX15	DFEJ	DFEK				

Instructions

1. Locate the circuit breaker feature code or part number and use the charts below to find the corresponding manufacturer circuit breaker catalog number.

2. Use the first letter of the circuit breaker catalog number to determine the "frame" of the breaker. If the first letter is an “N”, use the second letter. Then follow the corresponding website link from the table below to find the breaker catalog number description.

Please refer to the catalog numbering systems page, which is given in the chart, to understand the nomenclature of the catalog number.

Frame	Catalog name*	Catalog number description page(s)
P	0612CT0101 http://www.schneider-electric.us/en/download/document/0612CT0101/	16-17
H, J, and L	0611CT1001 http://www.schneider-electric.us/en/download/document/0611CT1001/	8-9
Q	0734CT0201 http://www.schneider-electric.us/en/download/document/0734CT0201/	4

*The following link may also be used to search specifically by the breaker part number or for the catalog name listed above. http://products.schneider-electric.us/technical-library/

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3. Search the catalog by using the first 3 letters of the breaker catalog number and the first 5 numbers to find information such as trip curves, accessories, and dimensional details regarding the circuit breaker.

*If the catalog number starts with “N”, skip the N and begin your search with the second letter.

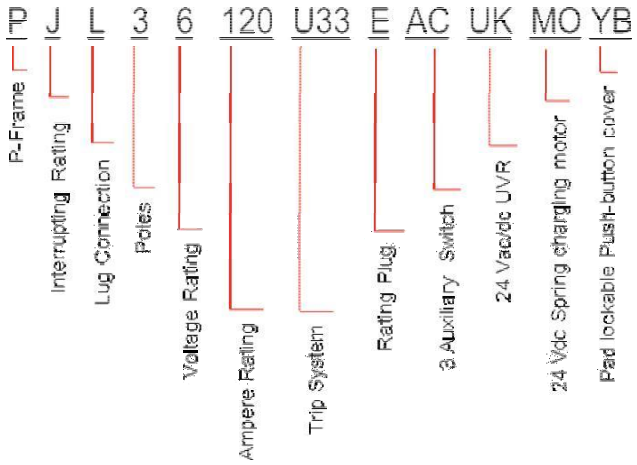
*If the first 3 letters are “PJP,” the search will not work. You will need to start with just “PJ” and use the description pages to obtain the information you are looking for on the “PJP.”

Example

After finding your circuit breaker catalog number to be "PJL36120U33EACUKMOYB," navigate to the P-frame catalog by using the link provided.

Look at pages 16-17 of the pdf catalog to find the nomenclature of the breaker.

Search the P-frame spec sheet using the search "PJL36120.”



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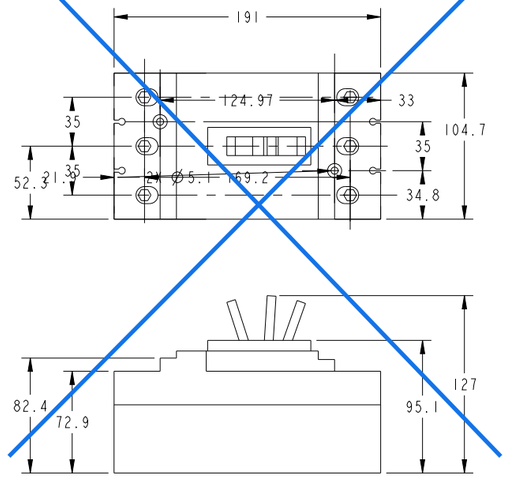
Feature Code	Breaker Box Description	Cummins Part #	Manufacturer	Breaker Catalog Number	Trip Unit	Plug Type
KV35-2	CB,Loc A,50A,3P,600VAC,80%,UL	A043L461	Schneider Electric	HDL36050	Thermal Magnetic	N/A
KV36-2	CB,Loc A,60A,3P,600VAC,80%,UL	A043L459	Schneider Electric	HDL36060	Thermal Magnetic	N/A
KV37-2	CB,Loc A,70A,3P,600VAC,80%,UL	A043L451	Schneider Electric	HDL36070	Thermal Magnetic	N/A
KV38-2	CB,Loc A,80A,3P,600VAC,80%,UL	A043L012	Schneider Electric	HDL36080	Thermal Magnetic	N/A
KV39-2	CB,Loc A,90A,3P,600VAC,80%,UL	A043K997	Schneider Electric	HDL36090	Thermal Magnetic	N/A
KV40-2	CB,Loc A,100A,3P,600VAC,80%,UL	A043L024	Schneider Electric	HDL36100	Thermal Magnetic	N/A
KV41-2	CB,Loc A,125A,3P,600VAC,80%,UL	A043K994	Schneider Electric	HDL36125	Thermal Magnetic	N/A
KV42-2	CB,Loc A,150A,3P,600VAC,80%,UL	A043K991	Schneider Electric	HDL36150	Thermal Magnetic	N/A
KV43-2	CB,Loc A,175A,3P,600VAC,80%,UL	A043L619	Schneider Electric	JDL36175	Thermal Magnetic	N/A
KV44-2	CB,Loc A,200A,3P,600VAC,80%,UL	A043L520	Schneider Electric	JDL36200	Thermal Magnetic	N/A
KV45-2	CB,Loc A,225A,3P,600VAC,80%,UL	A043L517	Schneider Electric	JDL36225	Thermal Magnetic	N/A
KV46-2	CB,Loc A,250A,3P,600VAC,80%,UL	A043L510	Schneider Electric	JDL36250	Thermal Magnetic	N/A
KV47-2	CB,Loc A,250A,3P,600VAC,100%,UL	A044C640	Schneider Electric	JDL36250U31XLC	MicroLogic 3.2S	N/A
KV55-2	CB,Loc B,15A,2P,600VAC,80%,UL	A043E189	Schneider Electric	HDL26015	Thermal Magnetic	N/A
KV57-2	CB,Loc B,25A,2P,600VAC,80%,UL	A043E191	Schneider Electric	HDL26025	Thermal Magnetic	N/A
KV58-2	CB,Loc B,30A,2P,600VAC,80%,UL	A043E185	Schneider Electric	HDL26030	Thermal Magnetic	N/A
KV59-2	CB,Loc B,40A,2P,600VAC,80%,UL	A043E183	Schneider Electric	HDL26040	Thermal Magnetic	N/A

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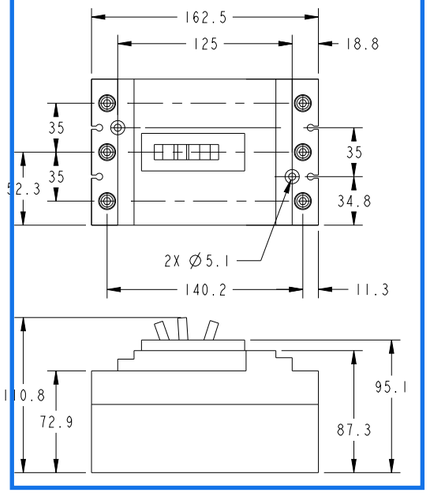
PTC® Creo® Parametric

REL NO	LTR	NO	REVISION	DWN	CKD	APVD	DATE
ECO-176287	D	1	PART A050J727; "UPDATE MEP"	KSP	KAM	M.WINGFIELD	03APR18
		2	ZONE A3; RMV C11 LABEL	KSP	KAM	M.WINGFIELD	03APR18

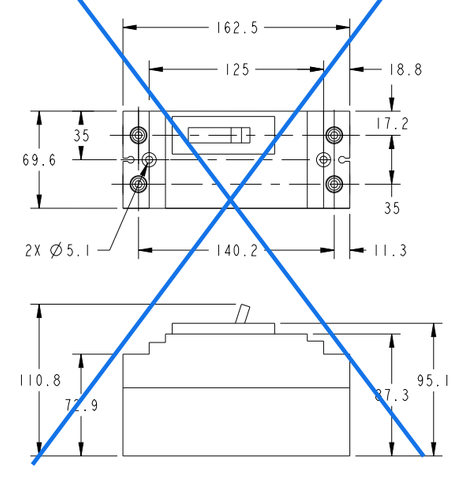
2 POLE & 3 POLE J-FRAME



3 POLE H-FRAME



2 POLE H-FRAME



NOTES:

1. THIS PART IS MANUFACTURER SOURCE CONTROLLED.
2. SUPPLIED WITH LINE & LOAD MECHANICAL LUGS :
   2.1 FOR THERMAL-MAGNETIC TRIP : AL/CU.
   2.2 FOR ELECTRONIC TRIP: CU FOR 90°C.
3.

INTERRUPTING RATINGS		KA
UL/ CSA/ NOM	240 Vac	25
	480 Vac	18
	600 Vac	14
IEC 947-2 Icu/Ics	220/240 Vac	25/25
	380/440/415 Vac	18/18
	500/525 Vac	14/14

4. H-FRAME: .65" WIRE STRIP LENGTH,
   LUG TORQUE= A : #14-#10 AWG 50 LB-IN, 75°C.
   B : #8-3/0 AWG 120 LB-IN, 75°C.
5. J-FRAME: 1" WIRE STRIP LENGTH,
   LUG TORQUE= 1/0 AWG- 300 kcmil 250 LB-IN, 75°C.

TABULATION

PART NUMBER	CURRENT ER	AMP_RATING	VOLTS (UL/IEC)	FRAME_TYPE	POLES	BREAKER_TYPE	TRIP
A043E193	ECO-126169	250A	600	J-FRAME	2	JD	
A043E195	ECO-126169	225A	600	J-FRAME	2	JD	
A043E199	ECO-126169	200A	600	J-FRAME	2	JD	
A043E202	ECO-126169	175A	600	J-FRAME	2	JD	
A043L510	ECO-126169	250A	600	J-FRAME	3	JD	
A043L517	ECO-126169	225A	600	J-FRAME	3	JD	
A043L520	ECO-126169	200A	600	J-FRAME	3	JD	
A043L619	ECO-126169	175A	600	J-FRAME	3	JD	
A043C676	ECO-126169	150A	600	H-FRAME	2	HD	
A043D274	ECO-126169	125A	600	H-FRAME	2	HD	
A043D324	ECO-126169	100A	600	H-FRAME	2	HD	
A043D326	ECO-126169	90A	600	H-FRAME	2	HD	
A043D328	ECO-126169	80A	600	H-FRAME	2	HD	
A043E169	ECO-126169	70A	600	H-FRAME	2	HD	
A043E179	ECO-126169	60A	600	H-FRAME	2	HD	
A043E181	ECO-126169	50A	600	H-FRAME	2	HD	
A043E183	ECO-126169	40A	600	H-FRAME	2	HD	
A043E185	ECO-126169	30A	600	H-FRAME	2	HD	THERMAL-MAGNETIC 50-60 Hz
A043E187	ECO-126169	20A	600	H-FRAME	2	HD	
A043E189	ECO-126169	15A	600	H-FRAME	2	HD	
A043E191	ECO-126169	25A	600	H-FRAME	2	HD	
A043K991	ECO-126169	150A	600	H-FRAME	3	HD	
A043K994	ECO-126169	125A	600	H-FRAME	3	HD	
A043K997	ECO-126169	90A	600	H-FRAME	3	HD	
A043L012	ECO-126169	80A	600	H-FRAME	3	HD	
A043L024	ECO-126169	100A	600	H-FRAME	3	HD	
A043L451	ECO-126169	70A	600	H-FRAME	3	HD	
A043L453	ECO-126169	60A	600	H-FRAME	3	HD	
A043L461	ECO-126169	50A	600	H-FRAME	3	HD	
A043L464	ECO-126169	40A	600	H-FRAME	3	HD	
A043L475	ECO-126169	30A	600	H-FRAME	3	HD	
A043L480	ECO-126169	20A	600	H-FRAME	3	HD	
A043L506	ECO-126169	15A	600	H-FRAME	3	HD	
A043L508	ECO-126169	25A	600	H-FRAME	3	HD	
A044C640	ECO-126169	SET TRIP: 70 TO 250 A	600	J-FRAME	3	JD	ELECTRONIC 50-60 Hz
A047W923	ECO-137891	225A Cu LUG	600	J-FRAME	3	JD	THERMAL-MAGNETIC 50-60 Hz
A050J725	ECO-145094	250A	600	J-FRAME	3	JD	LSI ELECTRONIC TRIP 80%
A050J727	ECO-145094	250A	600	J-FRAME	3	JD	LSI ELECTRONIC TRIP 100%

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS
DIM: X ±1; .X ±0.8; .XX± 0.38
HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13
ANG TOL: ± 1.0° SCALE: 1/2

SIM TO NONE
DO NOT SCALE PRINT
- CONFIDENTIAL -
PROPERTY OF CUMMINS POWER GENERATION GROUP

DWN S_GAMBHIRE
CKD M_TULADHAR
APVD M_POZO
DATE 24SEP12
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994
FIRST USED ON ARROW

SITE CODE PGF

CUMMINS POWER GENERATION
BREAKER,CIRCUIT
DWG SIZE D | A043W056 | SHEET 1 OF 1 | DWG REV D

Regulatory Review and Approval is required prior to changing this item per PGG 1-01-01-116. This item impacts compliance with these External Regulations: UL,CSA,RoHS

Drawing Name: A043W056 Revision: D
Part Name: A043L508 Revision: A
ECO-126169 Sheet 1 of 2

Table 11: Circuit Breakers

Circuit Breaker		150 A H-Frame					250 A J-Frame					400 A L-Frame					600 A L-Frame					1200 A L-Frame	
Circuit Breaker Type		HD	HG	HJ	HL	HR	JD	JG	JJ	JL	JR	LD	LG	LJ	LL	LR	LD	LG	LJ	LL	LR	LG	LL
Number of poles[1]		2, 3				3	2, 3				3	3, 4					3, 4					4	
Amperage Range (A)		15-150					70-250					70-400					200-600					700-1200	
UL 489 Circuit Breaker Ratings																							
Breaking Capacity (AIR) UL/CSA/NOM (kA rms)	240 Vac	25	65	100	125	200	25	65	100	125	200	25	65	100	125	200	25	65	100	125	200	—	—
	480 Vac	18	35	65	100	200	18	35	65	100	200	18	35	65	100	200	18	35	65	100	200	—	—
	600 Vac	14	18	25	50	100	14	18	25	50	100	14	18	25	50	100	14	18	25	50	100	—	—
	250 Vdc[2]	20	20	20	20	—	20	20	20	20	—	—	—	—	—	—	—	—	—	—	—	—	—
	500 Vdc[2, 3]	—	20	—	50	—	—	20	—	—	50	—	20	—	—	50	—	20	—	20	—	20	50
IEC 947-2 Circuit Breaker Ratings																							
Ultimate breaking capacity (Icu) (kA rms)	220/240 Vac	25	65	100	125	150	25	65	100	125	150	25	65	100	125	150	25	65	100	125	150	—	—
	380/415 Vac	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125	—	—
	440/480 Vac	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125	—	—
	500/525 Vac	14	18	25	50	75	14	18	25	50	75	14	18	25	50	75	14	18	25	50	75[4]	—	—
	690 Vac	—	—	—	—	20	—	—	—	—	20	—	—	—	—	20	—	—	—	—	20	—	—
	250 Vdc[2]	—	—	—	—	—	20	20	20	20	—	—	—	—	—	—	—	—	—	—	—	—	—
	500 Vdc[2, 3]	—	—	—	—	—	20	20	20	20	—	—	—	—	—	—	—	—	—	—	—	—	—
Service breaking capacity (Ics)	% Icu	100%					100%					100%					100%					—	—
Insulation Voltage	V_i	750 Vac					750 Vac					750 Vac					750 Vac					—	—
Impulse Withstand Voltage	V_{imp}	8 kVac					8 kVac					8 kVac					8 kVac					—	—
Operational Voltage	V_e	690 Vac					690 Vac					690 Vac					690 Vac					—	—
Sensor Rating	I_n	150 A					250 A					400 A					600 A					—	—
Utilization Category	—	A					A					A					A					—	—
Operations (Open-Close Cycles)																							
Without Current		4000					5000					5000					5000					—	
With Current		4000					1000					1000					1000					—	
Protection and Measurements																							
Short-circuit protection	Magnetic only	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	—	—
Overload/short-circuit protection	Thermal-magnetic	X	X	X	X	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	X	X
	Electronic	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	—	—
	with neutral protection (Off-0.5-1-OSN)[5]	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	—	—
	with ground fault protection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	—	—
	with zone selective interlocking (ZSI)[6]	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	—	—
Display / I, V, f, P, E, THD measurements / interrupted-current measurement		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	—	—
Options	Front display module (FDM121)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	—	—
	Operating assistance	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	—	—
	Counters	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	—	—
	Histories and alarms	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	—	—
	Metering Com	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	—	—
	Device status/control com	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	—	—
Dimensions / Weight / Connections																							
Dimensions (Three-Pole Unit Mount) in. (mm)	Height	6.4 (163)					7.5 (191)					13.38 (340)					13.38 (340)					13.38 (340)	
	Width	4.1 (104)					4.1 (104)					5.51 (140)					5.51 (140)					5.51 (140)	
	Depth	3.4 (86)					3.4 (86)					4.33 (110)					4.33 (110)					4.33 (110)	
Weight - lb. (Kg)		4.8 (2.2)					5.3 (2.4)					13.2 (6.0)					13.7 (6.2)					13.7 (6.2)	
Connections / Terminations	Unit Mount	X					X					X					X					X	
	I-Line	X					X					X					X					—	
	Rear Connection	X					X					X					X					X[7]	
	Plug-In	X					X					X					X					—	
	Drawout	X					X					X					X					—	
	Optional Lugs	X					X					X					X					—	

1 H and J-frame breakers with Micrologic trip units available only with three poles. The HJ, HL and the J-Frame two pole circuit breakers are three pole modules.

2 DC not available with PowerPact H, J or L-frame circuit breakers with Micrologic trip units.

3 500 Vdc specific catalog numbers, ungrounded UPS systems only.

4 I_{cs} for 600 A L-frame circuit breaker at 525 V is 19 kA.

5 OSN: Over Sized Neutral protection for neutrals carrying high currents (e.g. 3rd harmonics).

6 ZSI using restraint wires.

7 Rear connection is not available for 700–1200 A four pole L-frame circuit breakers.

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H- and J-Frame Catalog Numbers

Unit-Mount Circuit Breaker Catalog Numbers

Table 14: PowerPact H-Frame 150 A Unit-Mount[1] Thermal-Magnetic Circuit Breakers (600 Vac, 250 Vdc) with Factory Sealed Trip Unit (Suitable for Reverse Connection)

Current Rating @ 40 C	Fixed AC Magnetic Trip		Interrupting Rating							
			D		G		J[2]		L[2]	
	Hold	Trip	Standard (80%) Rated	100% Rated[3]	Standard (80%) Rated	100% Rated[3]	Standard (80%) Rated	100% Rated[3]	Standard (80%) Rated	100% Rated[3]
H-Frame, 150 A, 2P, 600 Vac 50/60Hz, 250 Vdc[4]										
15 A	350 A	750 A	HDL26015	HDL26015C	HGL26015	HGL26015C	HJL26015	HJL26015C	HLL26015	HLL26015C
20 A	350 A	750 A	HDL26020	HDL26020C	HGL26020	HGL26020C	HJL26020	HJL26020C	HLL26020	HLL26020C
25 A	350 A	750 A	HDL26025	HDL26025C	HGL26025	HGL26025C	HJL26025	HJL26025C	HLL26025	HLL26025C
30 A	350 A	750 A	HDL26030	HDL26030C	HGL26030	HGL26030C	HJL26030	HJL26030C	HLL26030	HLL26030C
35 A	400 A	850 A	HDL26035	HDL26035C	HGL26035	HGL26035C	HJL26035	HJL26035C	HLL26035	HLL26035C
40 A	400 A	850 A	HDL26040	HDL26040C	HGL26040	HGL26040C	HJL26040	HJL26040C	HLL26040	HLL26040C
45 A	400 A	850 A	HDL26045	HDL26045C	HGL26045	HGL26045C	HJL26045	HJL26045C	HLL26045	HLL26045C
50 A	400 A	850 A	HDL26050	HDL26050C	HGL26050	HGL26050C	HJL26050	HJL26050C	HLL26050	HLL26050C
60 A	800 A	1450 A	HDL26060	HDL26060C	HGL26060	HGL26060C	HJL26060	HJL26060C	HLL26060	HLL26060C
70 A	800 A	1450 A	HDL26070	HDL26070C	HGL26070	HGL26070C	HJL26070	HJL26070C	HLL26070	HLL26070C
80 A	800 A	1450 A	HDL26080	HDL26080C	HGL26080	HGL26080C	HJL26080	HJL26080C	HLL26080	HLL26080C
90 A	800 A	1450 A	HDL26090	HDL26090C	HGL26090	HGL26090C	HJL26090	HJL26090C	HLL26090	HLL26090C
100 A	900 A	1700 A	HDL26100	HDL26100C	HGL26100	HGL26100C	HJL26100	HJL26100C	HLL26100	HLL26100C
110 A	900 A	1700 A	HDL26110	HDL26110C	HGL26110	HGL26110C	HJL26110	HJL26110C	HLL26110	HLL26110C
125 A	900 A	1700 A	HDL26125	HDL26125C	HGL26125	HGL26125C	HJL26125	HJL26125C	HLL26125	HLL26125C
150 A	900 A	1700 A	HDL26150	HDL26150C	HGL26150	HGL26150C	HJL26150	HJL26150C	HLL26150	HLL26150C
H-Frame, 150 A, 3P, 600 Vac 50/60Hz, 250 Vdc										
15 A	350 A	750 A	HDL36015	HDL36015C	HGL36015	HGL36015C	HJL36015	HJL36015C	HLL36015	HLL36015C
20 A	350 A	750 A	HDL36020	HDL36020C	HGL36020	HGL36020C	HJL36020	HJL36020C	HLL36020	HLL36020C
25 A	350 A	750 A	HDL36025	HDL36025C	HGL36025	HGL36025C	HJL36025	HJL36025C	HLL36025	HLL36025C
30 A	350 A	750 A	HDL36030	HDL36030C	HGL36030	HGL36030C	HJL36030	HJL36030C	HLL36030	HLL36030C
35 A	400 A	850 A	HDL36035	HDL36035C	HGL36035	HGL36035C	HJL36035	HJL36035C	HLL36035	HLL36035C
40 A	400 A	850 A	HDL36040	HDL36040C	HGL36040	HGL36040C	HJL36040	HJL36040C	HLL36040	HLL36040C
45 A	400 A	850 A	HDL36045	HDL36045C	HGL36045	HGL36045C	HJL36045	HJL36045C	HLL36045	HLL36045C
50 A	400 A	850 A	HDL36050	HDL36050C	HGL36050	HGL36050C	HJL36050	HJL36050C	HLL36050	HLL36050C
60 A	800 A	1450 A	HDL36060	HDL36060C	HGL36060	HGL36060C	HJL36060	HJL36060C	HLL36060	HLL36060C
70 A	800 A	1450 A	HDL36070	HDL36070C	HGL36070	HGL36070C	HJL36070	HJL36070C	HLL36070	HLL36070C
80 A	800 A	1450 A	HDL36080	HDL36080C	HGL36080	HGL36080C	HJL36080	HJL36080C	HLL36080	HLL36080C
90 A	800 A	1450 A	HDL36090	HDL36090C	HGL36090	HGL36090C	HJL36090	HJL36090C	HLL36090	HLL36090C
100 A	900 A	1700 A	HDL36100	HDL36100C	HGL36100	HGL36100C	HJL36100	HJL36100C	HLL36100	HLL36100C
110 A	900 A	1700 A	HDL36110	HDL36110C	HGL36110	HGL36110C	HJL36110	HJL36110C	HLL36110	HLL36110C
125 A	900 A	1700 A	HDL36125	HDL36125C	HGL36125	HGL36125C	HJL36125	HJL36125C	HLL36125	HLL36125C
150 A	900 A	1700 A	HDL36150	HDL36150C	HGL36150	HGL36150C	HJL36150	HJL36150C	HLL36150	HLL36150C

1 Standard Lug Kit: AL150HD Terminal Wire Range: 14–3/0 AWG Al or Cu

2 UL Listed/CSA Certified as current limiting circuit breakers.

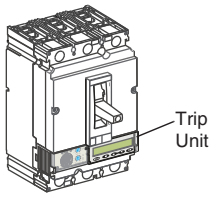
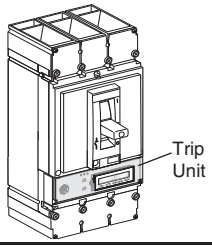
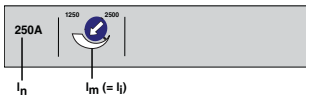
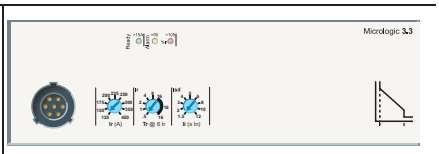
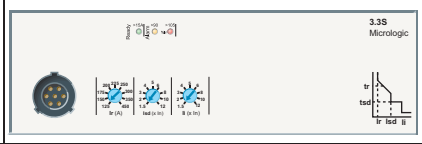
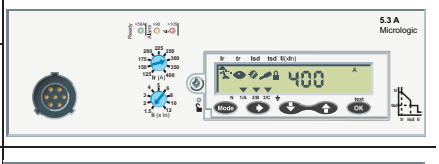
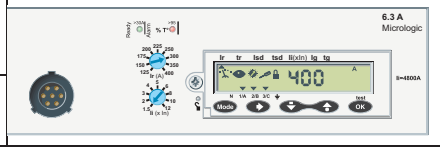
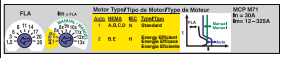
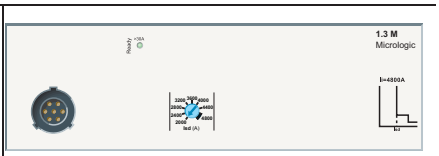
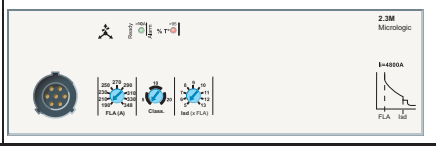
3 100% rated circuit breakers have copper lugs and can be used with copper wire only.

4 HD and HG circuit breakers are true 2-pole construction.

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Table 62: Trip Unit Availability

Trip Unit Type	Trip Unit	H-, J-Frame	Trip Unit	L-Frame
				
Distribution Protection Thermal-Magnetic	T-M		N/A	
Distribution Protection LI	Micrologic 3.2 and 3.2-W		Micrologic 3.3 and 3.3-W	
Distribution Protection LSI Fixed ST and LT delays	Micrologic 3.2S and 3.2S-W		Micrologic 3.3S and 3.3S-W	
Distribution Protection LSI + Ammeter	Micrologic 5.2 A and 5.2 A-W		Micrologic 5.3 A and 5.3 A-W	
Distribution Protection LSI + Energy Monitoring	Micrologic 5.2 E and 5.2 E-W		Micrologic 5.3 E and 5.3 E-W	
Distribution Protection LSIG + Ammeter	Micrologic 6.2 A and 6.2 A-W		Micrologic 6.3 A and 6.3 A-W	
Distribution Protection LSIG + Energy Monitoring	Micrologic 6.2 E and 6.2 E-W		Micrologic 6.3 E and 6.3 E-W	
Motor Circuit Protection Magnetic Only	M		N/A	
Motor Protection Micrologic 1 M	N/A		Micrologic 1.3M	
Motor Protection Micrologic 2 M	Micrologic 2.2 M		Micrologic 2.3 M	

NOTE: W = mission critical trip unit.

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Specification Sheet

Battery Charger-6 Amp



A045D925 60Hz/50Hz

Description

Cummins® fully automatic battery chargers are designed to both recharge your batteries, and extend your battery's life in applications where it is stored for long periods of time. This charger can handle poor power quality, exposure to extreme weather and rough handling.

To maximize battery life, a 3-stage charging cycle is implemented. The three charging stages are bulk stage, absorption stage and maintenance stage. During the bulk stage, the charger uses its full amp output to do the heaviest charging, quickly bringing your battery to about 75% of capacity. In the absorption stage, the current slows, adjusting for maximum charging efficiency while it gently tops off the battery to about 98% of capacity.

During the maintenance stage, a lower, closely-regulated, constant voltage is applied to maintain full charge and prevent discharge.

Unlike some "trickle chargers," the float charger won't apply more current than necessary to maintain full charge. Batteries can be connected indefinitely, without harm; in fact, the float charge extends battery life.

Features

Protection – Surge protected to IEEE and EN standards. All models include single pole cartridge type fuses mounted on the printed circuit board to protect against input or output overcurrent.

Lightweight and Silent – Lighter than transformer types, completely silent but still provides full output when overloaded outlets drop AC voltage below the normal 115V.

Monitoring – Status LED indicators are provided to show the condition or charging status of the battery. When the red LED is on, it indicates that the battery is discharged and is recharging at the 'BULK' rate. When both the red and green LEDs are on, the battery is charging at the 'midrange' rate. When the green LED is on, the battery is 90% charged and ready for use.

Construction – Made using epoxy-potted cases making it the ultimate in durability, completely waterproof and able to withstand numerous caustic chemicals and gases, as well as being shockproof.

Fault Indication – The charger senses and indicates the following fault conditions: Defective or damaged cells, under-voltage at the battery, battery drawing more current than charger can replace, loss of power or extremely low AC voltage at the charger, other battery fault conditions and charger failure.

Compatibility – Works with Sealed Lead Acid (SLA), Absorbed Glass Mat (AGM) and Gel type batteries.

Low Electromagnetic and Radio

Frequency Interference – This product meets FCC class B for conducted and radiated emissions.

Listed – This product is UL listed according to the UL 1236 Standard.

Warranty – This product has a two year warranty

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Specifications

Performance and Physical Characteristics

Output:	Nominal voltage	12 VDC
	Float voltage – 12 V batteries	13.0-13.6 VDC at 0-2 amps
	Maximum output current	6 A @ 12 VDC nom
Input:	Voltage AC	115, 208, 240 ±10%, 90-135
	Frequency	60 Hz ±5%
Battery:	Maximum battery size	150 Amp Hours
	Maximum recharge time	20 hours
Approximate net weight		4 lbs. (1.81 Kg)
Approximate dimensions: height x width x depth-in(mm)		2.25 x 6.4 x 3.5 (57 x 162 x 89)
Ambient temperature operation: At full rated output		-40°F to 122 °F (-40 °C to 50 °C)



Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect generator sets to any building electrical system except through an approved device or after building main switch is open.

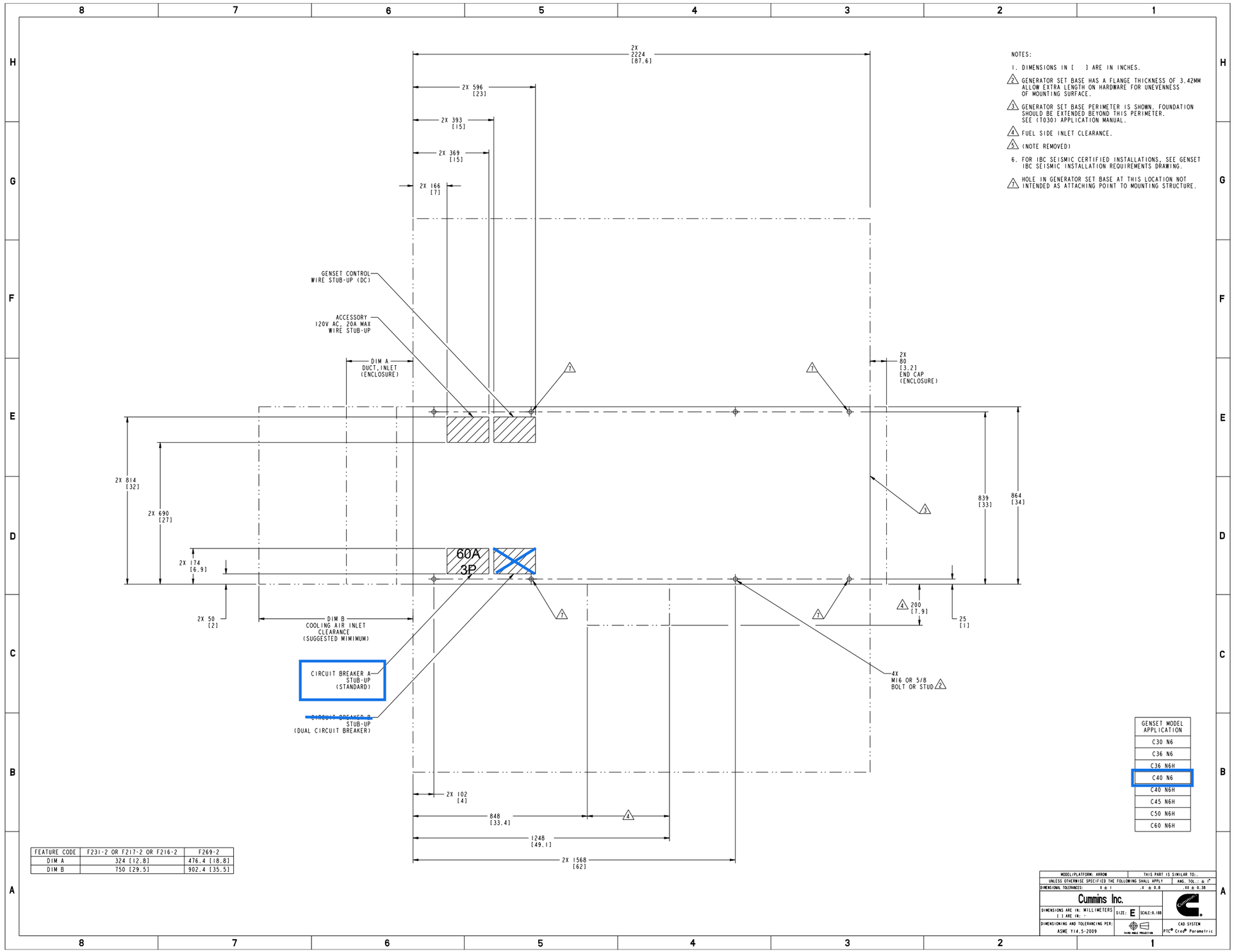
Warning: For professional use only. Must be installed by a qualified service technician. Improper installation presents hazards of electrical shock and improper operation, resulting in severe personal injury and/or property damage.

For more information contact your local Cummins distributor or visit power.cummins.com

Our energy working for you.™

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NAAC-5943-EN / PDA059R693 (06/21)

SECTION 4
GENERATOR DRAWINGS AND INTERCONNECTS



Document Generated: **13MAY2021 14:20 GMT**

Cummins Data Classification:
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Part Number: **A044T182** Part Revision: **H**

Part Name: **OUTLINE,GENSET**

Drawing Category: **Detail** State: **Released** Sheet **1** of **2**

PTC® Creo® Parametric

REL NO	LTR	NO	REVISION	DWN	CKD	APVD	DATE
ECO-178681	E	1	ZONE A4; F231-2 AND F216-2___	--	--	--	--
			CONFIGURATIONS WAS F231-2___	--	--	--	--
			CONFIGURATION	PPP	KAM	W.WINGFIELD	09JUL18
		2	UPDATE VIEWS PICTORIALLY	PPP	KAM	W.WINGFIELD	09JUL18

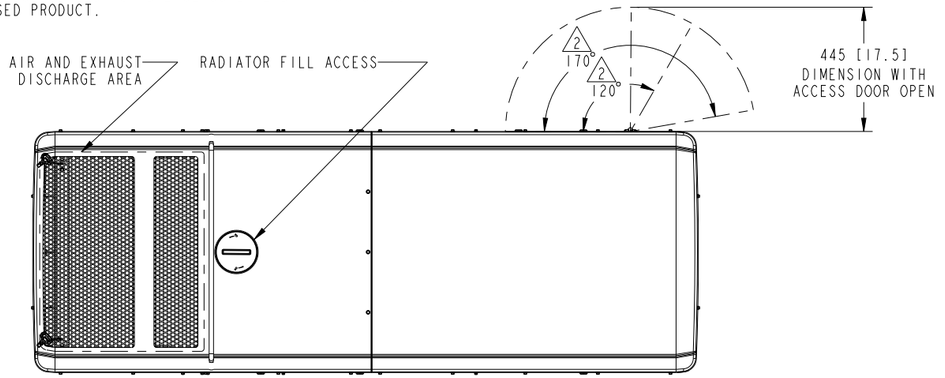
NOTES:

1. DIM [] IN INCHES

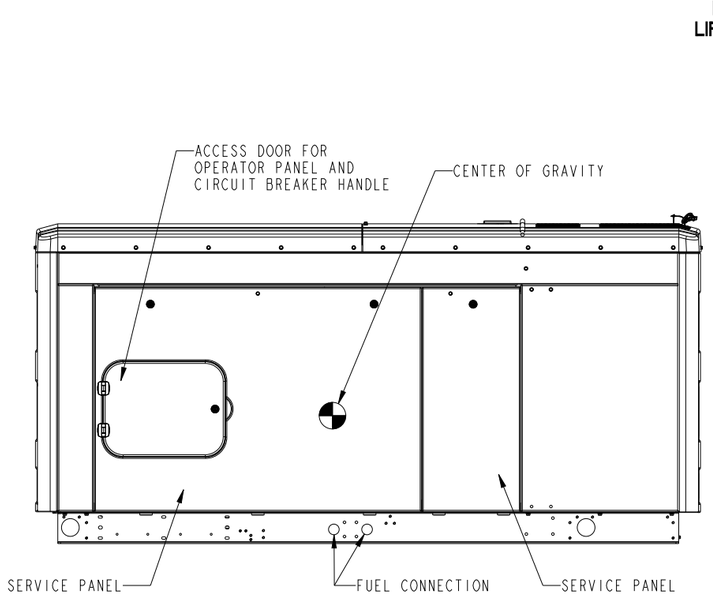
2. 120° AND 170° ARE DETENTED OPEN ANGLE FOR HINGE.

3. WHEN THE HOUSING INSTALLED ON AN OPEN GENERATOR SET, THE TOTAL WEIGHT WILL INCREASE BY 98 KG (216 LBS). THIS INCLUDES THE MUFFLER.

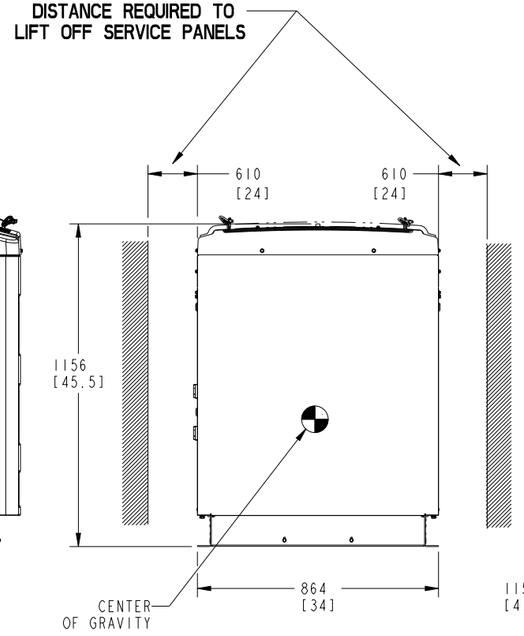
4. THE CENTER OF GRAVITY(CG) OF THE GENERATOR SET WHEN EQUIPPED WITH THIS HOUSING SHIFTS APPROXIMATELY 8MM (0.31 INCH) TOWARDS THE AIR DISCHARGE END OF THE HOUSING AND 38MM (1.5 INCH) HIGHER FROM THE GROUND. COMPARED TO THE EQUIVALENT NON-HOUSED PRODUCT WITH THE F179 SKID. SEE HOUSING READY SKID BASE OUTLINE DRAWING FOR CG LOCATION OF NON HOUSED PRODUCT.



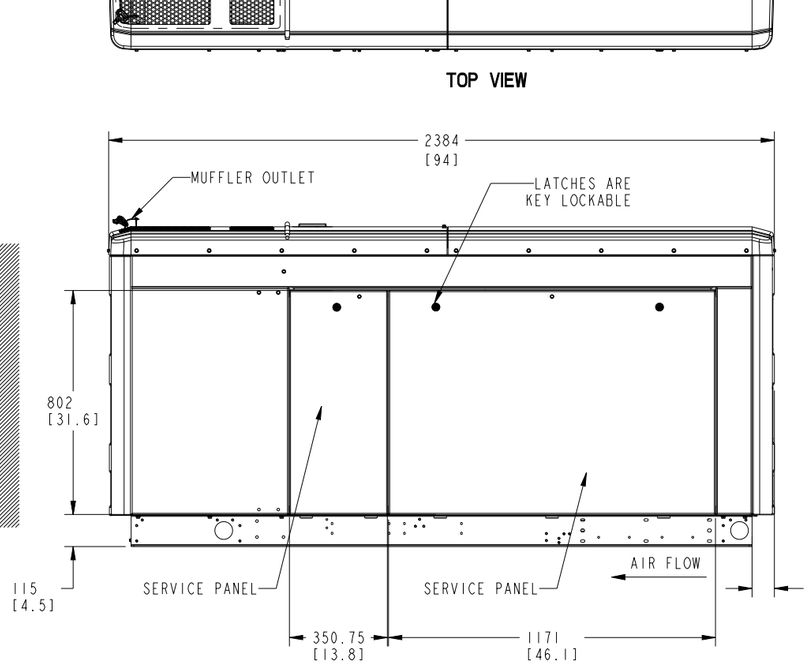
TOP VIEW



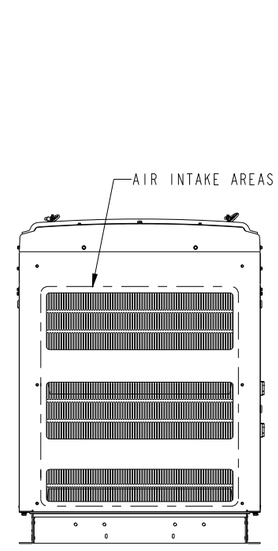
RIGHT SIDE VIEW



OUTLET VIEW



LEFT SIDE VIEW



INLET VIEW

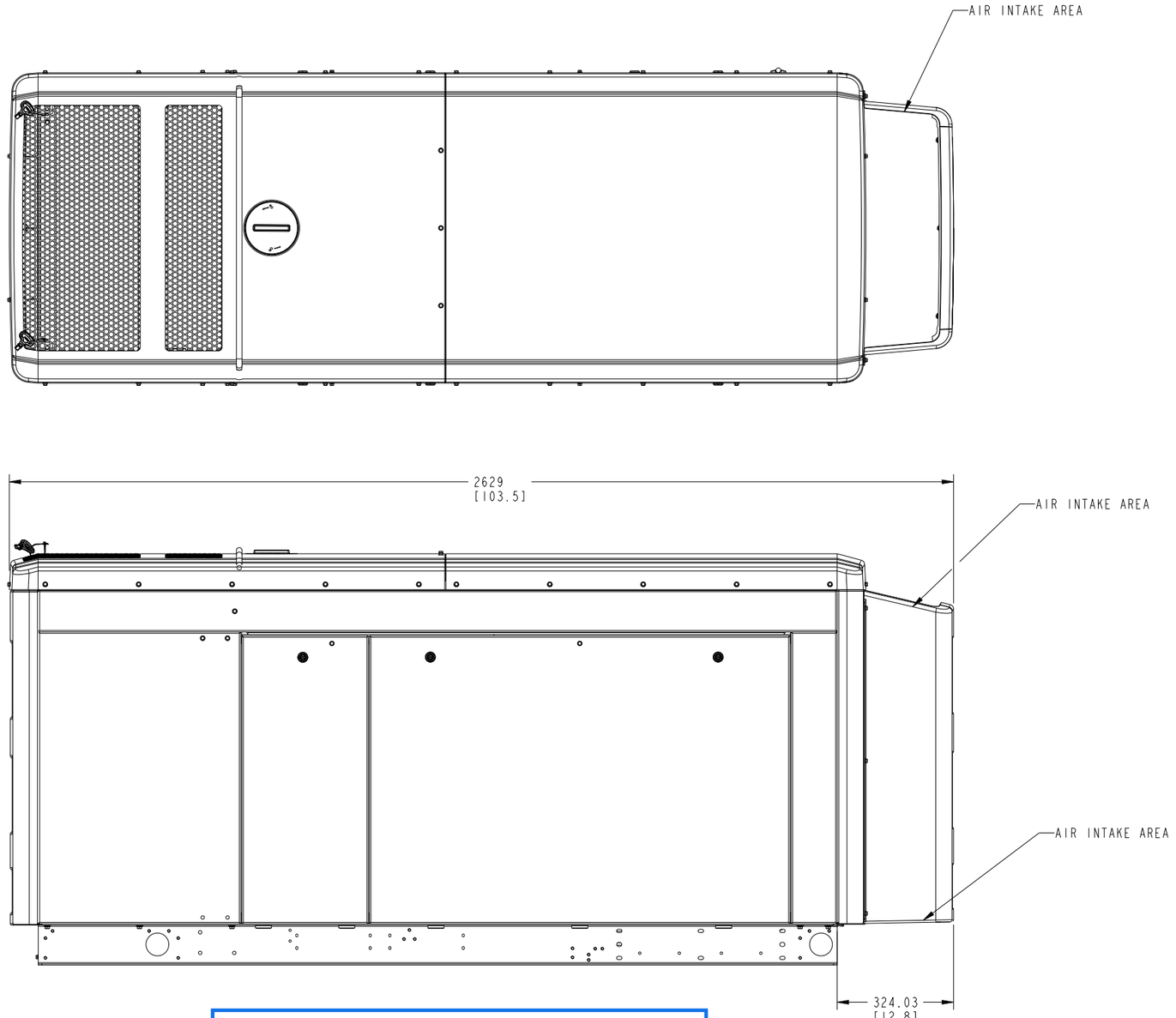
F231-2 AND F216-2 ENCLOSURE CONFIGURATIONS

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS	SIM TO NONE	DWN S_GAMBHIRE		CUMMINS POWER GENERATION	
DIM: X ±1; .X ±0.8; .XX± 0.38 — HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13	DO NOT SCALE PRINT	CKD T_RADKE		OUTLINE,ENCLOSURE	
ANG TOL: ± 0.5° — SCALE: 1/10	- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP	APVD J_MATTHEWS	SITE CODE		
	FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994	DATE 17JAN13	PGF	SIZE D — A043J729	SHEET 1 OF 2 — REV E
	FIRST USED ON ARROW				

Drawing Name: A043J730 Revision: E
Part Name: A043J729 Revision: E
ECO-178681 Sheet 1 of 3

PTC® Creo® Parametric

REL NO	LTR	NO	REVISION	DWN	CKD	APVD	DATE
ECO-178681	E	-	---	AM	RN	W.WINGFIELD	09JUL18



F217-2 ENCLOSURE CONFIGURATION

REFER TO PAGE 1 (F231-2 ENCLOSURE) FOR
OTHER F217-2 ENCLOSURE DIMENSIONS.

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS DIM: X ±1, .X ±0.8, .XX± 0.38 HOLE: 0.00- 4.99 +0.15/-0.08, 5.00- 9.99 +0.20/-0.10, 10.00-17.49 +0.25/-0.13, 17.50-24.99 +0.30/-0.13 ANG TOL: ± 0.5° SCALE: 1/10	SIM TO NONE DO NOT SCALE PRINT - CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP	DWN S_GAMBHIRE CKD T_RADKE APVD J_MATTHEWS DATE 17JAN13 FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994 FIRST USED ON ARROW	Cummins SITE CODE PGF CUMMINS POWER GENERATION OUTLINE, ENCLOSURE DWG SIZE D · A043J729 · SHEET 2 OF 2 · DWG REV E

PTC® Creo® Parametric

REL NO	LTR	NO	REVISION	DWN	CKD	APVD	DATE
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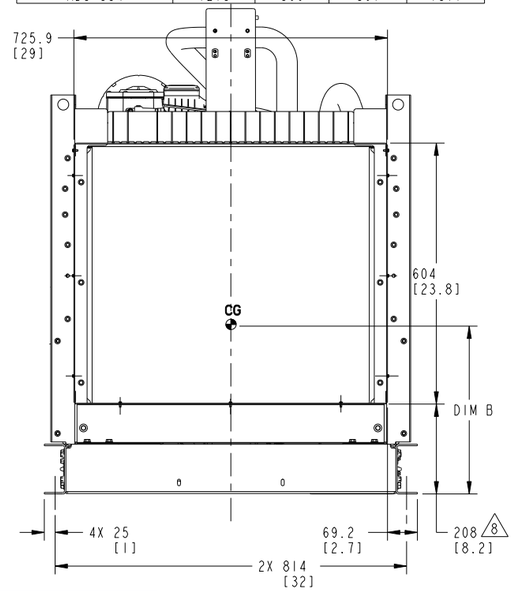
NOTES:

1. DIMENSIONS SHOWN IN [ ] ARE IN INCHES.
2. REFER TO CIRCUIT BREAKER OUTLINE DRAWING FOR ELECTRICAL STUB-UP AREA FOR SPECIFIC BREAKERS.
3. CONTROL INTERFACE CONNECTIONS SHOULD BE MADE WITH FLEXIBLE CONNECTIONS.
4. Ø21 [0.8] HOLES MARKED BY △ FOR SECURING TO MOUNTING SURFACE.
5. OIL DRAIN EXTENSION: 3/8 INCH HOSE ID.
6. FOR IBC SEISMIC CERTIFIED INSTALLATION, SEE GENSET IBC SEISMIC INSTALLATIION REQUIREMENT DRAWING.
7. DRY WEIGHT = WET WEIGHT-16 KG (35 LB).
8. Ø3.2 HOLES FOR CUSTOMER-SUPPLIED COOLING EXHAUST AIR DUCT ADAPTER.
9. C30 N6 MODEL IS ONLY TURBOCHARGED, NOT AFTER-COOLED.

TABULATION

ALT DATA SHEET #	DIM A	DIM B	GENSET WET WEIGHT	
			KG	LB
ADS-574	1140	401	498	1097
ADS-576	1153	384	508	1119
ADS-577	1181	397	508	1119
ADS-579	1189	395	536	1182
ADS-580	1202	393	564	1244
ADS-581	1213	391	574	1266
ADS-584	1218	390	597	1317

GENSET CONTROL WIRE STUB-UP (DC)
SKID INSTALLATION (F179-2)
ACCESSORY 120V AC, 20A MAX WIRE STUB-UP
DIM A
~~BACK BATTERY~~ (F065-2)
OPTIONAL DUCT ADAPTER (F013-2)
AIR FLOW
793 [31.2]
687 [27]
864 [34]
814 [32.1]
690 [27.2]
2X 50 [2]
174 [6.9]
60A 3P
CG
431 [17]
432 [17]
227 [8.9]
176 [6.9]
70 [2.8]
3X Ø3.2 [0.1]
166 [6.5]
369 [14.5]
393 [15.5]
596 [23.5]
CIRCUIT BREAKER 1 STUB-UP (STANDARD)
ENGINE OIL
~~EXHAUST CONNECTOR~~ 2.5 INCH NPT (A299-2)
~~CIRCUIT BREAKER~~ 2 STUB-UP (DUAL CIRCUIT BREAKER)
311 [12.2]
648 [25.5]
868 [34]
RADIATOR FILL
ENGINE COOLING-HIGH AMBIENT AIR TEMPERATURE (E125-2)
CONTROL PCI.1 (H700-2)
DIP STICK
HOT
1123 [44.2]
923 [36.4]
848 [33.4]
709 [27.9]
6X Ø3.2 [0.1]
ENGINE CRANKSHAFT
2X 737 [29]
2X 505 [19.9]
327 [12.9]
273.2 [11]
2X 273 [10.7]
4X Ø64 [2.5] LIFTING HOLES
3/4 INCH NPT FEMALE FUEL CONNECTION FOR C30 N6, C40 N6 AND C36 N6
1 INCH NPT FEMALE FUEL CONNECTION FOR C60 N6H
51 [2]
4X 58 [2.3]
2X 332 [13.1]
2X 349 [13.7]
2X 656 [25.8]
1116 [43.9]
2X 2122 [83.6]
2X 2179 [85.8]
2224 SKID [87.6]



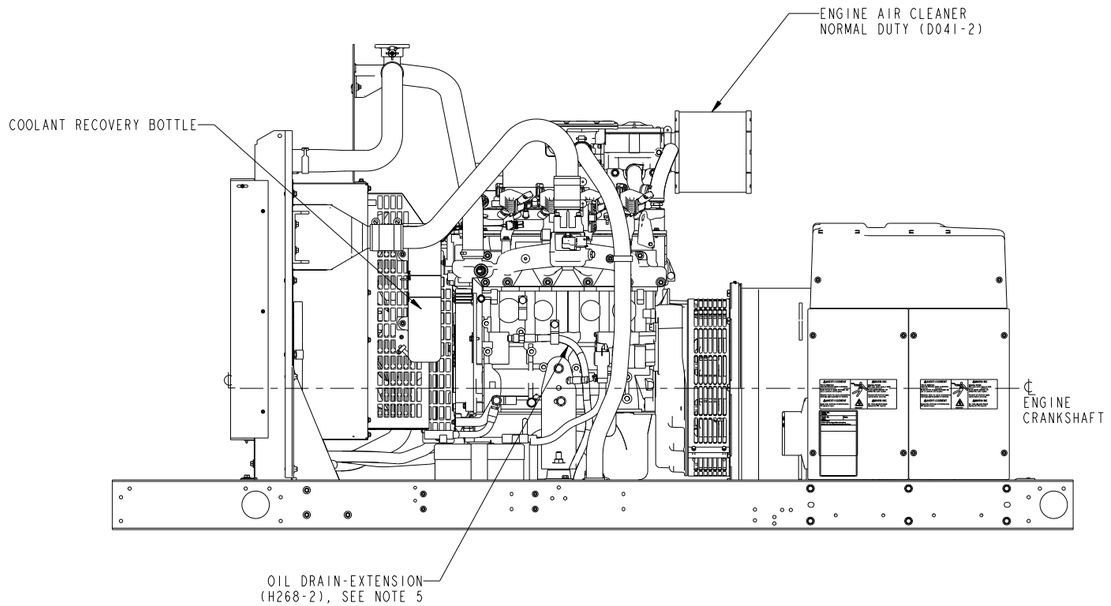
C30 N6, C36 N6, C40 N6, C60 N6H

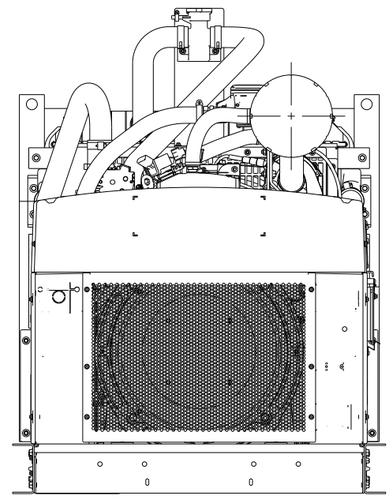
UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS	SIM TO	NONE	DWN	V_MOHITE	CUMMINS POWER GENERATION
DIM: X ±0; .X ±0.0; .XX± 0.00 — HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13	DO NOT SCALE PRINT		CKD	I_VOLETY	OUTLINE,GENSET
ANG TOL: ± 0.0°	SCALE: 1/6	- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP	APVD	D_GILLETT	SITE CODE: PGF
			DATE	22MAY13	DWG SIZE: D — A045C217 — SHEET 1 of 2 — DWG REV: F
		FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994	FIRST USED ON	ARROW	

Drawing Name: A045C218 Revision: F
Part Name: A045C217 Revision: F
ECO-163223 Sheet 1 of 3

PTC® Creo® Parametric

REL NO	LTR	NO	REVISION	DWN	CKD	APVD	DATE
ECO-163223	F	-	- - -	RP	JP	J.BUTLER	04JUL16





9

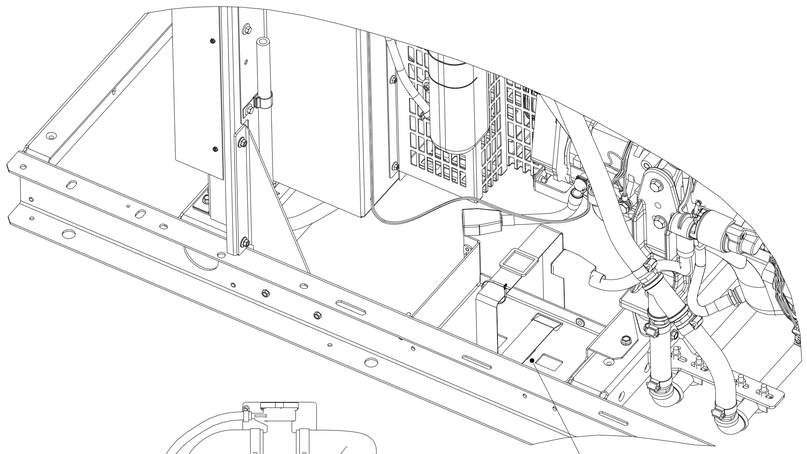
C30 N6, C36 N6, C40 N6, C60 N6H

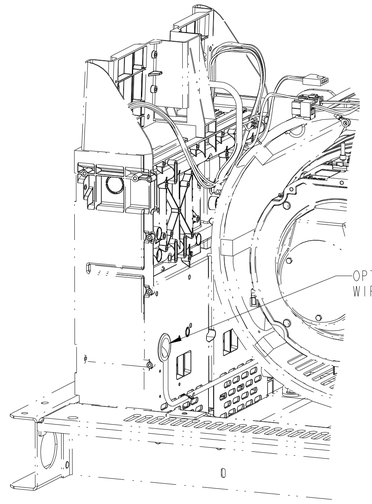
UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS			SIM TO NONE	DWN V_MOHITE		CUMMINS POWER GENERATION
DIM: X ±0 / .X ±0.0 / .XX±0.00	HOLE: 0.00-4.99 +0.15/-0.08; 5.00-9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13		DO NOT SCALE PRINT	CKD I_VOLETY		OUTLINE, GENSET
ANG TOL: ± 0.0°	SCALE: 1/6		- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP	APVD D_GILLETT	SITE CODE	
				DATE 22MAY13	PGF	DWG SIZE D: A045C217 SHEET 2 of 2 DWG REV F
				FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994 FIRST USED ON ARROW		

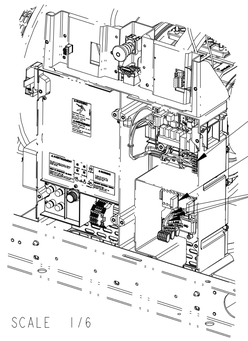
Drawing Name: A045C218 Revision: F
Part Name: A045C217 Revision: F
ECO-163223 Sheet 2 of 3

PTC® Creo® Parametric

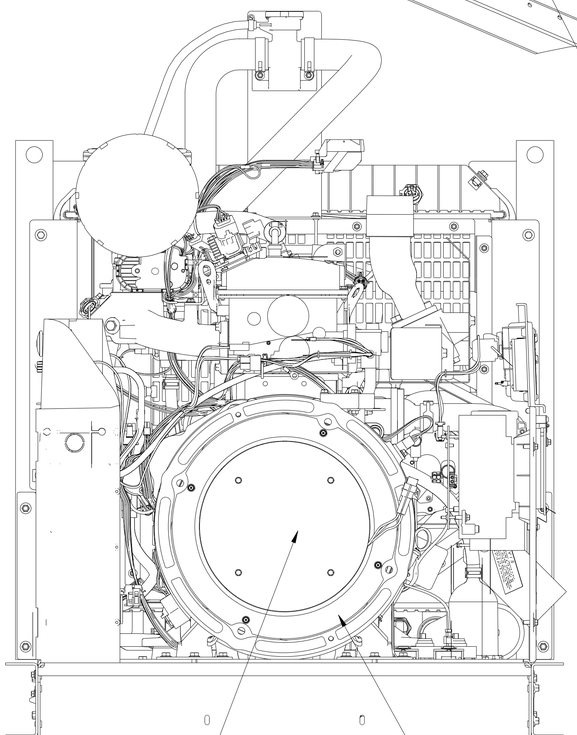
REL NO	LTR	NO	REVISION	DWN	CKD	APVD	DATE
ECO-149443	E	3	ZONE D5; ADDED VIEW TO SHOW LARGER BATTERY TRAY OPTION (F253-2)	-	-	-	-
				DKS	MMJ	M. JAWALE	20JAN15
		4	ZONE A2; 500W COOLANT HTR OPTION WAS (H036-2), ADDED 1000W COOLANT HTR OPTION (E154-2)	-	-	-	-
				-	-	-	-
				DKS	MMJ	M. JAWALE	20JAN15

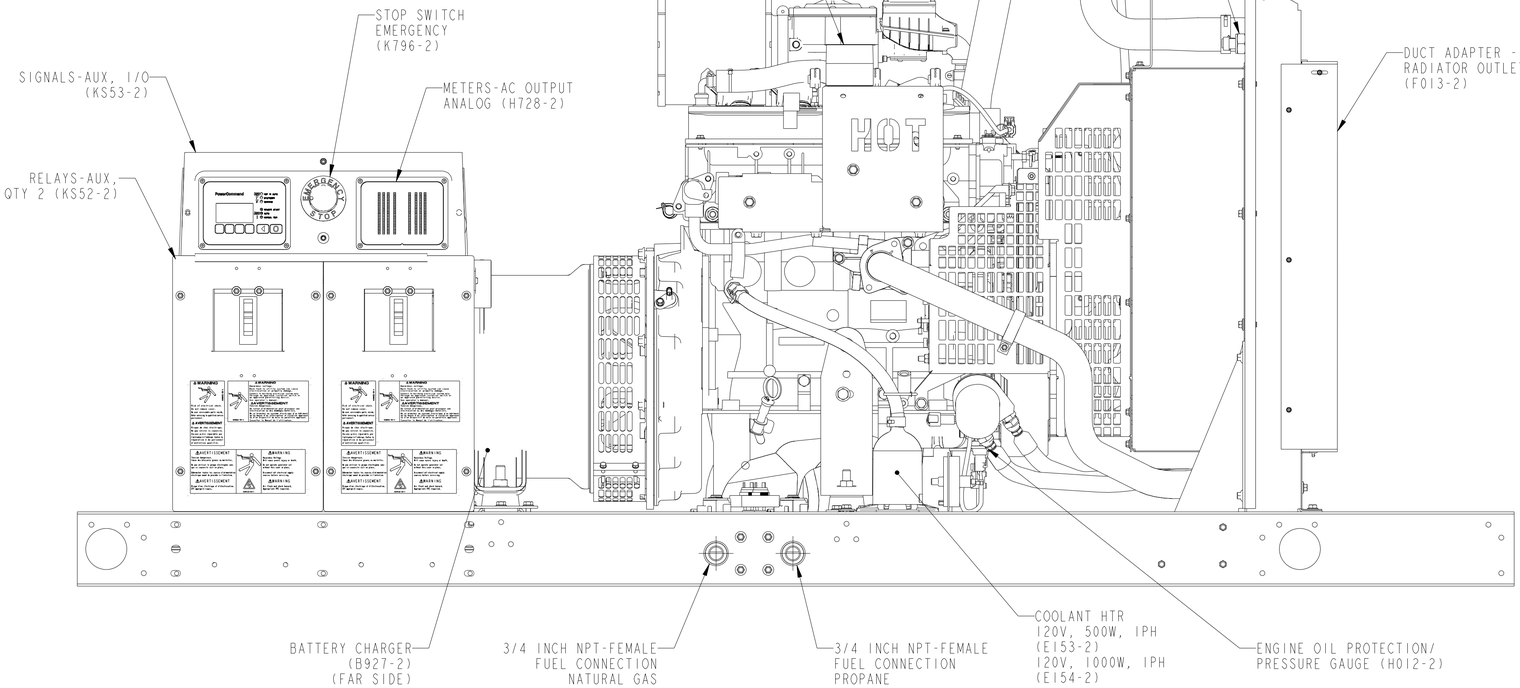






SCALE 1/6





DOME AND MESH REMOVED FOR CLARITY

C30 N6, C36 N6, C40 N6, C36 N6H, C40 N6H, C45 N6H, C50 N6H

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS		SIM TO NONE	DWN C_BADGUJAR		CUMMINS POWER GENERATION
DIM: X ± 1, .X ± 0.8, .XX± 0.38 / HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13		DO NOT SCALE PRINT	CKD S_DULAM		OUTLINE, GENSET
			APVD D_GILLETT	SITE CODE	OPTIONS
ANG TOL: ± 0.5°	SCALE: 1/4	- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP	DATE 10JUN13	PGF	DWG SIZE D — A045C215 — SHEET 2 of 3 — DWG REV E
			FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994	FIRST USED ON ARROW	

Drawing Name: A045C216 Revision: E
Part Name: A045C215 Revision: E
Sheet 2 of 4

Part A045C215 E

Description	Legacy Name	External Regulations	Application Status	Release Phase Code	Security Classification	Alternates
OUTLINE,GENSET	A045C215	None	Production Only	Production	Proprietary	

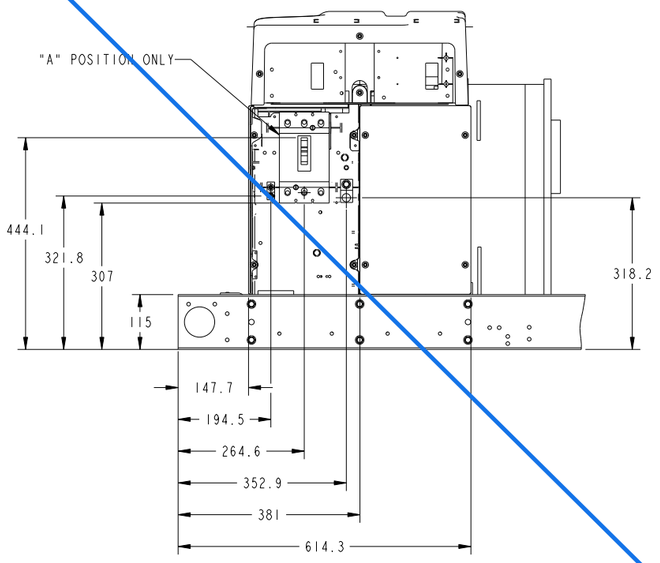
Part Specifications :A045C215 E

Name	Description	Legacy Name
A030B356	SPECIFICATION,MATERIAL	CES10903
A045C216	DRAWING,ENGINEERING	A045C216

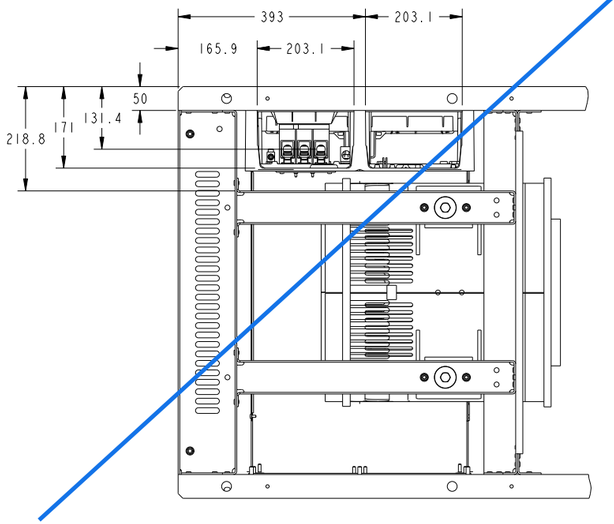
Creo Parametric

REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-134624	B	1	PRODUCTION RELEASE	SP	PL	P_LARSON	13MAY13
		2	DRAWING HAS BEEN PICTORIALLY UPDATED	SP	PL	P_LARSON	13MAY13
		3	ZONE (D3) ADD PHRASE "(J-FRAME SHOWN)"	SP	PL	P_LARSON	13MAY13
		4	ZONE (D5) ADD PHRASE "(J-FRAME SHOWN)"	SP	PL	P_LARSON	13MAY13
		5	ZONE (D3) ADD PHRASE "B" POSITION	SP	PL	P_LARSON	13MAY13
		6	ZONE (D4) ADD PHRASE "A" POSITION	SP	PL	P_LARSON	13MAY13
		7	ZONE (D6) ADD PHRASE "A" POSITION ONLY	SP	PL	P_LARSON	13MAY13
		8	ADD C11 LABEL	SP	PL	P_LARSON	13MAY13
		9	ZONE (D6) DIM 444.1 WAS 417.2	SP	PL	P_LARSON	13MAY13
		10	ZONE (D4) DIM 444.1 WAS 417.2	SP	PL	P_LARSON	13MAY13
		11	ZONE (D2) DIM 438.8 WAS 412.26	SP	PL	P_LARSON	13MAY13
		12	ADD SIM TO NONE	SP	PL	P_LARSON	13MAY13

SINGLE BREAKER (J-FRAME SHOWN)

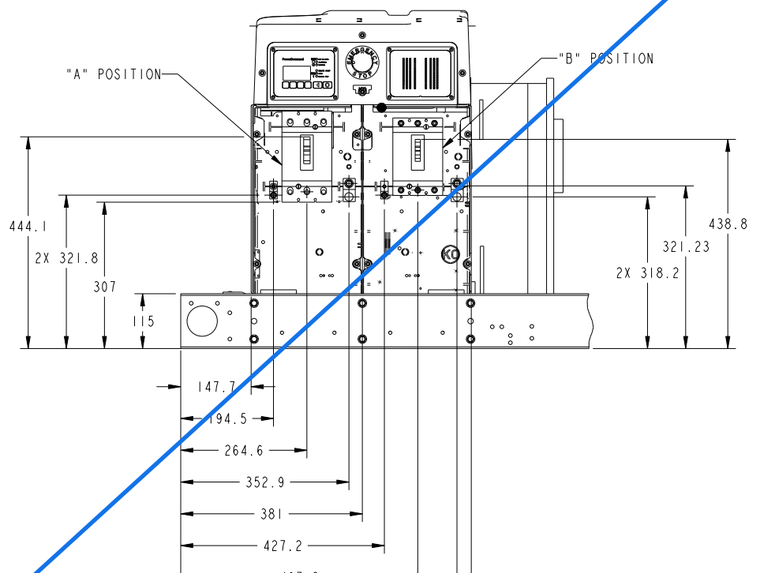


SIDE VIEW

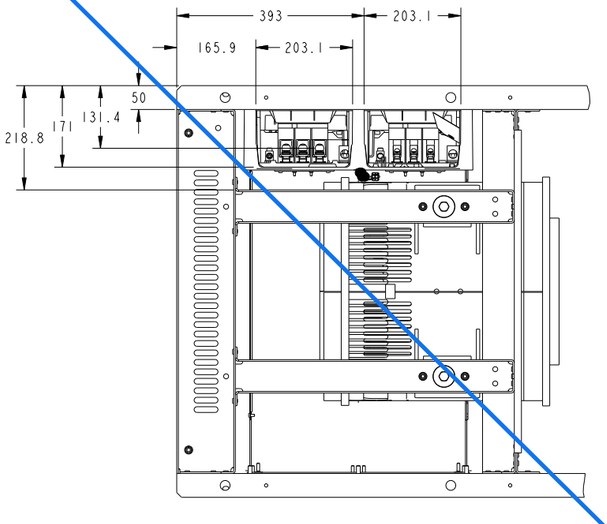


BOTTOM VIEW

DUAL BREAKER (J-FRAME SHOWN)



SIDE VIEW



BOTTOM VIEW

CIRCUIT BREAKER ACCESSORIES	
1	SHUNT TRIP (MX) 12 VDC COIL BURDEN < 5 WATTS 10 AMP IN-RUSH
2	AUXILIARY CONTACTS OPEN/CLOSED (OF) TRIP INDICATION (SD) FORM C CONTACTS RATING: 6 AMPS AT 24 VAC, 48 VAC, 110 VAC 6 AMPS AT 24 VDC, 2.5 AMPS AT 48 VDC 0.6 AMPS AT 110 VDC MAXIMUM OF 4 CONTACTS PER CIRCUIT BREAKER

FRAME	LUG	COPPER CONDUCTOR RANGE AWG	STRIP LENGTH
H-FRAME THERMAL-MAGNETIC 15-150 AMP	AL 150 HD	(1) #14-3/0 #14-#10 50 LB-IN #8-3/0 120 LB-IN	0.65 INCH
J-FRAME THERMAL-MAGNETIC 175 AMP	AL 175 JD	(1) 4-4/0 225 LB-IN	1.00 INCH
J-FRAME THERMAL-MAGNETIC 200-250 AMP	AL 250 JD	(1) 3/0-350 KCMIL 225 LB-IN	1.00 INCH
J-FRAME ELECTRONIC TRIP ADJUSTABLE RANGE 70-250 100% RATED ASSEMBLY	CU 250 JD	(1) 1/0-300 KCMIL 250 LB-IN	1.00 INCH

-THIS IS A CONTROLLED ITEM-
PER CPG PROCEDURE FRE-1002

TO MAINTAIN COMPLIANCE WITH REQUIREMENTS OF THE CODES, STANDARDS, OR AGENCIES LISTED BELOW

☒ CSA ☒ UL ☐ CE ☐ RVIA ☐ ABYC
☒ IBC ☒ OTHER OSHPD ☐ OTHER

CHANGES, DEVIATIONS, OR SUBSTITUTIONS OF MATERIAL, PROCESS, OR PERFORMANCE FOR THIS ITEM MUST BE APPROVED BY THE FOLLOWING CONTROLLED ITEM APPROVER

RESPONSIBLE C/A ROLE STATIONARY GENSET C/A
RESPONSIBLE C/A ROLE SEISMIC
RESPONSIBLE C/A ROLE

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS
DIM: X ± 1; .X ± 0.8; .XX± 0.38
HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13
ANG TOL: ± 1.0° SCALE: 1/1

SIM TO NONE
DO NOT SCALE PRINT
- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP

DWN R_WEHRENBERG
CKD P_LARSON
APVD P_LARSON
DATE 19NOV12
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994
FIRST USED ON ARROW

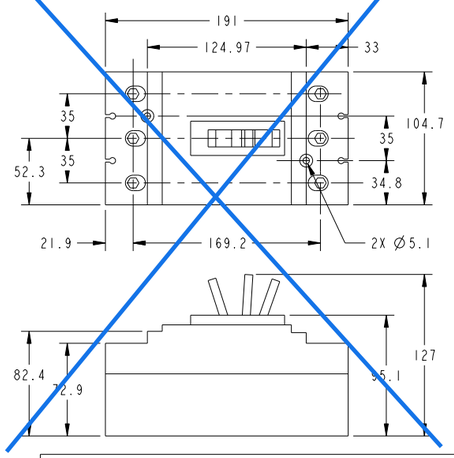
SITE CODE PGF

CUMMINS POWER GENERATION
OUTLINE, CIRCUIT BREAKER
SIZE D DWG A044P050 SHEET 1 OF 1 REV B

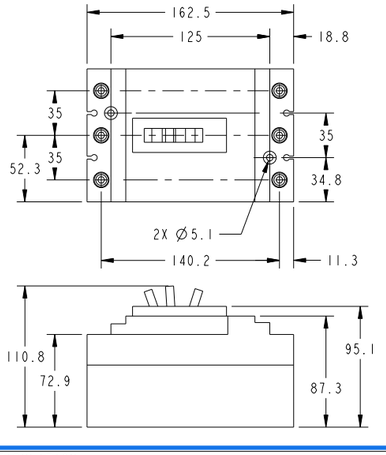
Drawing Name: A044P051 Revision: B
Part Name: A044P050 Revision: B
Sheet 1 of 2

PTC® Creo® Parametric

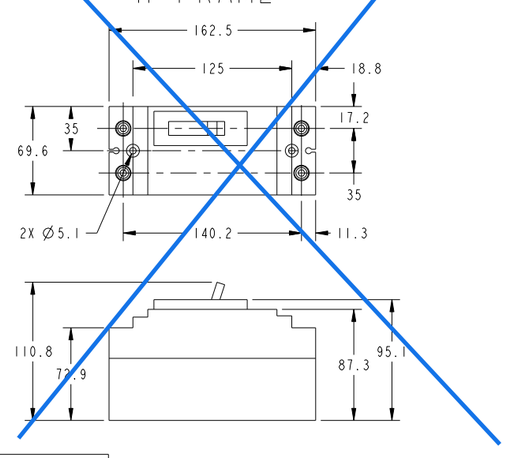
2 POLE & 3 POLE J-FRAME



3 POLE H-FRAME



2 POLE H-FRAME



REL NO	LTR	NO	REVISION	DWN	CKD	APVD	DATE
ECO-145094	C	1	PRODUCTION_RELEASE A050J725 AND A050J727	MK	AG	A.GRILLIOT	17JUL14
		2	RESPONSIBLE CIA ROLE 'STATIONARY	--	--	--	--
			GENSET CIA' WAS 'STATIONARY GENSET'	MK	AG	A.GRILLIOT	17JUL14

NOTES:

1. THIS PART IS MANUFACTURER SOURCE CONTROLLED.
2. SUPPLIED WITH LINE & LOAD MECHANICAL LUGS :
   2.1 FOR THERMAL-MAGNETIC TRIP : AL/CU.
   2.2 FOR ELECTRONIC TRIP: CU FOR 90°C.
3.

INTERRUPTING RATINGS		KA
UL/ CSA/ NOM	240 Vac	25
	480 Vac	18
	600 Vac	14
IEC 947-2 Icu/Ics	220/240 Vac	25/25
	380/440/415 Vac	18/18
	500/525 Vac	14/14

4. H-FRAME:.65" WIRE STRIP LENGTH,
   LUG TORQUE= A : #14-#10 AWG 50 LB-IN,75°C.
   B : #8-3/0 AWG 120 LB-IN,75°C.
5. J-FRAME:1" WIRE STRIP LENGTH,
   LUG TORQUE= 1/0 AWG- 300 kcmil 250 LB-IN,75°C.

TABULATION

PART NUMBER	CURRENT ER	AMP_RATING	VOLTS (UL/IEC)	FRAME_TYPE	POLES	BREAKER_TYPE	TRIP
A043E193	ECO-126169	250A	600	J-FRAME	2	JD	
A043E195	ECO-126169	225A	600	J-FRAME	2	JD	
A043E199	ECO-126169	200A	600	J-FRAME	2	JD	
A043E202	ECO-126169	175A	600	J-FRAME	2	JD	
A043L510	ECO-126169	250A	600	J-FRAME	3	JD	
A043L517	ECO-126169	225A	600	J-FRAME	3	JD	
A043L520	ECO-126169	200A	600	J-FRAME	3	JD	
A043L619	ECO-126169	175A	600	J-FRAME	3	JD	
A043C676	ECO-126169	150A	600	H-FRAME	2	HD	
A043D274	ECO-126169	125A	600	H-FRAME	2	HD	
A043D324	ECO-126169	100A	600	H-FRAME	2	HD	
A043D326	ECO-126169	90A	600	H-FRAME	2	HD	
A043D328	ECO-126169	80A	600	H-FRAME	2	HD	
A043E169	ECO-126169	70A	600	H-FRAME	2	HD	
A043E179	ECO-126169	60A	600	H-FRAME	2	HD	
A043E181	ECO-126169	50A	600	H-FRAME	2	HD	
A043E183	ECO-126169	40A	600	H-FRAME	2	HD	
A043E185	ECO-126169	30A	600	H-FRAME	2	HD	THERMAL-MAGNETIC 50-60 Hz
A043E187	ECO-126169	20A	600	H-FRAME	2	HD	
A043E189	ECO-126169	15A	600	H-FRAME	2	HD	
A043E191	ECO-126169	25A	600	H-FRAME	2	HD	
A043K991	ECO-126169	150A	600	H-FRAME	3	HD	
A043K994	ECO-126169	125A	600	H-FRAME	3	HD	
A043K997	ECO-126169	90A	600	H-FRAME	3	HD	
A043L012	ECO-126169	80A	600	H-FRAME	3	HD	
A043L024	ECO-126169	100A	600	H-FRAME	3	HD	
A043L451	ECO-126169	70A	600	H-FRAME	3	HD	
A043L459	ECO-126169	60A	600	H-FRAME	3	HD	
A043L461	ECO-126169	50A	600	H-FRAME	3	HD	
A043L464	ECO-126169	40A	600	H-FRAME	3	HD	
A043L475	ECO-126169	30A	600	H-FRAME	3	HD	
A043L480	ECO-126169	20A	600	H-FRAME	3	HD	
A043L506	ECO-126169	15A	600	H-FRAME	3	HD	
A043L508	ECO-126169	25A	600	H-FRAME	3	HD	
A044C640	ECO-126169	SET TRIP: 70 TO 250 A	600	J-FRAME	3	JD	ELECTRONIC 50-60 Hz
A047W923	ECO-137891	225A Cu LUG	600	J-FRAME	3	JD	THERMAL-MAGNETIC 50-60 Hz
A050J725	ECO-145094	250A	600	J-FRAME	3	JD	LSI ELECTRONIC TRIP 80%
A050J727	ECO-145094	250A	600	J-FRAME	3	JD	LSI ELECTRONIC TRIP 100%

-THIS IS A CONTROLLED ITEM-
PER CPG PROCEDURE FRE-1002

TO MAINTAIN COMPLIANCE WITH REQUIREMENTS OF THE CODES, STANDARDS, OR AGENCIES LISTED BELOW

☐ CSA ☐ UL ☐ CE ☐ RVIA ☐ ABYC ☐ IBC ☐ OTHER _____ ☐ OTHER _____

CHANGES, DEVIATIONS, OR SUBSTITUTIONS OF MATERIAL, PROCESS, OR PERFORMANCE FOR THIS ITEM MUST BE APPROVED BY THE FOLLOWING CONTROLLED ITEM APPROVER

RESPONSIBLE CIA ROLE STATIONARY GENSET CIA
RESPONSIBLE CIA ROLE _____
RESPONSIBLE CIA ROLE _____

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE	
X	± 1	0.00- 4.99	+0.15/-0.08
.X	± 0.8	5.00- 9.99	+0.20/-0.10
		10.00-17.49	+0.25/-0.13
.XX	± 0.38	17.50-24.99	+0.30/-0.13

ANG TOL: ± 1.0° SCALE: 1/2

SIM TO NONE
DO NOT SCALE PRINT
- CONFIDENTIAL -
PROPERTY OF CUMMINS POWER GENERATION GROUP

DWN S_GAMBHIRE
CKD M_TULADHAR
APVD M_POZO
DATE 24SEP12
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994
FIRST USED ON ARROW

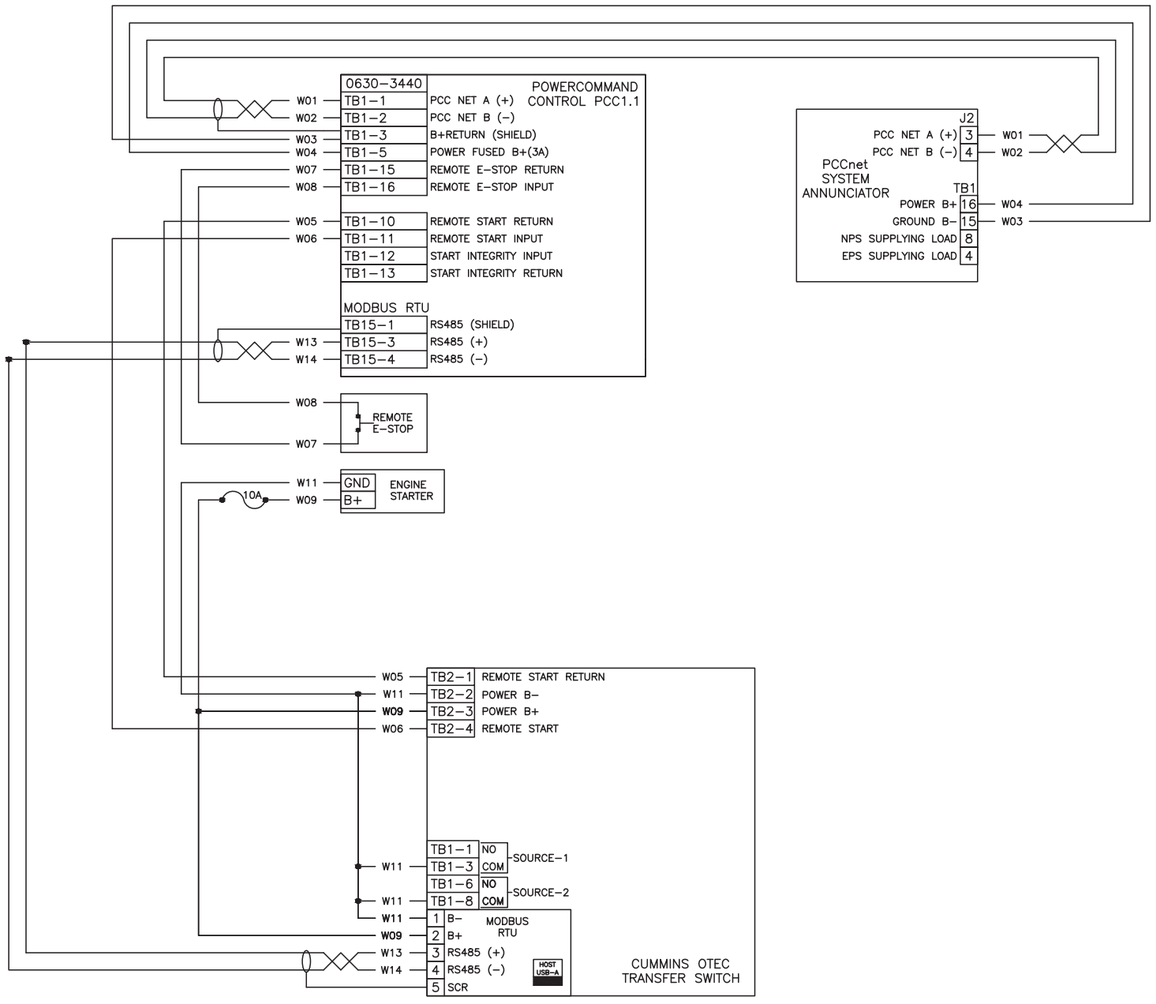
SITE CODE PGF

CUMMINS POWER GENERATION

BREAKER,CIRCUIT

DWG SIZE D | A043W056 | SHEET 1 OF 1 | DWG REV C

Drawing Name: A043W056 Revision: C
Part Name: A043L520 Revision: A
Sheet 1 of 2



- ALL INTERCONNECT WIRING AND DATA CABLING IS TO BE DONE WITH STRANDED WIRE PER NFPA 37.
- PCC NET CABLE: BELDEN 9729. (24 AWG, STRANDED, SHIELDED, TWISTED PAIR)
- OTEC PC40 MODBUS RS485 CABLE: BELDEN 9841. (22 AWG, STRANDED, SHIELDED, TWISTED PAIR)
- TOTAL NETWORK LENGTH NOT TO EXCEED 4000 FT.
- ATS LOAD SHED WIRING IS SHOWN FOR REF.-----

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES

TOLERANCES:
FRACTIONAL:
.X: .06
.XX: .03
.XXX: .01
ANGLES: .5°

FINISH: N/A

REFERENCES	PREP. BY:	CHKD BY:	MODIFIED BY:	ENGINE FAMILY:
A052B811	KDU	–	–	PCC1302
0630-3440	10/17/24	–	–	
A048V214				
A065K034				
A065H780				
–				

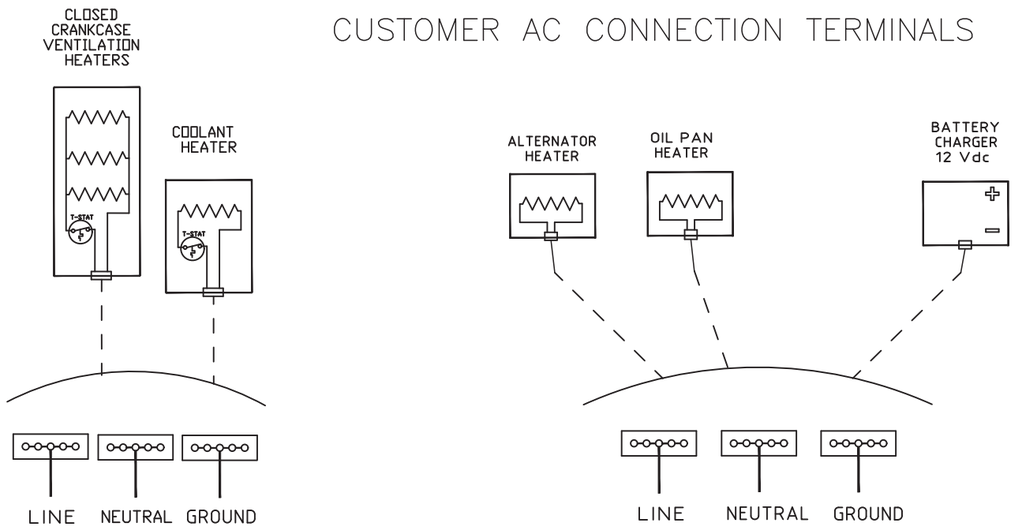
OTEC ATS

CSSNA POWER GEN	SITE NAME: – –	CONTACT NAME: –	CUSTOMER PROJECT NO: –	TITLE: PCC1.1 CONTROL / OTEC ATS QSJ5.9G	
	CONTRACTOR NAME: –	CONTACT NO: –	CSSNA PROJECT NO: –	SIZE: B	DWG NO: PCC1.1 INTERCONNECT REV 1
				SCALE: NONE	DO NOT SCALE PRINT SHEET 1 OF 1

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES

AC ACCESSORY LOAD TABLE

CUSTOMER AC CONNECTION TERMINALS



NOTES:

1. INSTALLER TO PROVIDE BRANCH CIRCUITS TO POWER ALL ACCESSORIES
2. ALL ACCESSORIES ARE SINGLE PHASE 120/240 Vac 60 Hz
3. FOLLOW REGIONAL REGULATIONS AND APPLICABLE ELECTRIC CODES FOR INSTALLATION
4. CCV HEATERS MUST BE CONNECTED TO A CONTINUOUSLY ENERGIZED CIRCUIT FROM BOTH UTILITY AND GENERATOR

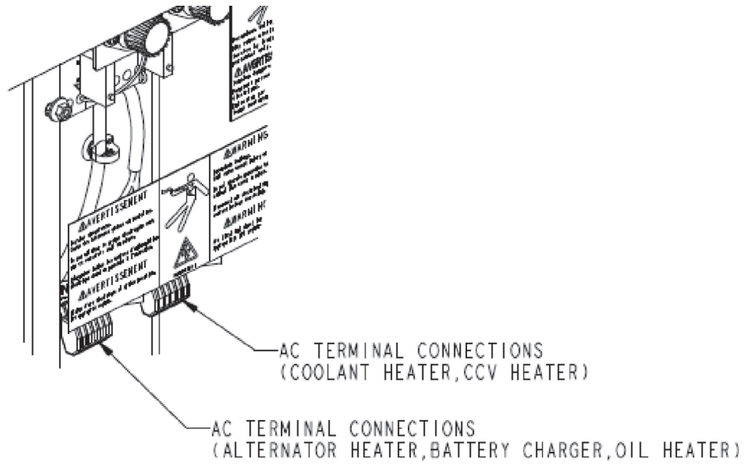
COOLANT HEATER 1000 WATTS, 120 VAC, 8.33 AMPS

CCV HEATERS 120 WATTS, 120VAC, 1.0 AMP

BATTERY CHARGER 192 WATTS, 120 VAC, 1.67 AMPS

ALTERNATOR HEATER 100 WATTS, 120 VAC, 0.83 AMPS

OIL PAN HEATER 150 WATTS, 120VAC, 1.25 AMPS



PREP. BY:	JPK	12/3/2024

CSSNA POWER GEN

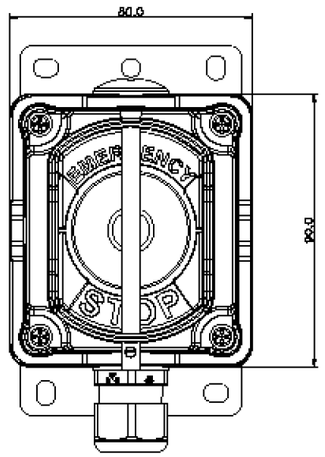
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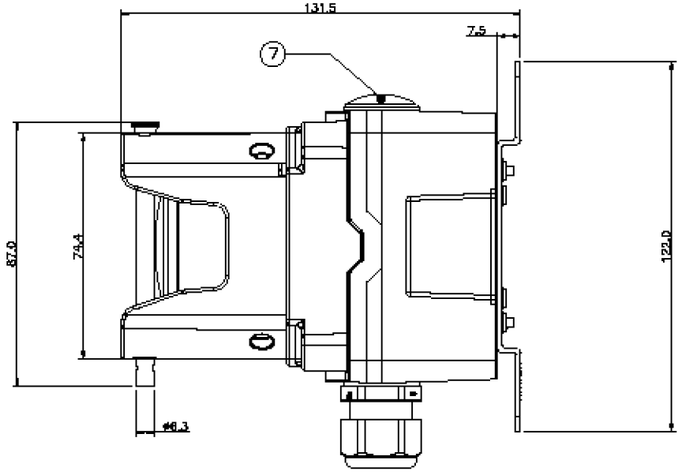
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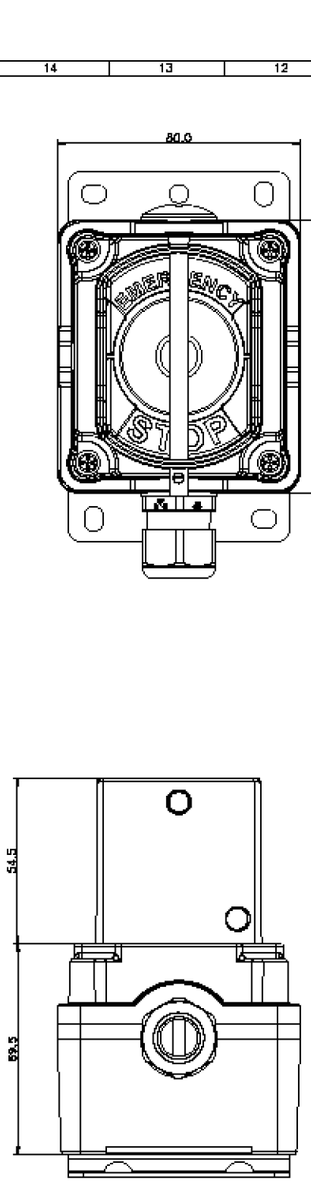
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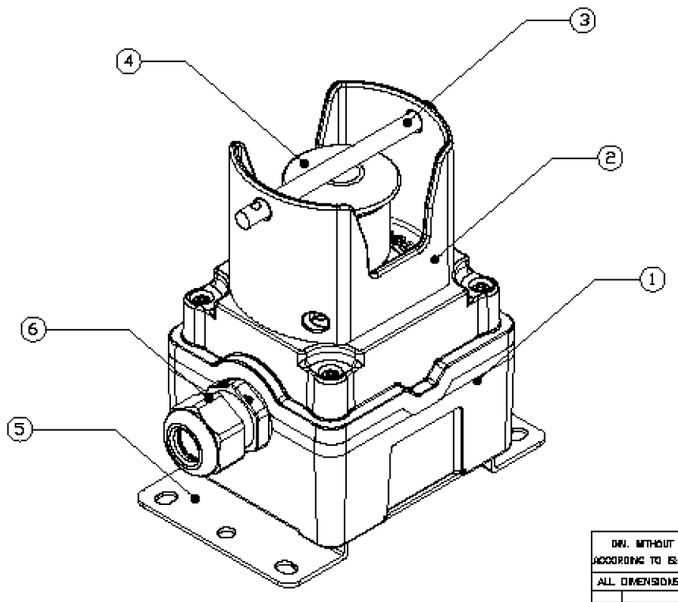
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0	2021-281	INITIAL RELEASE	DDG	CTB	CTB	30NOV21

NOTES:
MANUFACTURER: TEKNIC P/N: 44.924
ASSEMBLY SHALL HAVE NEMA 4X ENCLOSURE RATING
1 N/O CONTACT
1 N/C CONTACT
MEANS SHALL BE PROVIDED FOR LOCKOUT OF E-STOP SWITCH









Part	Qty	Description	Part No
7	1	½" NPT Plug	NPT1/2
6	1	½" NPT Cable Gland	53DB 921
5	1	Common Mounting Plate	1WUMBRK-B-04
4c	1	NC Contact Element	S2
4b	1	NO Contact Element	S1
4a	1	Mushroom Actuator	P2AMPPT4
4	1	Mushroom Push Button	P2PSWPPT411
3	1	Shaft	2ESS3S
2	1	Actuator Shroud	2ESS3-2-UL
1	1	1 WAY PDC Y/B	2005A1D

DIM. WITHOUT TOLERANCES ACCORDING TO IS: 2102—m(1993)
ALL DIMENSIONS ARE IN mm.

No.	ALTERATION	DATE	NAME

SUPERSEDES
SUPERSEDED BY

	DATE	NAME
2021		
Drawn	24.11.21	Pansawy
Checked		
Approved		

SCALE NTS
PAGE: 1 OF: 1
REV. NO. 01 02 04 05 06 08

MATERIAL –
SURFACE TREATMENT ———
TITLE 1 Way Enclosure Assembly Type 4
DWG. No. –
FILE NAME ———

TEKNIC

SUPPLIER DRAWING

ONLY THE SUPPLIER MAY REVISE THIS DRAWING.

CUMMINS INC HAS THE RIGHT TO SHARE THIS DRAWING INTERNALLY AND WITH THIRD PARTIES LICENSED TO DESIGN, MANUFACTURE, ASSEMBLE OR ASSEMBLE WITH CUMMINS PRODUCTS.

CUMMINS ENGINEERING STANDARD 10084

DIMENSIONS ARE IN: INCHES
[ ] ARE IN: ...
DRAWING TOLERANCES APPLY TO PRIMARY DIMENSIONS UNLESS OTHERWISE SPECIFIED
X: ± 1 IN OR 4 mm
X.X: ± .1 IN OR 2.7 mm
X.XX: ± .030 IN OR 0.25 mm
X.XXX: ± .010 IN OR 0.025 mm
ANGULAR TOLERANCE: ±1°

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SCALE 1.000

CMI DATA CLASSIFICATION
Cummins Confidential
DWN D.D.GROSS
CKD C.T.BOECKMAN
APVD C.T.BOECKMAN
DATE 30NOV21
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5-2009

MUST CONFORM TO CES 10903

Cummins Inc.
ITEM NAME
SWITCH, EMERGENCY STOP
E-STOP BUTTON

DWG SIZE	CAD SHEET	ITEM NUMBER	REV
D	1 OF 1	A067X909	0

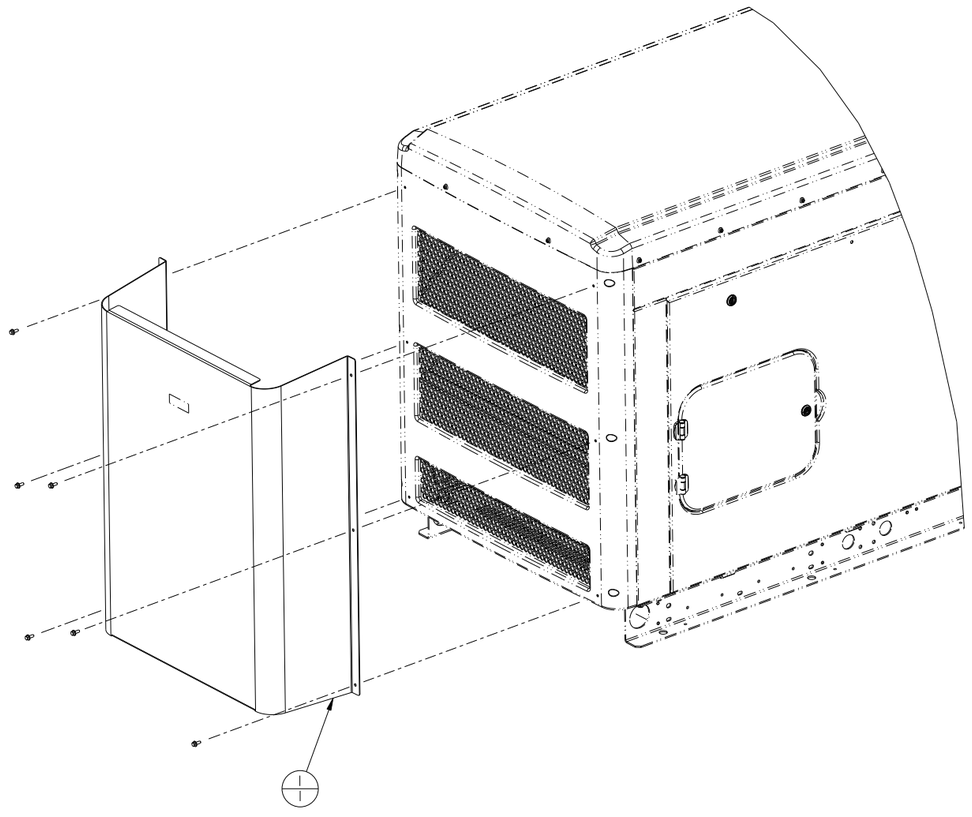
PTC® Creo® Parametric

REL NO	LTR	NO	REVISION	DWN	CKD	APVD	DATE
ECO-160606	D	1	A054U440 QTY 1 WAS A045L831 QTY 1	JPR	JB	J BUTLER	22MAR16
		2	RMV CII LABEL	JPR	JB	J BUTLER	22MAR16

NOTES:

1. TORQUE TO 9.8 - 11.9 Nm

2. MAKE SURE THERE IS NO DEBRIS IN MOUNTING HOLES PRIOR TO INSTALLATION.



UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS			SIM TO A043J733	DRN A_KAPADIA		CUMMINS POWER GENERATION	
DIM: X ±1, .X ±0.8, .XX± 0.38	HOLE: 0.00- 4.99 +0.15/-0.08, 5.00- 9.99 +0.20/-0.10, 10.00-17.49 +0.25/-0.13, 17.50-24.99 +0.30/-0.13		DO NOT SCALE PRINT	CKD N_KASIBHOTLA		KIT, ENCLOSURE	
				APVD J_MATTHEWS			
				DATE 21JUN13		SITE CODE	SI-S2 UPGRADE
ANG TOL: ± 0.5°	SCALE: 5/32	- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP	FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994	FIRST USED ON ARROW	PGF	DWG SIZE D	A043U607 SHEET 1 or 1 DWG REV D

Regulatory Review and Approval is required prior to changing this item per PGG 1-01-01-116. This item impacts compliance with these External Regulations: UL,CSA,IBC,OSHPD

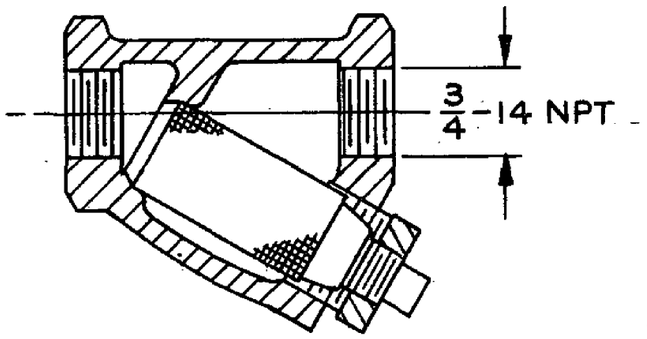
Drawing Name: A043U608 Revision: D
Part Name: A043U607 Revision: D
ECO-160606 Sheet 1 of 2

149-0558

MICROFILMED

ER Nº	LET	#	REVISION	ENG	CKR	DATE
			SUPSD'S 149P558 W/CHGS-OLD DWG DTD			10-21-59
	A		NOTE 3 WAS 30 OR 40 MESH	TdA	CP	10-24-73
	A		"W/LINER" REMOVED	TdA	WB	1-9-74
	A		WAS 40-60 MESH, 1/64 OPEN, .010 WIRE	TdA	WB	3-25-74
	A		ADDED NOTE 3-B	TdA	HP	10-31-77
31889	B	1	CHNG NOTE 3	JER	BW	

V.O. DRAWING



NOTES:

1. 3/4 PIPE SIZE

2. MATL – CAST SEMI-STEEL BODY

(A) (B1) 3. 20 MESH .033 OPENING (STAINLESS STEEL OR MONEL)
A. 20 MESH .033 OPENING (.020)
.047 DIA. WIRE .012 WIRE DIA.

B. ALTN MATL: STAINLESS STEEL
WIRE MESH

4. SELF CLEANING

5. FOR USE WITH NATURAL GAS.

		SEPIA FROM	ITEM	PART NO.				DWG SIZE	QTY	*BULK	DESCRIPTION OR MATERIAL
NEXT ASSY	SIMILAR TO	DR JER		relay	price	tp	pu(2)	me	Onan		DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota
TOLERANCES UNLESS OTHERWISE SPECIFIED		CKR CP		weld	sa	hsg	gd	qc			
FRACTIONS ±	DECIMALS	ENGR WW		sec	punch	crank	ck	po	TITLE		STRAINER
ANGLES. . .±	2 PLACE ±	SAMP REL	DATE 2-12-71				sc ~				
HOLES. . . . + .006 − .002	3 PLACE ±	PROD REL WW 2-18-71	MODEL						DWG NO.		149-0558
The proprietary design information on this print is owned by the Onan Division of Studebaker Corporation. Conveyance of this right is not extended to others.		PROD REL									HUNTSVILLE

FORM 8E024

SECTION 5
ATS SPECIFICATIONS AND DRAWINGS

POWERCOMMAND®
OTEC TRANSFER SWITCH

POWERCOMMAND® 40-11 CONTROL | OPEN TRANSITION | 40 A-1200 A

AUTOMATIC TRANSFER SWITCH

DESCRIPTION

The OTEC series transfer switch provides the basic features typically required for primary source and generator set monitoring, generator set starting and load transfer functions for emergency standby power applications. They are suitable for use in emergency, legally required, and optional standby circuits in commercial and light industrial applications. The OTEC transfer switch features the new PowerCommand® 40-11 control with a comprehensive feature list to suit a wide variety of ATS applications.

FEATURES

PowerCommand® 40-11 control – A fully featured microprocessor-based control with LCD digital display and tactile-feel soft-switches for easy operation and screen navigation. Control highlights include front panel PC software configuration, three phase sensing on both sources, sync check, phase rotation and imbalance sensing, and event logging. Additional optional features include load shed from standby source, Modbus RTU and TCP network communication, and configurable output contact modules. Completely network compatible with the new Cummins transfer switch remote annunciator. Please see the S-6560 PowerCommand® 40-11 control specification sheet for the full description, benefits, and features.

Programmed transition – Open transition timing can be adjusted to completely disconnect the load from both sources for a programmed time period, as recommended by NEMA MG-1 for transfer of inductive loads.



Advanced transfer switch mechanism – Unique bi-directional linear actuator provides virtually frictionless constant force, straight-line transfer switch action during automatic operation.

Positive interlocking – Mechanical and electrical interlocking prevent source-to-source connection through the power or control wiring.

Main contacts – Heavy-duty silver alloy contacts used with multi-leaf arc chutes are rated for motor loads or total system load transfer. They require no routine contact maintenance. Continuous load current not to exceed 100% of switch rating and tungsten loads not to exceed 30% of switch rating.

Ease of service and access – Single-plug harness connection and compatible terminal markings simplify servicing. Access space is ample. Door-mounted controls are field-programmable; no special tools are required.

Complete product line – Cummins is a single source supplier with a wide range of equipment, accessories, and services to suit virtually any backup power application.

Warranty and service - Products are backed by a comprehensive warranty and a worldwide network of distributors with factory-trained service technicians.

TRANSFER SWITCH MECHANISM

- Transfer switch mechanism is electrically operated and mechanically held in the Source 1 and Source 2 positions. The transfer switch incorporates electrical and mechanical interlocks to prevent inadvertent interconnection of the sources.
- Independent break-before-make action is used for both 3-pole and 4-pole simultaneously switched neutral. This design allows use of sync check operation when required, or control of the operating speed of the transfer switch for proper transfer of motor and rectifier-based loads (programmed transition feature).
- True 4-pole switching allows for proper ground (earth) fault sensing and consistent, reliable operation for the life of the transfer switch. The neutral poles of the transfer switch have the same ratings as the phase poles and are operated by a common crossbar mechanism, eliminating the possibility of incorrect neutral operation at any point in the operating cycle, or due to failure of a neutral operator.
- Electrical interlocks prevent simultaneous closing signals to normal and emergency contacts and interconnection of normal and emergency sources through the control wiring.
- High pressure silver alloy contacts resist burning and pitting. Separate arcing surfaces further protect the main contacts. Contact wear is reduced by multiple leaf arc chutes that cool and quench the arcs. Barriers



separate the phases to prevent interphase flashover. A transparent protective cover allows visual inspection while inhibiting inadvertent contact with energized components.

- Switch mechanism, including contact assemblies, is UL 1008 certified to verify suitability for applications requiring high endurance switching capability for the life of the transfer switch. Withstand and closing ratings are validated using the same set of contacts, further demonstrating the robust nature of the design.

SPECIFICATIONS	
Voltage rating	Up to 600 V AC, 50 or 60 Hz.
Arc interruption	Multiple leaf arc chutes provide dependable arc interruption.
Neutral bar	A full current-rated neutral bar with lugs is standard on enclosed 3-pole transfer switches.
Auxiliary contacts	Two isolated contacts (one for each source) indicating switch position are provided for customer use. Contacts are normally open, and close to indicate connection to the source. Wired to terminal block for easy access. Rated at 10 A Continuous and 250 V AC maximum.
Operating temperature	-22 ˚F (-30 ˚C) to 140 ˚F (60 ˚C)
Storage temperature	-40 ˚F (-40 ˚C) to 140 ˚F (60 ˚C)
Humidity	Up to 95 % relative, non-condensing
Altitude	Up to 10,000 ft (3,000 m) without derating
Surge withstand ratings	Voltage surge performance and testing in compliance with the requirements of IEEE C62.41 (Category B3) and IEEE C62.45.
Total transfer time (source-to-source)	Will not exceed 6 cycles at 60 Hz with normal voltage applied to the actuator and without programmed transition enabled.
Manual operation*	Transfer switch mechanisms are equipped with means to manually transfer. All sources must be de-energized before manual operation is attempted.

**See Operator Manual for further details.*

TRANSITION MODES

Open delayed transition – In this transition mode the time required for the transfer switch to transfer between sources is adjustable so that the load- generated voltages decay to a safe level before connecting to an energized source. Recommended by NEMA MG-1 to prevent nuisance tripping breakers and load damage. Adjustable 0.5 secs - 10 minutes, and default 0.5 seconds.

Open in-phase translation – Initiates open transition transfer when in-phase monitor senses both sources are in phase (voltage, phase, and frequency). Operates in a break-before-make sequence. Includes ability to enable programmed transition as a backup. The module waits indefinitely for synchronization unless the 'Return to programmed transition' function is active in which case after 2 minutes it performs a programmed delayed transfer.

UL 1008 WITHSTAND AND CLOSING RATINGS (WCR)

The transfer switches listed below must be protected by circuit breakers or fuses. Referenced drawings include detailed listings of specific breakers or fuse types that must be used with the respective transfer switches. Consult with your distributor/dealer to obtain the necessary drawings. Withstand and Closing Ratings (WCR) are stated in symmetrical RMS amperes.

BREAKER PROTECTION								
Frame	Amperage rating (A)	MOLDED CASE CIRCUIT BREAKER (MCCB) PROTECTION				SPECIAL CIRCUIT BREAKER PROTECTION		
		With specific manufacturers MCCB (kA at 480V)	With specific manufacturers MCCB (kA at 600V)	Max MCCB ratings (A)	Drawing reference	With specific Current limiting breakers (kA at 600V)	Max. Current limiting breakers CLB rating (A)	Drawing reference
A	40, 70, 125 (3-pole only)	14	14	225	A050J441	200	225	A048J566
	40, 70, 125 (4-pole only)	30	30	400	A048E949	200	400	A051D533
B	150, 225, 260	30	30	400	A048E949	200	400	A051D533
C	300, 400, 600	65	65	1200	A056M829	200	1200	A048J564
D	800, 1000	65	50	1400	A056M821	200	1400	A048J562
E	1200	85	65	1600	A056M825	200	1600	A048P186

FUSE PROTECTION				
Frame	Amperage rating (A)	WCR with current limiting fuses (kA)	Fuse size and type	Drawing reference
A	40, 70, 125 (3-pole only)	200	200 A, Class: J, RK1, RK5	A050J441
	40, 70, 125 (4-pole only)	200	1200 A Class L or T, or 600A class J, RK1, RK5	A048E949
B	150, 225, 260	200	1200 A Class L or T, or 600A class J, RK1, RK5	A048E949
C	300, 400, 600	200	1200 A Class L or T, or 600A class J, RK1, RK5	A056M829
D	800, 1000	200	2000 A Class L or 1200 A Class T or 600 A Class J, RK1, RK5	A056M821
E	1200	200	2000 A Class L or 1200 A Class T or 600 A Class J, RK1, RK5	A056M825

All WCR values are at 600 V

TIME BASED RATINGS: 0.05S (3-CYCLES AT 60 HZ)				
Frame	Amperage rating (A)	WCR (kA at Vmax and below)	Max. MCCB rating (A)	Drawing reference
C	300, 400, 600	25 at 600 V	1200	A056M829
D	800, 1000	35 at 600 V	1400	A056M821
E	1200	42 at 600 V	1600	A056M825

TRANSFER SWITCH LUG CAPACITIES				
Frame	Amperage rating (A)	Cables per phase	Certified Cable Size	Part Number
A	40, 70, 3-pole	1	#14 AWG - 2/0	0332-3084 **
			#12 AWG - 2/0	0332-3085 ***
	40, 4-pole	1	#14 AWG - 2/0	0332-3514-01
	70, 4-pole	1	#6 AWG - 300MCM	0332-3038
	125, 3-pole	1	#14 AWG - 2/0	0332-3084 **
			#12 AWG - 2/0	0332-3085 ***
	125, 4-pole	1	#6 AWG - 300MCM	0332-3038
B	150, 225	1	#6 AWG - 300MCM	0332-3038
	260	1	#6 AWG - 400MCM	0332-3039
C	300, 400	2*	3/0 - 600MCM & #4 AWG - 250MCM	0332-2704
	600	2	250 - 500MCM	0332-2660
D	800, 1000	4	250 - 500MCM	0332-2736
E	1200	4	500-750MCM ^	0332-2736 ****
			#2 AWG – 600MCM ^^	0332-1557 ****
			1/0 - 750MCM ^^^	0332-3036

All lugs 90°C rated and accept copper or aluminum wire unless indicated otherwise.
Refer to the latest NFPA 70 Article 310 - Conductors for general wiring for the ampacity calculations.
** One cable for each lug range listed*
*** Load*
**** Emergency and normal*
***** See A030H735 drawing for lugs specifications*
^ Compression lug adapter suitable for 500-750MCM (Optional feature N032-7)
^^ #2 AWG – 600MCM (Standard feature N045-7)
^^^1/0 - 750MCM (Optional feature N066-7)

ENCLOSURE

The transfer switch and control are wall-mounted in a key-locking enclosure. Wire bend space complies with NEC.

DIMENSIONS – TRANSFER SWITCH IN UL TYPE 1 ENCLOSURE									
Frame	Amperage rating (A)	Height		Width		Depth		Weight	
		in	mm	in	mm	in	mm	lb	kg
A	40, 70, 125 3-pole	27	686	20.5	521	12	305	148	67
	40, 70, 125 4-pole	35.5	902	26	660	16	406	214	97
B	150, 225	35.5	902	26	660	16	406	214	97
	260	43.5	1105	28.5	724	16	406	238	108
C	300, 400, 600	54	1372	25.5	648	18	457	322	146
D	800, 1000	68	1727	30	762	19.5	495	448	203
E	1200	90	2286	39	991	27	698	862	391

DIMENSIONS – TRANSFER SWITCH IN UL TYPE 3R, 4, 4X, OR 12 ENCLOSURES										
Frame	Amperage rating (A)	Height		Width		Depth		Weight		Cabinet Type
		in	mm	in	mm	in	mm	lb	kg	
A	40, 70, 125 3-pole	34	864	26.5	673	12.5	318	220	100	3R, 4
		46	1168	32	813	16	406	307	139	4X
		34	864	26.5	673	12.5	318	201	91	12
	40, 70, 125 4-pole	42.5	1080	30.5	775	16	406	304	138	3R, 4
		46	1168	32	813	16	406	335	152	4X
		42.5	1080	30.5	775	16	406	287	130	12
B	150, 225	42.5	1080	30.5	775	16	406	304	138	3R, 4
		46	1168	32	813	16	406	335	152	4X
		42.5	1080	30.5	775	16	406	287	130	12
	260	46	1168	32	813	16	406	322	146	3R, 4
		46	1168	32	813	16	406	335	152	4X
		46	1168	32	813	16	406	304	138	12
C	300, 400, 600	59	1499	27.5	699	16.5	419	415	188	3R, 4
		73.5	1867	32.5	826	19.5	495	520	236	4X
		59	1499	27.5	699	16.5	419	397	180	12
D	800, 1000	73.5	1867	32.5	826	19.5	495	588	267	3R, 4
		73.5	1867	32.5	826	19.5	495	588	267	4X
		73.5	1867	32.5	826	19.5	495	556	252	12
E	1200	90	2286	39	991	27	698	891	404	3R, 4
		90	2286	39	991	27	698	891	404	4X
		90	2286	39	991	27	698	873	396	12

ENCLOSURE ACCESS FOR CABLE INSTALLATION AND MAINTENANCE

All frames allow for top, side, and bottom cable entry. NEC Requires Minimum 36” Front Access. Additional front clearance is needed to remove the mechanism. Refer to the outline drawing.

OTEC DRAWING PART NUMBERS				
Frame	Amperage rating (A)	Outline Drawing		
		Type 1, 3R, 12, 4, 4X (3 Pole)	Type 1, 3R, 12, 4, 4X (4 Pole)	Open Construction
A	40, 70, 125	A074K565	A074K632	A074K681
B	150, 225	A074K575	A074K587	
	260	A074K613	A074K634	
C	300, 400, 600	A074K635	A074K645	
D	800, 1000	A074K646	A074K658	
E	1200	A074K659		A074K695

WIRING DIAGRAM PART NUMBERS

Frame	Amperage rating (A)	Wiring Diagram				
		Utility to Genset (120 – 480 V)	Utility to Genset (600 V)	Interconnection	Utility to Genset, Open Construction (120 – 480 V)	Utility to Genset, Open Construction (600 V)
A	40, 70, 125 (3-pole)	A074P733	A074P730	A065H780	A074P731	A074P732
	40, 70, 125 (4-pole)					
B	150, 225					
	260					
C	300, 400, 600					
D	800, 1000	A074P729				
E	1200					

SUBMITTAL DETAIL

Model

- 40, 70, 125 A, (3- and 4-pole)
- 150, 225, 260 A
- 300, 400, 600 A
- 800, 1000 A
- 1200 A

Poles

- A028 Poles – 3 (solid neutral)
- A029 Poles – 4 (switched neutral)

Application

- A035 Utility-to-genset

Frequency

- A044 60 Hz
- A045 50 Hz

Phase

- A041 single phase, 2-wire or 3-wire
- A042 three phase, 3-wire or 4-wire

Voltage ratings

- R020 120V
- R038 190V
- R021 208V
- R022 220V
- R023 240V
- R024 380V
- R025 416V
- R035 440 V
- R026 480 V
- R027 600 V

Enclosure

- B001 Type 1: Indoor use, provides some protection against dirt (similar to IEC type IP30)
- B002 Type 3R: Intended for outdoor use, provides some protection from dirt, rain, and snow (similar to IEC type IP34)
- B003 Type 4: Indoor or outdoor use, provides some protection from wind-blown dust and water spray (similar to IEC type IP65)
- B004 open construction: no enclosure - includes automatic transfer switch and controls.
- B010 Type 12: Indoor use, some protection from dust (similar to IEC type IP61).
- B025 Type 4X: Stainless steel, indoor or outdoor use, provides some protection from corrosion (similar to IEC Type IP65).

Standards

- A046 UL 1008/CSA certification
- A080 IBC seismic certification

Control voltage

- M033 12V, Genset starting voltage.
- M034 24V, Genset starting voltage.

Control options

- M032 Elevator signal relay
- M081 MODBUS RS485 Communication module
- M079 integral control power supply provides DC voltage to control from source power.
- M086 Ethernet communication module
- L216 1X auxiliary relay I/O module
- L217 2X auxiliary relay I/O module

Auxiliary relays

- Relays are UL Listed, and factory installed. All relays provide (2) normally closed isolated contacts rated 10A @ 600 VAC. Relay terminals accept (1) 18 gauge to (2) 12-gauge wires per terminal.
- L101 24 VDC coil - installed, not wired (for customer use).
- L102 24 VDC coil - emergency position – relay energized when switch is in source 2 (emergency) position.
- L103 24 VDC coil - normal position - relay energized when switch is in source 1 (normal) position.
- L201 12 VDC coil installed, not wired (for customer use)
- L202 12 VDC coil - emergency position – relay energized when switch is in source 2 (emergency) position.
- L203 12 VDC coil - normal position - relay energized when switch is in source 1 (normal) position.

Optional Cable Lugs

- N032 Lug adapters, compression, ½ stab (1200A only)
- N045 Cable lugs, mechanical, 600 MCM, 4 per pole (1200A only)
- N066 Cable lugs, mechanical, 750 MCM, 4 per pole (1200A only)

Miscellaneous

- C027 Cover - guard
- M003 Terminal block - 30 points (not wired)

Optional features

- M080 Anti-condensation heater for outdoor enclosures
- L214 Load shed from standby source
- M085 Load power monitoring

Accessories

- AC-170 Accessories specification sheet
- A065L320 Control panel cover guard

Request for quotation (RFQ)

- Z555 Nonconfigurable spec [ETO]

Warranty

- G004 2-years, comprehensive
- G007 5-years, comprehensive
- G014 3-years, comprehensive
- G015 10-years, comprehensive

Shipping

- A051 Packing - export box (800 – 1000 A)

CODES AND STANDARDS

UL	All switches are UL 1008 Listed with UL 50E Type Rated cabinets and UL Listed CU-AL terminals.	**NEC®**	Suitable for use in emergency, legally required and Standby and Critical Operations Power Systems (COPS) applications per NEC 700, 701, 702 and 708.
NEMA	All switches comply with NEMA ICS 10.	**ISO®**	All switches are designed and manufactured in facilities certified to ISO 9001.
CSA®	All switches are certified to CSA C22.2 No. 178.1 switching of electrical energy in emergency or other systems, up to 600 VAC and 4 kA.	**IBC®**	All switches are certified to IBC 2018.
IEEE	All switches comply with IEEE 446 Recommended Practice for Emergency and Standby Power Systems.	**EMC**	Display controllers meet the following Electromagnetic Compatibility (EMC) standards: • EN 61000-6-2 Generic Immunity Standard for the Industrial Environment. • EN 61000-6-4 Generic Emission Standard for the Industrial Environment.
NFPA®	All switches comply with NFPA 70, 99 and 110 (Level 1).		

For more information, please contact your local Cummins distributor or visit cummins.com.

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S-6556 OTEC Spec Sheet NSE - PD00000752 - Rev. 02/25

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POWERCOMMAND® 40-11 TRANSFER SWITCH CONTROL

OTEC TRANSFER SWITCHES

DESCRIPTION

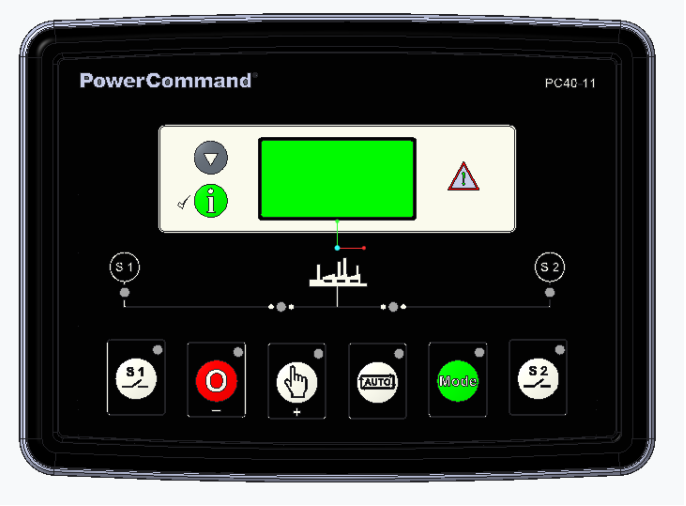
The PowerCommand® 40-11 Transfer Switch Control is a sophisticated microprocessor-based control with the basic features you need for primary source and generator set monitoring, generator set starting and load transfer functions for emergency standby power applications.

The control human machine interface (HMI) includes a LCD display with tactile-feel soft-switches for easy operation and screen navigation. All data on the control can be viewed by scrolling through screens with a display scroll button. The control displays the current active fault, fault occurrences and time ordered history of the 10 previous faults with respect to Real Time Clock Stamp and Engine Running Time.

FEATURES

Digital display – The PowerCommand® 40-11 offers a clear back-lit LCD 4-line text display, showing system status, contextual icons and warnings. The display is also equipped with 5 red and 4 green LEDs indicating operational status.

Modbus network communication – Modbus network communications capable. Optional Modbus RTU RS485 connection (1 serial port) and TCP Ethernet communication module (1 RJ45 port).



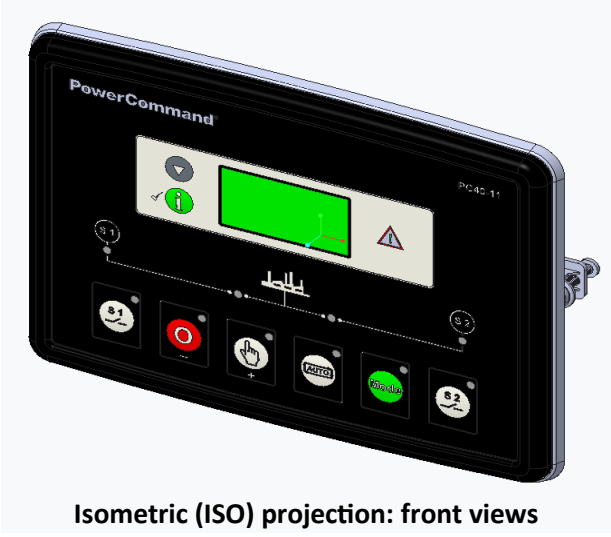
Diagnostics and reporting – Detailed event logging with enhanced fault codes, alert lists, power event history, and source statistics enhances diagnostic capability during service events and provides the ability to meet any reporting requirements.

PC & Front Panel Configurations – The modules can be easily configured using the PC software. Selected front panel editing is also available.

Ease of service and access – Built-in plug-and-play control with minimized point-to-point connections and compatible terminal markings simplify servicing.

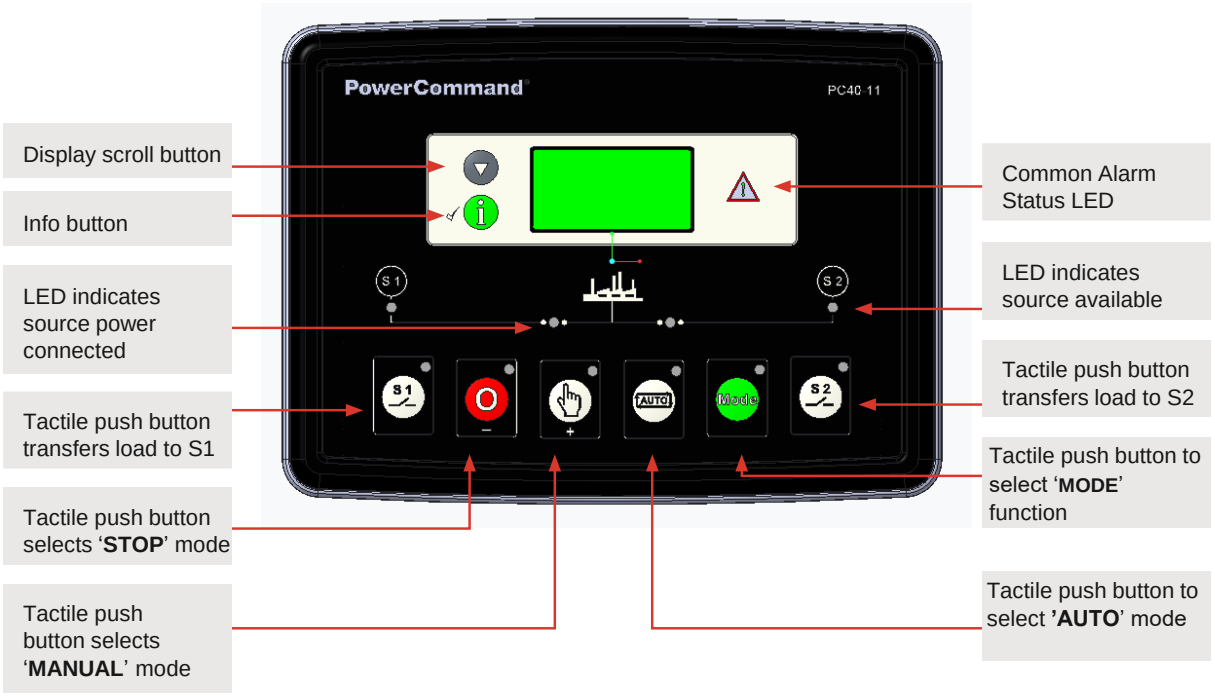
Complete product line – Cummins is a single source supplier with full scope of power system solutions, integration, and service capability, from paralleling to system level controls, switchgear, and remote connectivity.

Warranty and service – Products are backed by a comprehensive warranty and a worldwide network of distributors with factory-trained service technicians.



Isometric (ISO) projection: front views

HUMAN MACHINE INTERFACE (HMI) CAPABILITIES



CONTROL FUNCTIONS

TRANSFER INHIBIT

When transfer inhibit external input is active, the control does not automatically transfer the transfer switch to a standby source even when the preferred source fails.

RETRANSFER INHIBIT

When retransfer inhibit external input is active, the control does not automatically retransfer the transfer switch to a preferred source even when the preferred source returns.

REAL TIME CLOCK

This feature is used by the control for fault and event time stamping and as a reference for exerciser schedules and exception schedules.

TEST – REMOTE

Test feature allows the user to automatically test the standby source and the transfer switch. The test command can be issued from the remote source.

The test has following types available:

- Remote Start On Load
- Remote Start Off Load

ELEVATOR SIGNAL

This optional feature allows an elevator connected to the system to come to a complete stop before the switch transfers.

EXERCISER SCHEDULER

The Scheduler allows the user to configure pre-set automatic starting and stopping of the Generator (when in Auto mode).

BANK 1 / BANK 2

Each Bank of the Exercise Scheduler is used to give up to 8 scheduled runs per bank, 16 in total. This run schedule is configurable to repeat every 7 days (weekly) or every 28 days (monthly). Do Not Transfer, Off Load and On Load. Each scheduler bank configured differently either to weekly or monthly based exercises.

SOURCE AVAILABILITY

This feature monitors the frequency and voltage sensors on the preferred and standby sources to determine and declare the availability status of the two sources, irrespective of which source is connected to the load. It declares the states as event codes. Preferred/Standby Available - active inactive.

VOLTAGE SENSING

3-phase sensing on Source 1 and Source 2 (up to 600 Vac with no need for additional PTs). Plant battery voltage monitoring.

ALPHANUMERIC DISPLAY

- S2 Voltage L1-N
- S2 Voltage L-L
- S2 Frequency
- S1 Voltage L1-N
- S1 Voltage L-L
- S1 Frequency
- Battery voltage
- Current alarms with icons
- Event log
- Scheduler
- About

LOAD SHED

This feature allows the user to shed/disconnect the electrical load from a standby source. This feature is typically used to reduce non-emergency load demand on the generator when the generator is in an overload condition.

LOAD POWER MONITORING

This feature allows the monitoring of the following parameters on the load side of the transfer switch using the display, or remotely via the optional communication modules:

- Amps: L1 - L2 - L3
- Watts: L1 - L2 - L3 - Total
- VA: L1 - L2 - L3 - Total
- Var: L1 - L2 - L3 - Total
- Power Factor: L1 - L2 - L3 - Average

RELAY EXPANSION MODULE DSE2157

This feature allows the user to provide additional output to the control system, up to 16 user configurable dry contact sets - 8 NO, 8 Form-C.

TIME DELAYS

The following adjustable time delays are built into the transfer switch control. External modules to accomplish these delays are not required.

- **Start Delay** (Also known as Time Delay Engine Start, TDES adjustable from 0 to 10 hours)
- **Warming** (Also known as Time Delay Normal to Emergency, TDNE adjustable from 0 to 1 hour)
- **Elevator Delay** (Also known as Time Delay Elevator, TDEL adjustable from 0 to 5 minutes)
- **Non-sync Transfer Time** (Also known as Time Delay Programmed Transition, TDPT adjustable from 0.5 s to 10 minutes)
- **Return Delay** (Also known as Time Delay Emergency to Normal, TDEN adjustable from 0 to 5 hours)
- **Cooling** (Also known as Time Delay Engine Cool-down, TDEC adjustable from 0 to 1 hour)

LED INDICATOR LIGHTS

- Auto mode (RED)
- Source 1 available (GREEN)
- Source 2 available (GREEN)
- Source 1 connected to load (GREEN)
- Source 2 connected to load (GREEN)
- Common Alarm indicator (RED)
- Select Operating mode (RED)
- Stop mode (RED)
- Manual Mode (RED)

EVENTS LOG

The control displays information on up to 10 events displayed in chronological order, beginning with the most recent event, about either source. The event information includes the following:

- Failure modes
- Warning
- Tests and exercises
- User-driven inputs (e.g., override, transfer inhibit)

SUPPORTED APPLICATIONS

APPLICATION TYPES

- Utility - Generator Set

COMMUNICATIONS

The PowerCommand® 40-11 Transfer Switch Control features an optional network communication module.

Features include:

- Optional Modbus® RTU RS485 communication module (1 isolated serial port) TCP Ethernet communication module (1 RJ45 port)
- USB port for service tool interface

PROTECTION

PHASE ROTATION AND VOLTAGE IMBALANCE SENSING

- Source 1 and Source 2

UNDER-VOLTAGE SENSING

- 3-phase normal, 3-phase emergency, Accuracy: ±2 % of full-scale phase to phase
- Phase to neutral voltage range 50Vac to 414Vac.
- Phase to phase voltage range 86Vac to 717Vac.

OVERVOLTAGE SENSING

- 3-phase normal, 3-phase emergency, Accuracy: ±2 % of full-scale phase to phase
- Phase to neutral voltage range 52Vac to 416Vac.
- Phase to phase voltage range 90Vac to 720Vac.

OVER/UNDER FREQUENCY SENSING

- Normal and emergency
- Accuracy: ±0.2 Hz
- Frequency range 3.5 – 75 Hz

SYNC CHECK

- For in-phase transfer

ENVIRONMENT

Operating Temperature Range	Control operates over an ambient temperature range: -30 ºC to 70 ºC.
Storage Temperature Range	The control operates after being exposed to Storage Temperatures in the range of -40 ºC to 85ºC.
Ingress Protection	The front panel is to be IP65.
Sun Protection	Suitable for outdoor use with respect to exposure to Ultraviolet Light, Water exposure and Immersion in accordance with UL 746C.

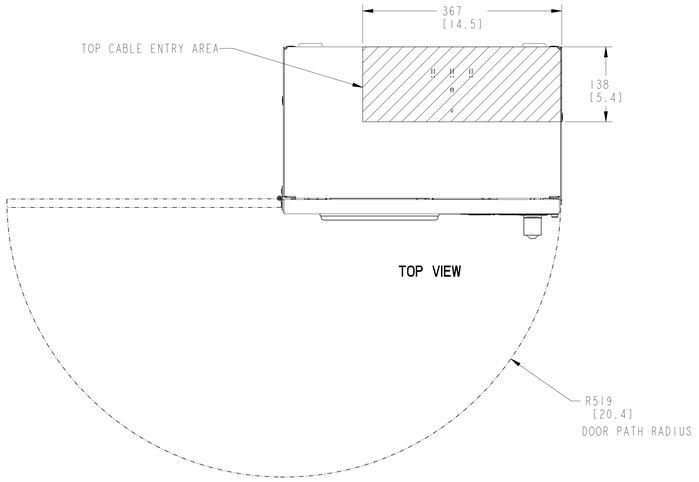
CODES AND STANDARDS

c UL us	The PC40-11 control is a UL Recognized Component Marked for United States and Canada.	NFPA	Capable of being used on systems compliant with NFPA 70, 99 and 110 (Level 1).
UK CA	The PC40-11 control fulfills the requirements of UKCA standard product directives.	NEMA	Control and display as installed in a transfer switch enclosure comply with NEMA 4X and IP65 at the transfer switch level - if the transfer switch enclosure is also NEMA 4X & IP65 compliant.
RoHS	The control is RoHS compliant.	NEC®	Capable of being used on systems suitable for use in emergency, legally required and Standby and Critical Operations Power Systems (COPS) applications per NEC 700, 701, 702 and 708.
CE	Fulfills the requirements of relevant European product directives.	LVD	The unit is designed to comply with European directive 72/23/EEC by complying with harmonized European safety standard BS EN 60950.
CSA®	All switches are certified to CSA C22.2 No. 178.1 switching of electrical energy in emergency or other systems, up to 600 VAC and 4 kA.	IEEE	The control is IEEE C37.90.2 certified. Capable of being used on IEEE 446 compliant systems; Recommended Practice for Emergency and Standby Power Systems.
EMC	The control is tested to meet the following CE Electromagnetic Compatibility (EMC) standards for EN 61000 series (electromagnetic compatibility): • EN 61000-6-2 Generic Immunity Standard • EN 61000-6-4 Generic Emissions		

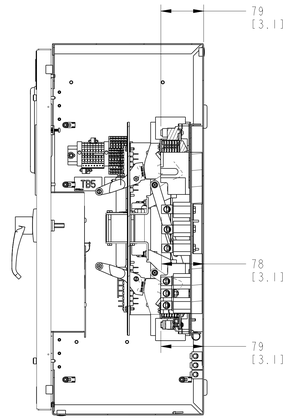
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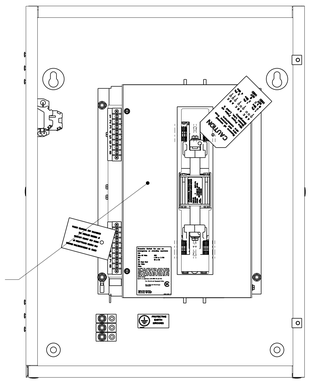
Cummins Inc.
Box 3005
Columbus, IN 47202-3005 U.S.A.
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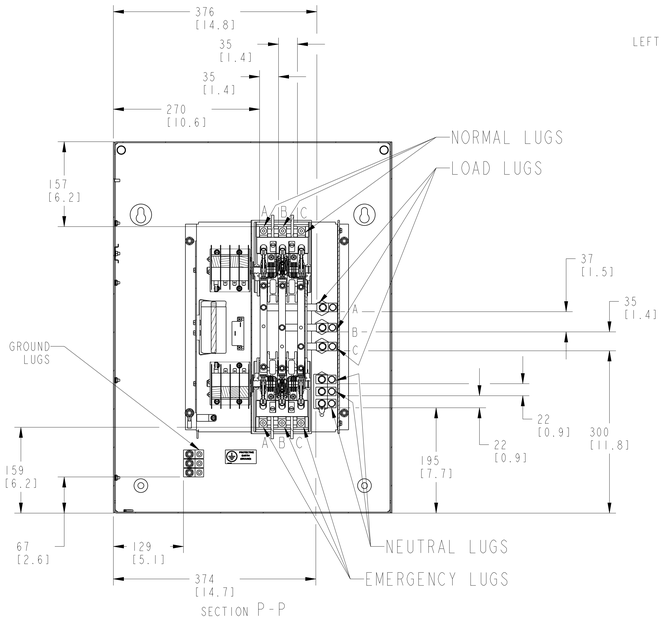
TOP VIEW



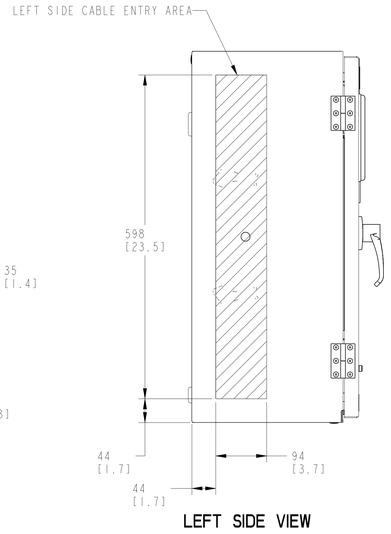
SECTION R-R



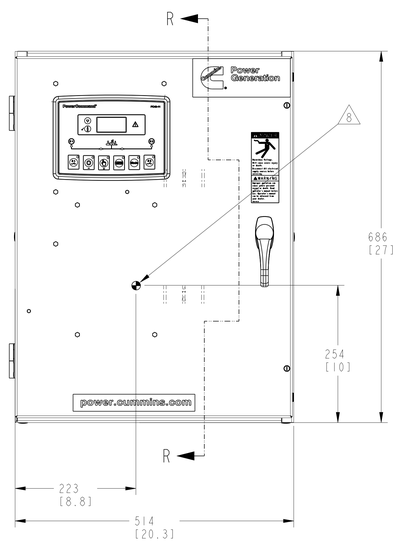
FRONT VIEW
DOOR HIDDEN FOR CLEAR VISUALIZATION



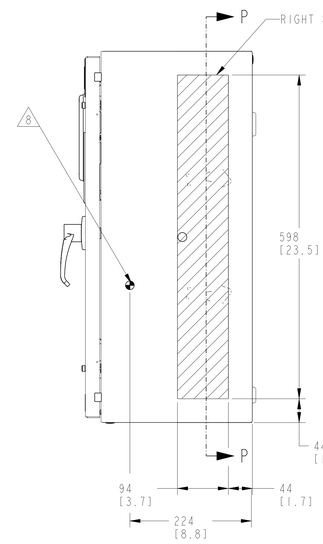
SECTION P-P



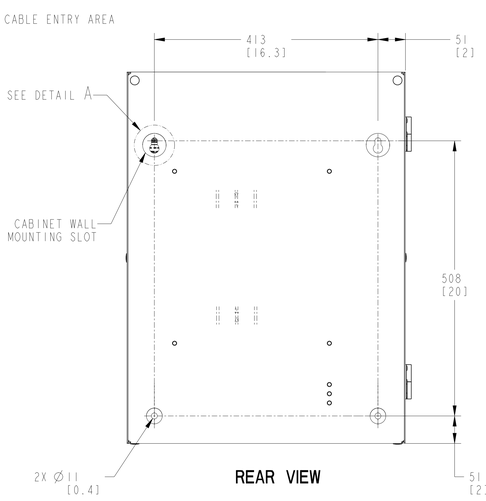
LEFT SIDE VIEW



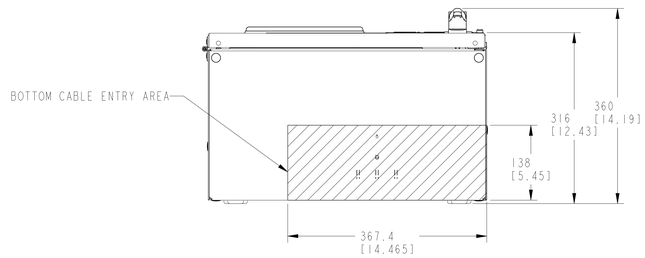
FRONT VIEW



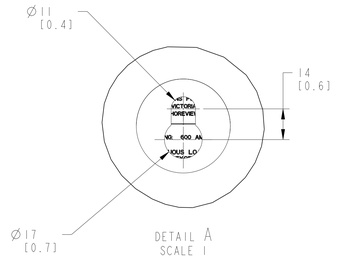
RIGHT SIDE VIEW



REAR VIEW



BOTTOM VIEW



DETAIL A
SCALE 1

SIMILAR IN 2 PLACES

NOTES:

1. APPROXIMATE WEIGHT BASED ON CAD MODEL (NOT FOR INSPECTION):
   FOR TYPE 1: 143.6 LBS (65.2 KG)
   FOR TYPE 3R: 212.8 LBS (96.5 KG)
   FOR TYPE 4: 214.5 LBS (97.3 KG)
   FOR TYPE 4X: 291.4 LBS (132.2 KG)
   FOR TYPE 12: 195.1 LBS (88.5 KG)

2. MECHANICAL LUG CAPACITY:
   NORMAL & EMERGENCY LUGS:
   #12-2/0 CU-AL (QTY 1 WIRE)
   LOAD & NEUTRAL LUGS:
   #14-2/0 CU-AL (QTY 1 WIRE)
   GROUND LUGS:
   #14-1/0 CU-AL (QTY 1 WIRE)

3. USE SEPARATE CONDUITS FOR CONTROL WIRING AND POWER WIRING. DO NOT COMBINE.

4. SHADED AREA INDICATES WIRING & CABLE ENTRANCE AREA. DO NOT INSTALL OUTSIDE OF SHADED AREA.

5. WIRE BENDING SPACE CONFORMS TO NATIONAL ELECTRIC CODE (NFPA70).

6. REFER TO THE NATIONAL ELECTRIC CODE FOR MINIMUM CLEAR SPACE IN FRONT OF THIS ENCLOSURE.

7. ALL DIMENSIONS ARE REFERENCE, UNLESS SPECIFICALLY TOLERANCES.

8. CENTER OF GRAVITY IS APPROXIMATE.

9. FOR UNITS WITH BOLTED DOOR CLAMPS; DO NOT TIGHTEN WITH IMPACT DRIVER AND USE THE FOLLOWING TORQUE REQUIREMENTS: 5/16-18= 13.6-16.3 Nm

LAST DATUM LETTER USED:	LAST REFERENCE LETTER USED: A
MODEL/PLATFORM: OTEC 40-125A	THIS PART IS SIMILAR TO:
PART NUMBER: A074K565	PART REVISION: B
PART NAME: OUTLINE,ENCLOSURE	
DRAWING CATEGORY: OUTLINE	
STATE: RELEASED	SHEET: 1 OF 6
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL	

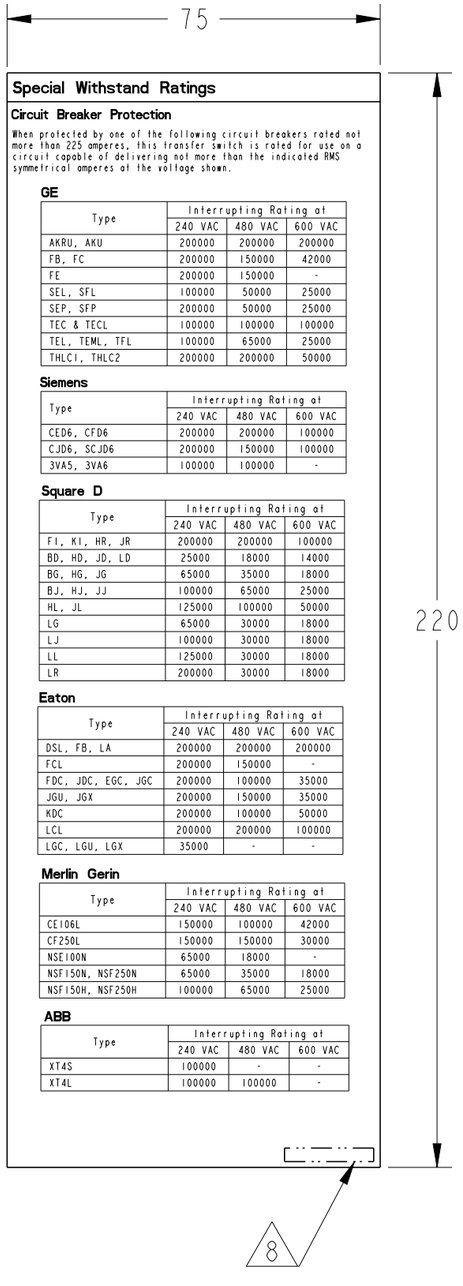
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DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: -
SIZE A0 SCALE: 0.25
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009
THIRD ANGLE PROJECTION
CAD SYSTEM PTC® Creo® Parametric

APX B-71

OTEC 40-125A, 3 POLE, TYPE 1



NOTES:

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2. ALL TEXT TO BE HELVETICA SANS SERIF, OR EQUIVALENT.
3. BLACK TEXT AND WHITE BACKGROUND.
4. MATERIAL THICKNESS: 10 MIL.
5. SEE CUMMINS MATERIAL SPECIFICATIONS FOR APPLICATION INFORMATION.
6. IF CORNERS SHOWN SQUARE, RADIUS OPTIONAL.
7. IF CSA AGENCY APPROVAL REQUIRED LOCATE VENDOR CSA IDENTIFICATION MARK IN LOWER RIGHT HAND CORNER.
8. PART NUMBER & REVISION LETTER TO BE LOCATED WHERE SHOWN IN THE FOLLOWING FORMAT: PART NUMBER LTR (EXAMPLE: A123B456 A).

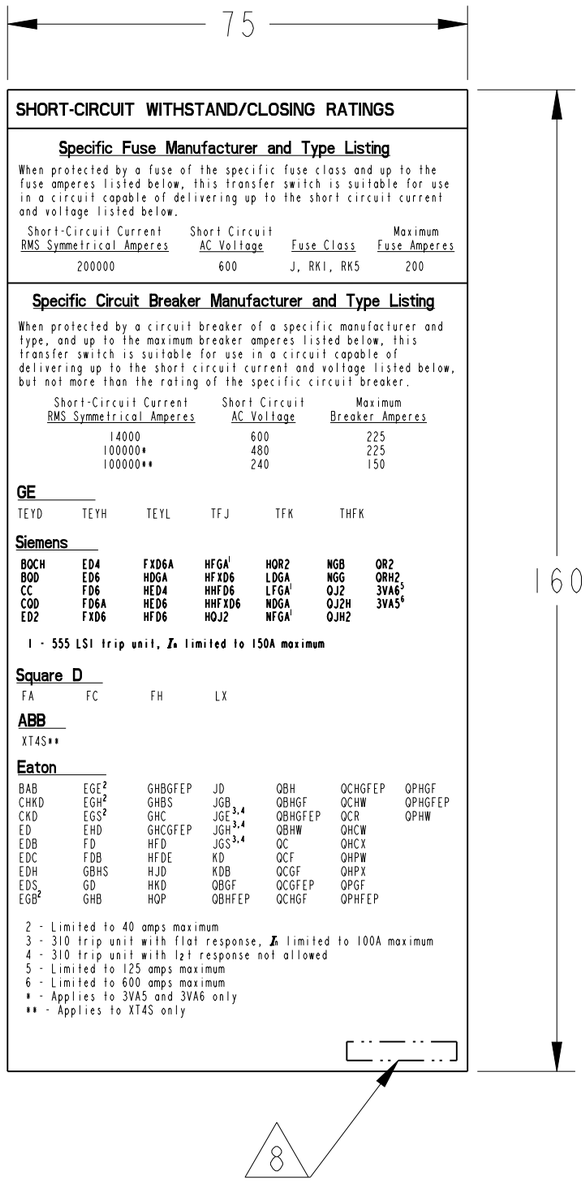
MODEL/PLATFORM: OT/OTPC/OTEC 40-125A	THIS PART IS SIMILAR TO:
UNLESS OTHERWISE SPECIFIED THE FOLLOWING SHALL APPLY	ANG. TOL.: ± 1°
DIMENSIONAL TOLERANCES: X ± 1 .X ± 0.8 .XX ± 0.38	
Cummins Inc.	
DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: - / SIZE: A3 / SCALE:1	
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009 / THIRD ANGLE PROJECTION	CAD SYSTEM PTC® Creo® Parametric

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Part Number: **A048J566** Part Revision: **C**
Part Name: **LABEL,INFORMATION**
Drawing Category: **Detail** State: **Released**



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3. BLACK TEXT AND WHITE BACKGROUND.
4. MATERIAL THICKNESS: 10 MIL.
5. SEE CUMMINS MATERIAL SPECIFICATIONS FOR APPLICATION INFORMATION.
6. IF CORNERS SHOWN SQUARE, RADIUS OPTIONAL.
7. IF CSA AGENCY APPROVAL REQUIRED LOCATE VENDOR CSA IDENTIFICATION MARK IN LOWER RIGHT HAND CORNER.
8. PART NUMBER & REVISION LETTER TO BE LOCATED WHERE SHOWN IN THE FOLLOWING FORMAT: PART NUMBER LTR (EXAMPLE: A123B456 A).

MODEL/PLATFORM: OT 40-125A	THIS PART IS SIMILAR TO:
UNLESS OTHERWISE SPECIFIED THE FOLLOWING SHALL APPLY	ANG. TOL.: ± 1°
DIMENSIONAL TOLERANCES: X ± 1	.X ± 0.8 .XX ± 0.38

PART NUMBER: A050J441	PART REVISION: D
PART NAME: LABEL,INFORMATION	
DRAWING CATEGORY: DETAIL	
STATE: RELEASED	SHEET: 1 OF 2
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL	

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DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: -	SIZE: A3	SCALE:1
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009	THIRD ANGLE PROJECTION	CAD SYSTEM PTC® Creo® Parametric

SECTION 6
START-UP AND WARRANTY

Cummins Sales and Service

Customer / Contractor Pre Commissioning Inspection Form

The intent of this form is for the contractor to prepare for equipment to be commissioned by a certified Cummins Field Service Power Generation Technician. Filling out this form is required and will minimize delays due to equipment failing to meet requirements. Completing this checklist in its entirety should minimize the need for additional billing beyond the previously provided commissioning quote.

The items listed are the responsibility of the contractor and not Cummins Sales and Service.

Project Name/End User: _____

Contractor: _____

Address: _____ **Contact:** _____

Business Phone: _____ **Cell Phone:**_____

Email: _____

ON SITE INFORMATION

On-Site Contact Information: _____

Address: _____

Time Requested Onsite: _____

Sub location of Generator (ie. Roof, basement, floor): _____

Does the facility have the following: Loading Dock ☐ Elevator ☐

Access (from truck and load bank parking to generator in feet): _____

Parking: Is parking available on-site for service truck: Yes ☐ No ☐

Permits: Have all necessary air quality and local permits been secured: Yes ☐ No ☐ N/A ☐

Fuel Tank Testing: Is fuel tank testing required: Yes ☐ No ☐

If yes when is the inspector scheduled for: _____

Cummins Sales and Service

ON SITE INFORMATION CONTINUED

YES	NA	NO	
☐	☐	☑	Is the facility occupied and is customer aware there will be power outages after generator is started?
☑	☑	☐	Will there be any site safety training needed for technician prior to beginning? On site contact for training: _____
☐	☐	☐	Will customer representative be on site for operator training? On site contact for operator training: _____

MECHANICAL LOCATION AND PLACEMENT OF THE GENERATOR SET

YES	NA	NO	
☐	☐	☐	Generator is properly secured to pad or vibration isolators
☐	☐	☐	Generator Enclosure and/or Room is free of all debris
☐	☐	☐	No airflow obstructions to the engine or generator are present for cooling combustion (See Cummins T-030 or Installation manual of generator set)
☐	☐	☐	Room is designed for adequate inlet and outlet airflow

GASEOUS FUEL Natural Gas/LP Vapor/LP Liquid

YES	NA	NO	
☐	☐	☐	Natural gas and/or LPG fuel supply is connected.
☐	☐	☐	Fuel piping is the appropriate size based on full-load CFH/BTU requirement. Pipe size after service regulator: _____
☐	☐	☐	Service regulator(s), (if supplied), fuel strainer(s), flexible fuel line(s) and manual shut off are installed
☐	☐	☐	Fuel pressure after service regulator is:_____inches of H2O

I have read and fully understand the fuel requirements for this equipment, I am verifying that the piping and fuel supply meets or exceeds those requirements. I also understand failure to meet the requirements will result in additional charges.

_____ _____

Contractor "requestor" Signature ***Date***

Sales and Service

DIESEL FUELED GENERATORS

YES	NA	NO	
☐	☐	☐	Flexible fuel connections, (supply and return) are connected to generator and piping.
☐	☐	☐	Day tank installed, wired and plumbed (lines free of obstruction) to genset and main fuel tank if applicable. Only black iron pipe for fuel lines, never use copper or galvanized pipe.
☐	☐	☐	All tanks filled with enough fuel to perform startup and testing.
☐	☐	☐	A return line from engine to day tank and day tank to main tank should be in place

EXHAUST SYSTEM

YES	NA	NO	
☐	☐	☐	Exhaust wrapped or isolated to prevent accidental activation of fire protection devices and sprinklers.
☐	☐	☐	Exhaust flex-pipe is installed at engine exhaust outlet (The silencer and flex-pipe are supplied with the generator set).
☐	☐	☐	Silencer is installed with appropriate supports (no weight should be placed on the exhaust outlet of the genset).
☐	☐	☐	Exhaust system has proper expansion joints and wall thimbles (Thimbles are required for wall or roof penetration).

GENERATOR ELECTRICAL CONNECTIONS

YES	NA	NO	
☐	☐	☐	Load conductors connected to breakers
☐	☐	☐	Flexible connections used on all conduit connections to the generator set output box
☐	☐	☐	Remote start interconnection **stranded** wiring is installed between the generator set and the automatic transfer switch(s) and annunciator.
☐	☐	☐	AC Power conductors in dedicated conduit separate from any DC control or network wiring
☐	☐	☐	Ground fault connected/functioning on generator, if supplied
☐	☐	☐	AC power wired to the coolant heaters (Do NOT energize)
☐	☐	☐	Check for AC oil pan heater, control heater or generator winding heater (Needing AC wiring)
☐	☐	☐	Generator is grounded in compliance with local codes
☐	☐	☐	If applicable, louver motors are operational and connected to generator controls

Sales and Service

GENERATOR ELECTRICAL CONNECTIONS CONTINUED

YES	NA	NO
☐	☐	☐
☐	☐	☐
☐	☐	☐

Where is annunciator located? _____

Are there additional ancillary devices/equipment that need to be integrated into the system? If yes, please define_____

Battery charger mounted (free of vibration, weather, accessible for an operator to observe easily) and connected to the appropriate AC and DC wiring to operate the charger.

TRANSFER SWITCH ELECTRICAL CONNECTIONS

YES	NA	NO
☐	☐	☐
☐	☐	☐
☐	☐	☐

Conductors connected for Utility, Load and Emergency

Remote start interconnection **stranded** wiring is installed between the generator set and the automatic transfer switch(s).

Four Pole Transfer Switch: Is generator neutral grounded? ☐

DAY OF STARTUP

YES	NA	NO
☐	☐	☐
☐	☐	☐
☐	☐	☐

Training of facility personnel will be done on the same day as start up. Additional trips for operational training will be an additional charge.

Can transfer switch be tested at time of generator startup? (There will be a power interruption) ***Note: After hours testing could result in additional charges.***

If the associated switchgear and/or ATS(s) are not provided by Cummins, will the manufacturer's representative be on site?

Exercise with or without load? ☐

If known, Transfer Time delay set recommendations Generator Set to exercise Day:_____ Time:_____

_____ _____

Contractor "requestor" Signature ***Printed Name***

Date: _____

Please complete this form and return to schedule start up, if not returned within 5 business days prior to scheduled startup it may be delayed. I understand that the start-up date may have to be rescheduled at my expense if the above items have not been completed properly.

Warranty Statement

Global Commercial Warranty Statement

Generator Set

APX B-79

English
Original Instructions

7-2017

A028U870 (Issue 5)

Our energy working for you.™

Power Generation

Limited Warranty

Commercial Generating Set

This limited warranty applies to all Cummins Power Generation® branded commercial generating sets and associated accessories (hereinafter referred to as "Product").

This warranty covers any failures of the Product, under normal use and service, which result from a defect in material or factory workmanship.

Warranty Period:

The warranty start date† is the date of initial start up, first rental, demonstration or 18 months after factory ship date, whichever is sooner. See table for details.

Continuous Power (COP) is defined as being the maximum power which the generating set is capable of delivering continuously whilst supplying a constant electrical load when operated for an unlimited number of hours per year. No overload capability is available for this rating.

Prime Power (PRP) is defined as being the maximum power which a generating set is capable of delivering continuously whilst supplying a variable electrical load when operated for an unlimited number of hours per year. The permissible average power output over 24 hours of operation shall not exceed 70% of the PRP. For applications requiring permissible average output higher than stated, a COP rating should be used.

Limited-Time Running Power (LTP) is defined as the maximum power available, under the agreed operating conditions, for which the generating set is capable of delivering for up to 500 hours of operation per year.

Emergency Standby Power (ESP) is defined as the maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 500 hours of operation per year. The permissible average power output over 24 hours of operation shall not exceed 70% of the ESP.

Environmental Protection Agency – Stationary Emergency (EPA-SE) is defined as being the maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generator set is capable of delivering in the event of a utility power outage or under test conditions and used in strict accordance with the EPA NSPS for stationary engines, 40 CFR part 60, subparts IIII and JJJJ, where a reliable utility must be present. The permissible average power output over 24 hours of operation shall not exceed 70% of the EPA-SE.

Data Center Continuous (DCC) is defined as the maximum power which the generator is capable of delivering continuously to a constant or varying electrical load for unlimited hours in a data center application.

Base Warranty Coverage Duration (Whichever occurs first)

Rating	Months	Max. Hours
COP	12	Unlimited
PRP	12	Unlimited
LTP	12	500 hrs
ESP	24	1000 hrs
EPA-SE	24	Unlimited
DCC	24	Unlimited

† Warranty start date for designated rental and oil and gas model Products is determined to be date of receipt of Product by the end customer.

Cummins Power Generation® Responsibilities:

In the event of a failure of the Product during the warranty period due to defects in material or workmanship, Cummins Power Generation® will only be responsible for the following costs:

- All parts and labor required to repair the Product.
- Reasonable travel expenses to and from the Product site location.
- Maintenance items that are contaminated or damaged by a warrantable failure.

Owner Responsibilities:

The owner will be responsible for the following:

- Notifying Cummins Power Generation® distributor or dealer within 30 days of the discovery of failure.
- Installing, operating, commissioning and maintaining the Product in accordance with Cummins Power Generation®'s published policies and guidelines.
- Providing evidence for date of commissioning.
- Providing sufficient access to and reasonable ability to remove the Product from the installation in the event of a warrantable failure.
- Incremental costs and expenses associated with Product removal and reinstallation resulting from non-standard installations.
- Costs associated with rental of generating sets used to replace the Product being repaired.
- Costs associated with labor overtime and premium shipping requested by the owner.
- All downtime expenses, fines, all applicable taxes, and other losses resulting from a warrantable failure.

Limitations:

This limited warranty does not cover Product failures resulting from:

- Inappropriate use relative to designated power rating.
- Inappropriate use relative to application guidelines.
- Inappropriate use of an EPA-SE application generator set relative to EPA's standards.
- Normal wear and tear.
- Improper and/or unauthorized installation.
- Negligence, accidents or misuse.
- Lack of maintenance or unauthorized repair.
- Noncompliance with any Cummins Power Generation® published guideline or policy.
- Use of improper or contaminated fuels, coolants or lubricants.
- Improper storage before and after commissioning.
- Owner's delay in making Product available after notification of potential Product problem.
- Replacement parts and accessories not authorized by Cummins Power Generation®.
- Use of Battle Short Mode.
- Owner or operator abuse or neglect such as: operation without adequate coolant or lubricants; overfueling; overspeeding; lack of maintenance to lubricating, cooling or air intake systems; late servicing and maintenance; improper storage, starting, warm-up, run-in or shutdown practices, or for progressive damage resulting from a defective shutdown or warning device.
- Damage to parts, fixtures, housings, attachments and accessory items that are not part of the generating set.

This limited warranty does not cover costs resulting from:

- Difficulty in gaining access to the Product.
- Damage to customer property.

A "Data center" is defined as a dedicated facility that house computers and associated equipment for data storage and data handling.

Reliable utility is defined as utility power without routine or regularly scheduled black-outs.

Please contact your local Cummins Power Generation® Distributor for clarification concerning these limitations.

CUMMINS POWER GENERATION® RIGHT TO FAILED COMPONENTS:

Failed components claimed under warranty remain the property of Cummins Power Generation®. Cummins Power Generation® has the right to reclaim any failed component that has been replaced under warranty.

Extended Warranty:

Cummins Power Generation® offers several levels of Extended Warranty Coverage. Please contact your local Cummins Power Generation ® Distributor for details.
www.power.cummins.com

THE WARRANTIES SET FORTH HEREIN ARE THE SOLE WARRANTIES MADE BY CUMMINS POWER GENERATION ® IN REGARD TO THE PRODUCT. CUMMINS POWER GENERATION® MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT IS CUMMINS POWER GENERATION® LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

This limited warranty shall be enforced to the maximum extent permitted by applicable law. This limited warranty gives the owner specific rights that may vary from state to state or from jurisdiction to jurisdiction.

Product Model Number:_____
Product Serial Number:_____
Date in Service:_____

Warranty Statement

Transfer Switch Extended Warranty

Limited 2 Year Comprehensive Extended Warranty – G004

Transfer Switch and Paralleling Systems

When purchased, this limited extended warranty applies to all Cummins Power Generation® branded Transfer Switches, Paralleling Systems and associated accessories (hereinafter referred to as "Product").

This warranty covers any failures of the Product, under normal use and service, which result from a defect in material or factory workmanship.

Warranty Period:

The warranty start date is the date of initial start up, first rental, demonstration or 18 months after factory ship date, whichever is sooner. The coverage duration is 2 years from warranty start date.

Cummins Power Generation® Responsibilities:

In the event of a failure of the Product during the extended warranty period due to defects in material or workmanship, Cummins Power Generation® will only be responsible for the following costs:

- All parts and labor required to repair the Product.
- Reasonable travel expenses to and from the Product site location.
- Maintenance items that are contaminated or damaged by a warrantable failure.

Owner Responsibilities:

The owner will be responsible for the following:

- Notifying Cummins Power Generation® distributor or dealer within 30 days of the discovery of failure.
- Installing, operating, commissioning and maintaining the Product in accordance with Cummins Power Generation®'s published policies and guidelines.
- Providing evidence for date of commissioning.
- Providing sufficient access to and reasonable ability to remove the Product from the installation in the event of a warrantable failure.

In addition, the owner will be responsible for:

- Incremental costs and expenses associated with Product removal and reinstallation resulting from non-standard installations.
- Costs associated with rental of generating sets used to replace the Product being repaired.
- Costs associated with labor overtime and premium shipping requested by the owner.
- All downtime expenses, fines, all applicable taxes, and other losses resulting from a warrantable failure.

Limitations:

This limited extended warranty does not cover Product failures resulting from:

- Inappropriate use relative to designated power rating.
- Inappropriate use relative to application guidelines.
- Failures due to normal wear, corrosion, varnished fuel system parts, lack of reasonable and necessary maintenance, unauthorized modifications and/or repair, and use of add-on or modified parts.
- Improper and/or unauthorized installation.
- Owner's or operator's negligence, accidents or misuse.
- Noncompliance with any Cummins Power Generation® published guideline or policy.
- Improper storage before and after commissioning.
- Owner's delay in making Product available after notification of potential Product problem.

Limitations Continued:

- Replacement parts and accessories not authorized by Cummins Power Generation®.
- Use of Battle Short Mode
- Owner or operator abuse or neglect such as: operation without adequate coolant or

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lubricants; overfueling; overspeeding; lack of maintenance to lubricating, cooling or air intake systems; late servicing and maintenance; improper storage, starting, warm-up, run-in or shutdown practices, or for progressive damage resulting from a defective shutdown or warning device.

- Damage to parts, fixtures, housings, attachments and accessory items that are not part of the generating set.

This limited extended warranty does not cover costs resulting from:

- Difficulty in gaining access to the Product.
- Damage to customer property.
- Repair of cosmetic damage to enclosures.

www.cumminspower.com

CUMMINS POWER GENERATION® RIGHT TO FAILED COMPONENTS:

Failed components claimed under warranty remain the property of Cummins Power Generation®. Cummins Power Generation® has the right to reclaim any failed component that has been replaced under warranty.

THE WARRANTIES SET FORTH HEREIN ARE THE SOLE WARRANTIES MADE BY CUMMINS POWER GENERATION ® IN REGARD TO THE PRODUCT. CUMMINS POWER GENERATION® MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT IS CUMMINS POWER GENERATION® LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

This limited extended warranty shall be enforced to the maximum extent permitted by applicable law. This limited extended warranty gives the owner specific rights that may vary from state to state or from jurisdiction to jurisdiction.

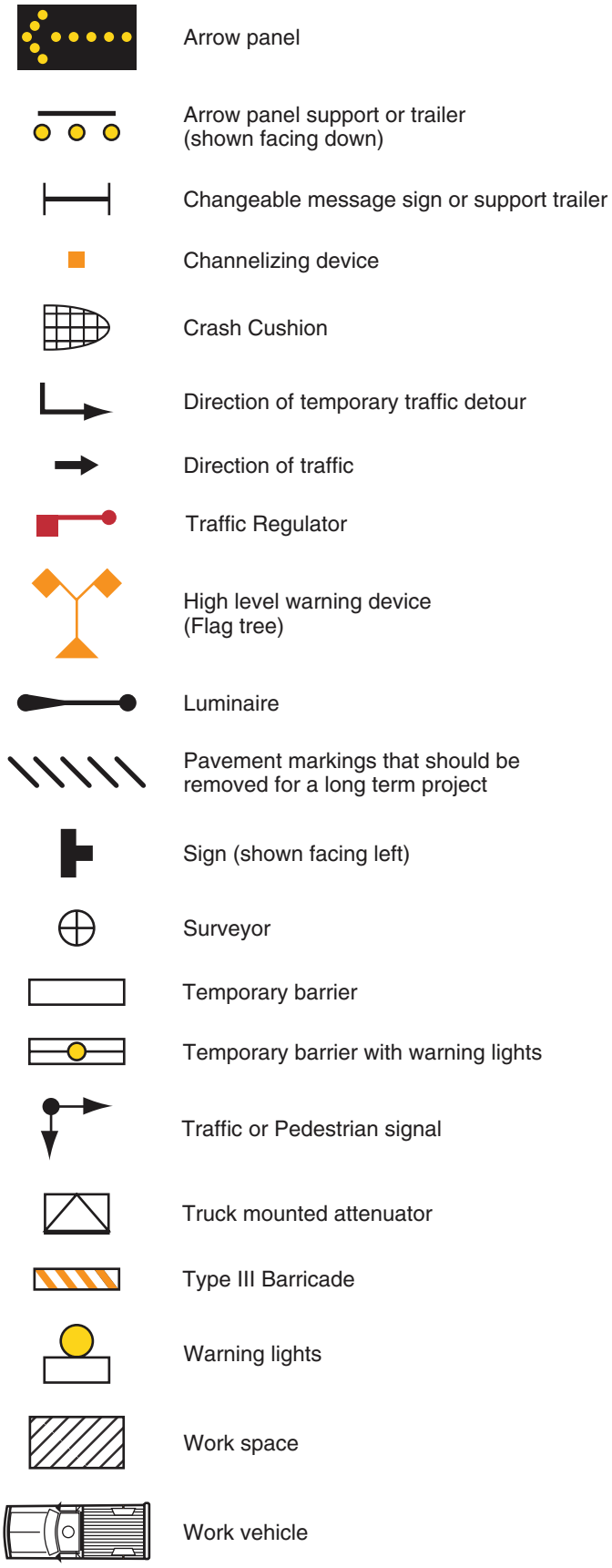
Product Model Number:_____

Product Serial Number:_____

Date in Service:_____

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Table 6H-2. Meaning of Symbols on Typical Application Diagrams (MI)



Arrow panel

Arrow panel support or trailer (shown facing down)

Changeable message sign or support trailer

Channelizing device

Crash Cushion

Direction of temporary traffic detour

Direction of traffic

Traffic Regulator

High level warning device (Flag tree)

Luminaire

Pavement markings that should be removed for a long term project

Sign (shown facing left)

Surveyor

Temporary barrier

Temporary barrier with warning lights

Traffic or Pedestrian signal

Truck mounted attenuator

Type III Barricade

Warning lights

Work space

Work vehicle

Table 6H-3. Meaning of Letter Codes on Typical Application Diagrams

Road Type	Distance Between Signs**		
	A	B	C
Urban (low speed)*	30 (100)	30 (100)	30 (100)
Urban (high speed)*	100 (350)	100 (350)	100 (350)
Rural	150 (500)	150 (500)	150 (500)
Expressway / Freeway	300 (1,000)	450 (1,500)	800 (2,640)

***** Speed category to be determined by highway agency

****** Distances are shown in meters (feet). The column headings A, B, and C are the dimensions shown in Figures 6H-1 through 6H-46. The A dimension is the distance from the transition or point of restriction to the first sign. The B dimension is the distance between the first and second signs. The C dimension is the distance between the second and third signs. (The third sign is the first one in a three-sign series encountered by a driver approaching a TTC zone.)

Table 6H-4. Formulas for Determining Taper Lengths

Speed Limit (S)	Taper Length (L) Meters
60 km/h or less	$L = \frac{WS^2}{155}$
70 km/h or more	$L = \frac{WS}{1.6}$

Speed Limit (S)	Taper Length (L) Feet
40 mph or less	$L = \frac{WS^2}{60}$
45 mph or more	L = WS

Where: L = taper length in meters (feet)

W = width of offset in meters (feet)

S = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in km/h (mph)

Notes for Figure 6H-18—Typical Application 18 (MI)
Lane Closure on Minor Street

Standard:

1. This TTC shall be used only for low-speed facilities having low traffic volumes.

Option:

2. Where the work space is short, where road users can see the roadway beyond, and where volume is low, vehicular traffic may be self-regulating.

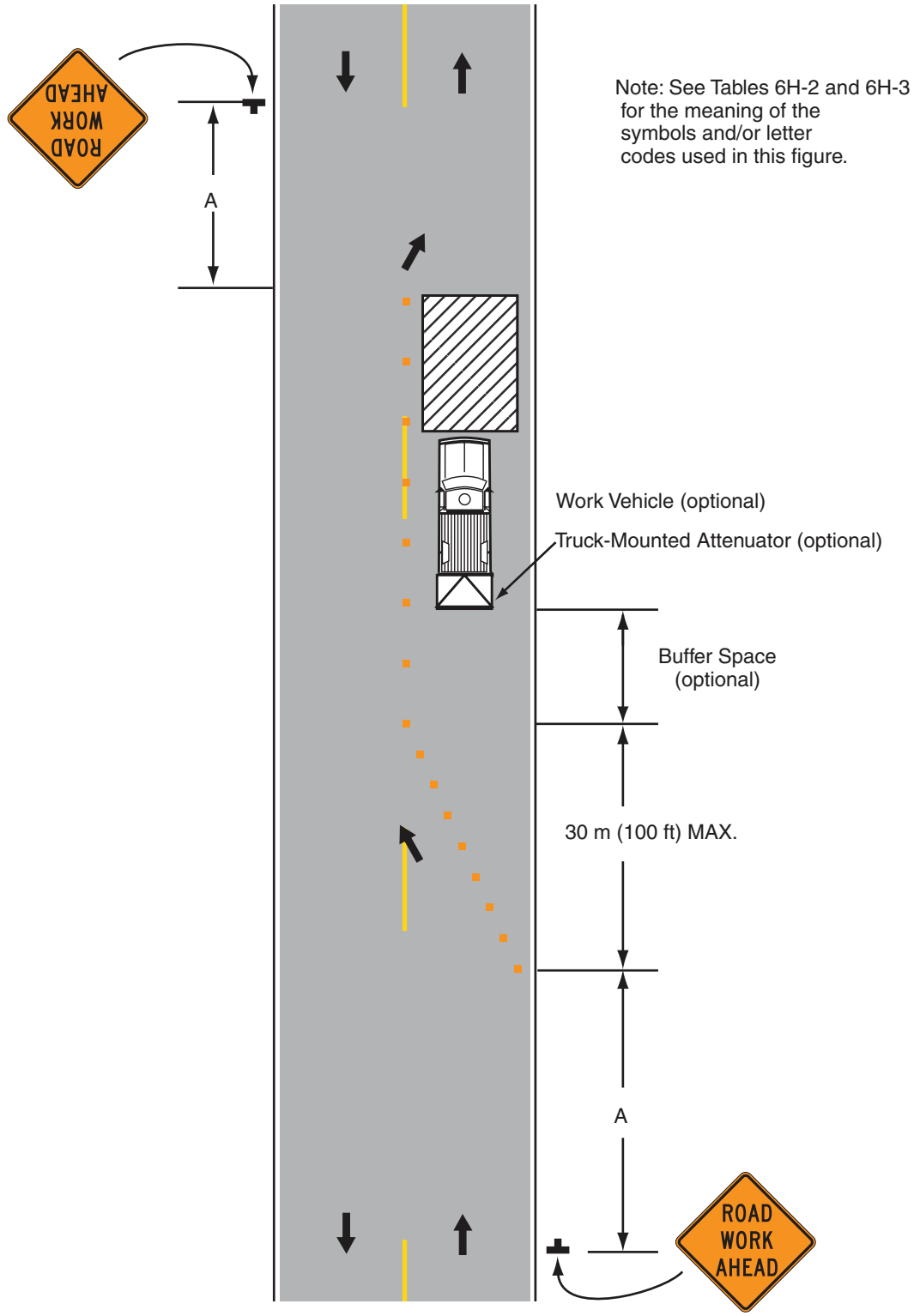
Standard:

3. Where vehicular traffic cannot effectively self-regulate, one or two traffic regulators shall be used as illustrated in Figure 6H-10.

Option:

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. A truck-mounted attenuator may be used on the work vehicle and the shadow vehicle.

Figure 6H-18. Lane Closure on Minor Street (MI) (TA-18)



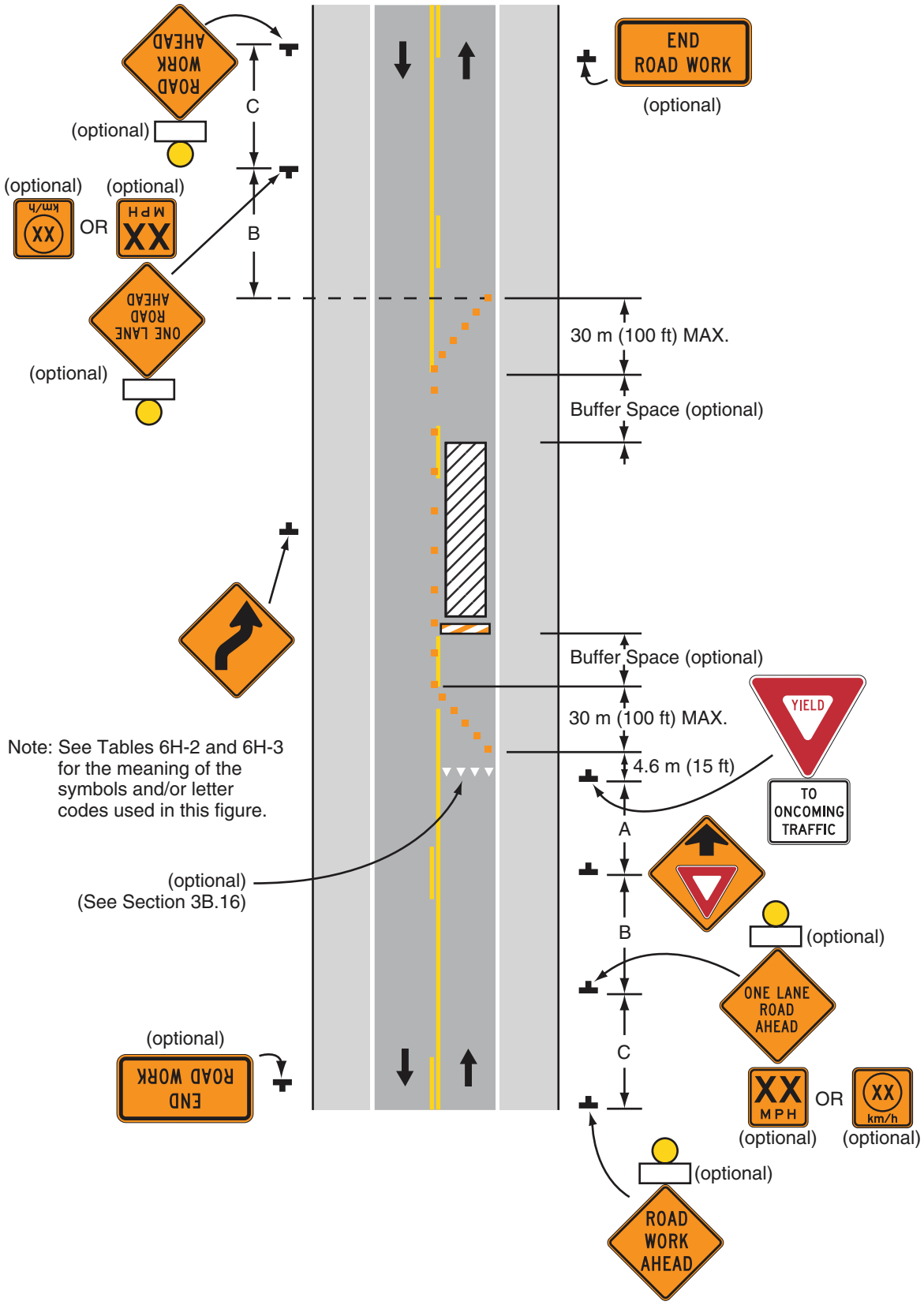
Typical Application 18

Notes for Figure 6H-11—Typical Application 11 (MI)
Lane Closure on Two-Lane Road with Low Traffic Volumes

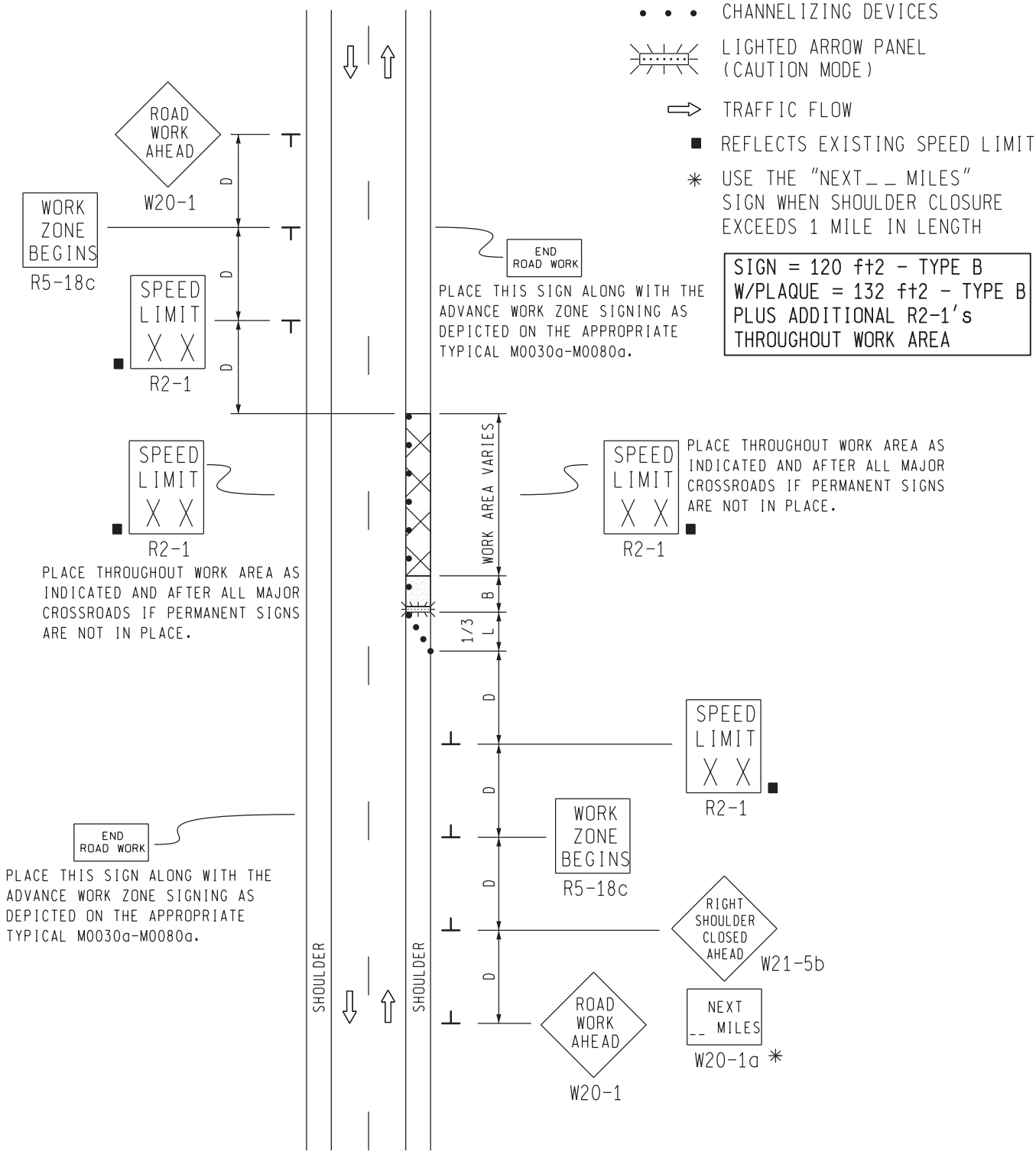
Option:

1. This TTC zone application may be used as an alternate to the TTC application shown in Figure 6H-10 (using traffic regulators) when the following conditions exist:
   a. Vehicular traffic volume is such that sufficient gaps exist for vehicular traffic that must yield.
   b. Road users from both directions are able to see approaching vehicular traffic through and beyond the work site and have sufficient visibility of approaching vehicles.
2. The Type B flashing warning lights may be placed on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs whenever a night lane closure is necessary.

Figure 6H-11. Lane Closure on Two-Lane Road with Low Traffic Volumes (MI)



Typical Application 11



APX - C-7

NOT TO SCALE

MDOT Michigan Department of Transportation

TRAFFIC AND SAFETY

MAINTAINING TRAFFIC TYPICAL

TYPICAL TEMPORARY TRAFFIC CONTROL FOR A SHOULDER CLOSURE ON A TWO LANE TWO-WAY ROADWAY NO SPEED REDUCTION

DRAWN BY: CON:AE:djf	OCTOBER 2011	M0110a	SHEET 1 OF 2
CHECKED BY: BMM:CRB	PLAN DATE:		
FILE: PW RD/TS/Typicals/Signs/MT NON FWY/M0110a.dgn REV. 10/04/2011			

NOTES

1. D = DISTANCE BETWEEN TRAFFIC CONTROL DEVICES
   1/3 L = MINIMUM LENGTH OF TAPER
   B = LENGTH OF LONGITUDINAL BUFFER
   SEE M0020a FOR "D," "L," AND "B" VALUES

2. ALL NON-APPLICABLE SIGNING WITHIN THE CIA SHALL BE MODIFIED TO FIT CONDITIONS, COVERED OR REMOVED.

3. DISTANCES BETWEEN SIGNS, THE VALUES FOR WHICH ARE SHOWN IN TABLE D, ARE APPROXIMATE AND MAY NEED ADJUSTING AS DIRECTED BY THE ENGINEER.

3A. THE "WORK ZONE BEGINS" (R5-18c) SIGN SHALL BE USED ONLY IN THE INITIAL SIGNING SEQUENCE IN THE WORK ZONE. SUBSEQUENT SEQUENCES IN THE SAME WORK ZONE SHALL OMIT THIS SIGN AND THE QUANTITIES SHALL BE ADJUSTED APPROPRIATELY.

4E. THE MAXIMUM RECOMMENDED DISTANCE(S) BETWEEN CHANNELIZING DEVICES SHOULD BE EQUAL IN FEET TO THE POSTED SPEED IN MILES PER HOUR ON TAPER(S) AND TWICE THE POSTED SPEED IN THE PARALLEL AREA(S).

5. FOR OVERNIGHT CLOSURES, TYPE III BARRICADES SHALL BE LIGHTED.

6. WHEN CALLED FOR IN THE FHWA ACCEPTANCE LETTER FOR THE SIGN SYSTEM SELECTED, THE TYPE A WARNING FLASHER, SHOWN ON THE WARNING SIGNS, SHALL BE POSITIONED ON THE SIDE OF THE SIGN NEAREST THE ROADWAY.

7. ALL TEMPORARY SIGNS, TYPE III BARRICADES, THEIR SUPPORT SYSTEMS AND LIGHTING REQUIREMENTS SHALL MEET NCHRP 350 CRASHWORTHLY REQUIREMENTS STIPULATED IN THE CURRENT EDITION OF THE MICHIGAN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, THE CURRENT EDITION OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION, THE STANDARD PLANS AND APPLICABLE SPECIAL PROVISIONS. ONLY DESIGNS AND MATERIALS APPROVED BY MDOT WILL BE ALLOWED.

8. WHEN BUFFER AREAS ARE ESTABLISHED, THERE SHALL BE NO EQUIPMENT OR MATERIALS STORED OR WORK CONDUCTED IN THE BUFFER AREA.

29A. THE TYPE OF REFLECTIVE SHEETING USED FOR THE W20-1a PLAQUE SHALL BE THE SAME AS THE TYPE USED FOR THE PARENT SIGN.

SIGN SIZES

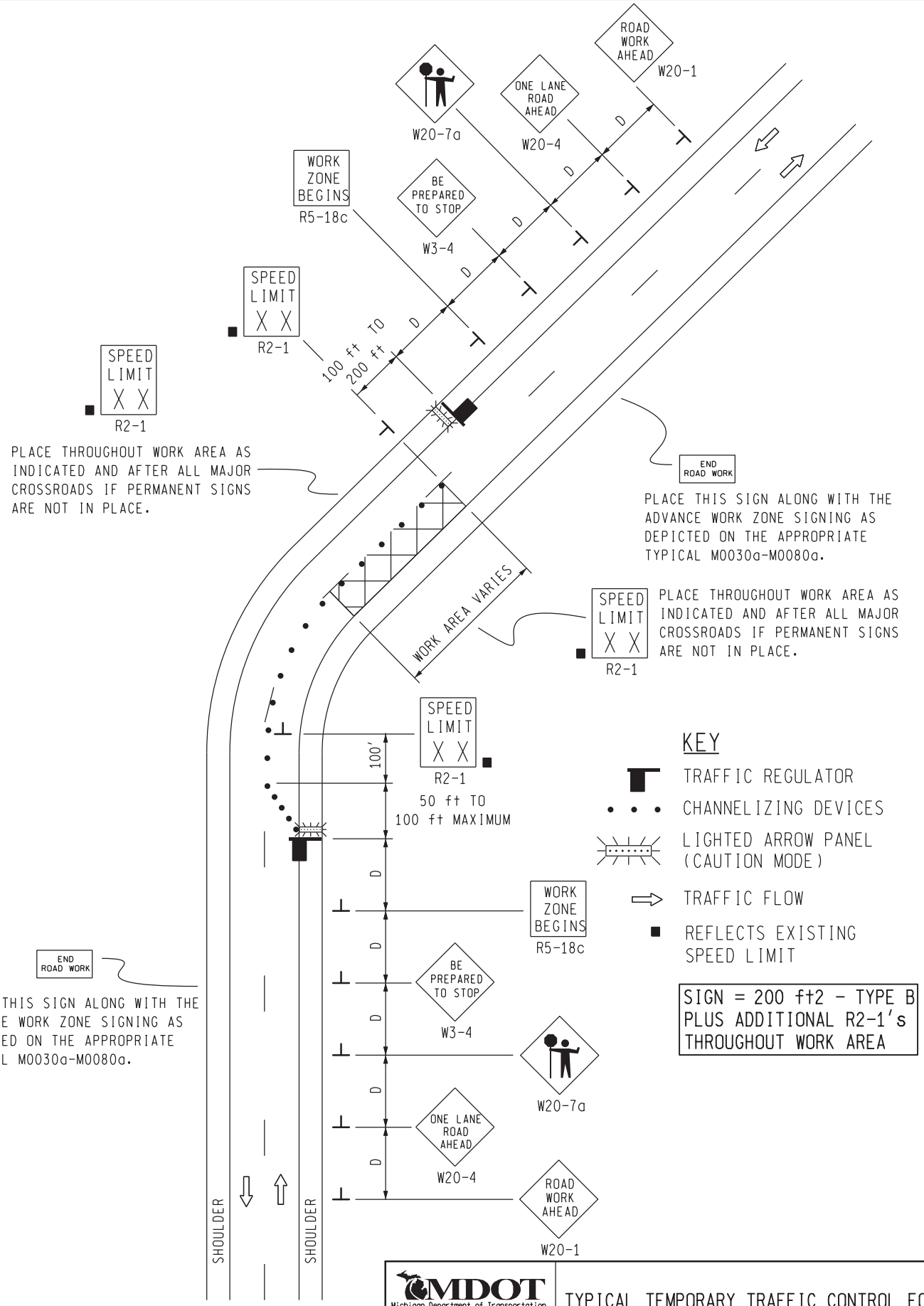
DIAMOND WARNING	- 48" x 48"
W20-1a PLAQUE	- 48" x 36"
R2-1 REGULATORY	- 48" x 60"
R5-18c REGULATORY	- 48" x 48"

NOT TO SCALE

MDOT Michigan Department of Transportation
TRAFFIC AND SAFETY
MAINTAINING TRAFFIC TYPICAL

TYPICAL TEMPORARY TRAFFIC CONTROL FOR A SHOULDER CLOSURE ON A TWO LANE TWO-WAY ROADWAY NO SPEED REDUCTION

DRAWN BY: CON:AE:djf	OCTOBER 2011	M0110a	SHEET 2 OF 2
CHECKED BY: BMM:CRB	PLAN DATE:		
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MDOT Michigan Department of Transportation

TRAFFIC AND SAFETY

MAINTAINING TRAFFIC TYPICAL

TYPICAL TEMPORARY TRAFFIC CONTROL FOR A TWO-LANE TWO-WAY ROADWAY WHERE ONE LANE IS CLOSED UTILIZING TRAFFIC REGULATORS, NO SPEED REDUCTION

DRAWN BY: CON:AE:djf	OCTOBER 2011	M0140a	SHEET 1 OF 2
CHECKED BY: BMM:CRB	PLAN DATE:		
FILE: PW RD/TS/Typicals/Signs/MT NON FWY/M0140a.dgn REV. 10/04/2011			

NOT TO SCALE

NOTES

1H. D = DISTANCE BETWEEN TRAFFIC CONTROL DEVICES AND LENGTH OF LONGITUDINAL BUFFERS SEE M0020a FOR "D" VALUES.

2. ALL NON-APPLICABLE SIGNING WITHIN THE CIA SHALL BE MODIFIED TO FIT CONDITIONS, COVERED OR REMOVED.

3. DISTANCES BETWEEN SIGNS, THE VALUES FOR WHICH ARE SHOWN IN TABLE D, ARE APPROXIMATE AND MAY NEED ADJUSTING AS DIRECTED BY THE ENGINEER.

3A. THE "WORK ZONE BEGINS" (R5-18c) SIGN SHALL BE USED ONLY IN THE INITIAL SIGNING SEQUENCE IN THE WORK ZONE. SUBSEQUENT SEQUENCES IN THE SAME WORK ZONE SHALL OMIT THIS SIGN AND THE QUANTITIES SHALL BE ADJUSTED APPROPRIATELY.

4A. THE MAXIMUM RECOMMENDED DISTANCE(S) BETWEEN CHANNELIZING DEVICES IN THE TAPER AREA(S) SHOULD BE 15 FEET AND SHOULD BE EQUAL IN FEET TO TWICE THE POSTED SPEED IN MILES PER HOUR IN THE PARALLEL AREA(S).

5. FOR OVERNIGHT CLOSURES, TYPE III BARRICADES SHALL BE LIGHTED.

6. WHEN CALLED FOR IN THE FHWA ACCEPTANCE LETTER FOR THE SIGN SYSTEM SELECTED, THE TYPE A WARNING FLASHER, SHOWN ON THE WARNING SIGNS, SHALL BE POSITIONED ON THE SIDE OF THE SIGN NEAREST THE ROADWAY.

7. ALL TEMPORARY SIGNS, TYPE III BARRICADES, THEIR SUPPORT SYSTEMS AND LIGHTING REQUIREMENTS SHALL MEET NCHRP 350 CRASHWORTHLY REQUIREMENTS STIPULATED IN THE CURRENT EDITION OF THE MICHIGAN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, THE CURRENT EDITION OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION, THE STANDARD PLANS AND APPLICABLE SPECIAL PROVISIONS. ONLY DESIGNS AND MATERIALS APPROVED BY MDOT WILL BE ALLOWED.

9. ALL TRAFFIC REGULATORS SHALL BE PROPERLY TRAINED AND SUPERVISED.

9A. IN ANY OPERATION INVOLVING MORE THAN ONE TRAFFIC REGULATOR, ONE PERSON SHOULD BE DESIGNATED AS HEAD TRAFFIC REGULATOR.

10. ALL TRAFFIC REGULATORS' CONDUCT, THEIR EQUIPMENT, AND TRAFFIC REGULATING PROCEDURES SHALL CONFORM TO THE CURRENT EDITION OF THE MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MMUTCD) AND THE CURRENT EDITION OF THE MDOT HANDBOOK ENTITLED "TRAFFIC REGULATORS INSTRUCTION MANUAL."

11. WHEN TRAFFIC REGULATING IS ALLOWED DURING THE HOURS OF DARKNESS, APPROPRIATE LIGHTING SHALL BE PROVIDED TO SUFFICIENTLY ILLUMINATE THE TRAFFIC REGULATOR'S STATIONS.

12E. THE MAXIMUM DISTANCE BETWEEN THE TRAFFIC REGULATORS SHALL BE NO MORE THAN 2 MILES IN LENGTH UNLESS RESTRICTED FURTHER IN THE SPECIAL PROVISIONS FOR MAINTAINING TRAFFIC. ALL SEQUENCES OF MORE THAN 2 MILES IN LENGTH WILL REQUIRE WRITTEN PERMISSION FROM THE ENGINEER BEFORE PROCEEDING.

13. WHEN INTERSECTING ROADS OR SIGNIFICANT TRAFFIC GENERATORS (SHOPPING CENTERS, MOBILE HOME PARKS, ETC.) OCCUR WITHIN THE ONE-LANE TWO-WAY OPERATION, INTERMEDIATE TRAFFIC REGULATORS AND APPROPRIATE SIGNING SHALL BE PLACED AT THESE LOCATIONS.

14. ADDITIONAL SIGNING AND/OR ELONGATED SIGNING SEQUENCES SHOULD BE USED WHEN TRAFFIC VOLUMES ARE SIGNIFICANT ENOUGH TO CREATE BACKUPS BEYOND THE W3-4 SIGNS.

15. THE HAND HELD (PADDLE) SIGNS REQUIRED BY THE MMUTCD TO CONTROL TRAFFIC WILL BE PAID FOR AS PART OF FLAG CONTROL.

28E. THE TRAFFIC REGULATORS SHOULD BE POSITIONED AT OR NEAR THE SIDE OF THE ROAD SO THAT THEY ARE SEEN CLEARLY AT A MINIMUM DISTANCE OF 500 FEET. THIS MAY REQUIRE EXTENDING THE BEGINNING OF THE LANE CLOSURE TO OVERCOME VIEWING PROBLEMS CAUSED BY HILLS AND CURVES.

SIGN SIZES

DIAMOND WARNING - 48" x 48"
R2-1 REGULATORY - 48" x 60"
R5-18c REGULATORY - 48" x 48"

APX - C-10

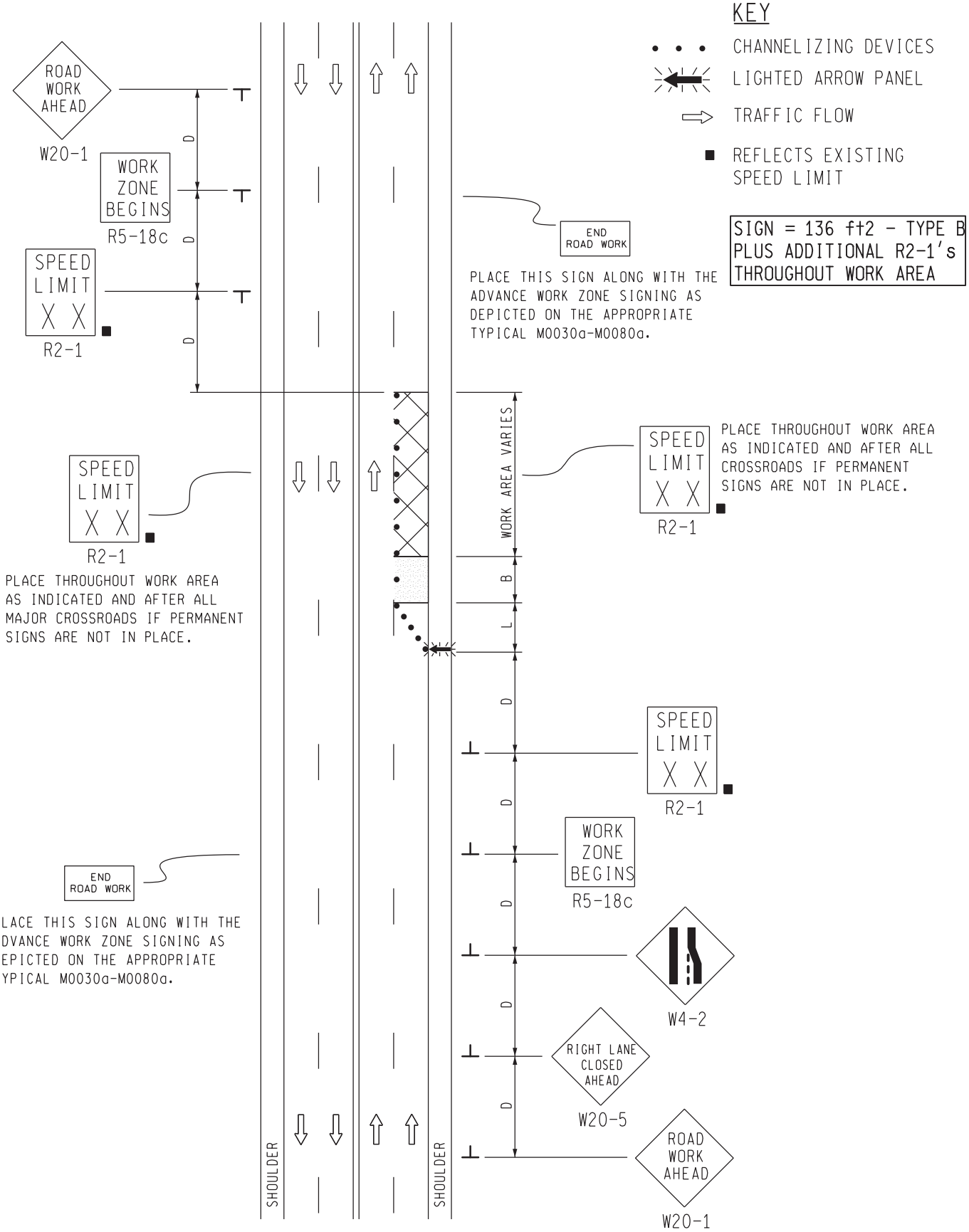
NOT TO SCALE

MDOT Michigan Department of Transportation
TRAFFIC AND SAFETY
MAINTAINING TRAFFIC TYPICAL

TYPICAL TEMPORARY TRAFFIC CONTROL FOR A TWO-LANE TWO-WAY ROADWAY WHERE ONE LANE IS CLOSED UTILIZING TRAFFIC REGULATORS, NO SPEED REDUCTION

DRAWN BY: CON:AE:djf	OCTOBER 2011	M0140a	SHEET 2 OF 2
CHECKED BY: BMM:CRB	PLAN DATE:		

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APX - C-11

NOT TO SCALE

MDOT Michigan Department of Transportation

TRAFFIC AND SAFETY

MAINTAINING TRAFFIC TYPICAL

TYPICAL TEMPORARY TRAFFIC CONTROL FOR A ONE-LANE CLOSURE ON AN UNDIVIDED MULTI-LANE ROADWAY, NO SPEED REDUCTION

DRAWN BY: CON:AE:djf	OCTOBER 2011	M0240a	SHEET 1 OF 2
CHECKED BY: BMM:CRB	PLAN DATE:		

FILE: PW RD/TS/Typicals/Signs/MT NON FWY/M0240a.dgn REV. 10/11/2011

NOTES

1B. D = DISTANCE BETWEEN TRAFFIC CONTROL DEVICES
L = MINIMUM LENGTH OF TAPER
B = LENGTH OF LONGITUDINAL BUFFER
SEE M0020a FOR "D," "L," AND "B" VALUES

2. ALL NON-APPLICABLE SIGNING WITHIN THE CIA SHALL BE MODIFIED TO FIT CONDITIONS, COVERED OR REMOVED.

3. DISTANCES BETWEEN SIGNS, THE VALUES FOR WHICH ARE SHOWN IN TABLE D, ARE APPROXIMATE AND MAY NEED ADJUSTING AS DIRECTED BY THE ENGINEER.

3A. THE "WORK ZONE BEGINS" (R5-18c) SIGN SHALL BE USED ONLY IN THE INITIAL SIGNING SEQUENCE IN THE WORK ZONE. SUBSEQUENT SEQUENCES IN THE SAME WORK ZONE SHALL OMIT THIS SIGN AND THE QUANTITIES SHALL BE ADJUSTED APPROPRIATELY.

4E. THE MAXIMUM RECOMMENDED DISTANCE(S) BETWEEN CHANNELIZING DEVICES SHOULD BE EQUAL IN FEET TO THE POSTED SPEED IN MILES PER HOUR ON TAPER(S) AND TWICE THE POSTED SPEED IN THE PARALLEL AREA(S).

5. FOR OVERNIGHT CLOSURES, TYPE III BARRICADES SHALL BE LIGHTED.

6. WHEN CALLED FOR IN THE FHWA ACCEPTANCE LETTER FOR THE SIGN SYSTEM SELECTED, THE TYPE A WARNING FLASHER, SHOWN ON THE WARNING SIGNS, SHALL BE POSITIONED ON THE SIDE OF THE SIGN NEAREST THE ROADWAY.

7. ALL TEMPORARY SIGNS, TYPE III BARRICADES, THEIR SUPPORT SYSTEMS AND LIGHTING REQUIREMENTS SHALL MEET NCHRP 350 CRASHWORTHLY REQUIREMENTS STIPULATED IN THE CURRENT EDITION OF THE MICHIGAN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, THE CURRENT EDITION OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION, THE STANDARD PLANS AND APPLICABLE SPECIAL PROVISIONS. ONLY DESIGNS AND MATERIALS APPROVED BY MDOT WILL BE ALLOWED.

8. WHEN BUFFER AREAS ARE ESTABLISHED, THERE SHALL BE NO EQUIPMENT OR MATERIALS STORED OR WORK CONDUCTED IN THE BUFFER AREA.

21. ALL EXISTING PAVEMENT MARKINGS WHICH ARE IN CONFLICT WITH EITHER PROPOSED CHANGES IN TRAFFIC PATTERNS OR PROPOSED TEMPORARY TRAFFIC MARKINGS, SHALL BE REMOVED BEFORE ANY CHANGE IS MADE IN THE TRAFFIC PATTERN. EXCEPTION WILL BE MADE FOR DAYTIME-ONLY TRAFFIC PATTERNS THAT ARE ADEQUATELY DELINEATED BY OTHER TRAFFIC CONTROL DEVICES.

26. THE LIGHTED ARROW PANEL SHALL BE LOCATED AT THE BEGINNING OF THE TAPER AS SHOWN. WHEN PHYSICAL LIMITATIONS RESTRICT ITS PLACEMENT AS INDICATED, THEN IT SHALL BE PLACED AS CLOSE TO THE BEGINNING OF THE TAPER AS POSSIBLE.

SIGN SIZES

DIAMOND WARNING - 48" x 48"
R2-1 REGULATORY - 48" x 60"
R5-18c REGULATORY - 48" x 48"

APX - C-12

NOT TO SCALE

MDOT Michigan Department of Transportation
TRAFFIC AND SAFETY
MAINTAINING TRAFFIC TYPICAL

TYPICAL TEMPORARY TRAFFIC CONTROL FOR A ONE-LANE CLOSURE ON AN UNDIVIDED MULTI-LANE ROADWAY, NO SPEED REDUCTION

DRAWN BY: CON:AE:djf	OCTOBER 2011	M0240a	SHEET 2 OF 2
CHECKED BY: BMM:CRB	PLAN DATE:		
FILE: PW RD/TS/Typicals/Signs/MT NON FWY/M0240a.dgn REV. 10/11/2011			

Meridian Township
Forest Hills Sewage Lift Station

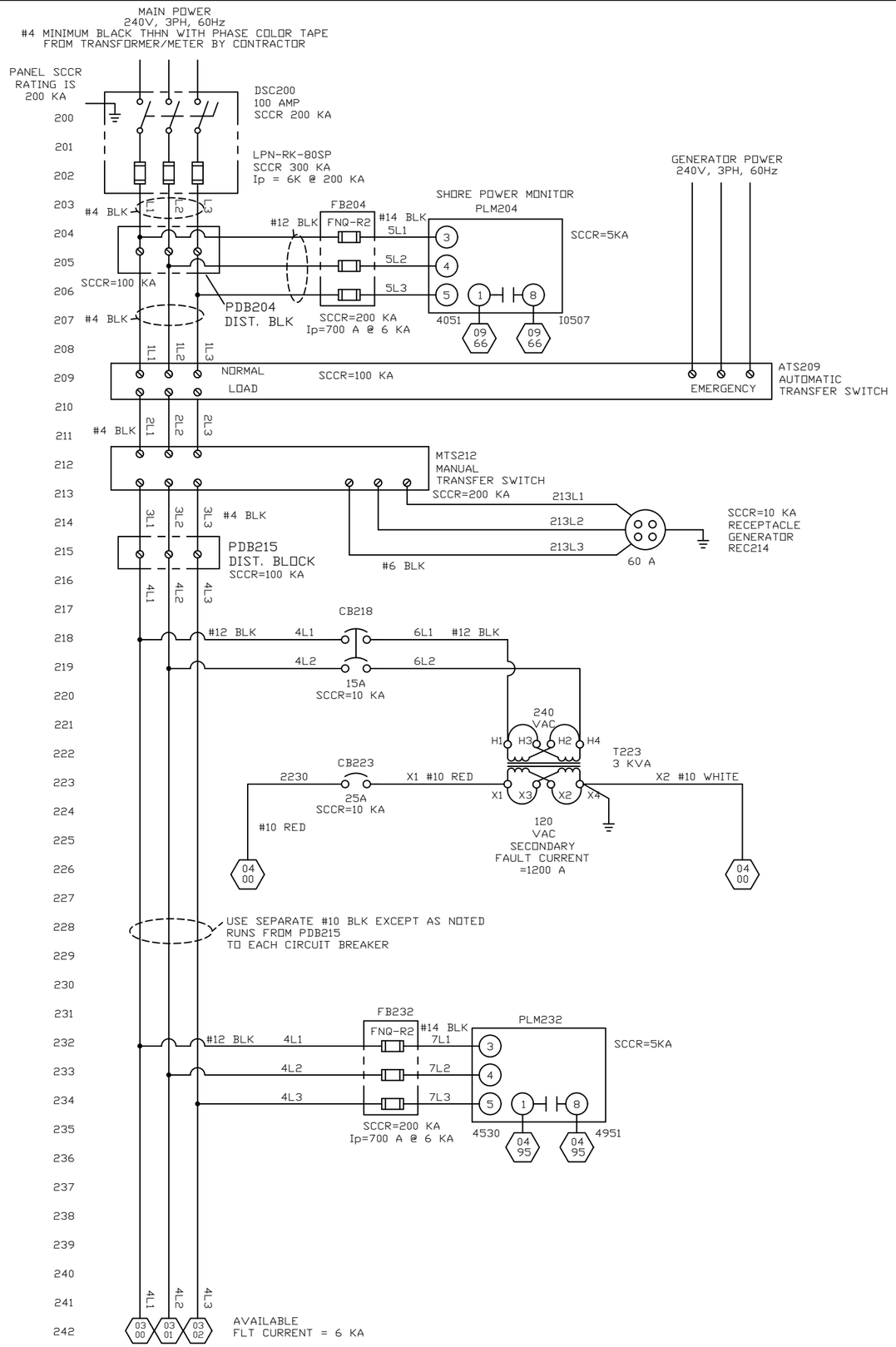
SHEET NO.	DESCRIPTION
1	INDEX
2	240 VAC WIRING
3	VFD WIRING
4	120VAC WIRING
5	TELEMETRY POWER & FLOAT SW. WIRING
6	COMPACTLOGIX RACK
7	COMPACTLOGIX POWER & ANALOG INPUTS
8	ISOLATED RELAY OUTPUTS & FPD
9	120V INPUTS
10	120V OUTPUTS
11	SPARE
12	PANEL LAYOUT - POWER DISTRIBUTION
13	PANEL LAYOUT - PLC AND CONTROLS
14	CONTROL PANEL BUTTON LAYOUT
15	STOCKLIST

APX D-1

REV	CHANGE
A	UPDATE SHEET 2 TO 240 VAC

IDC CORPORATION
5100 N. CANAL ROAD
DIMONDALE, MI 48821

FILE:14521-01.DWG	
JOB: 14521	DWG. TITLE FOREST HILLS
DATE:08/06/25	SEWAGE LIFT
DRAWN: BK	SHT. TITLE INDEX
CHECK: KRB	
PRELIM	REV. A SHT. 001 OF 015



APX D-2

IDC CORPORATION 5100 N. CANAL ROAD DIMONDALE, MI 48821	
FILE: 14521-02.DWG	
JOB: 14521	DWG. TITLE: FOREST HILLS
DATE: 07/16/25	SEWAGE LIFT
DRAWN: BK	SHT. TITLE: 3 PHASE POWER
CHECK: KRB	WIRING
PRELIM	REV. - SHT. 002 OF 015

SEE NOTE ON LINE 228

240 VAC 3 PH 60 HZ FROM SHT 1

AVAILABLE FLT CURRENT = 6 KA

02 42 4L1
02 42 4L2
02 42 4L3

SCCR=50 KA Ip=4 K @ 6 k

CB300 29A

8L1 8L2 8L3

#10 BLK #10 BLK

CON460

18L1 18L2 18L3

MTR TERM JBOX

CONDUCTOR NUMBER 1 2 3

PUMP CABLE OUTER JACKET

18L1 18L2 18L3 GRN/YEL

#10 VFD CABLE

FLYGT CONCERTOR PUMP/ VFD PACKAGE

P1

PUMP 1
5.5 HP TO 7.5 HP 16.8 FLA TO 22 FLA

NOTE: ALL LEADS IN THE PUMP CABLES MUST BE PREPARED AND CONNECTED AS SPECIFIED IN THE FLYGT CONCERTOR INSTALLATION AND OPERATION MANUAL

04 63 4530 — 4630 04 63

03 07
03 29

04 83 4831
04 82 4821

PHASES OK CR495 3081 3082

POWER ON DELAY TDR490

RUN PUMP 1 CR453 3101

PLC HI LVL CR1002 3121

P1 IN AUTO CR458 3122

CR564 HI LVL 3081

FLT RST CR1004 3131

TB9 0 VDC +24 VDC

TB6
DI1 RUN PUMP
DI2 HIGH SWITCH
DI3 ALARM ACKNOWLEDGE
GND

09 22 I0410
09 22 4051
09 23 I0411

DO1 PUMP RUN
DO2 ALARM
TB11

GW308
SUPPLIED BY OTHERS

03 06
PUMP CONTROL CABLE (2 SHIELDED PAIRS) TAPE OFF 2ND PAIR

CABLE 1
3091 RED
3102 BLK

TB12 T3 T4

MTR TERM JBOX

T3 T4

AO TB5

I1.1 I1.1C

07 61 07 63 PUMP 1 CURRENT

CABLE 1 (PC1) (2 SHIELDED PAIRS) TAPE OFF 2ND PAIR

TB10 DO4 COM NO

4530 4601 #16 RED

04 60 04 60 CONTACTOR ENABLE

ENET

FLYGT FPG414
IP ADDRESS: 10.10.10.10 (DEFAULT)
SUBNET MASK: 255.255.255.0

04 83 4831
04 82 4821

0 VDC +24 VDC

FLYGT
FOP402 HMI310
PUMP 1
IP ADDRESS: 10.10.10.20
SUBNET MASK: 255.255.255.0

ENET

SUPPLIED BY OTHERS

ENT316

DRIVE HMI COMMS WITH GATEWAY

Configure minimum HP of 5.5 and maximum of 7.5 HP
Configure DI1 for Call to Run
Configure DI2 for High Switch
Config. DO4 - Contactor Enable
Config. AO - Motor Current

SCCR=50 KA Ip=4 K @ 6 k

CB322 29A

L1 L2 L3

9L1 9L2 9L3

#10 BLK #10 BLK

CON473

19L1 19L2 19L3

MTR TERM JBOX

CONDUCTOR NUMBER 1 2 3

PUMP CABLE OUTER JACKET

19L1 19L2 19L3 GRN/YEL

#10 VFD CABLE

FLYGT CONCERTOR PUMP/ VFD PACKAGE

P2

PUMP 2
5.5 HP TO 7.5 HP 16.8 FLA TO 22 FLA

04 76 4350 — 4760 04 76

04 89 4891
04 88 4881

PHASES OK CR495 3301 3302

POWER ON DELAY TDR490

RUN PUMP 2 CR466 3321

PLC HI LVL CR1002 3341

P2 IN AUTO CR472 3342

TDR572 HI LVL 3301

FLT RST CR1004 3351

TB9 0 VDC +24 VDC

TB6
DI1 RUN PUMP
DI2 HIGH SWITCH
ALARM ACKNOWLEDGE
GND

09 24 I0412
09 24 4051
09 25 I0413

DO1 PUMP RUN
DO2 ALARM
TB11

GW330
SUPPLIED BY OTHERS

03 07
PUMP CONTROL CABLE (2 SHIELDED PAIRS) TAPE OFF 2ND PAIR

CABLE 2
3311 RED
3322 BLK

TB12 T3 T4

MTR TERM JBOX

T3 T4

AO TB5

I1.2 I1.2C

07 67 07 69 PUMP 2 CURRENT

CABLE 2 (PC2) (2 SHIELDED PAIRS) TAPE OFF 2ND PAIR

TB10 DO4 COM NO

4530 4731 #16 RED

04 73 04 73 CONTACTOR ENABLE

ENET

FLYGT FPG414
IP ADDRESS: 10.10.10.10 (DEFAULT)
SUBNET MASK: 255.255.255.0

04 89 4891
04 88 4881

0 VDC +24 VDC

FLYGT
FOP402 HMI327
PUMP 2
IP ADDRESS: 10.10.10.20
SUBNET MASK: 255.255.255.0

ENET

SUPPLIED BY OTHERS

ENT338

DRIVE HMI COMMS WITH GATEWAY

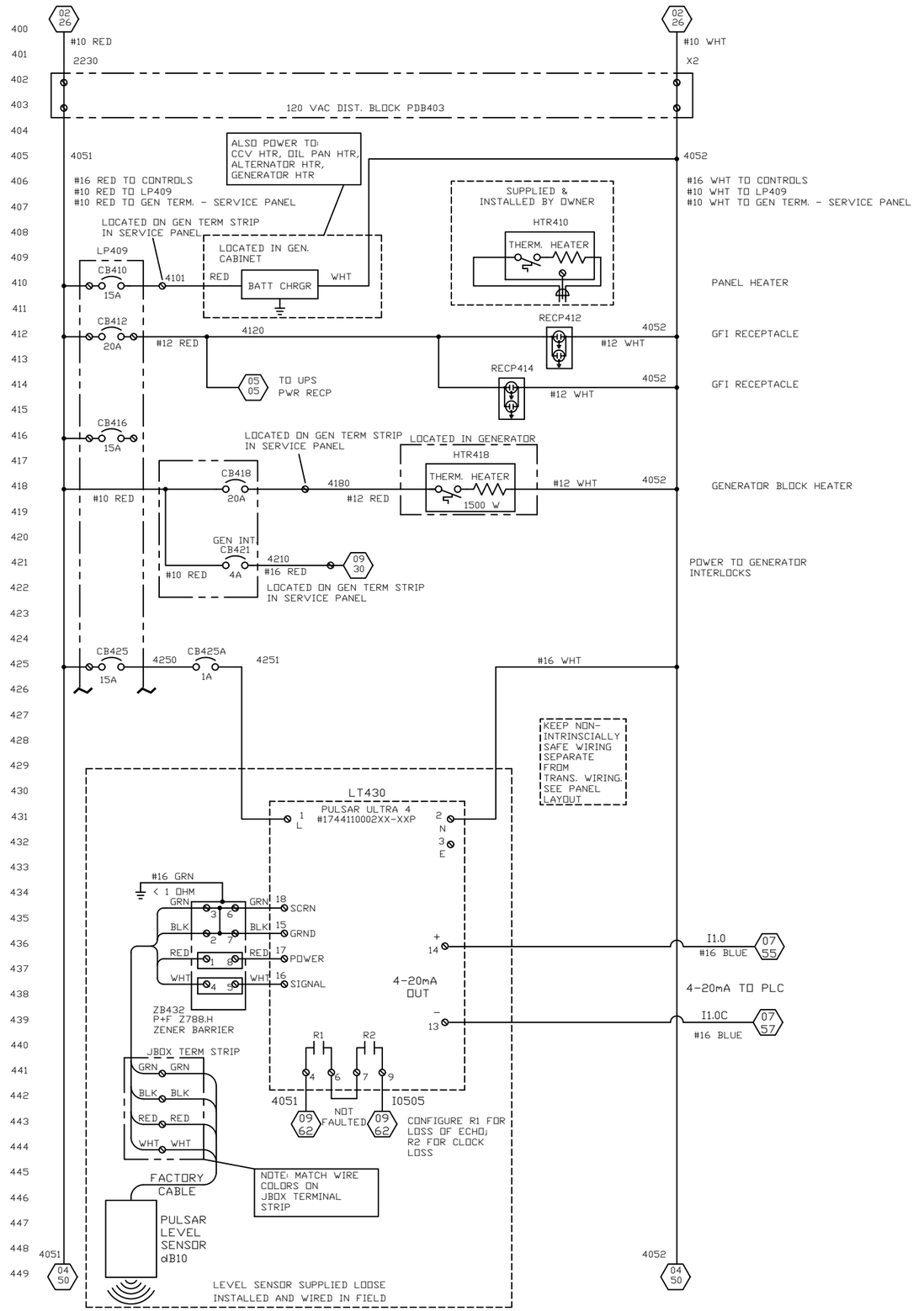
Configure minimum HP of 5.5 and maximum of 7.5 HP
Configure DI1 for Call to Run
Configure DI2 for High Switch
Config. DO4 - Contactor Enable
Config. AO - Motor Current

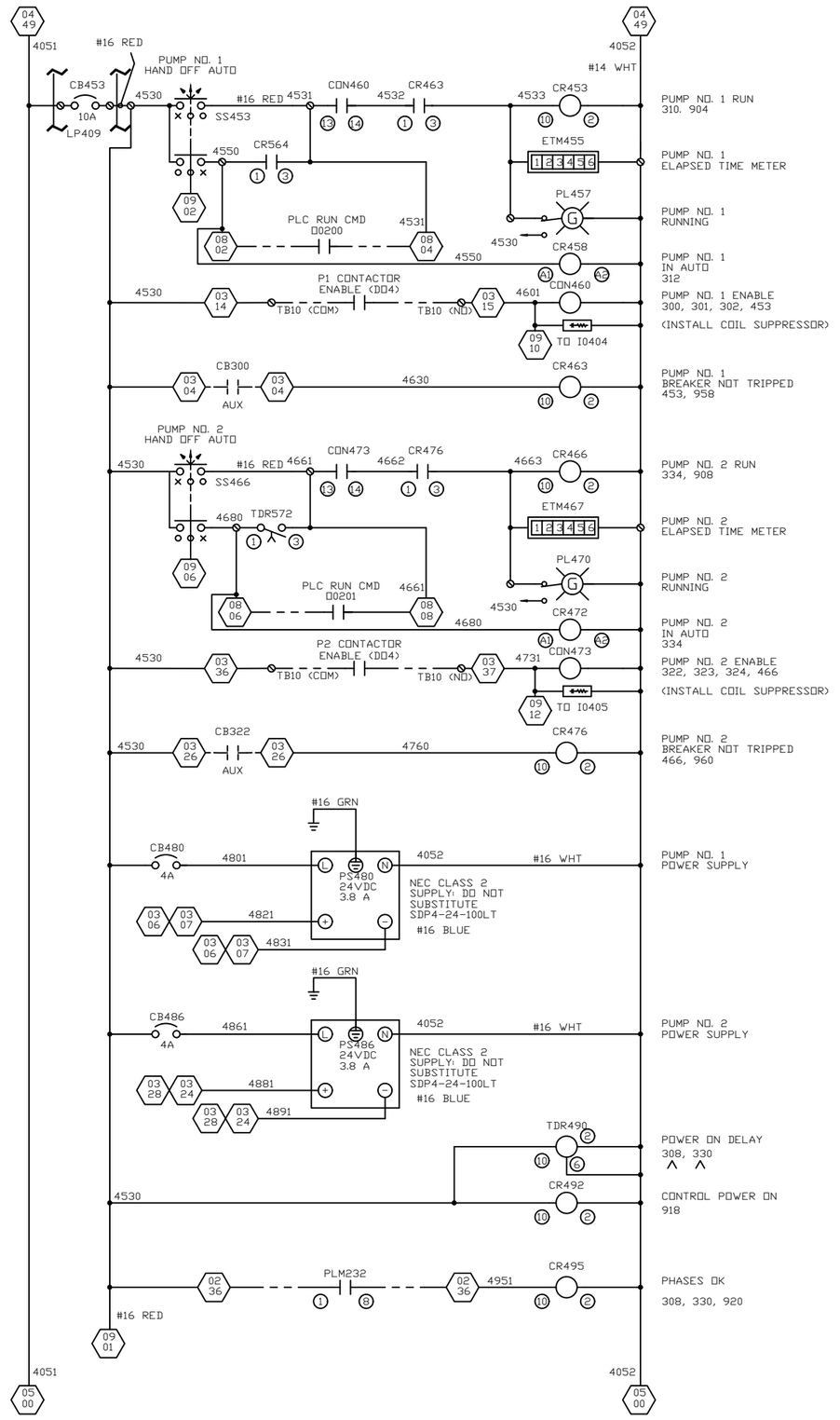
NOTE: MOTOR WIRING BETWEEN CONTACTORS AND REMOTE TERMINAL BOX MUST USE #10 AWG SHIELDED VFD CABLE

APX D-3

IDC CORPORATION
5100 N. CANAL ROAD
DIMONDALE, MI 48821

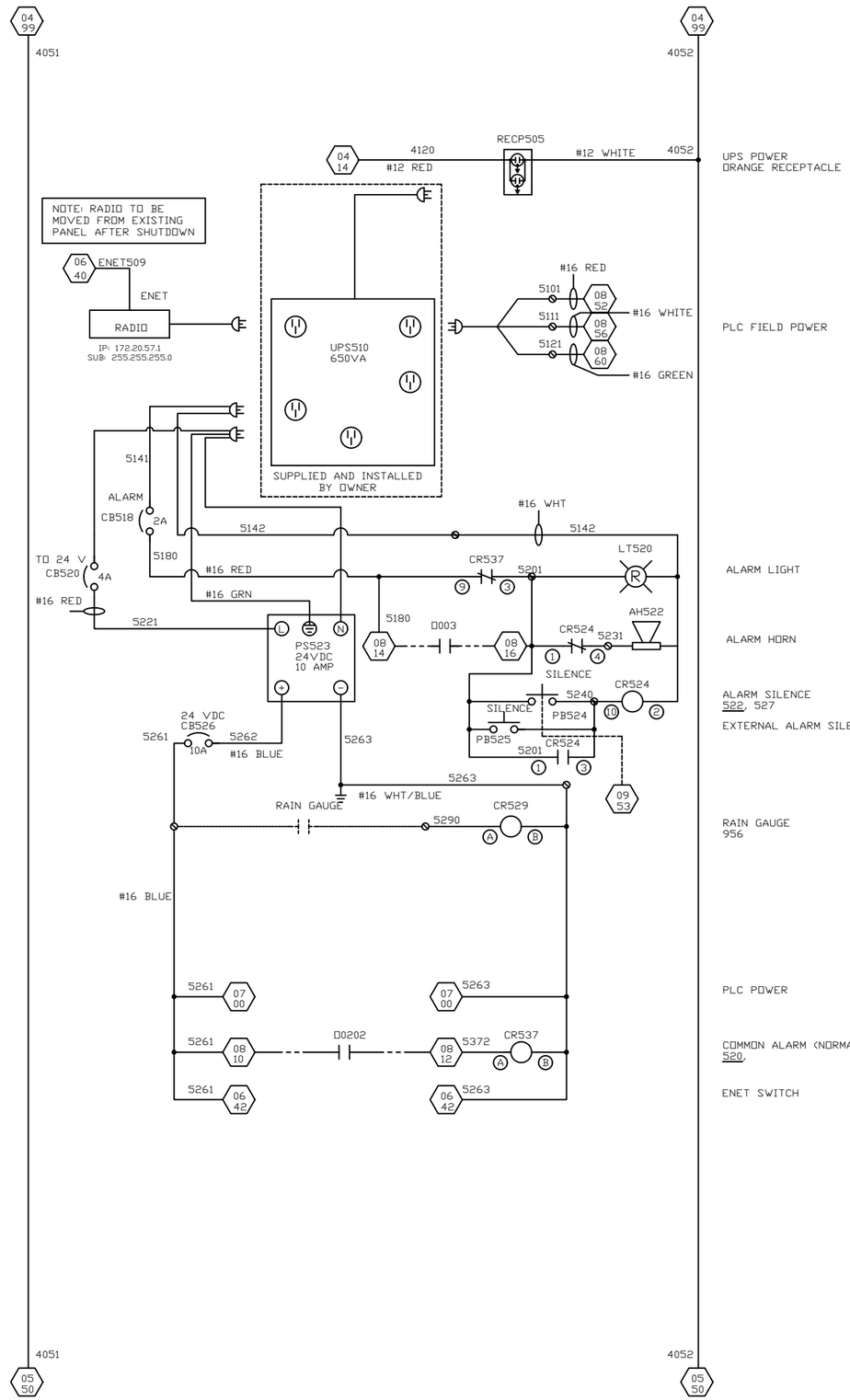
FILE: 14521-03.DWG	
JOB: 14521	DWG. TITLE MERIDIAN TWP
DATE: 07/16/25	FOREST HILLS PUMP STA.
DRAWN: BK	SHT. TITLE VFD WIRING
CHECK: KRB	
PRELIM	REV. - SHT. 003 OF 015

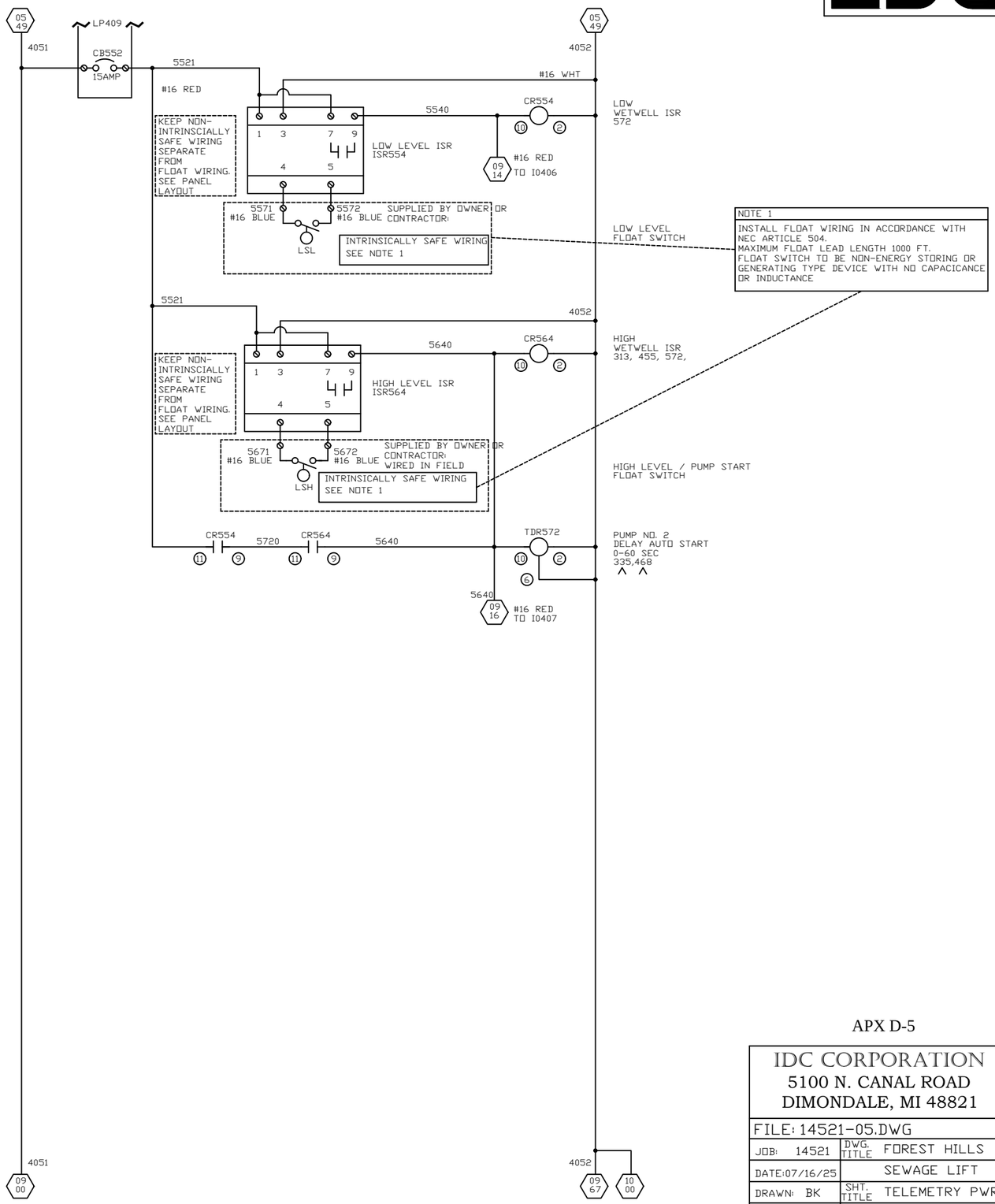




APX D-4

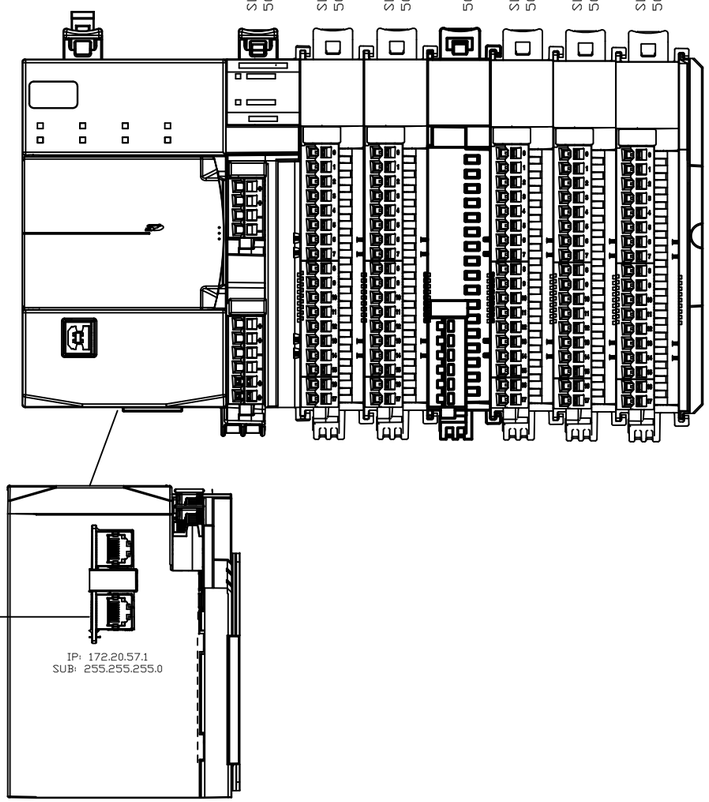
IDC CORPORATION 5100 N. CANAL ROAD DIMONDALE, MI 48821	
FILE: 14521-04.DWG	
JOB: 14521	DWG. TITLE: FOREST HILLS
DATE: 07/16/25	SEWAGE LIFT
DRAWN: BK	SHT. TITLE: 120VAC POWER
CHECK: KRB	WIRING
PRELIM	REV. - SHT. 004 OF 015

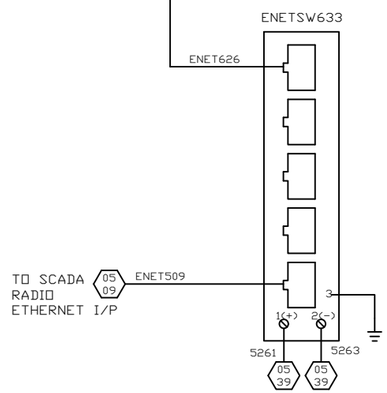




APX D-5

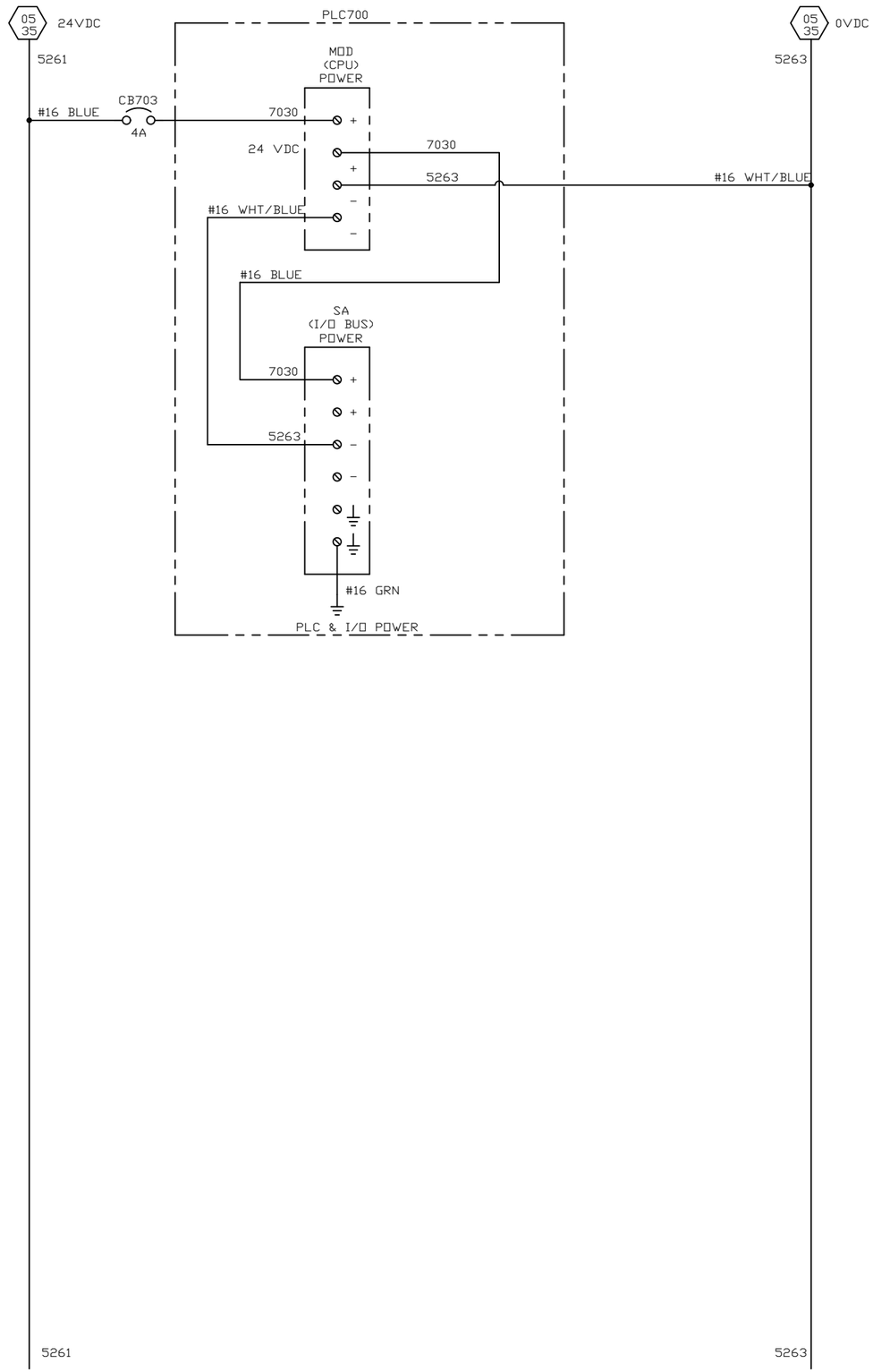
IDC CORPORATION 5100 N. CANAL ROAD DIMONDALE, MI 48821		
FILE: 14521-05.DWG		
JOB: 14521	DWG. TITLE	FOREST HILLS
DATE: 07/16/25		SEWAGE LIFT
DRAWN: BK	SHT. TITLE	TELEMETRY PWR
CHECK: KRB		WIRING
PRELIM	REV. -	SHT. 005 OF 015

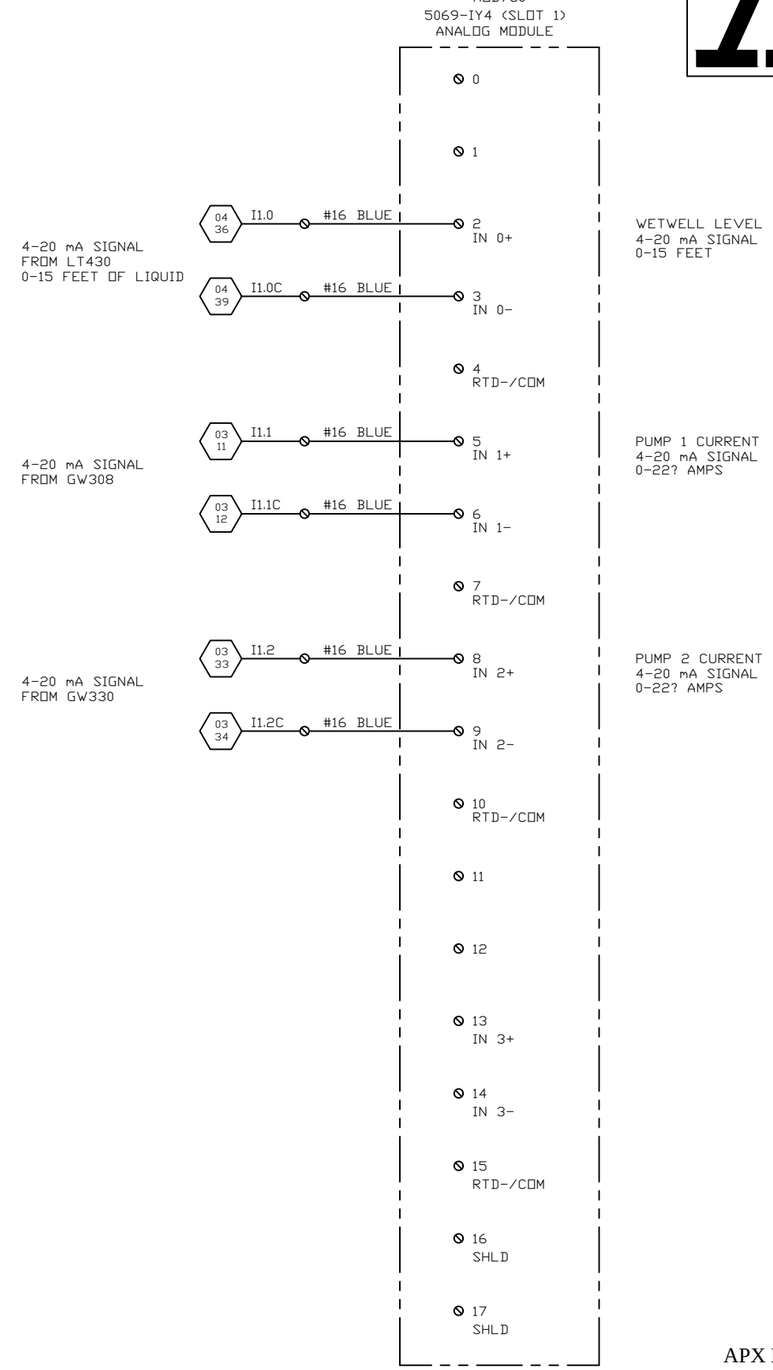




APX D-6

IDC CORPORATION 5100 N. CANAL ROAD DIMONDALE, MI 48821		
FILE: 14521-06.DWG		
JOB: 14521	DWG. TITLE	FOREST HILLS
DATE: 07/16/25		SEWAGE LIFT
DRAWN: BK	SHT. TITLE	COMPACTLOGIX
CHECK: KRB		RACK
PRELIM	REV. -	SHT. 006 OF 015

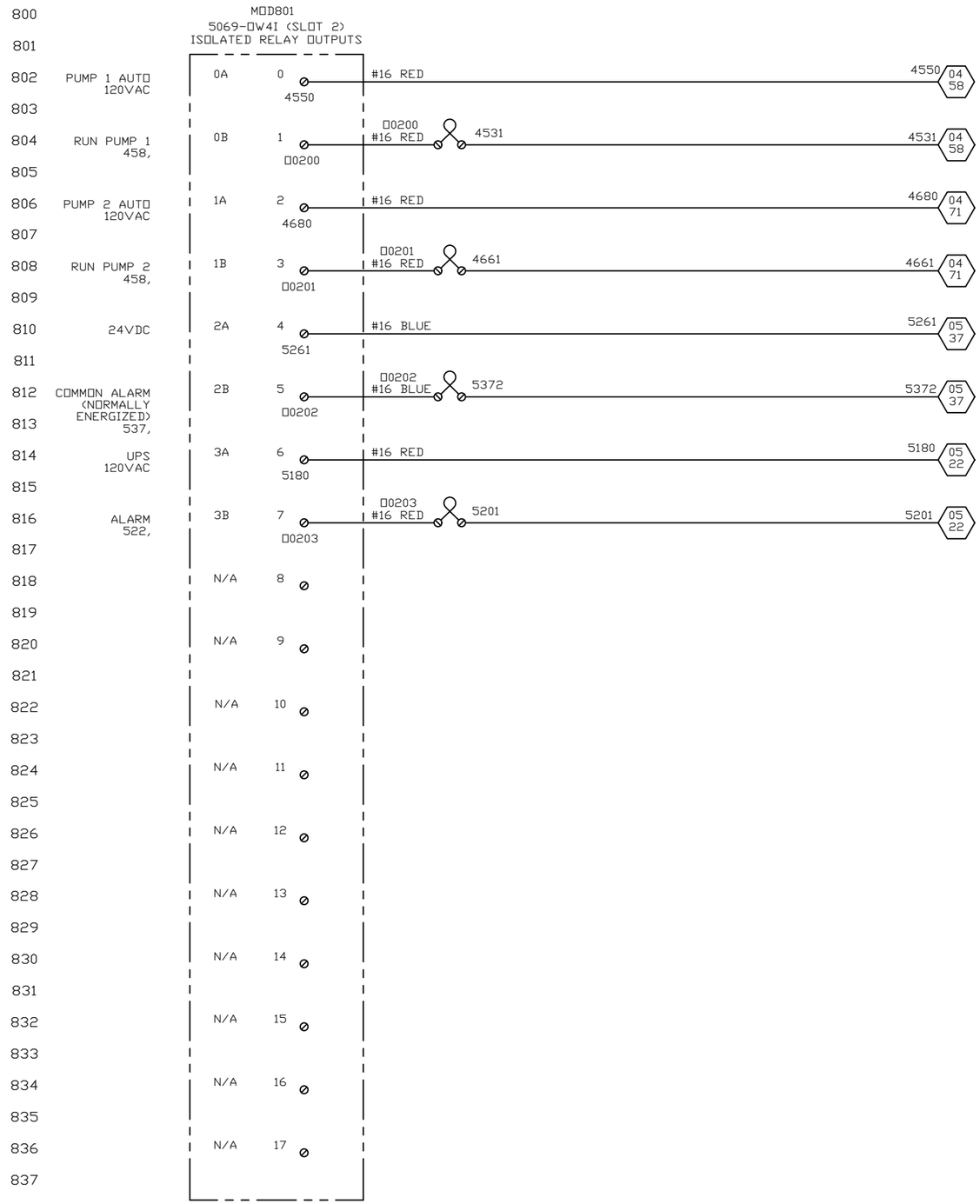


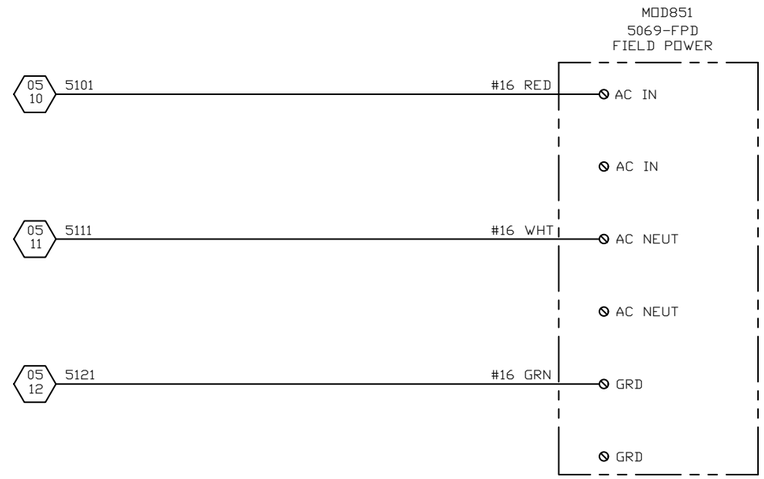


APX D-7

IDC CORPORATION
5100 N. CANAL ROAD
DIMONDALE, MI 48821

FILE: 14521-07.DWG	
JOB: 14521	DWG. TITLE MERIDIAN TWP
DATE:07/16/25	FOREST HILLS PUMP STA.
DRAWN: BK	SHT. TITLE COMPACTLOGIX POWER
CHECK: KRB	& ANALOG INPUT
PRELIM	REV. – SHT. 007 OF 015





APX D-8

IDC CORPORATION
5100 N. CANAL ROAD
DIMONDALE, MI 48821

FILE: 14521-08.DWG	
JOB: 14521	DWG. TITLE FOREST HILLS
DATE:07/16/25	SEWAGE LIFT
DRAWN: BK	SHT. TITLE ISOLATED RELAY
CHECK: KRB	OUTPUTS & FPD
PRELIM	REV. - SHT. 008 OF 015

MOD901
5069-IA16 (SLOT 3)
120 VAC INPUTS

0	IO300	IN 0	PUMP 1 AUTO	4530 — H-O-A (04 57) — SS453
1	IO301	IN 1	PUMP 1 RUN	4051 — CR453 (11)(9)
2	IO302	IN 2	PUMP 2 AUTO	4530 — H-O-A (04 70) — SS466
3	IO303	IN 3	PUMP 2 RUN	4051 — CR466 (11)(9)
4	IO304	IN 4	PUMP 1 NO ALARM	(04 62) 4601 #16 RED
5	IO305	IN 5	PUMP 2 NO ALARM	(04 75) 4731 #16 RED
6	IO306	IN 6	LOW LEVEL FLOAT PUMPS STOP	(05 56) 5540 #16 RED
7	IO307	IN 7	HIGH LEVEL FLOAT PUMPS START	(05 75) 5640 #16 RED
8	IO308	IN 8	CONTROL POWER	4051 — CR492 (1)(3)
9	IO309	IN 9	PHASE MONITOR	4051 — CR495 (6)(7)
10	IO310	IN 10	PUMP 1 RUNNING	4051 — PUMP 1 CONTROL (03 16)(03 15)
11	IO311	IN 11	PUMP 1 ALARM	(03 17)
12	IO312	IN 12	PUMP 2 RUNNING	4051 — PUMP 2 CONTROL (03 38)(03 37)
13	IO313	IN 13	PUMP 2 ALARM	(03 39)
14	IO314	IN 14	GENERATOR RUNNING	(04 21) 4210 — INTERLOCKS FROM GENERATOR CONTROL — RUNNING
15	IO315	IN 15	GENERATOR FAULT	FAULT
16	NO CONN			
17	NO CONN			

#16 RED — (09 50)

MOD951
5069-IA16 (SLOT 4)
120 VAC INPUTS

0	IO400	IN 0	SPARE
1	IO401	IN 1	FAULT RESET
2	IO402	IN 2	RAIN GUAGE
3	IO403	IN 3	PUMP 1 BREAKER NOT TRIPPED
4	IO404	IN 4	PUMP 2 BREAKER NOT TRIPPED
5	IO404	IN 5	LEVEL TRANSMITTER NOT FAULTED
6	IO405	IN 6	SPARE
7	IO407	IN 7	SHORE POWER OK
8	IO408	IN 8	SPARE
9	IO409	IN 9	SPARE
10	IO410	IN 10	SPARE
11	IO411	IN 11	SPARE
12	IO412	IN 12	SPARE
13	IO413	IN 13	SPARE
14	IO414	IN 14	SPARE
15	IO415	IN 15	SPARE
16	NO CONN		
17	NO CONN		

#16 RED — (09 42)

4051 — FAULT RESET — PB953 — (05 28) PB524

4051 — CR529 (7)(4)

4051 — CR463 (7)(4)

4051 — CR476 (7)(4)

4051 — (04 43) R1 (4)(6) LT430 R2 (7)(9) (04 43)

4051 — (02 07) PLM204 (1)(8) (02 07) — PL967 (G) — 4051 — 4052 #16 WHT (05 99)

APX D-9

IDC CORPORATION
5100 N. CANAL ROAD
DIMONDALE, MI 48821

FILE: 14521-09.DWG		
JOB: 14521	DWG. TITLE	FOREST HILLS
DATE: 07/18/25		SEWAGE LIFT
DRAWN: BK	SHT. TITLE	COMPACTLOGIX
CHECK: KRB		120V INPUTS
PRELIM	REV. -	SHT. 009 OF 015

MOD1001
5069-OA16 (SLOT 5)
120 VAC OUTPUTS

PLC HI LVL	OUT 0	0	O0500	#16 RED	O0500	CR1002 (10)(2)	4052 PLC HI LVL 312, 334
FAULT RESET	OUT 1	1	O0501	#16 RED	O0501	CR1004 (10)(2)	4052 FAULT RESET 313, 335
SPARE	OUT 2	2	O0502				
SPARE	OUT 3	3	O0503				
SPARE	OUT 4	4	O0504				
SPARE	OUT 5	5	O0505				
SPARE	OUT 6	6	O0506				
SPARE	OUT 7	7	O0507				
SPARE	OUT 8	8	O0508				
SPARE	OUT 9	9	O0509				
SPARE	OUT 10	10	O0510				
SPARE	OUT 11	11	O0511				
SPARE	OUT 12	12	O0512				
SPARE	OUT 13	13	O0513				
SPARE	OUT 14	14	O0514				
SPARE	OUT 15	15	O0515				
	NO CONN	16					
	NO CONN	17					

#16 WHT (05/99)

NOTE: SHEET 11 SPARE

APX D-10

IDC CORPORATION
5100 N. CANAL ROAD
DIMONDALE, MI 48821

FILE: 14521-10.DWG	
JOB: 14521	DWG. TITLE: FOREST HILLS
DATE: 07/18/25	SEWAGE LIFT
DRAWN: BK	SHT. TITLE: COMPACTLOGIX
CHECK: KRB	120V OUTPUTS
PRELIM	REV. - SHT. 010 OF 015

INSTALL DRIP KIT PER MANUFACTURER'S INSTRUCTIONS

DSC200 Main Service Disconnect Switch

SERVICE ENTRANCE SEE DWG SHT 14521-12 FOR CONNECTIONS BETWEEN LEVEL CONTROL AND SERVICE ENTRANCE

ETCHED ALUMINUM TAG LOCATED ON DOOR OF EXTERIOR PANEL

NOTE: ENCLOSURE EXTERIOR TO BE PAINTED RAL6021 GREEN

FOREST HILLS SERVICE ENTRANCE PANEL

MANUFACTURED BY IDC CORPORATION
UL FILE: E122737
JOB #14521, SERIAL #14521, DWG SET #14521
240 VAC, 3 PHASE, 60 HZ, 56 FLA
LARGEST MOTOR 7.5 HP
200 KA INTERRUPTING CAPACITY
TYPE 3R ENCLOSURE

INSTALL TAGS ON OUTSIDE PANEL DOOR

SERVICE ENTRANCE DSC200
7" DEEP

WARNING: REPLACE ONLY WITH TYPE AND RATING OF FUSE SHOWN ON PRINT AND CURRENTLY INSTALLED

42"

21"

27"

NEMA 1

AUTOMATIC TRANSFER SWITCH ATS209

SUPPLIED BY OTHERS

NOTE: SERVICE ENTRANCE & GEN. WIRING BY OTHERS

THIS DEVICE NOT TO SCALE

MANUAL TRANSFER SWITCH DTU323 MTS212
7" DEEP

PLM204FB204

TIME-MARK 2 POLE SOCKET 30A120

PDB204 16321 DIST. BLOCK

REC214 60 A

INSTALL DOOR STOP KIT PER MANUFACTURER'S DIRECTIONS (TWO PLACES)

INSTALL DOOR STOP KIT PER MANUFACTURER'S DIRECTIONS (TWO PLACES)

GEN TERM
J35
J35

CB418
CB421

INSTALL DRAIN/ BREATHER TWO PLACES.

SCE 60X42X16 INCH PANEL NEMA 12/3R

CONDUIT THROUGH LEGS. (TYP.)

GEN TERM SPARE
4052
4052
4180 (CB)
4210 (CB)
I0414
I0415
4101
SPARE

DANGER - HOT WITH TRANSFER SWITCH IN OFF POSITION

INSTALL TAG WITH RED BACKGROUND ON DOOR OF BOX

ALL FIELD WIRING TO BE STRANDED COPPER RATED 75 C MINIMUM

INSTALL PRINTED TAG ON BACKPLATE

INSTALL ON OUTSIDE OF RIGHT DOOR NEAR BOTTOM

ALL CONDUIT HUBS AND FITTINGS SHALL BE OF THE SAME ENVIRONMENTAL RATING AS THE TYPE 3R ENCLOSURE

ETCHED TAG

NOTE: 12" LEG KITS SHOWN

60"

MERIDIAN TWP FOREST HILLS PANEL LAYOUT 1
SERVICE ENTRANCE SIDE OF PANEL - MOUNT BACK TO BACK
WITH CONTROL PANEL ON UNISTRUT RACK OR LEG KITS

INSTALL UL508A TAG ON RIGHT DOOR, INSIDE, NEAR TOP

WIRING BETWEEN PANELS		
240 VAC		
Grd	#6 GRN	
3L1	#4 BLK	
3L2	#4 BLK	
3L3	#4 BLK	
120 VAC		
4052	#10 WHT	TO GEN TRM
4051	#10 RED	TO GEN TRM
I0414	#16 RED	
I0415	#16 RED	
4101	#16 RED	
SP1	#16 RED	
SP2	#16 RED	
SP3	#16 RED	
SP4	#16 RED	

INSTALL ON INSIDE OF L.H. EXTERIOR DOOR

PRINTED TERMINAL TORQUE TAG

GEN INTERLOCK HARNESS	GEN POWER HARNESS
4101 #12 RED 4052 #12 WHT 4180 #12 RED SPARE #16 RED 4210 #16 RED I0414 #16 RED I0415 #16 RED SPARE #16 RED	PH1 #4 BLACK PH2 #4 BLACK PH3 #4 BLACK GRD #4 BLACK USE STANDARD COLOR TAPE BANDS TO MARK PHASING
SUPPLIED AND INSTALLED BY CONTRACTOR	SUPPLIED AND INSTALLED BY CONTRACTOR

APX D-11

NOTE: SHEET 11 SPARE

IDC CORPORATION
5100 N. CANAL ROAD
DIMONDALE, MI 48821

FILE: 14521-12.DWG		
JOB: 14521	DWG. TITLE	FOREST HILLS
DATE:09/02/25		SEWAGE LIFT
DRAWN: BK	SHT. TITLE	PANEL LAYOUT
CHECK: KRB		PWR DISTRIBUTION
PRELIM	REV. A	SHT. 012 OF 015

INSTALL DRIP KIT PER MANUFACTURER'S INSTRUCTIONS

LABEL LEFT HAND DOOR
MOTOR CONTROLS

PRINTED TAG MOUNTED NEAR FUSE BLOCK

WARNING: REPLACE ONLY WITH TYPE AND RATING OF FUSE SHOWN ON PRINT AND CURRENTLY INSTALLED

LT520

ALARM LIGHT ON TOP OF ENCL.

PUMP LTS & SS IN PANEL DOOR SEE SHEET 14

LEVEL CONTROL SECTION SEE DWG SHT 14521-12 FOR CONNECTIONS BETWEEN LEVEL CONTROL AND SERVICE ENTRANCE

ENGRAVED TAG LOCATED ON DOOR OF EXTERIOR PANEL

NOTE: ENCLOSURE EXTERIOR TO BE PAINTED RAL6021 GREEN

FIELD TERMINAL JBOX

3 KVA XFORMER T223

16321 PDB215 PWR DIST. BLOCK

3P CB300 AUX

3P CB322 AUX

FB232

TYPE MARK B-PIN SOCKET

PLM232

CDN 460

CDN 473

TDR 490

CR 495

CR 1002

CR 1004

CR 458

CR 472

2X3 WIREWAY

CB480

SOLA 24VDC SIP4-24-100LT PS480

GW 308

CR 453

CR 463

1 X 3 WIREWAY

CB486

SOLA 24VDC SIP4-24-100LT PS486

GW 330

CR 466

CR 476

2 X 3 WIREWAY

1 X 3 WIREWAY

CB218 CB223

LP409
LOAD CENTER

CB410
CB412
CB416
CB425
CB453
CB552

PDB403 DIST. BLOCK
1323580

ENETSW633

CB703

PLC
5069-L306ER

ANALOG INPUT (SLOT 1)
ISOL. RLY OUT (SLOT 2)
FIELD POWER DIST.
120 VAC IN (SLOT 3)
120 VAC IN (SLOT 4)
120 VAC OUT (SLOT 5)
TERMINATOR

2X3 WIREWAY

CR 492
CR 524
CR 554
CR 564
TDR 572

CB518,520 425A

1X3 WIREWAY

1.5 X 3 WIREWAY

CR529
CR537

SOLA 24VDC SDN10-24-100C PS523

CB526

24 VDC TERM.

RADIO

SEE SHELF DETAIL ON SHT 14

1X3 WIREWAY

(65) 120 VAC TERM.

1X3 WIREWAY

AH522

3"

NOTE: SCRAPE PAINT UNDER BUS

GRD LUG/ BUS

RECP505
ORNG DPLX

DO NOT PLUG POWER TOOLS INTO THIS OUTLET

PRINTED TAG ON DOOR BY OUTLET

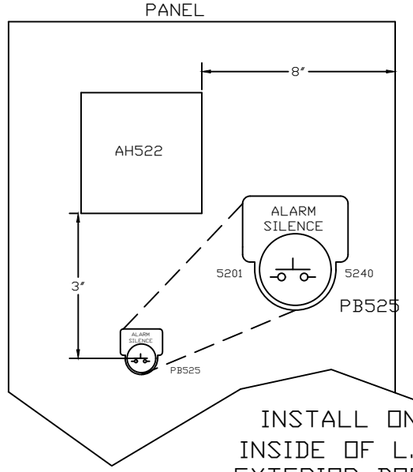
NOTE: RADIO TO BE MOVED INTO THIS PANEL FROM THE EXISTING PANEL AT THE SITE WHEN READY FOR OPERATION

120 VAC TERM LIST
4051
4051
4052
4052
4052
4052
4052
4052
4120
4120
4530
4530
4530
4531
4533
4550
4601
4661
4663
4680
4731
GND
5142
5101
5111
5121
5201
5231
5240
5521
5540
5640
SPARE
I0300
I0301
I0302
I0303
I0304
I0305
I0306
I0307
I0308
I0309
I0310
I0311
I0312
I0313
I0314
I0315
SPARE
I0401
I0402
I0403
I0404
I0405
SPARE
I0407
O0200
O0201
O0203
O0600
O0601
SPARE
SPARE
SPARE

24 VDC TERM LIST
5261
5261
5261
5263
5263
5263
5290
5372
O0202
SPARE
I1.0
I1.0C
I1.1
I1.1C
I1.2
I1.2C

FLOAT TERM LIST
5571
5572
5671
5672

RIGHT END VIEW OF PANEL



INSTALL ON INSIDE OF L.H. EXTERIOR DOOR

PRINTED TERMINAL TORQUE TAG

UPS510

HTR410
950 W HEATER & T'STAT

RCP412 RCP414

PRINTED TAG
GFCI RCPTS. FOR INTERNAL USE ONLY

GFCI DPLX

GFCI DPLX

ALL FIELD WIRING TO BE STRANDED COPPER RATED 75 C MINIMUM

INSTALL PRINTED TAG ON BACKPLATE

INSTALL DOOR STOP KIT PER MANUFACTURER'S DIRECTIONS (TWO PLACES)

INSTALL DRAIN/ BREATHER TWO PLACES.

CONDUIT THROUGH LEGS. (TYP).

GROUNDED METAL BARRIER

FLOAT TERM

ISR 554

ISR 564

2"

2"

INTRINSICALLY SAFE FIELD WIRING TERMINALS INSTALL IN ACCORDANCE WITH NEC ARTICLE 504 WARNING - SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY

INTRINSICALLY SAFE FIELD WIRING TERMINALS INSTALL IN ACCORDANCE WITH NEC ARTICLE 504 WARNING - SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY

PRINTED TAG: RED BACKGROUND W/ BLACK TEXT

WHITE BACKGROUND W/ BLACK TEXT

PROVIDES INTRINSICALLY SAFE CIRCUIT EXTENSIONS FOR USE IN CLASS I, GROUPS A,B,C & D HAZARDOUS LOCATIONS WHEN CONNECTED PER WIRING DIAGRAM, 14521 - SHTS 4 & 5 INCLUDED IN PANEL

RED BACKGROUND W/ WHITE TEXT

WARNING - TO PREVENT IGNITION OF FLAMMABLE GASES OR COMBUSTIBLE ATMOSPHERES, DISCONNECT POWER BEFORE SERVICING

INSTALL ON EXTERIOR DOOR

ALL CONDUIT HUBS AND FITTINGS SHALL BE OF THE SAME ENVIRONMENTAL RATING AS THE TYPE 3R ENCLOSURE

INSTALL ON OUTSIDE OF LEFT DOOR NEAR BOTTOM

ENGRAVED TAG

NOTE: 12" LEG KITS SHOWN

SCE 60X42X16 INCH PANEL NEMA 12/3R

42"

30"

60"

MERIDIAN TWP FOREST HILLS PANEL LAYOUT 2
CONTROL SIDE OF PANEL - MOUNT BACK TO BACK
WITH SERVICE ENTRANCE ON UNISTRUT RACK OR LEG KITS

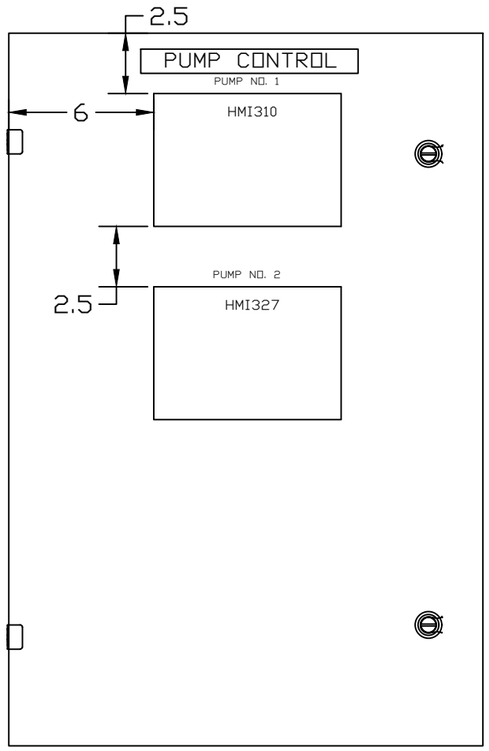
APX D-12

INSTALL UL508A TAG ON RIGHT DOOR, INSIDE, NEAR TOP

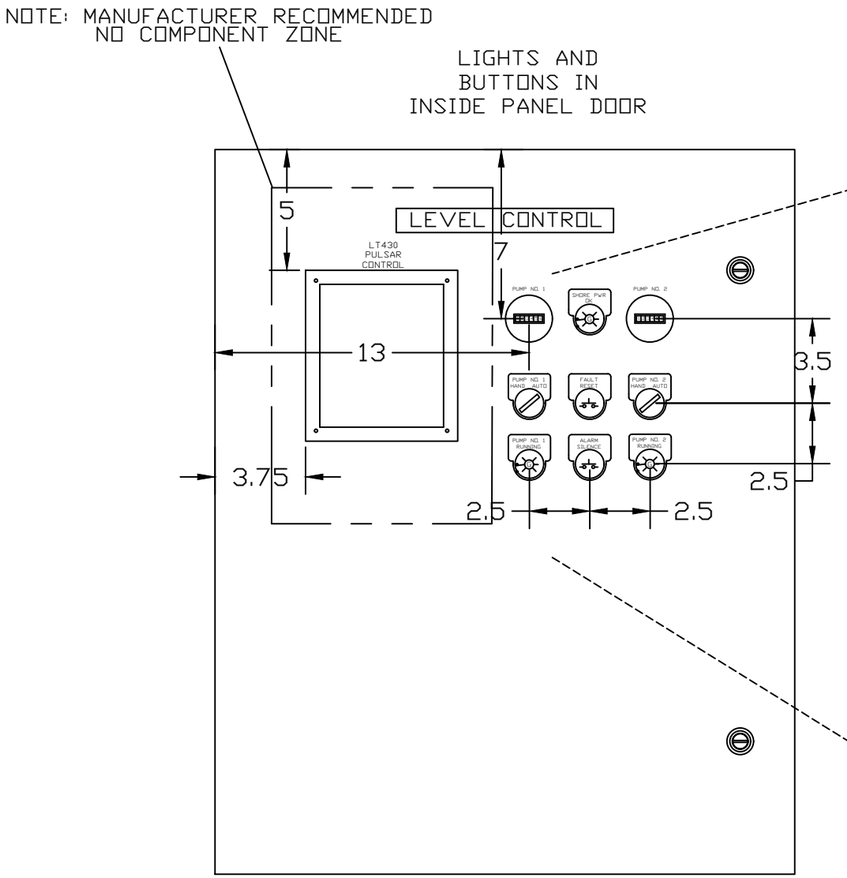
REV	CHANGE
A	UPDATE TAGS

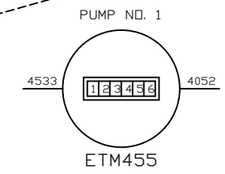
IDC CORPORATION
5100 N. CANAL ROAD
DIMONDALE, MI 48821

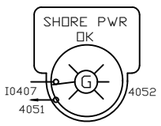
FILE: 14521-13.DWG	
JOB: 14521	DWG. TITLE: FOREST HILLS
DATE: 07/25/25	SEWAGE LIFT
DRAWN: BK	SHT. TITLE: PANEL LAYOUT
CHECK: KRB	PLC AND CONTROLS
PRELIM	REV. A SHT. 013 OF 015

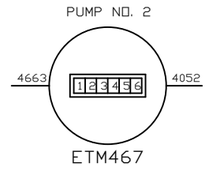


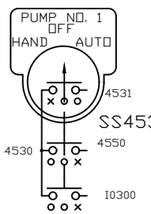
NOTE: ALL LEADS IN THE PUMP CABLES MUST BE PREPARED AND CONNECTED AS SPECIFIED IN THE FLYGT CONCERTOR INSTALLATION AND OPERATION MANUAL

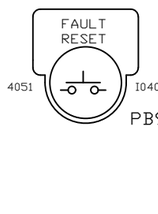


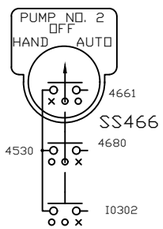


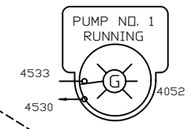


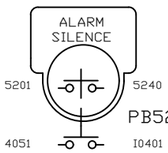


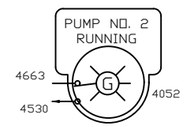


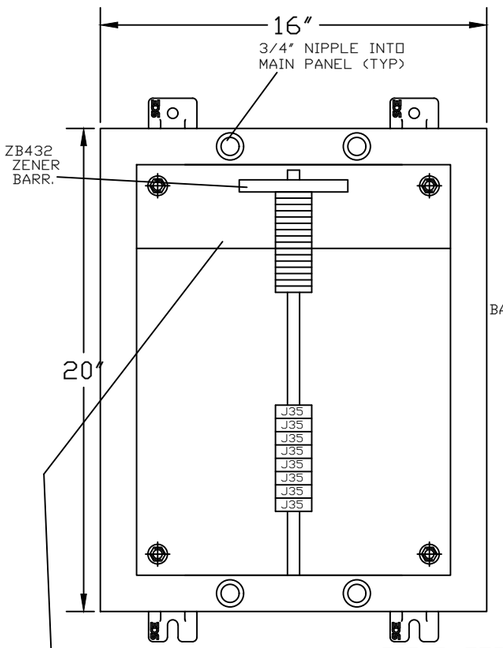






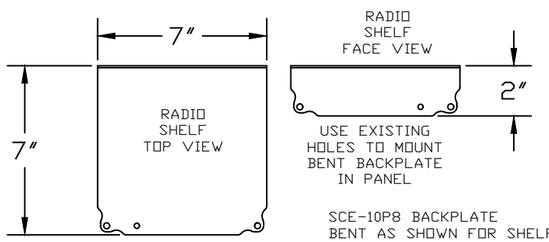






TERM LIST	
RED	INTRINSICALLY SAFE - SEPARATE CONDUITS
WHT	
BLK	
GRN	
5571	
5572	
5671	
5672	
BARRIER GND (JG4)	
3091	1492-HM1 SHIELDED PAIR CABLES - SEPARATE CONDUIT
3102	
SHLD	
3311	
3322	
SHLD	
SPARE	
1T1	MOTOR LEADS: VFD SHIELDED CABLE RUN THROUGH SEPARATE CONDUIT 1492-J35
1T2	
1T3	
GRD	
2T1	
2T2	
2T3	
GRD	

RADIO SHELF DETAIL



APX D-13

REV	CHANGE
A	UPDATE JUNCTION BOX SIZE

IDC CORPORATION
5100 N. CANAL ROAD
DIMONDALE, MI 48821

FILE: 14521-14.DWG	
JOB: 14521	DWG. TITLE: FOREST HILLS
DATE: 07/25/25	SEWAGE LIFT
DRAWN: BK	SHT. TITLE: INTERIOR PANEL
CHECK: KRB	BUTTON LAYOUT
PRELIM	REV. A — SHT. 014 OF 015

Qty	Part #	Description	Designation
2	SCE-426016WFALP	Saginaw Controls dual rated 12/3R enclosure painted RAL6021	
2	SCE-60BFP42	Saginaw Controls Backplate (White)	
4	SCE-BVK	Saginaw Controls Breather Kit	
2	SCE-DS60N4	Saginaw Controls Drip Kit painted RAL6021	
2	SCE-FK1216	Saginaw Controls 12" Floor Stand Kit Painted RAL6021	
4	SCE-DSTOPK	Saginaw Controls Door stop kit	
1	SCE-30EL2010LP	Saginaw Controls Enclosure Ansi 61 Gray	
1	SCE-30P20	Saginaw Controls Backplate (White)	
1	SCE-30EL2412LP	Saginaw Controls Enclosure Ansi 61 Gray	
1	SCE-30P24	Saginaw Controls Backplate (White)	
1	SCE-20H1606LP	Saginaw Controls Enclosure Painted RAL6021	
1	SCE-20P16	Saginaw Controls Backplate (White)	
1	SCE-10P8	Saginaw Controls Backplate (White)	
2	D866IS	Hoffman Instrumentation Enclosure	
2	A8P6	Hoffman Backplate	
1	A10086CH	Hoffman CH box	
1	A10P8	Hoffman Backplate	
1	03059.9-00	Thermal Edge CR 030 950 W Heater 6.3 W x 7.2 L x 3.9 H	HTR410
1	VH323N	Sq D 100 A Fusible Disconnect with viewing window	DSC200
1	RFK10	Class R Rejection Kit	DSC200
1	GTK03	Sq D Ground Kit	DSC200
1	DTU323	Sq. D transfer switch 100 A, 240 VAC, 3 phase	MTS212
1	SN0310	SQ D Solid Neutral assembly	MTS212
1	AR642-S22	Crouse Hinds 60 A, 240 V, 4 wire Gen. Recp.	REC214
2	16321-3	Bussmann Power Distribution block	PDB204, PDP215
2	CPDB-3	Bussmann Power Distribution block cover	PDB204, PDP215
1	1323580	Marathon power distribution block	PDB403
1	CH1323	Marathon power distribution block cover	PDB403
1	80-1050	Dongan 3 KVA transformer (or Equiv)	T223
1	QO816L100S	Square D Load Center	LP409
1	QO110	Square D Circuit Breaker	CB453
4	QO115	Square D Circuit Breaker	CB410,416,425,552
1	QO120	Square D Circuit Breaker	CB412
1	PK7GTA	Square D Ground Kit	LP409
1	GBKP21	Eaton Ground Bar	
3	LPNRK80SP	Bussmann 80 Amp fuses	DSC200
6	FNQ-R2	Buss Fuses	FB204,232
2	1492-FB3C30L	AB 3 pole fuseholder with indicator	FB204,232
2	257B	Time Mark phase monitor	PLM204,232
2	51X120	Time Mark socket	PLM204,232
1	1489-M1D200	AB Circuit Breaker (20 A)	CB418
5	1489-M1C040	AB Circuit Breaker (4 A)	CB421,480,486,520,703
1	1489-M1C020	AB Circuit Breaker (2 A)	CB518
1	1489-M2D150	AB Circuit Breaker (2 pole, 15 amp)	CB218
1	1489-M1D250	AB Circuit Breaker (25 A)	CB223
1	1489-M1D100	AB Circuit Breaker (10 A)	CB526
1	1489-M1D010	AB Circuit Breaker (1 A)	CB425A
2	140MT-D9E-C29	AB Motor Circuit Protection Circuit Breakers	CB300,322
2	140MT-CAFAR10A10	AB Aux Contacts 1 N.O. 1 N.O. closed only on trip	CB300,322
2	100-C30D10	AB 30 AMP CONTACTOR	CON460, 473
2	100-FSC280	AB Surge suppressors	CON460, 473

Qty	Part #	Description	Designation
16	1492-J35	AB motor terminals (#12-1/0 range)	
110	1492-HM1	AB Terminals	
3	199-DR1	AB terminal track	
4	1492-NM36	AB end barrier	
36	1492-EAHJ35	AB End Anchor	
11	700HA33A1-4	AB Relays	CR453,463,466,476,492,495,524,554,564,1002,1004
13	700HN101	AB Relay sockets	CR453,463,466,476,492,495,524,554,564,1002,1004,TDR490.572
2	700HR52TA17	AB Timer	TDR490.572
2	700-HB33Z24-4	AB Relays	CR529,537
2	700-HN154	AB Relay sockets	CR529,537
2	800FP-SM32PX10	AB 3 pos. Selector Switch	SS453,466
3	800F-ALP	AB Contact Block	PB524,525,953
8	800F-X10	AB N.O. contact blocks	SS453,466,PB524,525,953
3	800F-PX11	AB Mounting Latch - 1 N.O. 1 N.C. Contact	PLT457,470,967
3	800FP-LF3	AB Green Illuminated PB	PL457,470,967
3	800F-N5W	AB White LED (120 VAC)	PL457,470,967
3	800FP-F2	AB Black Pushbutton	PB524,525,953
2	700-HLT1U1	AB Terminal Block Relay	CR458,472
1	5069-L306ER	AB Compactlogix PLC	
2	5069-IA16	AB AC Input Module	
1	5069-OA16	AB AC Output Module	
1	5069-IY4	AB Analog Input Module	
1	5069-OW4I	AB Isolated Output Module	
1	5069-FPD	AB Field Power Distribution Module	
1	5069-RTB64-SCREW	AB Power Terminal RTB Kit for CompactLogix 5380	
5	5069-RTB18-SCREW	AB IO 18 Pin Terminal Block Screw Type	
1	5069-RTB6-SCREW	AB IO 6 Pin Terminal Block Screw Type	
1	942 132-001	5 port Ethernet switch	ENETSW633
1	125INCSR120AB	Edwards Signaling Red Alarm Light	LT520
2	ISEUR1	Macromatic ISR relays (Grainger **#55ER60)**	ISR554,564
1	Z788.H	P+F Intrinsically Safe Barrier	ZB432
3	1492-JG4	AB Grounding terminals	ISR554,564,ZB432
2	SDP4-24-100LT	Sola Power Supply 24 VDC, 3.8 A NEC CLASS 2	PS480, 486
1	SDN10-24-100C	Sola Power supply 24 VDC, 10 A	PS523
1	Back-UPS BE650G1	APC Schneider Electric UPS (Grainger 426N96)	UPS510
1	876-N5	Edwards alarm horn	AH522
1	17 4 41100 02 XX-XXP	Pulsar Ultra 4 module (Fascia Mount)	LT430
1	db10 030 00000 0-NP	Pulsar 0-30 Ft transducer w 98 ft cable	LT430
2	711-0160	Trumeter ETM	ETM455, 467
2	6720005422	Weidmuller GFCI outlet	RECP412,414
1	5262-IG	Leviton Orange Outlet	RECP505
1	CUT VFD 10/4	20' VFD Cable	
1		2' Ethernet Cable	Enet626
1		5' Ethernet Cable	Enet509
4	02547.70.01	16/3 SJT 6' Black Pigtail	

REV	CHANGE
A	UPDATE JBOX AND ENET SW
B	UPDATE GENERATOR PLUG
C	CHANGE ALARM LIGHT

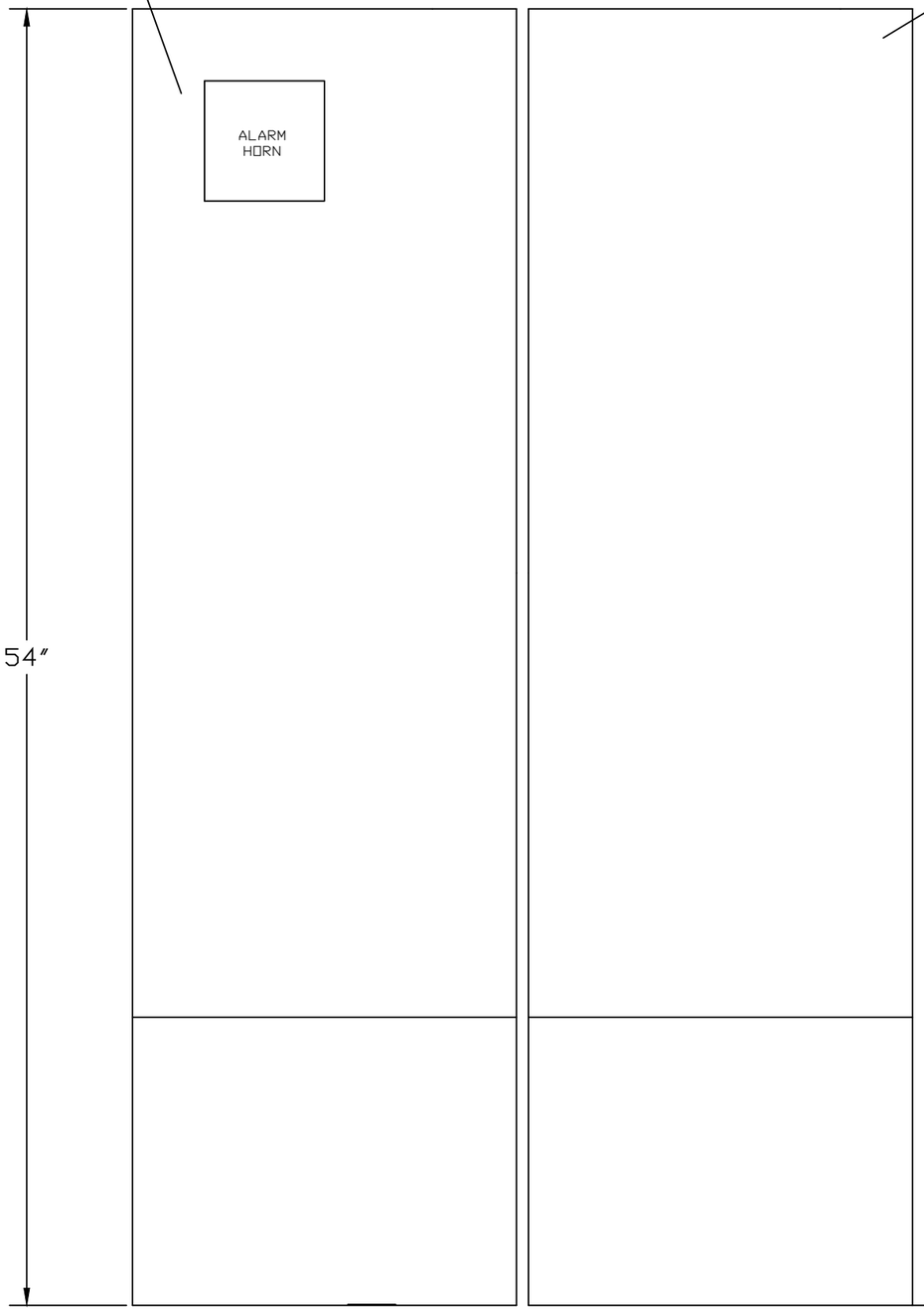
IDC CORPORATION
5100 N. CANAL ROAD
DIMONDALE, MI 48821

FILE: 14521-15.DWG

JOB: 14521	DWG. TITLE FOREST HILLS
DATE:09/04/25	SEWAGE LIFT
DRAWN: BK	SHT. TITLE STOCKLIST
CHECK: KRB	
PRELIM	REV. C SHT. 015 OF 015

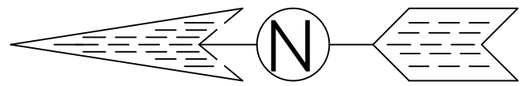
LEVEL CONTROL, ETC.

SERVICE ENTRANCE, ETC.



NOTES:
RELATIVE HEIGHT OF THE TOP OF THE PANELS TO THE TOP SLAB'S SURFACE IN RELATION TO THE CURRENT GROUND LEVEL.
SOME DETAILS ARE NOT TO SCALE, OR HAVE NOT BEEN MEASURED

THIS VIEW IS SHOWN LOOKING AT THE WEST END OF THE INSTALLED PANELS.



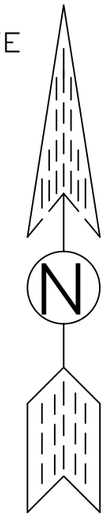
SIDE ELEVATION OF ASSEMBLED PANELS

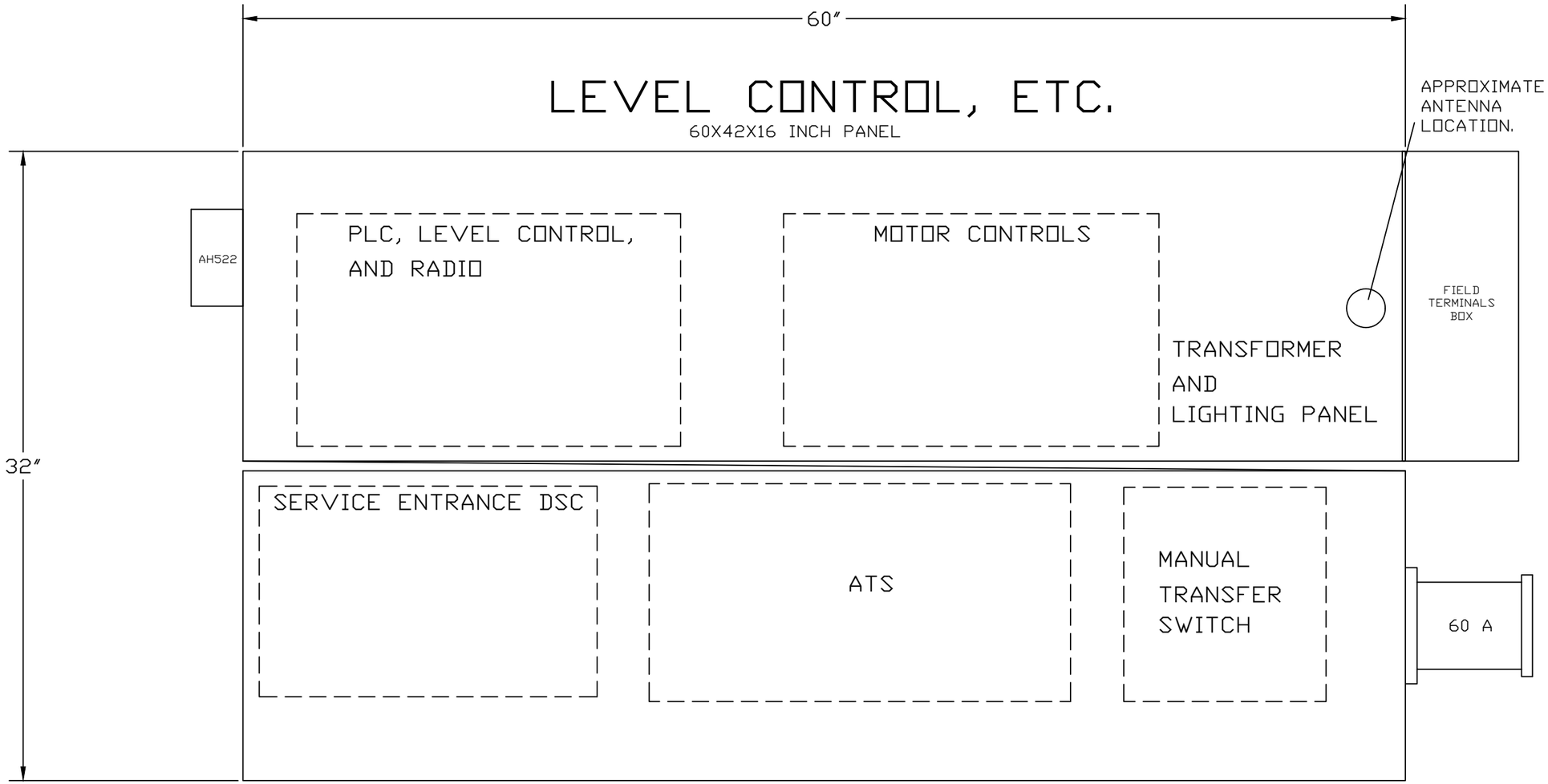
APX D-15

IDC CORPORATION
5100 N. CANAL ROAD
DIMONDALE, MI 48821

FILE: 14521END ELEV.DWG		
JOB: 14521	DWG. TITLE	FOREST HILLS
DATE:07/18/25		SEWAGE LIFT
DRAWN: BK	SHT. TITLE	PANEL SIDE ELEV
CHECK: KRB		SERVICE AND CONTROLS
PRELIM	REV. -	SHT. 001 OF 001

NOTE: DIRECTION ARROW IS APPROXIMATE





SERVICE ENTRANCE, ETC.

60X42X16 INCH PANEL

PLAN VIEW OF ASSEMBLED CONTROL PANELS

APX D-16

IDC CORPORATION
5100 N. CANAL ROAD
DIMONDALE, MI 48821

FILE: 14521-PLANVIEW 06-17-25.DWG	
JOB: 14521	DWG. TITLE: FOREST HILLS
DATE: 06/17/25	SEWAGE LIFT
DRAWN: BK	SHT. TITLE: PANEL PLAN VIEW
CHECK: KRB	SERVICE AND CONTROLS
PRELIM	REV. — SHT. 001 OF 001

KENNEDY INDUSTRIES
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SOLVE
MONITOR
REPAIR

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4925 HOLTZ DR. • WIXOM, MI 48393
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www.kennedyind.com

REVISED SUBMITTAL FOR APPROVAL

MERIDIAN TOWNSHIP
FORREST HILLS PS

FLYGT CONCERTOR PUMPS,
APCO AND EJ VALVES,
10" TOUCHSCREEN HMI,
& ACCESSORIES

CUSTOMER: MERIDIAN TOWNSHIP

SEPTEMBER 8, 2025 **JOB #129883**

KENNEDY INDUSTRIES | INNOVATE SOLVE MONITOR REPAIR

KENNEDY INDUSTRIES PERSONNEL HAVE DONE ITS DUE DILIGENCE TO ENSURE THAT ALL PROJECT REQUIREMENTS ARE MET BY OUR SUPPLY. THE FOLLOWING DRAWINGS, SPECIFICATIONS & CUT SHEETS ARE THE OFFERINGS THAT WE SUBMIT FOR APPROVAL TO SUPPLY. KENNEDY INDUSTRIES IS A SUPPLIER AND STRIVES TO PROVIDE OUR CUSTOMERS WITH THE HIGHEST QUALITY PRODUCTS AND LEVEL OF SERVICE. IF A CHANGE OR DEVIATION FROM THE FOLLOWING IS DESIRED PLEASE ADVISE US AND WE WILL CHANGE OUR SCOPE OF SUPPLY AS REQUIRED. IF MATERIALS OF CONSTRUCTION OR SCOPE OF SUPPLY CHANGES, IT MAY

PROJECT:	MERIDIAN TWP FORREST HILLS PS	**JOB #:**	129883
KI CONTACT:	RICK ALVAREZ / CHRISTIAN SPANGLER	**CUSTOMER:**	MERIDIAN TWP
OWNER:	MERIDIAN TWP	**ENGINEER:**	N/A
DATE:	9/8/2025	**CONDITION:**	600 GPM @ 27' TDH
PUMP TYPE:	FLYGT CONCERTOR DP N100 MT	**PIPE DIA:**	6"
PH/VOLT:	3/230V	**WW DEPTH:**	15'
WW DIA:	PLEASE CONFIRM		

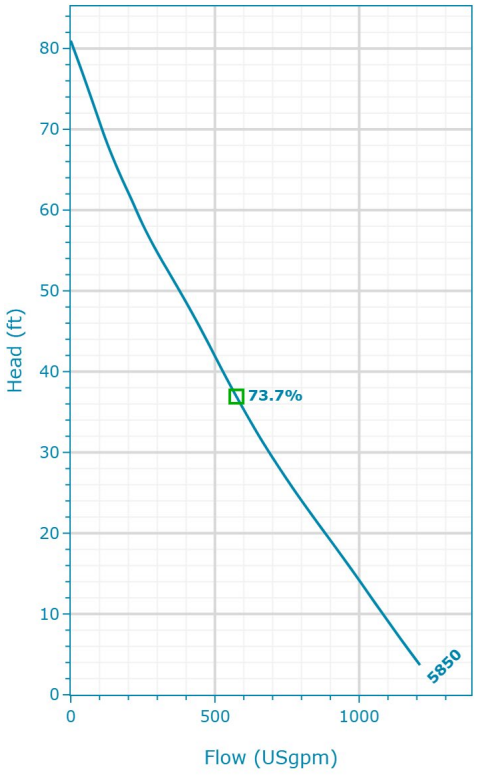
NOTES:

QTY.	DESCRIPTION	COMMENTS
2	FLYGT NP6020.092 MT, DP N100, 7.5 HP, 3/230V, 4"	TOTAL WT = 285 LBS
2	FM RATING	CLASS 1, DIVISION 1
2	FLS	DETECTS MECHANICAL SEAL LEAKS
2	POWER AND SENSOR CABLE	0.83" O.D., 50' LENGTH SHIELDED CABLES. TOTAL WT = 72 LBS
2	DISCHARGE CONNECTION	4", #5401305
2	P-INSTALL KIT	4" MT, #7481825
2	UPPER GUIDE BRACKET	2", 316SS
4	GUIDE RAILS	2", 304SS
2	LIFT CHAIN	5/16", 15' LENGTH, 316SS CAPACITY = 1,800 LBS
2	QUICK LINKS	5/16", 316SS CAPACITY = 1,700 LBS
2	6" APCO SWING CHECK VALVE	CVS,6,250A,F1,DIF,DI-S11-S2-NBR*LW
3	6" EJ GATE VALVE	2300600
2	CONCERTOR MODULE	FPM 711, #8482820
2	10.1" TOUCHSCREEN HMI	MAPLE SYSTEMS CMT3102XV2

PUMP WT (285) + CABLE WEIGHT (72) = 357 LBS TOTAL WT

Concertor 6020 DP N100 | Configuration Summary





Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for performance guarantees.

Concertor® is an intelligent wastewater pumping system that is designed to automatically deliver optimal pumping performance while at the same time significantly reducing the total cost of ownership.

GENERAL

Explosion Proof
Yes

Max. Pumped Media Temp.
104 °F

Approval
FM

MATERIAL AND COATING

Impeller Material
Hard-Iron

Stator Cover Material
Grey Cast Iron

Volute Material
Grey Cast Iron

MOTOR

Rated Voltage
230 V

Rated Power
7.5 Hp

INSTALLATION

Installation Type
P - Semi-Permanent, Wet

Project:	Created By:	Created On:	Last Update:
Concertor 6020 DP N100	Matt Johnson	8/6/25	-

Concertor 6020 DP N100 | Product Details

Description

Flygt Concertor®

Achieve clog-free, energy-efficient wastewater pumping with Flygt Concertor®

Using advanced software functionality and state-of-the-art hardware, Concertor® protects against unscheduled downtime and creates significant energy savings for your pump station. Adaptive pump performance optimizes the operating point for each duty cycle, while self-cleaning functionalities clear potential blockages. Integrated intelligence also makes setup and operation quick and easy.

A scalable system

Add Gateway

Concertor DP leverages your plant's existing process control algorithms while simplifying the adjustment of performance parameters and providing redundancy as an on/off control.

Product Features

- IE4 equivalent permanent magnet motor
- Adaptive N® hydraulic system
- Always correct impeller rotation
- Advanced cooling system
- Flygt Plug-in seal with Active Seal system
- Long-life bearings
- Thermal sensors
- Leakage sensors
- Cable cut protection

Construction Materials

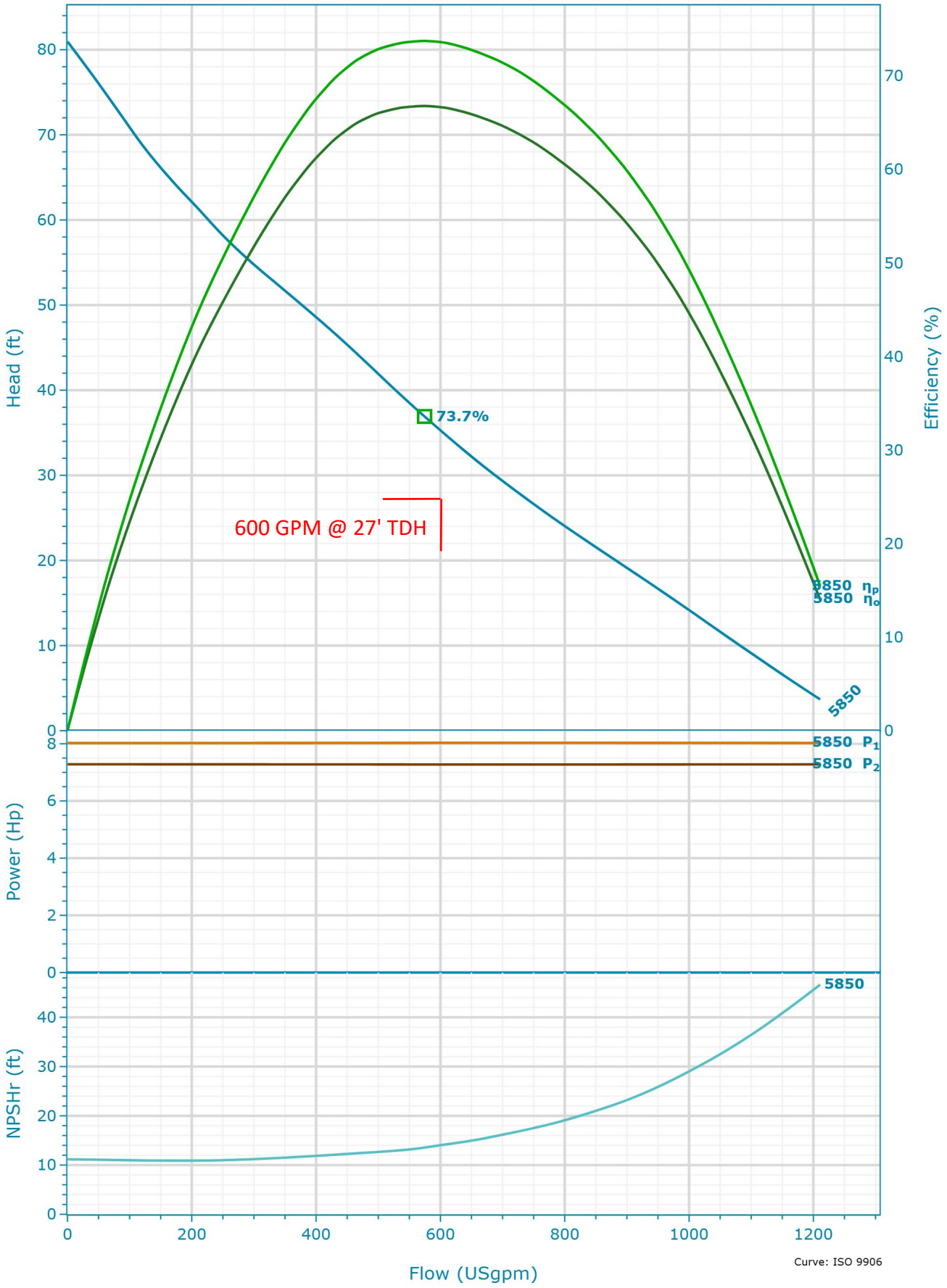
Impeller Material	Volute Material	Stator Cover Material
Hard-Iron	Grey Cast Iron	Grey Cast Iron

Motor

Rated Power	Motor Max Speed	Motor Module	Efficiency 50%
7.5 Hp	1,952 RPM	116	90.81 %
Motor Denomination	**Rated Voltage**	**Locked Rotor Code**	
18-08-1AZ	230 V	A	
Version Code	**Rated Current**	**Power Factor 100%**	
092	15.2 A	0.95	
Max P2 (1x)	**Insulation Class**	**Power Factor 75%**	
7.28 Hp	H	0.95	
Number Of Poles	**Approval**	**Power Factor 50%**	
10	FM	0.95	
Number Of Phases	**Type of duty**	**Efficiency 100%**	
3	S1	90.47 %	
Motor Min Speed	**Stator Variant**	**Efficiency 75%**	
500 RPM	1	90.67 %	

Project:	Created By:	Created On:	Last Update:
Concertor 6020 DP N100	Matt Johnson	8/6/25	-

Concertor 6020 DP N100 | Hydraulic Data & Performance Curve



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for performance guarantees.

Selection

Series
Concertor

Name

Fluid

Fluid Type
Water

Density
62.428 lb/ft³

Fluid Temperature

Dynamic Viscosity

Concertor 6020 DP N100

Frequency
60 Hz

System Type
Single Pump

Operating Pumps
1

Standby Pumps
No Standby Pump

Inlet Diameter
150 mm

Outlet Diameter
4 in

Number Of Vanes
2

39.2 °F

Specific Gravity
1

1.567212 cP

Fluid Vapor Pressure
0.118 psi

Design Curve

Max Flow
1,210.88 USgpm

H@QMin
80.96 ft

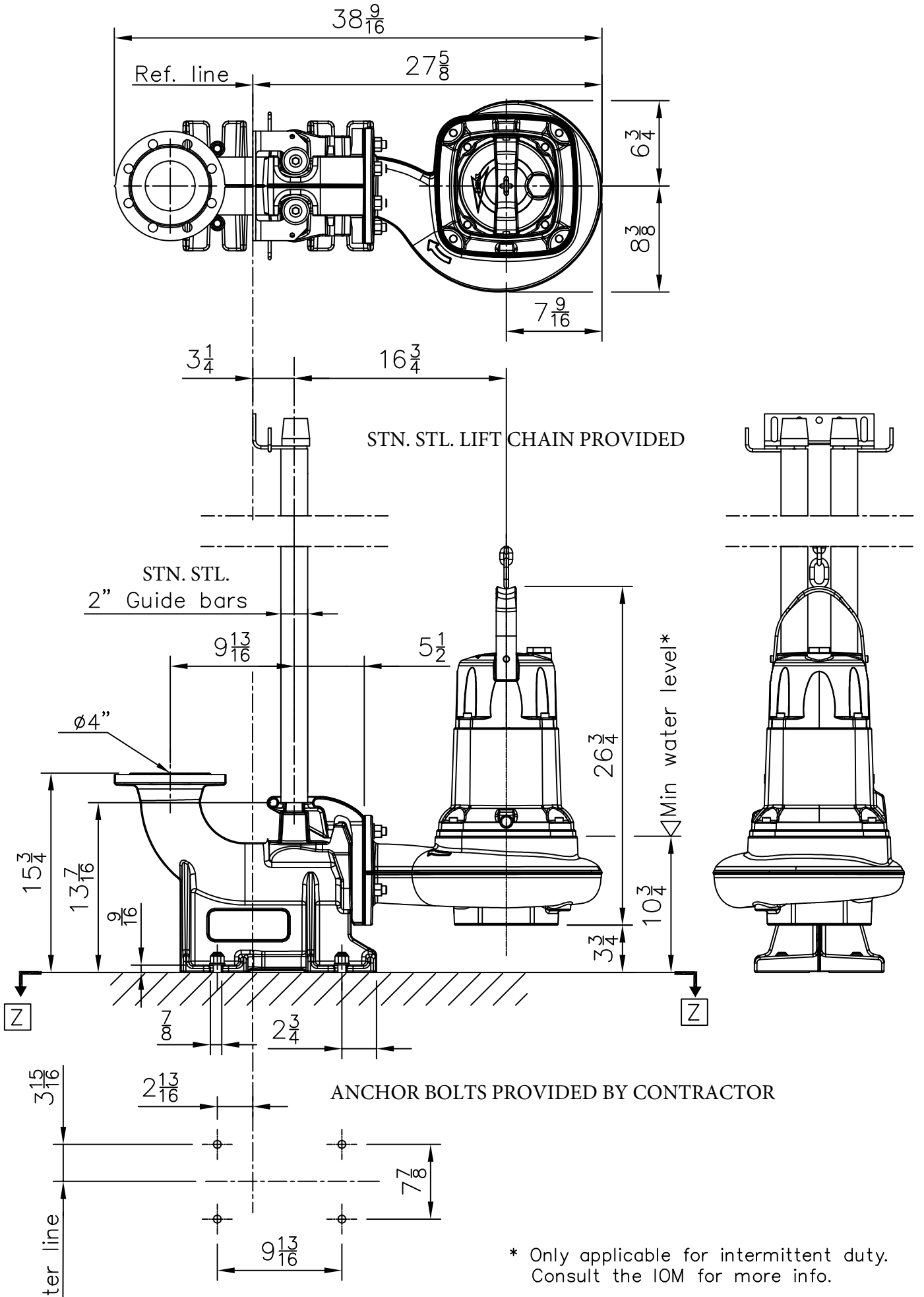
H@QMax
3.67 ft

BEP
73.7 %

BEP Flow
574.51 USgpm

BEP Head
36.91 ft

Max P2
7.28 Hp



* Only applicable for intermittent duty.
Consult the IOM for more info.

Weight	Pump	Discharge
lbs	285	95

	NP	6020	MT	Discharge outlet ø4" / Pump outlet ø4"	Scale 1:10	Date 231109
	APX E-7			Pump inlet / Suction inlet	Drawing number 8034100	Revision 4

6020 Standard Pump Cable

Pump Model	HP	Volts	Ø	Cable Size/ Nominal O.D.	Part Number	No. of Cables	Max. Cable Length (Ft)
6020	5.5	200 - 240	3	S3x6+3x6/3+S(4x0.5) 0.83"(21mm)	94 19 91	1	200
	7.5	380 - 480	3	S3x2.5+3x2.5/3+S(4x0.5) 0.75"(19mm)	94 19 90	1	280
	10	380 - 480	3	S3x2.5+3x2.5/3+S(4x0.5) 0.75"(19mm)	94 19 90	1	215

Flygt Concertor NX- 6020

The pump shall be equipped with a fully adjustable submersible electric motor, connected for operation on a 230 volt, 3 phase, 60 hertz. The pump shall be supplied with a mating cast iron 4 inch discharge connection and be capable of delivering 600 GPM at 27' TDH. The pump shall be fully adjustable in the field as needed due to potential field variances.

The motor horsepower shall be adequate and adjustable from 0-10 hp so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.
The motor shall be able to operate non-submerged without damage while pumping under load.

Starting method: Speed ramp up at reduced current. All devices to soft start the pump via reduced voltage shall be incorporated within the pump/motor housing. These same devices shall also provide for a "soft stop" of the pumping element.

Pump / Motor design – Explosion Proof Class 1, Division 1
Single-stage close-coupled submersible centrifugal pump with semi open multi vane impeller designed to transport wastewater with fibrous materials and heavy sludge. It shall be submersible up to 65 feet (20m) according to IEC 60034 and protection class IP 68.

The impeller blades shall be self-cleaning upon each rotation as they pass across a sharp relief groove in the Insert ring cast integrally into pump volute's replaceable bottom wear plate and shall keep the impeller blades clear of debris. The impeller shall move axially upwards on its shaft to allow larger debris to pass through and immediately return to normal operating position.

The pump shall be operated by a synchronous motor and an integrated control system and be capable to run at constant power at any point of the performance field without being overloaded. Motor shall utilize a permanent magnet rotor to maintain synchronous speed and maintain level IE-4 premium efficiency standards. The motor shall withstand at least 60 starts per hour.

An integrated pump control system installed in the pump/motor housing shall ramp up the speed at start-up of the pump to reduce the start-up current and secure that the direction of the impeller rotation is always correct. There shall be no need for any human intervention to ensure that the impeller is rotating in the correct direction within the volute. The control system that is integrated within the pump/motor housing shall be encapsulated to protect it against moisture ingress, and vibration. Motor, pump and control system shall be designed and produced by the same manufacturer.

The integral control system mounted within the pump/motor housing shall be capable of adjusting the motor/impeller speed so that the pump can safely operate without overloading anywhere within the pumps' operating envelope.

The pump shall incorporate a "pump-cleaning" function to remove debris from the impeller. The cleaning function shall be initiated when the integral control system senses an increase in current draw due to debris in the pump. The cleaning function shall consist of forced stopping, reversal and forward runs timed to allow for debris to fall from the impeller. After cleaning cycle is complete, the pump shall resume to automatic operation. If the pump impeller/volute does not clear itself after the programmed number of attempts, the control will initiate and alarm to notify that the pump inlet / volute is blocked by large debris.

The cooling system shall provide sufficient cooling to run the pump at continuous pump duty in a liquid temperature of up to 104°F (40°C). Operational restrictions at temperatures below 104°F (40°C) or the demand of auxiliary cooling systems like fans or blowers are not acceptable.

Stator shall be insulated with class H trickle impregnated insulation rated at 356°F (180°C)

Cable
The motor shall be equipped with 50 feet of shielded submersible cable. The shield within the cable shall allow for a control panel mounted interface component to communicate both ways with the integrally mounted control unit within the pump/motor housing. The power cable shall be sized according to the NEC and ICEA standards and shall

be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

Motor protection
The integrated control system shall continuously monitor the leakage sensor in the stator housing and the temperature of the motor. If the motor temperature is too high, the pump shall be capable of operating at a reduced speed until the high temperature conditions are normalized.

The operator shall be able to modify the setting of the control system to decide if the active leakage signal shall stop or not stop the pump. External trips or overload devices for motor protection shall not be required.

Bearings
The shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a single row ball bearing to handle radial loads. The lower bearing shall be a double row angular contact ball bearing to handle the thrust and radial forces. **Single row lower bearings are not acceptable.** The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump performance field.

Motor sealing
The cable entry shall be threaded and sealed by a field replaceable grommet. A nylon clamp shall secure a strain relief function. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

The shaft shall be sealed by two seals in a tandem arrangement, incorporated into a single unit assembly. The seals shall require neither maintenance nor adjustment and shall be capable of operating bi-directionally without damage or loss of seal function. The seal unit shall be designed as Plug-in unit which can be replaced without any special tools. The upper seal rotating surface shall include vanes etched into the seal surface to push any potential seal leakage back towards the pump volute.

Shaft seal face material of construction:
- Pump side: - Corrosion and abrasion resistant Tungsten carbide WCCR /WCCR
- Motor side: - Corrosion and abrasion resistant Tungsten carbide WCCR / WCCR

PUMP CONSTRUCTION
Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. The lifting handle shall be stainless-steel. All exposed nuts or bolts shall be AISI type 316 stainless steel construction.

Machined surfaces shall incorporate **metal-to-metal contact** between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or optional Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross-sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

Coating
All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be blasted and surface oils and debris removed for proper coating adhesion before coating. All wet surfaces are to be coated with two-pack oxyrane ester Duasolid 50. The total layer thickness should be at least 120 microns.
Zink dust primer shall not be used.

Impeller
Due to the likely presence of sand and or grit the impeller shall be of Hard-Iron™ ASTM A-532 Alloy III A 25% chrome cast iron, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The leading edges of the impeller shall be hardened to Rc 60 and shall be capable of handling

solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impeller shall be locked to the shaft, held by an impeller bolt.

Volute / Suction Cover
The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. Due to the likely presence or sand or grit the insert ring shall be cast of Hard-Iron™ ASTM A-532 Alloy III A 25% chrome cast iron and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

Pump Shaft
Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be stainless steel – ASTM A479 S43100-T.

The use of shaft sleeves of different material than the shaft shall not be acceptable.

Model: Flygt Concertor NP-6020
Pump design based on Flygt a Xylem brand. Other manufacturers meeting the materials of construction and above specifications must be approved by the Engineer by ___ business days prior to bid date.

Lifting and Installation equipment
Each pump shall be supplied with a mating cast iron 4-inch discharge connection. The pump shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. There shall be no need for personnel to enter the wet-well.
No portion of the pump shall bear directly on the sump floor. Each pump shall be fitted with (see plans for depth) feet of stainless-steel lifting chain. The working load of the lifting system shall be 50% greater than the pump unit weight.

CLOG-FREE GUARANTEE

The supplier of the pump and control system shall guarantee clog-free operation for a period of 24 months from the date of start-up. A certificate of guarantee shall be provided to the Owner on the day of start up with the local contact information and effective date. Should the impeller clog with typical solids and/or modern trash debris normally found in domestic wastewater during this period, an authorized representative shall either travel to the jobsite remove the pump, clear the obstruction and reinstall the pump at no cost or reimburse the Owner for reasonable cost to provide this service. A written report shall be provided to the Owner detailing the service call with pictures for verification purposes

START-UP SERVICE
A factory authorized start up technician shall be provided to visit the site for a minimum of 8 hours on-site and confirm pump/s and controls operation meets or exceeds the specifications. The name of the technician along with the qualifications shall be submitted prior to start up upon Engineer/Owner request. The service technician shall be outfitted with a service crane truck capable of pulling the pumps to verify rotation and perform a visual check of the pump(s).

Services shall include, but not be limited to, inspection of the completed pump station installation to ensure that it has been performed in accordance with the manufacturer's instructions and recommendations, supervision of all field-testing and activation of the Pump Manufacturer's Warranty. The test shall demonstrate to the satisfaction of the Owner that the equipment meets all specified performance criteria, is properly installed and anchored, and

operates smoothly without exceeding the full load amperage rating of the motor. The Contractor shall be responsible for coordinating the required field services with the Pump Manufacturer.

The factory start up form shall be submitted for approval prior to start up and approved by the Engineer/Owner. During this initial inspection, the manufacturer's service representative shall review recommended operation and maintenance procedures with the Owner's personnel.

WARRANTY

Pump shall be provided with a 5-year prorated warranty.

Storage

Each Flygt pump leaves the factory properly assembled and prepared to perform even after a reasonable idle time in storage. However, as prolonged idle time can be detrimental to any rotating machinery, the procedures outlined below should be followed in order to insure that the equipment is in top condition to operate when finally installed. Whenever possible, store pumping units in a dry environment free of extreme temperatures and strong direct sunlight.

NEW pumps:

Storage 6 to 12 months:
In general, rotating machinery left idle for extended periods of time, tends to establish a "set" position due to inaction of the moving parts. Some of these areas may be damaged (especially seals) from the sudden fast breakaway of start-up after a prolonged idle time. To insure that all rotating parts are free for final installation and start-up, it is good practice to rotate the impeller by hand once a month. It is also good practice to relieve the tension on the cable entry sealing grommet by backing off the cable entry compression screws slightly. If this is done, it is most important that a clear note be attached as a reminder to:
Re-Tighten Cable Entry Compression Screws Before Installation.

Storage 12 to 24 months:
In addition to the above, apply a protective spray coating of silicone or rust inhibiting oil to the impeller and inside of the volute by spraying in through the volute outlet and up through the volute inlet. Also coat the volute outlet flange face.

USED pumps:

Before storing a used pump for an extended period of time, the unit should be dismantled, checked for any defects, repaired where necessary and reassembled. At reassembly, follow instructions in the ***Service Manual***, especially regarding seal assemblies. Protect the impeller and volute as mentioned in the paragraph above.

In all cases, it is good practice to check all external bolts, nuts and screws for tightness before final installation after extended storage.

CONTROLS:

It is most important to make sure that Electrical Controls, when subjected to extended storage, be stored in a protected dry environment free from any corrosive atmosphere. Moisture in any form, including condensation, can cause serious corrosion problems to the contact point surfaces as well as terminal connections.

Even though all terminal connections have been made tight on initial assembly at the factory, they may not remain 100% tight over an extended storage period due to the compressibility of the copper wire and possible movement due to variations in ambient temperature. The problem will vary in degree depending on wire size and whether the terminal connection is of solid or stranded wire. To insure proper operation, recheck all terminal connection screws for tightness prior to placing the control on line.

WARRANTY
Xylem Water Solutions USA, Inc.

For the period defined, Xylem Water Solutions USA, Inc. offers a commercial warranty to the original End Purchaser against defects in workmanship and material on Flygt Products. Warranty covers Flygt parts and labor as outlined in **ADDENDUM – A**.

COVERAGE:
Xylem Water Solutions USA, Inc. will pay the cost of parts and labor during the warranty period, provided that the Flygt product, with cable attached, is returned prepaid to a Xylem Water Solutions USA, Inc. Authorized Service Facility for Flygt Product repairs. Coverage for Flygt parts and labor will be provided for the period shown in **ADDENDUM - A.** The warranty period will begin from date of shipment or date of a valid Start-up (For permanently installed pumps only). In cases where the Start-up date is used as the beginning of the warranty on a permanently installed Flygt pump, a Start-up Report completed by an approved service technician from a Xylem Water Solutions USA, Inc. Authorized Service Facility for Flygt products must be received by the Xylem Water Solutions USA, Inc. Area Service Manager for Flygt Products within thirty (30) days of the initial onset of the unit placed into service. If not received, the beginning of the warranty coverage will default to the Flygt product ship date. A Start-up for a permanently installed Flygt pump must occur within one (1) year from the date of shipment from a Xylem Water Solutions USA, Inc. authorized facility for Flygt Products or warranty will automatically default to ship date as start of warranty. (See **STORAGE** section) When using the start-up date as the beginning of the warranty, a copy of the Start-up Report will be required to support any Warranty Claims. Warranty on Flygt Dewatering pumps will begin with ship date only. No other date on Flygt Dewatering pumps will be considered.

Xylem Water Solutions USA, Inc.'s sole obligation under this Warranty for Flygt Products shall be to replace, repair or grant credit for Flygt Products upon Xylem Water Solutions USA, Inc.'s exclusive determination that the Flygt Product does not conform to the above warranty. In the event that the Flygt product is replaced, warranty on the replacement product will be equal to the balance remaining on the original product or ninety (90) days, whichever is greater.

MISUSE:
This Warranty shall not apply to any Flygt product or part of Flygt product which (i) has been subjected to misuse, misapplication, accident, alteration, neglect, or physical damage (ii) has been installed, operated, used and/or maintained in a manner which is in an application that is contrary to Xylem Water Solutions USA, Inc.'s printed instructions as it pertains to installation, operation and maintenance of Flygt Products, including but without limitation to (iii) operation of equipment without being connected to monitoring devices supplied with specific products for protection; or (iv) damaged due to a defective power supply, improper electrical protection, faulty installation or repair, ordinary wear and tear, corrosion or chemical attack, an act of God, an act of war or by an act of terrorism; or (v) has been damaged resulting from the use of accessory equipment not sold by Xylem Water Solutions USA, Inc. or not approved by Xylem Water Solutions USA, Inc. in connection with Flygt products.

WEAR PARTS:
This warranty does not cover costs for standard and/or scheduled maintenance performed, nor does it cover Flygt parts that, by virtue of their operation, require replacement through normal wear (aka: Wear Parts), unless a defect in material or workmanship can be determined by Xylem Water Solutions USA, Inc.. Wear Parts are defined as Cutters, Cutting Plates, Impellers, Agitators, Diffusers, Wear Rings (Stationary or Rotating), Volutes (when used in an abrasive environment), oil, grease, cooling fluids and/or any items deemed necessary to perform and meet the requirements of normal maintenance on all Flygt equipment.

WARRANTY
Xylem Water Solutions USA, Inc.

DISCLAIMERS:
(i) Xylem Water Solutions USA, Inc.'s warranties are null and void when Flygt Products are exported outside of the United States of America without the knowledge and written consent of Xylem Water Solutions USA, Inc.; (ii) Xylem Water Solutions USA, Inc. makes no independent warranty or representation with respect to parts or products manufactured by others and provided by Xylem Water Solutions USA, Inc. (however, Xylem Water Solutions USA, Inc. will extend to the Purchaser any warranty received from Xylem Water Solutions USA, Inc.'s supplier for such parts or products).

LIMITATIONS:
XYLEM WATER SOLUTIONS USA, INC. NEITHER ASSUMES, NOR AUTHORIZES ANY PERSON OR COMPANY TO ASSUME FOR XYLEM WATER SOLUTIONS USA, INC., ANY OTHER OBLIGATION IN CONNECTION WITH THE SALE OF ITS FLYGT EQUIPMENT. ANY ENLARGEMENT OR MODIFICATION OF THIS WARRANTY BY A FLYGT P RODU CT D IS TR IBU TO R, OR OTHER SELLING AGENT SHALL BECOME THE EXCLUSIVE RESPONSIBILITY OF SUCH ENTITY.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ANY AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES, GUARANTEES, CONDITIONS OR TERMS OF WHATEVER NATURE RELATING TO FLYGT PRODUCT(S), INCLUDING AND WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH ARE HEREBY EXPRESSLY DISCLAIMED AND EXCLUDED. PURCHASER'S EXCLUSIVE REMEDY AND XYLEM WATER SOLUTIONS USA, INC.'S AGGREGATE LIABILITY FOR BREACH OF ANY OF THE FOREGOING WARRANTIES IS LIMITED TO REPAIRING OR REPLACING FLYGT PRODUCTS AND SHALL IN ALL CASES BE LIMITED TO THE AMOUNT PAID BY THE PURCHASER HEREUNDER. IN NO EVENT IS XYLEM WATER SOLUTIONS USA, INC. LIABLE FOR ANY OTHER FORM OF DAMAGES, WHETHER DIRECT, INDIRECT, LIQUIDATED, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF USE, LOSS OF PROFIT, LOSS OF ANTICIPATED SAVINGS OR REVENUE, LOSS OF INCOME, LOSS OF BUSINESS, LOSS OF PRODUCTION, LOSS OF OPPORTUNITY OR LOSS OF REPUTATION.

XYLEM WATER SOLUTIONS USA, INC. WILL NOT BE HELD RESPONSIBLE FOR TRAVEL EXPENSES, RENTED EQUIPMENT, OUTSIDE CONTRACTOR'S FEES, OR ANY EXPENSES ASSOCIATED WITH A FLYGT PRODUCT REPAIR SHOP NOT AUTHORIZED BY XYLEM WATER SOLUTIONS USA, INC. U.S.A., INC. REIMBURSEMENT COSTS FOR CRANES AND/OR ANY SPECIAL EQUIPMENT USED IN CONJUNCTION FOR THE REMOVAL AND/OR REINSTALLATION OF ANY FLYGT EQUIPMENT IS NOT COVERED UNDER THIS WARRANTY.

ANY UNAUTHORIZED ALTERATIONS TO SUPPLIED FLYGT EQUIPMENT USED WITHOUT XYLEM WATER SOLUTIONS USA, INC. SUPPLIED FLYGT BRAND CABLE OR CONTROLS WILL NOT BE COVERED UNDER THIS WARRANTY, UNLESS IT CAN BE PROVEN SUCH ANCILLARY EQUIPMENT IS SUITABLE FOR THE PURPOSE AND EQUAL TO XYLEM WATER SOLUTIONS USA, INC. SUPPLIED FLYGT BRAND CABLES OR CONTROLS THAT WOULD ORIGINALLY HAVE BEEN SUPPLIED WITH THE TYPE OF EQUIPMENT IN USE.

REQUIREMENTS:
A copy of Electrical System Schematics of the Control used (including a Control's Bill of Material) could be required to support a Warranty Claim when a non Flygt Brand Control is used. In addition, a written record, hereby known as "the log", will be associated with each unit serial number and must be maintained by the organization having product maintenance responsibility. The log must record each preventative maintenance activity and any repair activity during the life of the warranty or verification that a Xylem Water Solutions USA, Inc. authorized Service Contract for Flygt Products is in force and must be available for review and/or auditing. Failure to meet these conditions could render this warrant null and void. Such logs could be required to determine warranty coverage.

WARRANTY
Xylem Water Solutions USA, Inc.

STORAGE:
Should a delay occur between ship date and the date of start-up, maintenance as outlined in Xylem Water Solutions USA, Inc.'s Care & Maintenance Manual for Flygt Products must be performed by the "CONTRACTOR" and/or "OWNER" during any such period of storage. Documentation providing proof and outlining what maintenance was performed must be provided to Xylem Water Solutions USA, Inc. or its Flygt Products representative within thirty (30) days of said maintenance, or the Xylem Water Solutions USA, Inc. warranty for Flygt Products could be considered void.

CONTROLS:
Warranty coverage for permanently installed controls will start for the end purchaser on the date of shipment. This warranty does not apply to controls that have been damaged due to a defective and/or improper input power supply, improper electrical protection, accidental damage, improper or unauthorized installation and/or repair, unauthorized alteration, negligence, environmental corrosion or chemical attack, improper maintenance or storage of control, any act of God, an act of war, an act of terrorism or damage resulting from the use of accessory equipment not approved by Xylem Water Solutions USA, Inc.. Further, this warranty does not apply in the event an adjustment is found to correct the alleged defect.

Solid state devices will be covered for a period of one (1) year. Electrical control panels containing controllers, PLC's, drives, soft starts, and other computerized equipment will require Transient Voltage Surge Suppression (TVSS) protection in order to satisfy the requirements of this warranty. The protection equipment associated with the control must be kept in working condition during the life of the warranty. Auxiliary equipment supplied with the control (air-conditioners etc.) is limited by the respective original equipment manufacturer's warranty offered. Consumable items such as: light bulbs, fuses, and relays are covered under normal operating conditions. Electrical surges experienced during startups and/or during normal operating use of the control panel will cause the consumable items not to be covered under this warranty policy. Components not supplied by Xylem Water Solutions USA, Inc. will not covered by this warranty.

TOP (The Optimum Pump Station)
Xylem Water Solutions USA, Inc. will warrant the Flygt TOP pre-engineered fiberglass pump station components against defects in material and workmanship for a period of one (1) year from date of start-up or eighteen (18) months from date of shipment and is valid only to the original owner of the station. Warranty shall cover the cost of labor and materials required to correct any warrantable defect, excluding any removal and reinstallation costs, FOB Xylem Water Solutions USA, Inc.'s authorized warranty service location for Flygt's TOP.

Flygt Products contained within a TOP pre-engineered fiberglass pump station will carry the standard Xylem Water Solutions USA, Inc. warranty for Flygt products and/or accessories installed in the TOP pre-engineered fiberglass pump station.

All Flygt Product restrictions and/or limitations as outlined and described within the context of this warranty are germane to all sections of this Xylem Water Solutions USA, Inc. Warranty document.

Xylem Water Solutions USA, Inc.
National Quality Assurance - US Corporate

WARRANTY

Xylem Water Solutions USA, Inc

ADDENDUM A - Warranty Coverage by Product

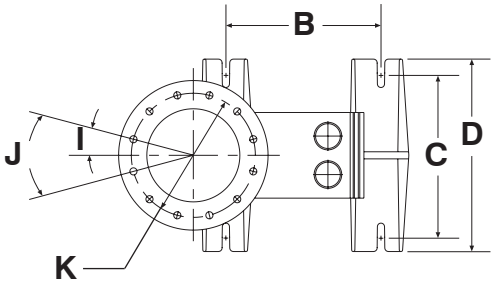
PRODUCT	PRODUCT SERIES AND CONFIGURATION	WARRANTY COVERAGE (Months)								
		1-12	13-18	19-24	25-36	37-39	40-48	49-60	61-84	85-120
Axial Flow / Mixed Flow / Centrifugal Pumps & Mixers	3000 Series (CP, NP, DP, CT, NT, CZ, NZ, LL) 4000 Series (SR, PP) 7000 Series (PL)	100%		50%			25%			
Concertor Pumping System	6000 Series (N, DP, iPS, XPC)	100%		50%			25%			
	6000 Series w/ iPS or XPC Panels (w/ 1 year purchase of Flygt Cloud and built in i2r)	100%			50%			25%		
ETO Electrical Control Panels	Engineered to Order, Xylem Manufactured Control Panels (permanently installed) - 3 Years	100%	LIMITED 100%							
Grinder Pumps	3000 Series (MP, MF, MH)	100% (From Ship Date)			100% (from manufacture date)					
Abrasion/Corrosion Resistant & Chopper Pumps	3000 Series (FP, FS, FT, HP, HS) 5000 Series (HP, HS) 8000.280Series (DP, DZ, DT, DS, DF)	100%								
Centrifugal Pumps	1300 Series	100%								
Dewatering Pumps	2000 Series (BS, KS) 3000 Series (CS, NS, DS) 8000.280 Series (DS, DF)	100% (From Ship Date)								
TOPS	Fiberglass Pump Station	100% (From Ship Date)								
Accessories	Permanent / Portable	100% (From Ship Date)								
Hydroejectors/Aerators	HE, JA	100%								
Portable Pump Controls TOPS Control Panels	Control Boxes (Nolta,MSHA etc.) TOPS controlpanels (permanently installed)	100% (From Ship Date)								
Small Pumps	3045, 3057,SX	100% (From Ship Date)								
Parts	All new Flygt parts (mechanical& electrical)	100% (From Ship Date)	NOTE: Parts that fail where used in a repair are warranted for one (1) year from the date of the repair for the failed part only – no labor; This Includes Flygt pumpcontrollers, Flygt supervision equipment, Flygt submersible level transducers, etc.							
Monitoring & Control	Multismart Pump Station Manager and Operating System	100 (From Ship Date)								
	Flygy Probes (excluding the DuoProbe)	100 (From Ship Date)								
	All other Xylem M&C Products	100% (From Ship Date)								

Standard CP/NP Discharge Connections (Cast Iron)

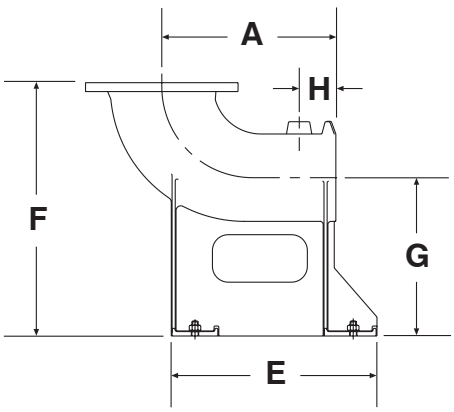
All dimensions (inches)

Pump Model	Part Number	Disch. Inlet	Disch. Outlet	A	B	C	D	E	F	G	H	I	J	K
2" - 3045, 3057, NP/DP/MP 3069*	486 55 01	2"	2"-11 1/2 NPT	3 13/16	4	4 1/2	5 1/2	7 1/4	6 3/4	3 15/16	7/8	---	---	---
2 1/2" - NP/DP 3069*	493 17 06	2 1/2"	2 1/2"	11 5/8	7 7/8	4 3/4	7 7/8	11 7/16	9 7/8	6 1/2	4 9/16	45°	90° x 4	5 5/8
3" - 3045, 3057, CNP/DP/MP 3069*	555 48 01	2"	3-8 NPT	6 3/4	5 1/2	4 1/8	5 1/2	10 3/4	6 3/4	3 15/16	7/8	---	---	---
3" - NP/DP 3069*, 3080,3085, 3102, 3127, 3153, 6020*	444 68 05	3"	3"	14	9 7/8	8	10 5/8	15 3/8	15 3/4	7 7/8	4 9/16	45°	90° x 4	6
4" - 3080, 3085, 3102, 3127,3153, 3171, 3202, 6020*	540 13 05	4"	4"	14 3/8	9 7/8	8	10 5/8	15 3/8	15 3/4	7 7/8	4 9/16	22.5°	45° x 8	7 1/2
6" - 3102, 3127(MT), 6020*	444 70 06	5 1/2"	6"	15 9/16	11	10	12 3/16	15 3/8	17 3/4	9 7/8	4 9/16	22.5°	45° x 8	9 1/2
6" - 3153, 3171, 3202.	602 33 06	5 1/2"	6"	15 9/16	11	10	12 3/16	15 15/16	17 3/4	9 7/8	4 9/16	22.5°	45° x 8	9 7/16
6" - R3231	388 25 06	6"	6"	20 11/16	19 3/4	15 3/4	19 3/4	23 5/8	15 3/4	7 7/8	6 7/8	22.5°	45° x 8	9 7/16
6" - 3127(LT), 3301, 3315.	604 56 06	6"	6"	15 9/16	11 1/8	10	12 3/16	15 15/16	18	10 1/8	4 9/16	22.5°	45° x 8	9 7/16

Note: Alternative discharge connections may be available, contact Flygt Application Engineering.
* Requires installation kit



Caution:
Contact Flygt applications engineering department when making a pump/ discharge connection combination other than those paired in the chart above.



Note:
The discharge connection shown here is typical in appearence for most pumps.



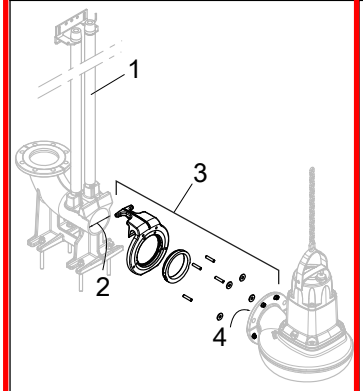
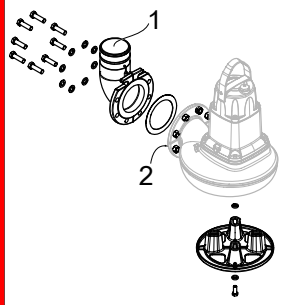
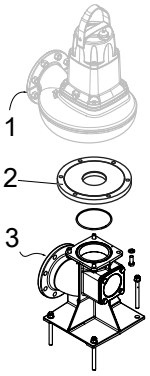
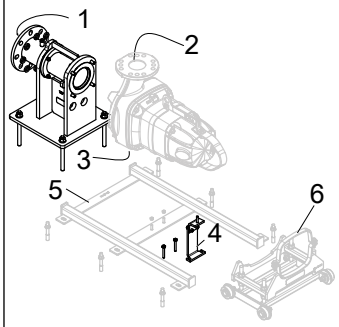
Concertor™

Installation Kits 6020

1 Practical Information

1.1 Definitions

Types of kits

P-installation	S-installation	T-installation	Z-installation
Sliding bracket kits for guide system 2 in. The discharge connections, guide pipes, and brackets are ordered separately.	Discharge bend for hose or threaded connection.	T-stand with 90° bend and inspection hatch. The rotation adapter is optional.	Z-stand with telescopic opening. The rails and the service cart are optional. Pump with lifting handle.
			
1. Discharge connection, guide pipes, and brackets. Optional. 2. Discharge connection inlet 3. Sliding bracket kit 4. Pump outlet	1. Coupling type: Hose or threaded 2. Pump outlet	1. Pump outlet 2. Rotation adapter. Optional 3. Stand unit inlet	1. Stand unit inlet 2. Pump outlet 3. Drainage plug 4. Support unit 5. Rails 6. Service cart

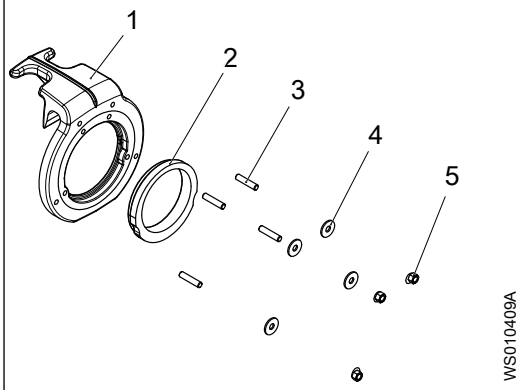
Coating

Standard coating	Primer and top coating.
Special coating	Blasted clean metal that is coated with oxirane ester. Thickness approximately 360 µm.

2 P-installation

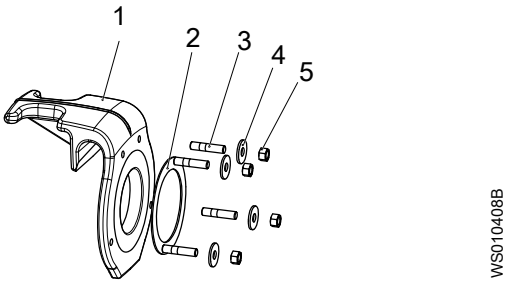
2.1 Sliding bracket kits

Flange surface: Rubber



1. Sliding bracket
2. Seal ring, rubber
3. Stud
4. Washer
5. Nut

Flange surface: Metal

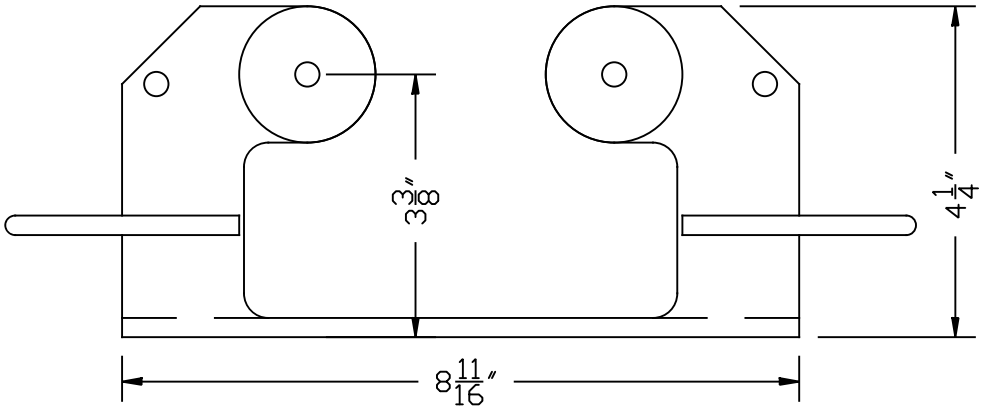


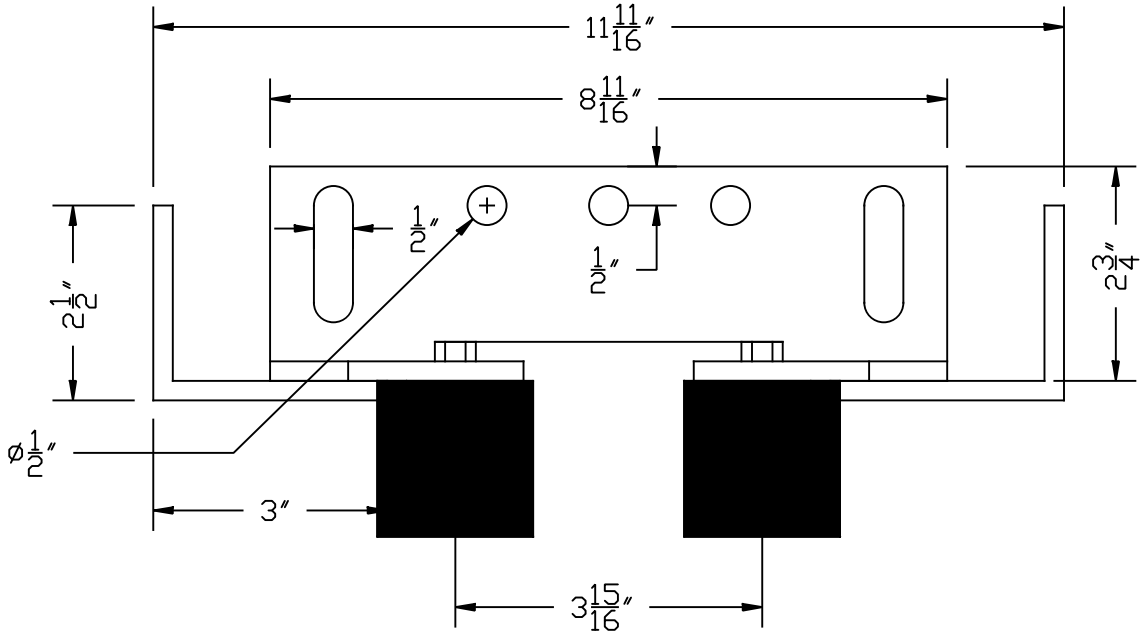
1. Sliding bracket
2. Gasket
3. Stud
4. Washer
5. Nut

All installation kits are applicable to guide system 2 in.

Kit part No.		Pump outlet DN (in.)	Flange surface	Discharge connection inlet, mm (in.)
Standard coating	Special coating			
748 18 15	748 18 45	DN 80 (3)	Metal	80 (3)
748 18 10	748 18 90	DN 80 (3)	Rubber	80 (3)
748 18 15	748 18 45	DN 80 (3)	Metal	100 (4)
748 18 63	748 18 64	DN 80 (3)	Rubber	100 (4)
748 18 25	748 18 46	DN 100 (4)	Metal	100 (4)
748 18 63	748 18 64	DN 100 (4)	Rubber	100 (4)
748 18 25	748 18 46	DN 100 (4)	Metal	150 (6)
748 18 33	748 18 49	DN 100 (4)	Rubber	150 (6)
748 18 35	748 18 48	DN 150 (6)	Metal	150 (6)
748 18 33	748 18 49	DN 150 (6)	Rubber	150 (6)

2" 316SS Upper Guiderail Bracket





NOTES:

1.) MATERIAL SHALL BE GRADE 316 STAINLESS STEEL.

2.) BREAK ALL SHARP EDGES.

Product Number

14-6136804

Design Features

-Materials
316 STAINLESS STEEL
-Design Load
N/A
-Open Area
N/A
-Coating
NONE
-√Designates Machined Surface

Certification

-
-WEIGHT: 2 LBS.
-FILE: 14-6136804 UGRB
-Country of Origin: USA

Drawing Revision

02/27/13 Designer: ARO
11/18/13 Revised By: RGB

Disclaimer

Weights (lbs/kg), dimensions (inches/mm) and drawings provided for your guidance. We reserve the right to modify specifications without prior notice.

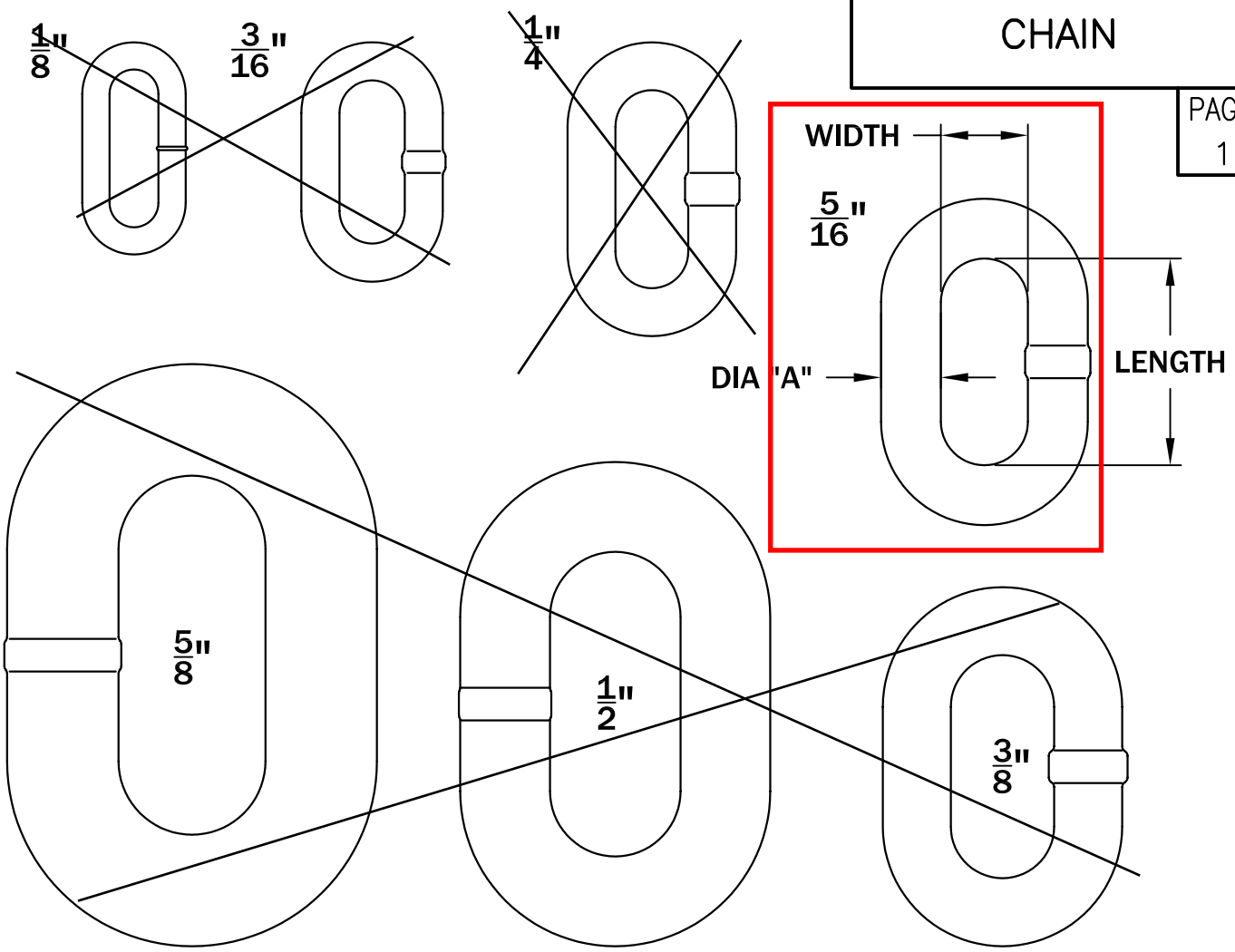
CONFIDENTIAL: This drawing is the property of EJ Group, Inc. and embodies confidential information, registered marks, patents, trade secret information, and/or know-how that is the property of EJ Group, Inc.
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Contact

800 626 4653
ejco.com

CHAIN

PAGE 1



SIZE	LENGTH	WIDTH	DIA "A"	SAFE WORK LOAD
1/8"	0.90"	0.29"	0.16"	375 lbs
3/16"	0.97"	0.40"	0.22"	800 lbs
1/4"	1.19"	0.50"	0.28"	1,400 lbs
5/16"	1.24"	0.50"	0.33"	1,800 lbs
3/8"	1.33"	0.57"	0.39"	2,800 lbs
1/2"	1.72"	0.75"	0.52"	4,500 lbs
5/8"	1.90"	0.82"	0.66"	6,800 lbs

ALL INFORMATION CONTAINED IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY TO CONERY MFG, INC.

CONERY MFG INC

CHANGES	TOLERANCES	DRAWN BY	DATE
F	DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	03/22/04
E		MATERIAL SPECIFICATION:	
D			
C			
B			
A			

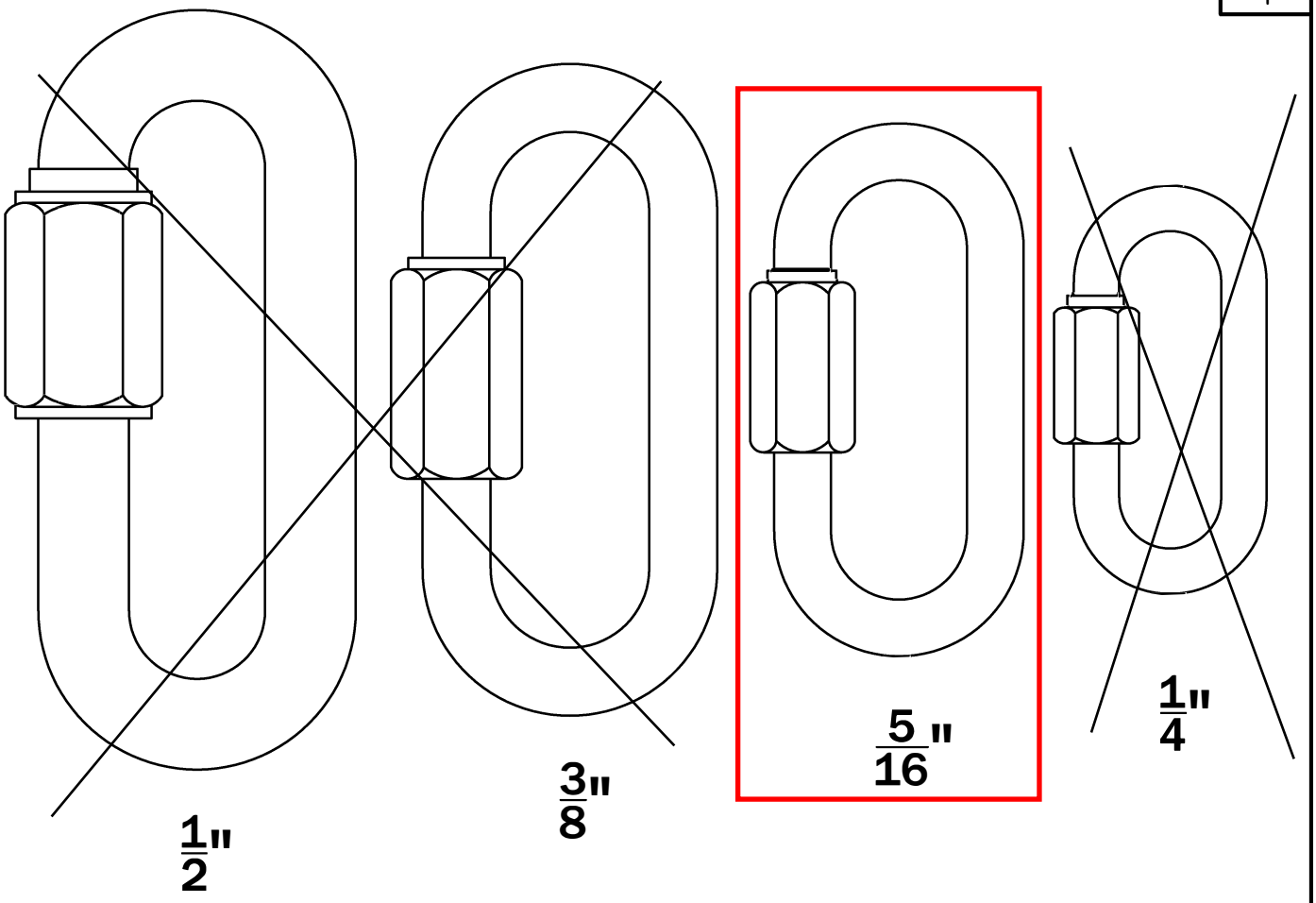
SPECIFICATION SHEET
DIMENSIONAL DATA

SCALE: FULL

PART NO. STAINLESS STEEL

QUICK LINK

PAGE 1



SIZE	LENGTH	WIDTH	MATERIAL	SAFE WORK LOAD
1/4"	2.25"	1.06"	316 SST	880 lbs
5/16"	2.94"	1.38"	316 SST	1,700 lbs
3/8"	3.53"	1.63"	316 SST	2,200 lbs
1/2"	4.18"	1.75"	316 SST	3,300 lbs

ALL INFORMATION CONTAINED IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY TO CONERY MFG, INC.

CONERY MFG INC

CHANGES	TOLERANCES	DRAWN BY	DATE
F	DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	03/22/04
E		MATERIAL SPECIFICATION:	
D			
C			
B			
A			

SPECIFICATION SHEET
DIMENSIONAL DATA

SCALE:	PART NO.
FULL	STAINLESS STEEL

APCO SWING CHECK VALVES

DeZURIK

Submittal Data Sheet
Date:August 6, 2025

KENNEDY INDUSTRIES INC
PO BOX 930079
WIXOM MI 48393
United States

P.O.
FACTORY QUOTE QUO254903
PROJ. NAME Forrest Hill Pump Station

LINE #	Cust LINE #	QTY	PART NO.	DESCRIPTION
1		2	9630493	CVS,6,250A,F1,DIF,DI-S11-S2-NBR*LW

Style	CVS	Swing Check Valve (CVS)
Size	6	6 Inch (150mm)
Body Style	250A	Series 250 Swing Check Valve
End Connection	F1	Flanged Drilling; ASME Class 150
Body Material	DIF	Ductile Iron: Fusion Bonded Epoxy, 12 Mils Interior and Exterior
Disc Material	DI	Ductile Iron
Shaft Material	S11	303 Stainless Steel
Body Seat Material	S2	316 Stainless Steel
Disc Seat Material	NBR	Acrylonitrile-Butadiene (NBR)
Coating	L41LD1	12 mils minimum of Blue Fusion Bonded Epoxy on Interior and Exterior with SP5 Surface Prep
Actuator	LW	Lever & Weight

Temperature Range	to 250 Degrees F.
Valve Pressure	to 250 psig

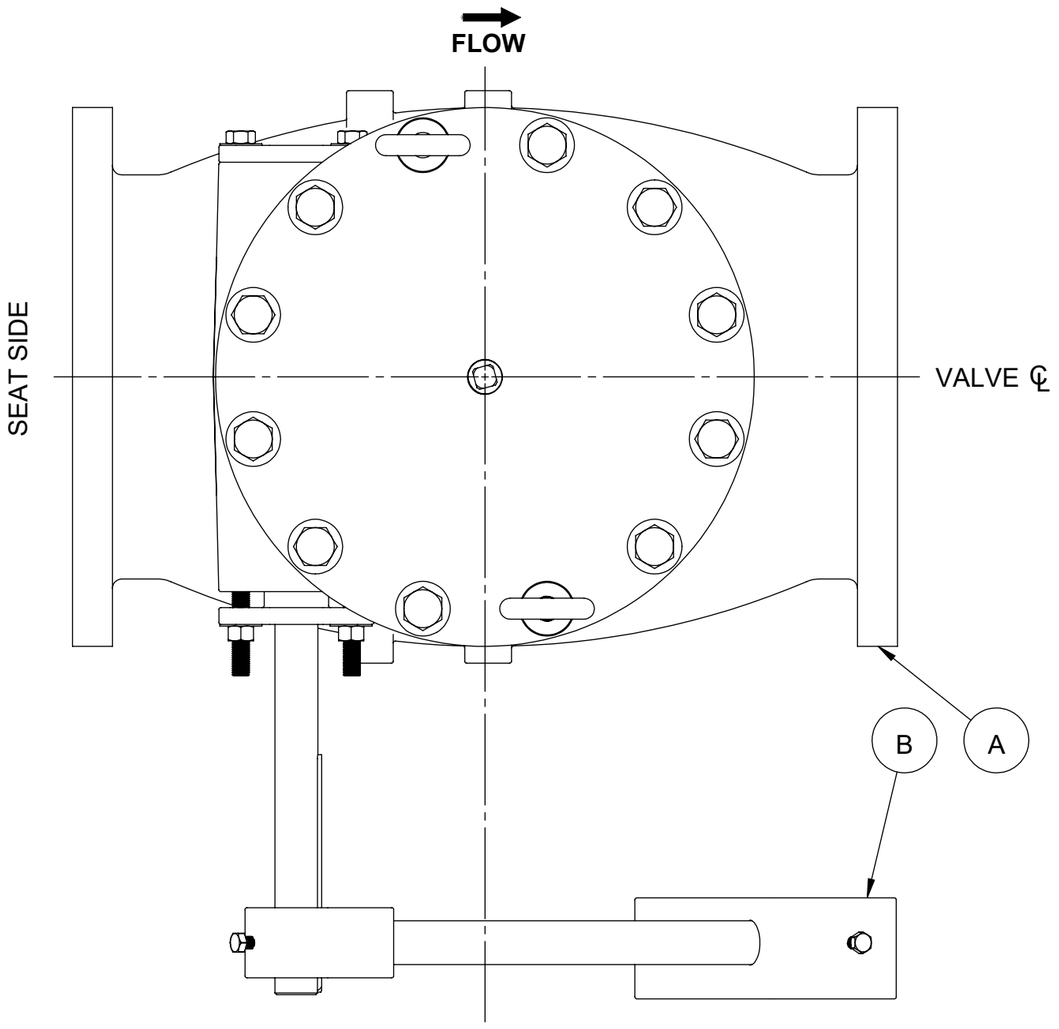
RELATED DOCUMENTS

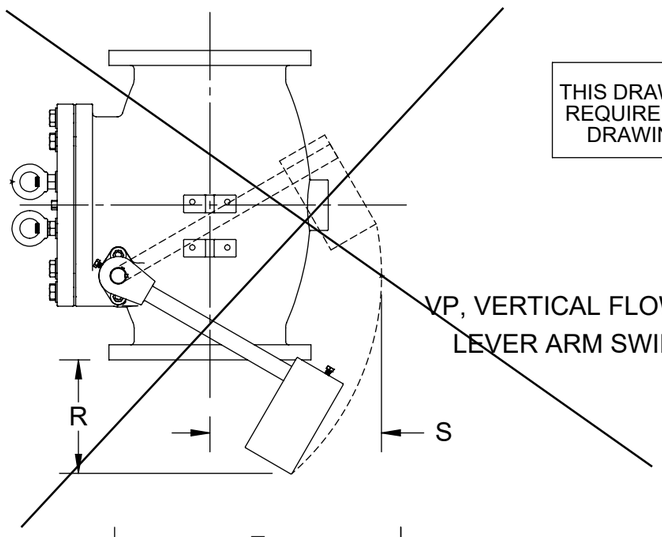
A70021: DWG INST CVS F1 LW 2-36" 250/250A
A70027: DWG VALVE ASSY CVS 2-36" 250/250A
A70064: DWG ASSY 250/250A LW CLOSURE CONTROL

DIMENSIONS (INCHES / MM)																	
VALVE SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S
2	8.00 203.2	10.00 254.0	3.50 88.9	10.92 277.4	4.12 104.6	6.00 152.4	4.75 120.7	0.63 16.0	-	-	4	5/8-11	0.62 15.7	7.00 177.8	10.00 254.0	6.00 152.4	9.38 238.1
2.5	8.50 215.9	9.72 246.8	3.50 88.9	10.92 277.4	4.12 104.6	7.00 177.8	5.50 139.7	0.88 22.4	-	-	4	5/8-11	0.88 22.4	6.50 165.1	9.88 250.8	6.13 155.6	9.38 238.1
3	9.50 241.3	10.00 254.0	4.50 114.3	11.00 279.4	4.00 101.6	7.50 190.5	6.00 152.4	0.75 19.1	-	-	4	5/8-11	0.75 19.1	5.88 149.2	10.13 257.2	5.50 139.7	9.25 235.0
4	11.50 292.1	10.75 273.1	5.00 127.0	11.75 298.5	5.00 127.0	9.00 228.6	7.50 190.5	0.94 23.8	0.75 19.7	6	2	5/8-11	0.94 23.8	4.88 123.8	10.75 273.1	4.88 123.8	8.75 222.3
6	14.00 355.6	11.75 298.5	5.75 146.1	13.50 342.9	6.50 165.1	11.00 279.4	9.50 241.3	1.00 25.4	0.88 22.2	6	2	3/4-10	1.00 25.4	2.13 54.0	11.63 295.3	4.63 117.5	7.88 200.0
8	19.50 495.3	13.75 349.3	7.25 184.2	17.00 431.8	7.50 190.5	13.50 342.9	11.75 298.5	1.13 28.6	0.88 22.2	8	-	-	-	2.00 50.8	15.50 393.7	5.88 149.2	10.38 263.5
10	24.50 622.3	15.00 381.0	9.38 238.1	16.25 412.8	9.00 228.6	16.00 406.4	14.25 362.0	1.19 30.2	1.00 25.4	12	-	-	-	3.00 76.2	18.38 466.7	9.00 228.6	13.63 346.1
12	27.50 698.5	19.00 482.6	11.00 279.4	18.25 463.6	11.00 279.4	19.00 482.6	17.00 431.8	1.25 31.8	1.00 25.4	12	-	-	-	3.25 82.6	21.13 536.6	9.00 228.6	14.25 362.0
14	31.00 787.4	22.50 571.5	13.50 342.9	26.00 660.4	14.00 355.6	21.00 533.4	18.75 476.3	1.38 34.9	1.13 28.6	12	-	-	-	6.63 168.3	25.88 657.2	11.75 298.5	18.75 476.3
16	36.00 914.4	24.50 622.3	14.25 362.0	29.50 749.3	15.00 381.0	23.50 596.9	21.25 539.8	1.44 36.5	1.13 28.6	16	-	-	-	2.00 50.8	32.00 812.8	7.25 184.2	15.88 403.2
18	40.00 1016.0	26.50 673.1	17.38 441.3	31.00 787.4	18.63 473.1	25.00 635.0	22.75 577.9	1.56 39.7	1.25 31.8	16	-	-	-	7.00 177.8	36.00 914.4	9.25 235.0	21.25 539.8
20	40.00 1016.0	28.75 730.3	17.63 447.7	32.38 822.3	18.63 473.1	27.50 698.5	25.00 635.0	1.69 42.9	1.25 31.8	20	-	-	-	6.00 152.4	41.00 1041.4		
24	48.00 1219.2	32.50 825.5	20.13 511.2	34.00 863.6	21.00 533.4	32.00 812.8	29.50 749.3	1.88 47.6	1.38 34.9	20	-	-	-	0	38.00 965.2	8.75 222.3	19.25 489.0
30	56.00 1422.4	37.20 945.0	21.85 555.0	39.00 990.6	24.00 609.6	38.75 984.3	36.00 914.4	2.13 54.0	1.38 34.9	28	-	-	-	14.13 358.8	53.13 1349.4	15.50 393.7	24.00 609.6
36	63.00 1600.2	42.91 1090.0	26.38 670.0	42.00 1066.8	27.00 685.8	46.00 1168.4	42.75 1085.9	2.38 60.3	1.63 41.3	32	-	-	-	14.63 371.5	57.50 1460.5	15.00 381.0	21.00 533.4
42	70.00 1778.0	56.30 1430.0	32.28 820.0	39.29 998	33.27 845	53.00 1346.2	49.50 1257.3	2.63 66.7	1.63 41.3	36	-	-	-	19.69 500.0	53.54 1360.0	22.83 580.0	14.17 360.0

ITEM NO.	DESCRIPTION
A	VALVE
B	LEVER & WEIGHT CLOSURE CONTROL

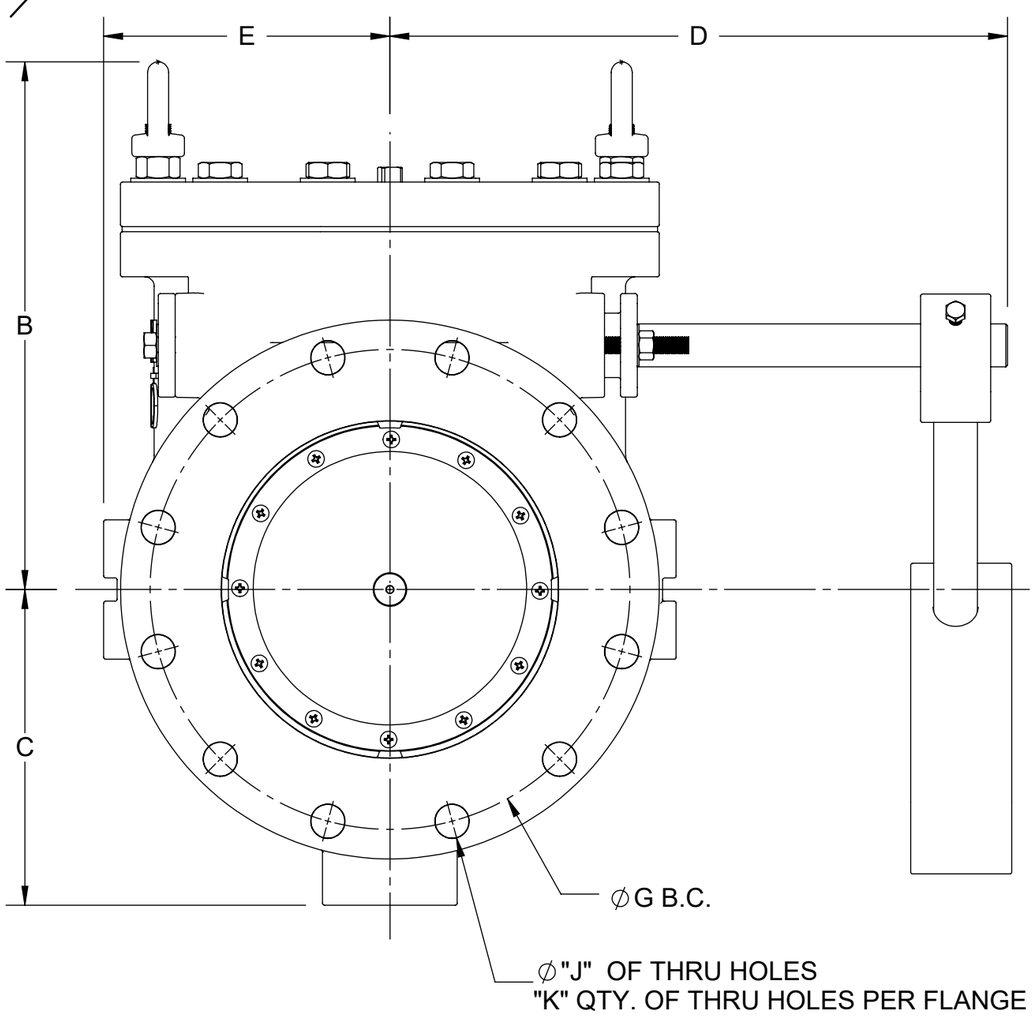
NOTE:
1. VALVE SIZES 2" THRU 14" ARE 250A BODY STYLE.
2. LEVER ARM IS ANGLED 30° BELOW THE HORIZONTAL WHEN VALVE IS CLOSED. LEVER ARM HAS A MAXIMUM OF 60° OF TRAVEL.
3. FACE TO FACE DIMENSIONS ARE IN COMPLIANCE WITH AWWA C508.

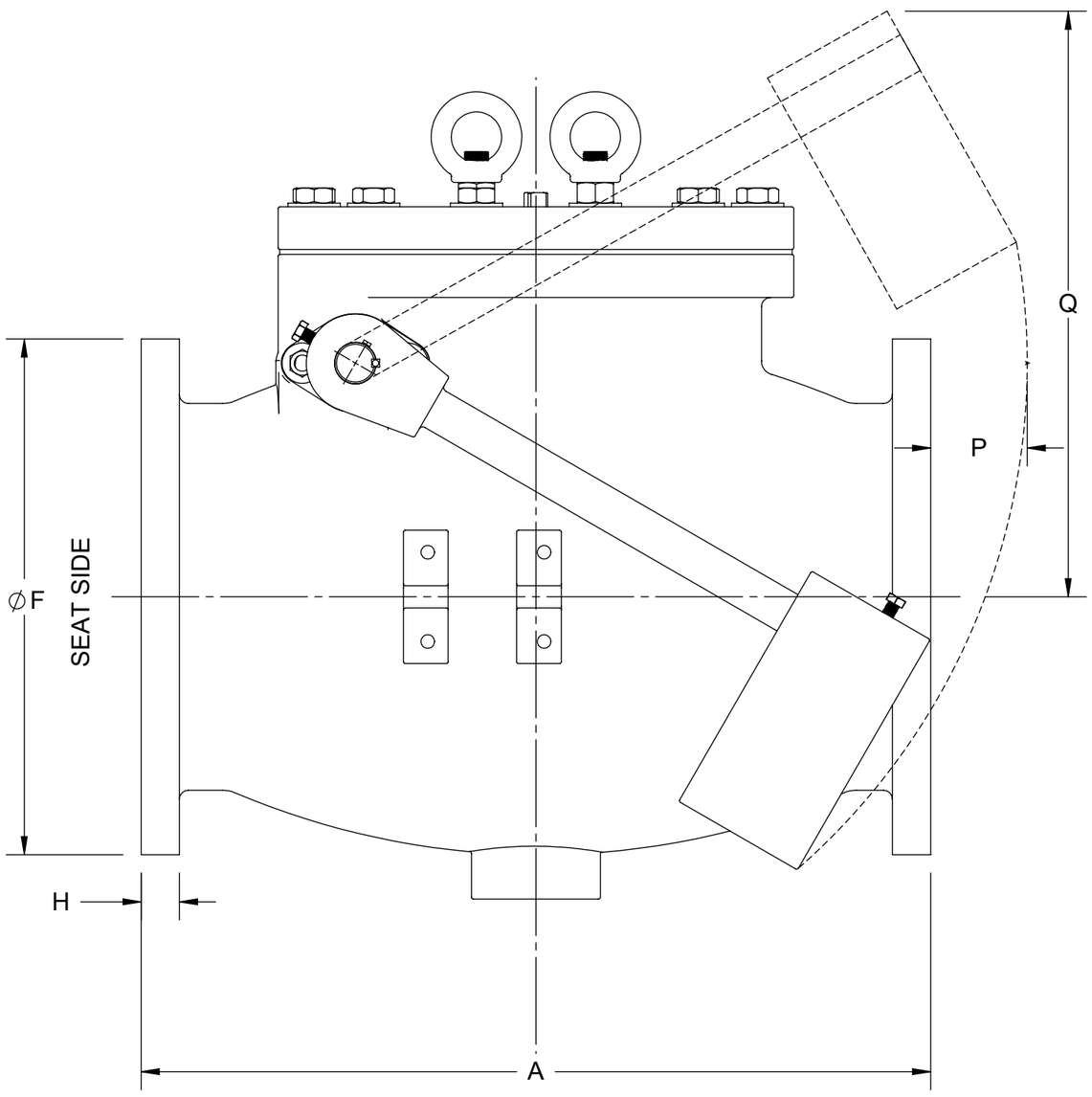


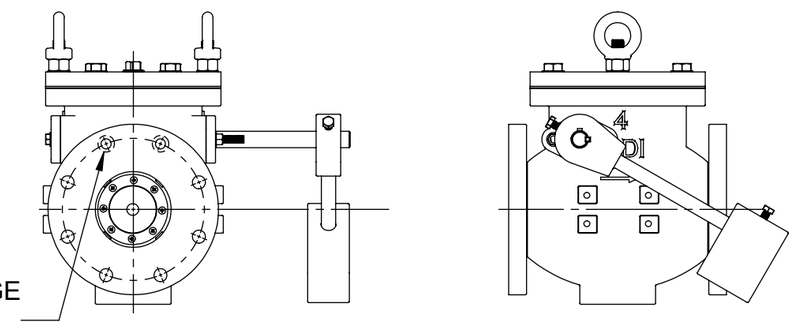


VP, VERTICAL FLOW UP
LEVER ARM SWING

NOTICE
THIS DRAWING DOES NOT SHOW ACCESSORIES. IF ACCESSORIES ARE REQUIRED, REFER TO THE APPROPRIATE ACCESSORY INSTALLATION DRAWING FOR DIMENSIONS AND OTHER RELATED INFORMATION.

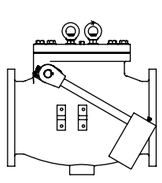




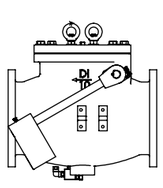


SIZES 2" THRU 6" VALVE BODY CONFIGURATION

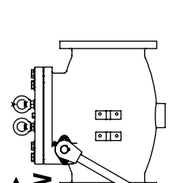
IF NO OPTION IS SELECTED, STANDARD IS PROVIDED



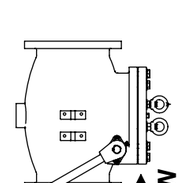
FLOW
STANDARD
(SHOWN)



FLOW
LEFT HAND



FLOW
VP, STANDARD



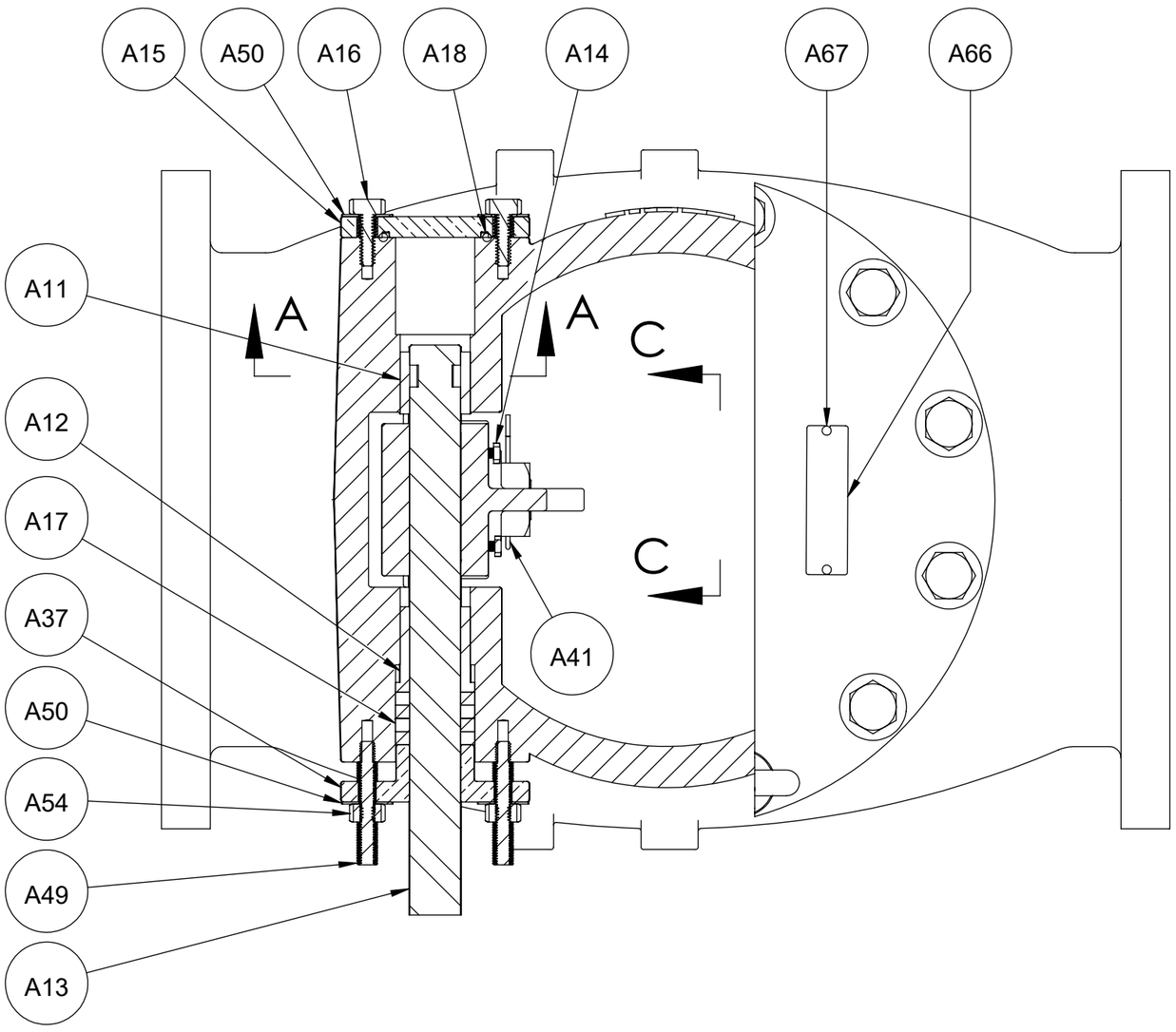
FLOW
VP, LEFT HAND

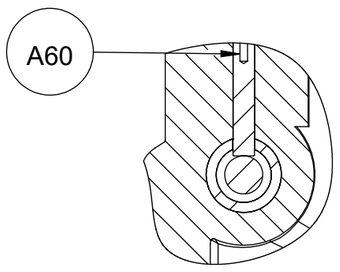
G	F	E	D	C	B 50312 7/11/17	A

DeZURIK
APCO | HILTON

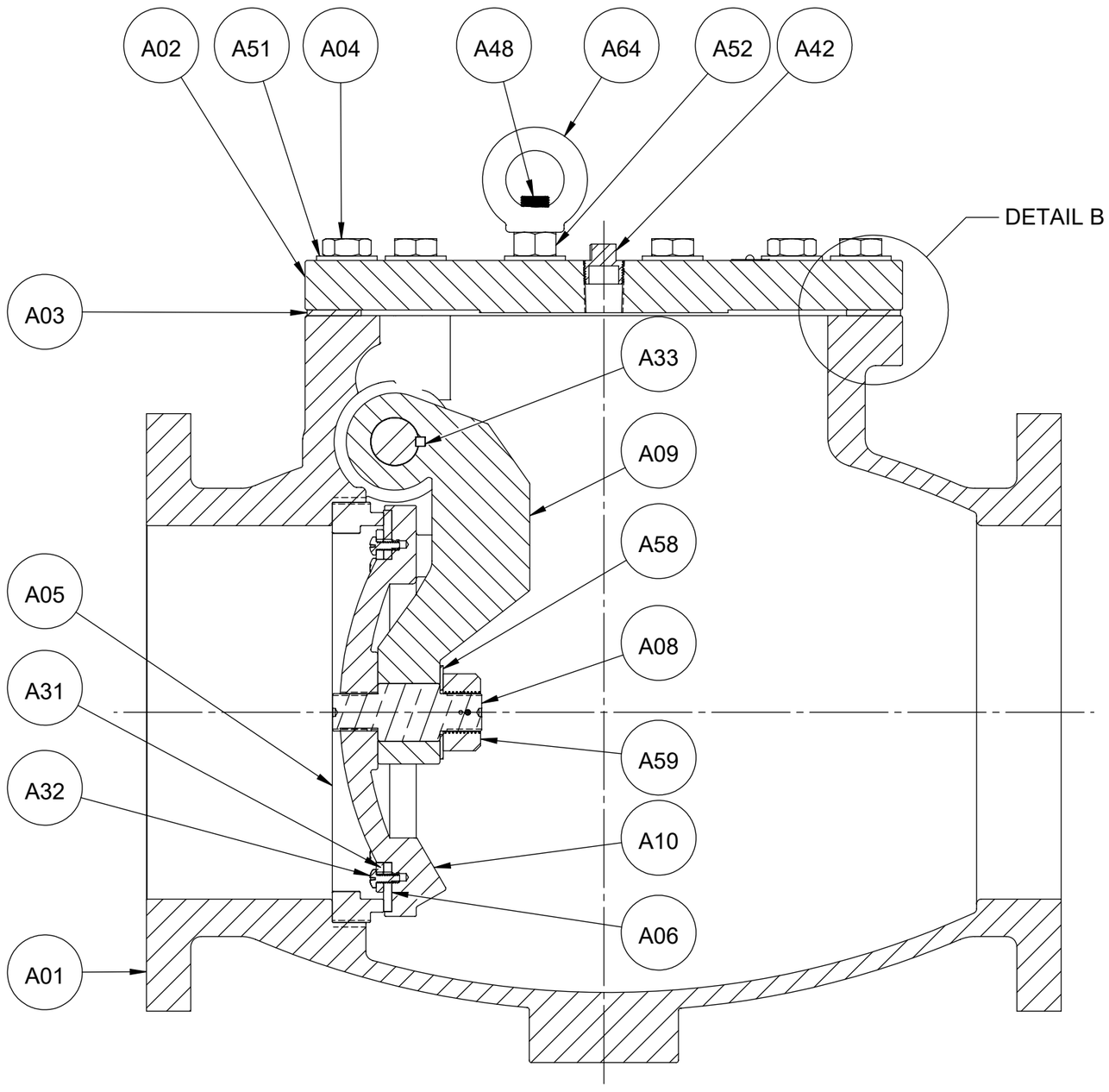
APCO CVS SWING CHECK VALVE, SIZES 2" THRU 36"
250 SERIES, LEVER & WEIGHT CLOSURE CONTROL

DOCT. CODE	DRAWN	APPROVED	A70021
C1	JPD	TMO	
	CHECKED DWZ	DATE 10/23/2013	





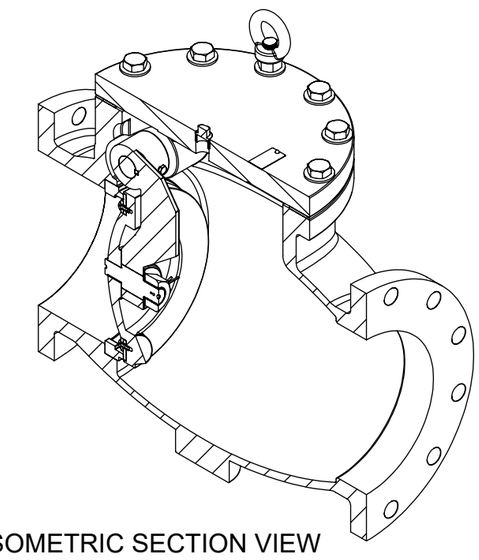
SECTION A-A



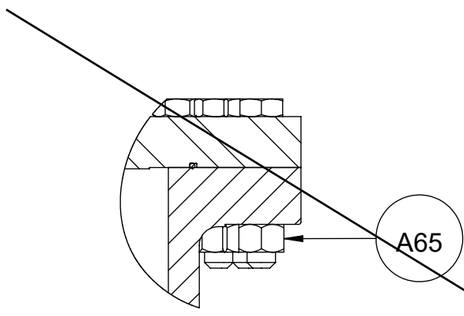
ITEM NO.	DESCRIPTION	QTY
A01	BODY	1
A02	COVER	1
A03	COVER SEAL[4]	1
A04	COVER BOLT	-
A05	BODY SEAT RING[1]	1
A06	DISC SEAT[4]	1
A08	DISC STEM / PIN	1
A09	DISC ARM	1
A10	DISC	1
A11	PIVOT SHAFT STRAIGHT BUSHING[2]	1
A12	PIVOT SHAFT FLANGED BUSHING[2]	1
A13	PIVOT SHAFT	1
A14	DISC ARM RETAINING SCREW	-
A15	PIVOT SHAFT COVER	1
A16	PIVOT SHAFT COVER BOLT	-
A17	PACKING[4]	1
A18	PIVOT SHAFT COVER SEAL[4]	1
A31	SEAT RETAINING RING[4]	1
A32	SEAT RETAINING SCREW[4]	-
A33	DISC ARM KEY (4" & UP)	1
A37	PACKING GLAND	1
A41	DISC PIN RETAINER	1
A42	COVER PIPE PLUG	1
A48	COVER STUD[3]	2
A49	PACKING GLAND STUD	2
A50	WASHER	4
A51	COVER BOLT WASHER	-
A52	COVER NUT	2
A54	PACKING GLAND NUT	-
A58	DISC ARM WASHER[3]	1
A59	DISC STEM NUT[3]	1
A60	SHAFT RETAINING PIN	1
A64	COVER EYE NUT[3]	2
A65	COVER NUT (30 & 36")	-
A66	DATA PLATE	1
A67	DRIVE SCREWS	2

NOTES:

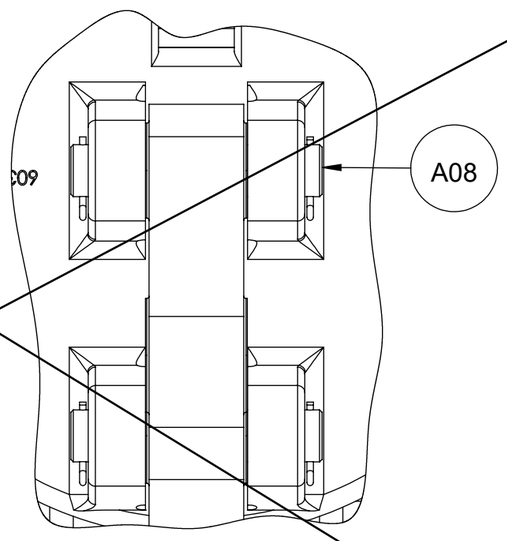
1. BODY SEAT RING ON VALVE SIZES 2" TO 24" IS THREADED.
2. ITEMS A11 & A12 ARE NOT USED ON VALVE SIZES 2", 2.5", OR 3".
3. ITEMS A48, A58, A59, A64 ARE NOT INCLUDED ON VALVE SIZES 30" & 36".
4. REPLACEABLE WEAR PARTS: A03, A06, A17, A18, A31, A32.



ISOMETRIC SECTION VIEW



DETAIL B
30" & 36" COVER CONNECTION



VIEW C-C
30" & 36" DOUBLE CLEVIS CONNECTION

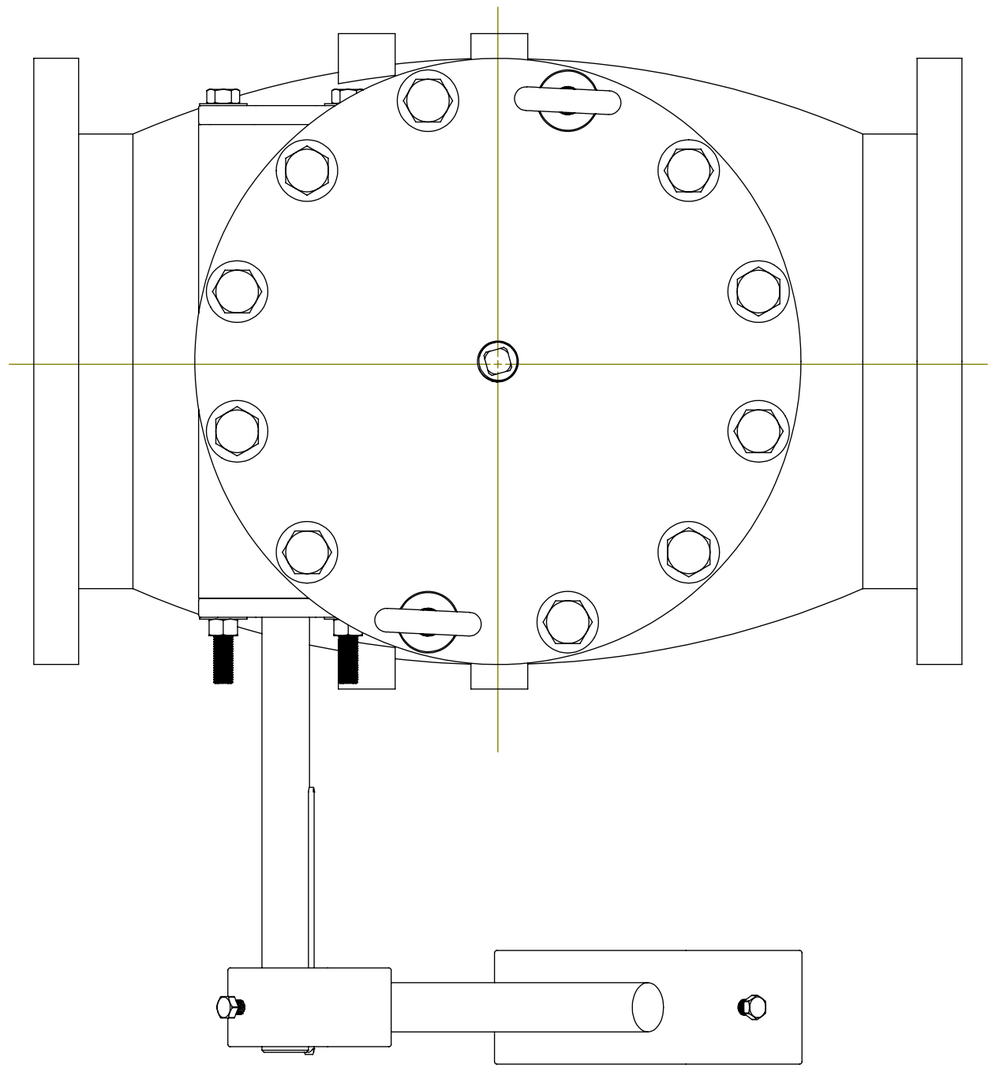
G	F	E	D	C	B 71280 10/4/22	A 50312 9/24/15	

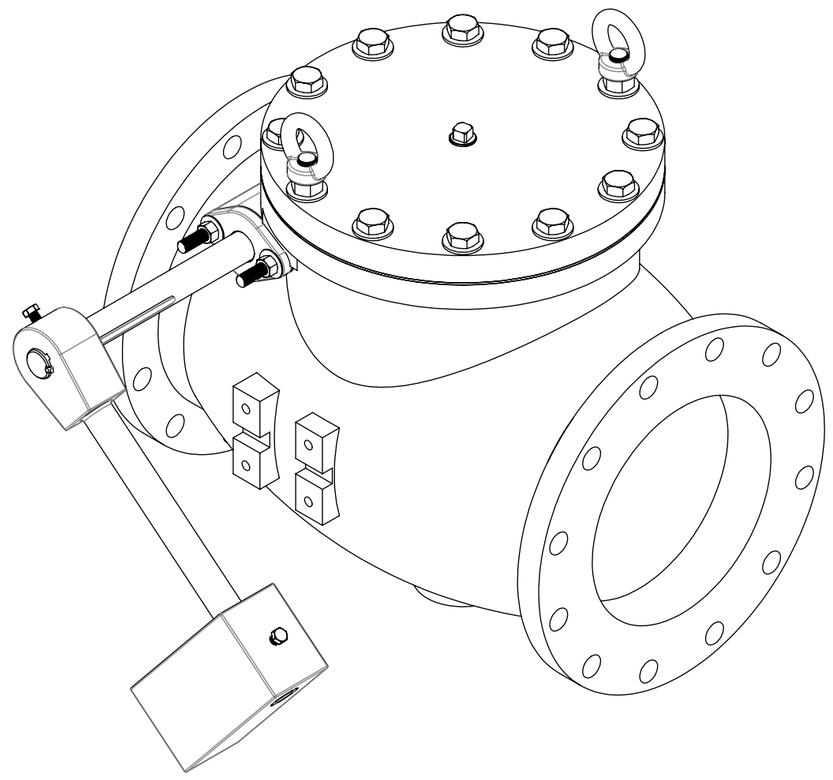
DeZURIK
APCO | HILTON

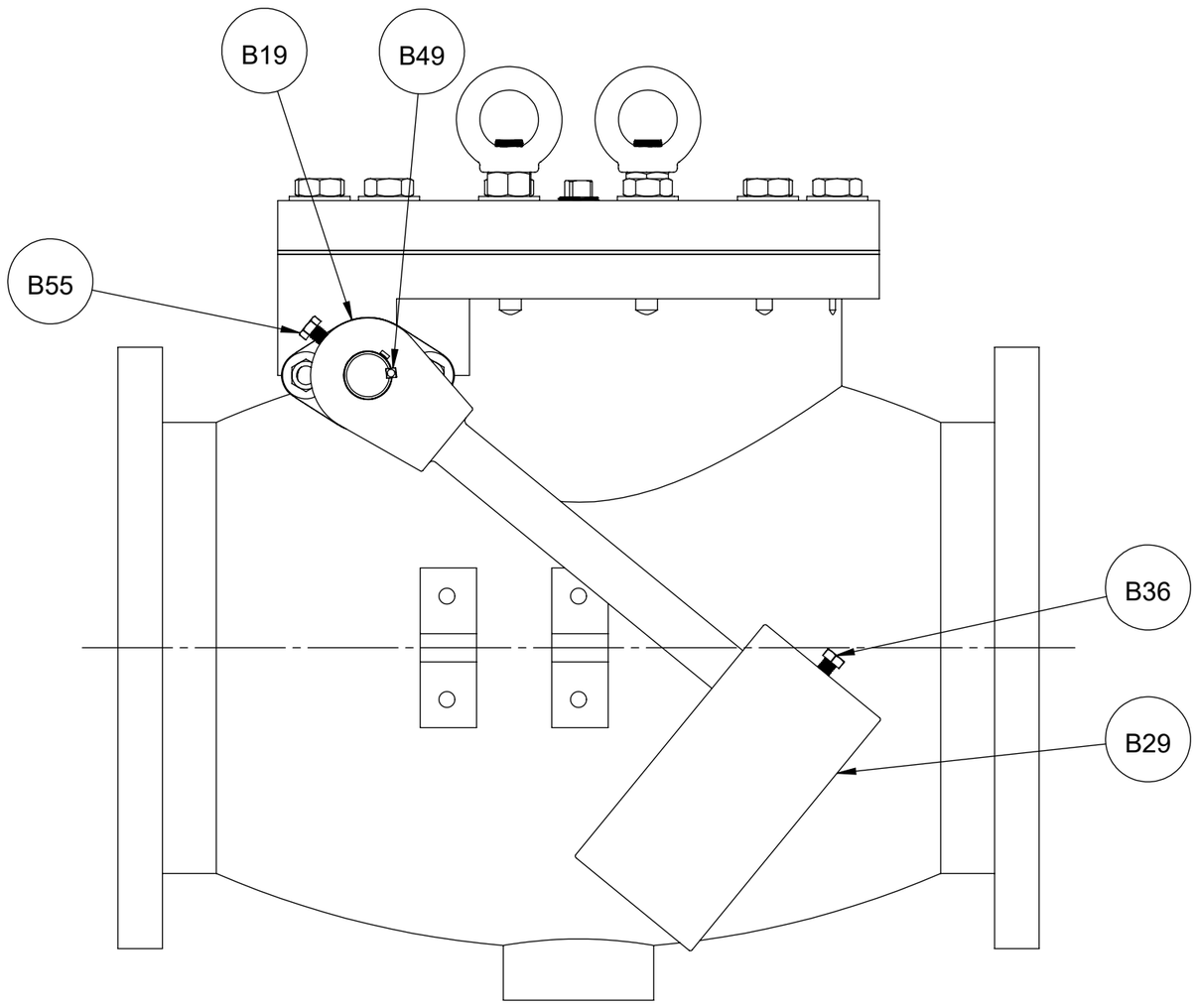
APCO CVS - SWING CHECK VALVE, 250 SERIES,
2" THRU 36" BASIC VALVE ASSEMBLY

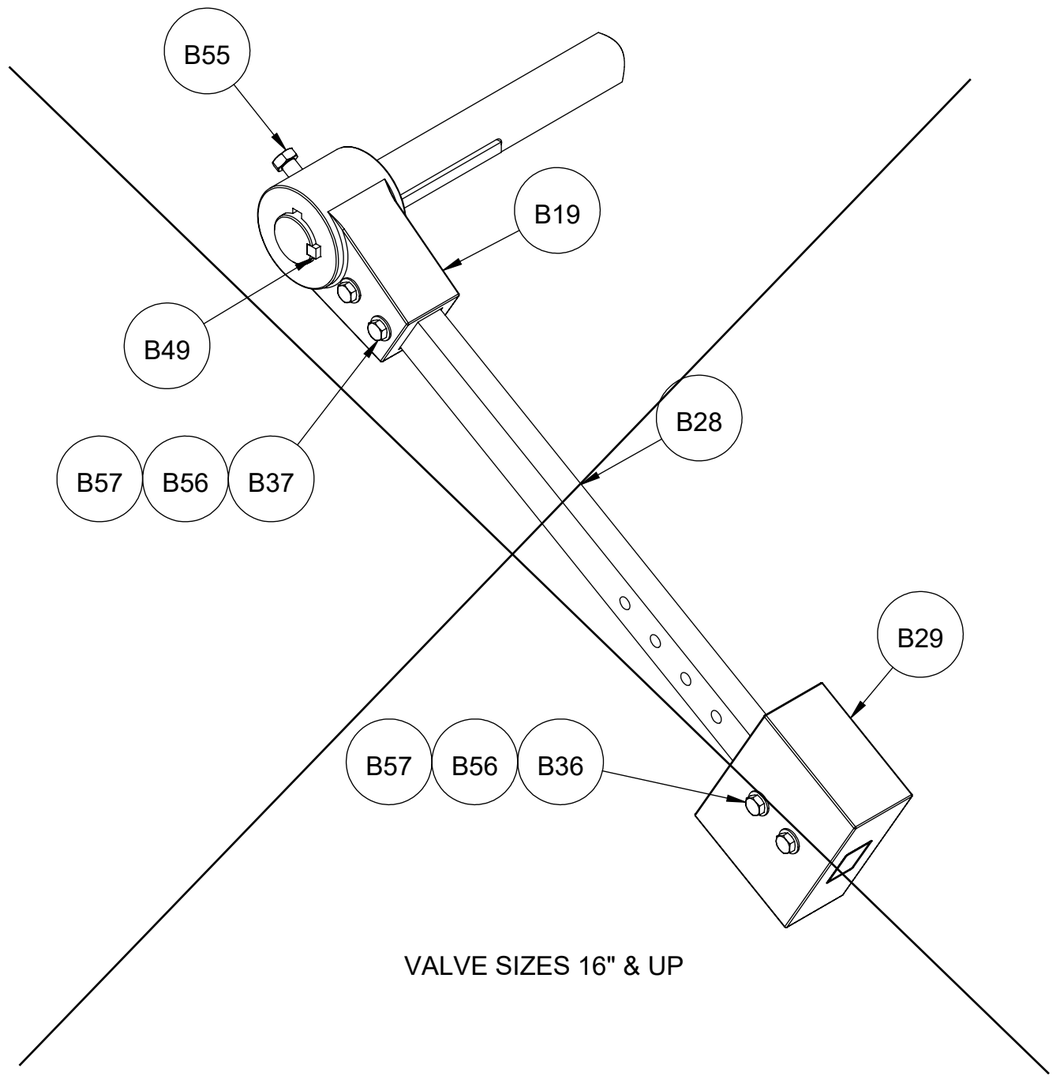
DOCT. CODE	DRAWN	APPROVED	
C1	JPD	DWZ	A70027
	CHECKED DWZ	DATE 10/28/2013	

ITEM NO.	DESCRIPTION	QTY
B19	COUNTERWEIGHT LEVER	1
B28	COUNTERWEIGHT ARM (16" & UP)	1
B29	COUNTERWEIGHT	1
B36	COUNTERWEIGHT ARM SET SCREW (2"-14")	1
	COUNTERWEIGHT ARM SCREW (16" & UP)	2
B37	LEVER ARM SCREW (16" & UP)	2
B49	LEVER ARM KEY	1
B55	LEVER ARM RETAINING SCREW	1
B56	LEVER ARM NUT (16" & UP)	4
B57	LEVER ARM WASHER (16" & UP)	8









VALVE SIZES 16" & UP

G						
F						
E						
D						
C						
B	50312	7/1/21				
A	70283	8/21/19				

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APCO CVS - SWING CHECK VALVE, 250 SERIES
LW - LEVER & WEIGHT CLOSURE CONTROL ASSEMBLY

DOCT. CODE	DRAWN	APPROVED	
C1	JPD	DWZ	A70064
	CHECKED DWZ	DATE 10/28/2013	

DeZURIK APCO HILTON WILLAMETTE

Red Valve Tideflex RKL Controls

RECOMMENDED SHORT & LONG TERM STORAGE PROCEDURES

SHORT TERM STORAGE (LESS THAN 6 MONTHS)

1. All valves shall be stored in the position in which they were shipped. Do not stack (or store) items on top of the rubber components.

2. Valves shall be protected from dirt, debris, excessive moisture and UV exposure. Store at temperatures ranging from 35°F to 95°F (2°C to 35°C) with humidity levels not exceeding 50%.

LONG TERM STORAGE (6 MONTHS +)

1. All valves shall be stored in the position in which they were shipped. Do not stack (or store) items on top of the rubber components.

2. Valves shall be stored fully enclosed in a crate or on a skid. It is acceptable to store the valves uncrated but protected from any dirt, debris or UV exposure as long as the environmental conditions as described in item 3 are met. Any desiccant packages received with the original shipment should be replaced before putting valves into long term storage. Please follow your desiccant manufacturer's recommended usage of any desiccant based on the volume of the enclosed area.

3. Valves shall be stored in a well ventilated, clean, dry indoor facility on skids or raised racks with temperatures ranging from 35°F to 95°F (2°C to 35°C) with humidity levels not exceeding 50%. Rubber components shall be stored within temperature range 59°F to 77°F (15°C to 25°C)

4. If the above conditions cannot be met, valves shall be separately packaged inside sealed heavy duty plastic sheeting and a weather resistant enclosure, or a standard crate lined with moisture proof paper, to protect the valves from dirt, debris and UV exposure. Desiccant packages shall be used to control moisture both inside the enclosure and the sealed heavy duty plastic covering. Please follow your desiccant manufacturer's recommended usage of any desiccant based on the volume of the enclosed area.

5. Do not store valves next to operating electric motors or equipment which may emit ozone, which can cause deterioration of valve elastomers. Store in an environment with less than 0.1 ppm concentration, at least 25 feet from ozone emitting devices, with ventilation.

6. Valves with cylinder actuators and control valves which are stored for extended periods may be subject to cylinder blow-by caused by permanent distortion of any of the seals. Valves should be operated prior to installation and damaged seals replaced. If possible, it is recommended that cylinders be cycled every 4-6 months to maintain seals.

7. Valves with electric motor operators shall be stored in accordance with the individual motor manufacturer's recommended long term storage procedures.

8. All electrical components shall be visually inspected prior to valve installation.

SHELF LIFE (RUBBER COMPONENTS)

For rubber components or elastomers stored for longer than the time shown below contact the manufacturer to coordinate a visual inspection.

- Three (3) years for Natural (Pure Gum) Rubber and Styrene-Butadiene (SBR) components.

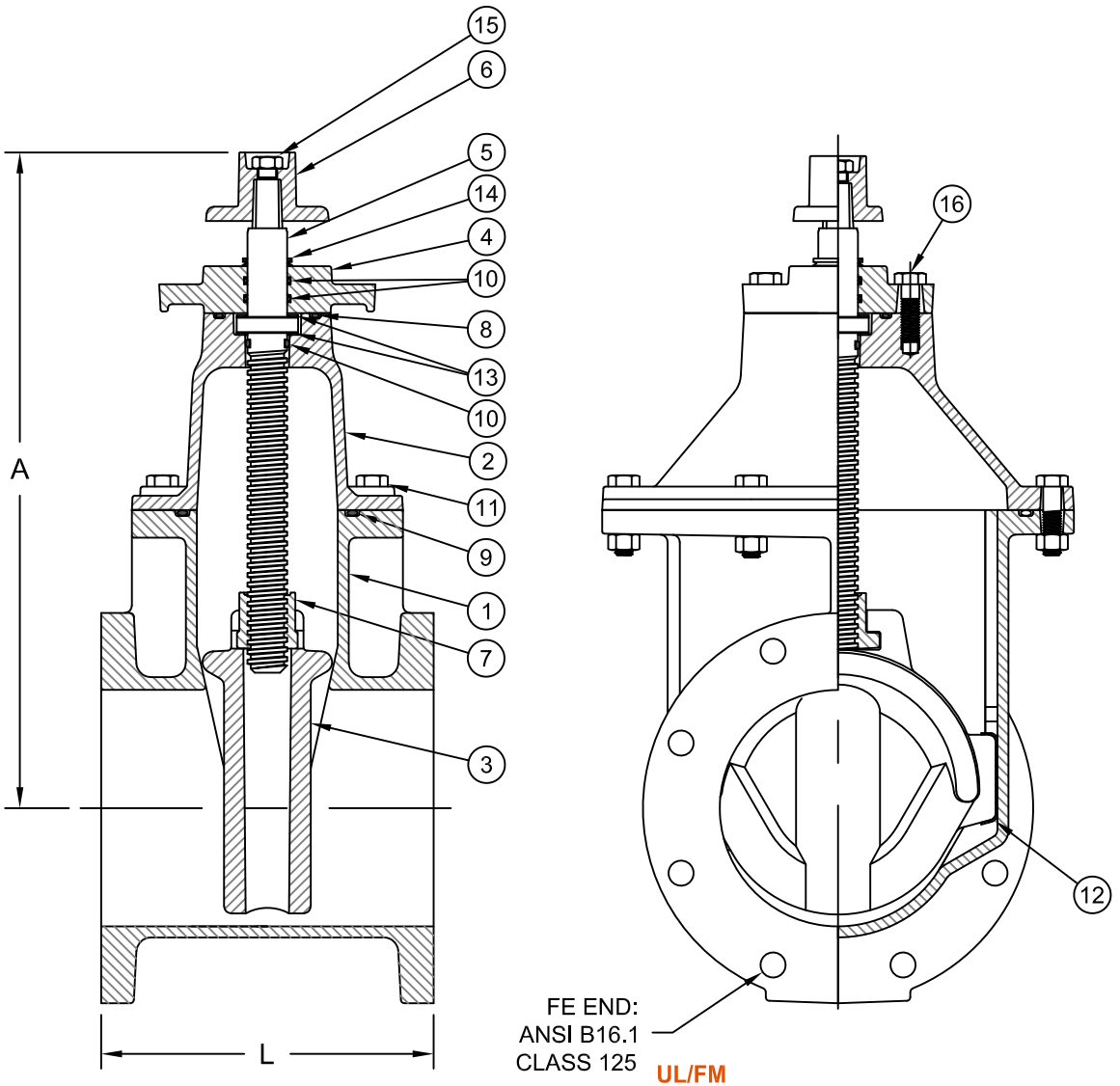
- Five (5) years for Chloroprene (Neoprene), Acrylonitrile-Butadiene (Nitrile, Buna-N), Chlorosulfonated Polyethylene (Hypalon), Chloro-Isobutylene-Isoprene (Chlorobutyl), EPDM, and Fluoroelastomer components.

Form 1454 Rev B
(Y67834 references this form)

Manufacturer Main Office
250 Riverside Avenue N
Sartell, MN 56377 USA
Ph: 320-259-2000

EJ GATE VALVES

Resilient Wedge Gate Valve



Product

Resilient Wedge Gate Valve, Flange x Flange

Design Features

1. Flange End Connection in Accordance with ANSI B16.1
2. EJ RW Gate Valves Conform to:
   AWWA C515
   AWWA C550 (Coating)
3. Working Pressure = 250 psi
4. Post Indicator Plates are available (4"-16")

Components

Item #	Description	Material
1	Body	Ductile Iron
2	Bonnet	Ductile Iron
3	Wedge	Ductile Iron / EPDM
4	Seal plate	Ductile Iron
5	Stem	Manganese Bronze
6	Operating nut	Cast Iron
7	Stem nut	Manganese Bronze
8	Seal plate O-ring	Rubber, Buna-N
9	Body O-ring	Rubber, Buna-N
10	Stem O-ring	Rubber, Buna-N
11	Hex cap screw w/nut	304 Stainless Steel
12	Ear cap	Polymer
13	Thrust washer	Polymer
14	Shaft seal	Rubber, Buna-N
15	Hex bolt	304 Stainless Steel
16	Hex bolt	304 Stainless Steel

Dimensions

Valve	"A"	"L"
3"	13 1/4"	8"
4"	15"	9"
6"	18 9/16"	10 1/2"
8"	22 11/16"	11 1/2"
10"	27"	13"
12"	31 1/8"	14"
14"	35 1/4"	17"
16"	39 1/2"	17"

UL/FM

All valves are manufactured to meet Underwriters Laboratories 262 and Factory Mutual 1130. 4", 6", 8" valves are UL listed and 4" - 12" are FM approved.

Drawing Revision

Designer: MCA 12/09/24
Revised By: MCA 07/24/25

Contact

800 626 4653
ejco.com

Disclaimer: Weights (lbs./kg) dimensions (inches/mm) and drawings provided for your guidance. We reserve the right to modify specifications without prior notice. CONFIDENTIAL: This drawing is the property of EJ Group, Inc., and embodies confidential information, registered marks, patents, trade secret information, and /or know how that it is the property of EJ Group, Inc. Copyright © 2025 EJ Group, Inc. All rights reserved.

6" Resilient Wedge Gate Valve FE 2" Operating Nut OL

Product: 2300600



GENERAL

Product Type:	Valve
Specialty Series:	FlowMaster®
Classic Series:	RW

CHARACTERISTICS

Opening Direction:	Open left (counter-clockwise)
Valve Size:	6
End Connection:	Flanged End x Flanged End
Valve Stem Material:	Manganese Bronze

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EJ
301 Spring Street
PO Box 439
East Jordan, MI 49727-0439

+1 231 536 2261
800 874 4100
ejco.com

WaterMaster® Fire Hydrants and FlowMaster® Gate Valves

10 Year Limited Warranty

WaterMaster® Fire Hydrants and FlowMaster® Gate Valves manufactured by EJ shall have a warranty period of ten years for latent defects.

Rich Brandell
Vice President and General Manager

All sales by EJ USA, Inc. are subject to and governed by the EJ USA, Inc. Customer Terms and Conditions of Sale, which can be located at **ejco.com/ustc**. Any additional or different terms proposed by buyer are unacceptable to and expressly rejected by EJ USA, Inc. EJ USA, Inc.'s performance under any purchase order issued by buyer is expressly limited to and conditioned upon buyer's acceptance of EJ USA, Inc.'s Customer Terms and Conditions of Sale exclusively.

August 2023. EJ Group, Inc.

EJ
301 Spring Street
PO Box 439
East Jordan, MI 49727-0439

+1 231 536 2261
800 874 4100
ejco.com

August 10, 2023

Dear Valued Customer,

SUBJECT: Product Warranty

Customer Terms and Conditions of Sale for EJ USA, Inc., can be viewed on our website at ejco.com/ustc and contains our general warranty information.

Section 6 of our Customer Terms and Conditions contains warranty information for our products:

Warranties and Limited Remedies. Unless otherwise set forth in the quotation, Seller warrants to Buyer only that, at the time of delivery, the goods will be free from defects in material and workmanship and will conform to any mutually agreed upon written specifications and/or drawings. If, however, Buyer's representative agrees, either orally or in writing, to a change in or waiver of a portion of the specifications for any shipment of goods, then such goods shall be considered conforming if they conform to the specifications as changed or with such waived portion excluded. The warranty period for the goods shall be as follows:

a. For hydrants, valves, or detectable warning plates manufactured by Seller, the warranty period shall be ten years from the date of delivery. Special finishes and other special equipment (if applicable) shall be warranted separately by the manufacturers of those products.
b. For aluminum hatches and composites manufactured by Seller, the warranty period shall be five years from the date of delivery. Special finishes and other special equipment (if applicable) shall be warranted separately by the manufacturers of those products.
c. For all other goods manufactured by Seller, the warranty period shall be one year from the date of delivery. Special finishes and other special equipment (if applicable) shall be warranted separately by the manufacturers of those products.

Buyer agrees to inspect all of the goods immediately upon receipt from Seller. In the event that Buyer believes that a good is non-conforming with the warranties specified herein, then Buyer will promptly notify Seller of the alleged defect in writing and provide to Seller as much information as is available to Buyer about the alleged non-conformity. If requested by Seller, Buyer will return to Seller all (or, if not feasible, a statistically significant sample) of the allegedly non-conforming goods and the assemblies into which such goods are incorporated, if applicable, together with any additional information or documentation reasonably requested by Seller, for the purpose of determining if the goods are non-conforming with the warranties specified herein.

If Seller determines that the goods are non-conforming, Seller's sole liability to Buyer and Buyer's SOLE AND EXCLUSIVE REMEDY under this warranty (whether or not the non-conforming goods have been installed and must be the subject of a recall, customer satisfaction or other service campaign or similar action) is limited to the repair or replacement of the non-conforming goods only; provided, however, that written notice that the goods are potentially non-conforming must be given by Buyer to Seller within five (5) days after the delivery of the goods to Buyer or, if Buyer's inspection of the goods could not have uncovered the potential non-conformance, within thirty (30) days after Buyer knew or reasonably should have known that the goods were potentially non-conforming, including, but not limited to, through information received from Buyer's direct or indirect customer or any other third party. For clarity, Seller shall not be responsible for the expense of locating or removing the non-conforming goods or re-installing any repaired or replacement goods. Except as stated herein, Buyer shall not have any right of rejection or revocation of acceptance of goods.

SPECIFICALLY EXCLUDED FROM THIS PARAGRAPH AND ANY WARRANTY ARE THE FOLLOWING, FOR WHICH SELLER SHALL HAVE NO LIABILITY WHATSOEVER: (i) Design defects in the goods, to the extent that the goods are designed, in whole or in part, by Buyer or a third party; (ii) defects or damage caused by unauthorized or improper installation, alteration, repair, maintenance (including failure to provide appropriate maintenance), storage, handling or operation of the goods by Buyer or any third party; (iii) goods considered by Seller to be samples, prototype, development or pre-production, which are provided on an "AS IS" basis only; (iv) goods sold by Seller but manufactured by a different entity, which are sold by Seller on an "AS IS" basis, provided, however, that Seller assigns to Buyer any warranties provided by the manufacturers of such goods, to the extent that they are assignable; (v) any product, system, or assembly not manufactured or sold by Seller and/or the integration, incorporation, interaction, connection, placement, or use of the goods in or with any such product, system, or assembly, (vi) goods that have been subject to damage attributable to or caused by: (a) misuse, abuse, or vandalism or any transit related damage; (b) acts of God or insurrection; (c) normal wear and tear; (d) or any other acts that are beyond Seller's reasonable control.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND ARE GIVEN AND ACCEPTED IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND AGAINST INFRINGEMENT, AND BUYER IS SOLELY RESPONSIBLE FOR THE SELECTION OF THE GOODS AND DETERMINING THE PROPER APPLICATION AND USE OF THE GOODS. THE REMEDIES OF THE PURCHASER SHALL BE LIMITED TO THOSE PROVIDED HEREIN TO THE EXCLUSION OF ANY AND ALL OTHER REMEDIES. NO AGREEMENT VARYING OR EXTENDING THE FOREGOING WARRANTIES, REMEDIES, OR THIS LIMITATION WILL BE BINDING UPON SELLER UNLESS IN WRITING AND SIGNED BY A DULY AUTHORIZED OFFICER OF SELLER.

Sincerely,

EJ USA, Inc.



Rich Brandell
Vice President and General Manager

CONCERTOR MODULE



FPM 711

Nexicon™ Machine Module Dirigo™

https://qr.xylemsales.com/90031601

1 Product Description

1.1 Product design

The machine module in the Nexicon™ system is used as a gateway to a Dirigo™ machine.

Main features:

- Machine interface for pump communication
- Alarm handling
- High-level switch

The module is energized from the backplane.

Product name	Part number	Description
FPM 711	848 28 20	Gateway module for a Dirigo™ machine

1.2 System description

The Nexicon™ is a programmable and extendable monitoring and control platform. Nexicon™ is designed as a modular system where each module is configured to monitor or control different assets or set of features.

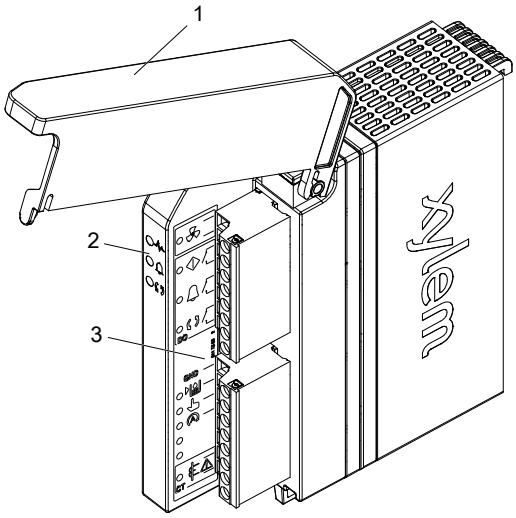
Communication between the modules in the system is made through the backplane.

The communication to a web interface or to a SCADA system is made through the application manager. The communication to a Xylem HMI or a service tool is made through the backplane supply module.

This image shows an example of a configuration of a controller for a pumping station. The following modules are seen from left to right: Backplane supply module, application manager, two pump modules, and one I/O module. All modules are connected to the backplane.

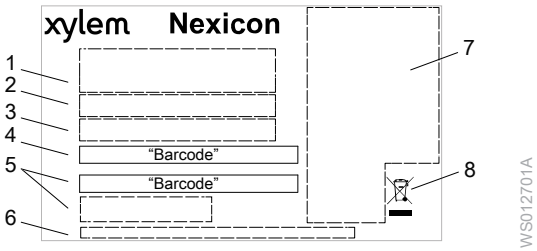


1.3 Parts



1. Hatch
2. Status LEDs
3. Terminals

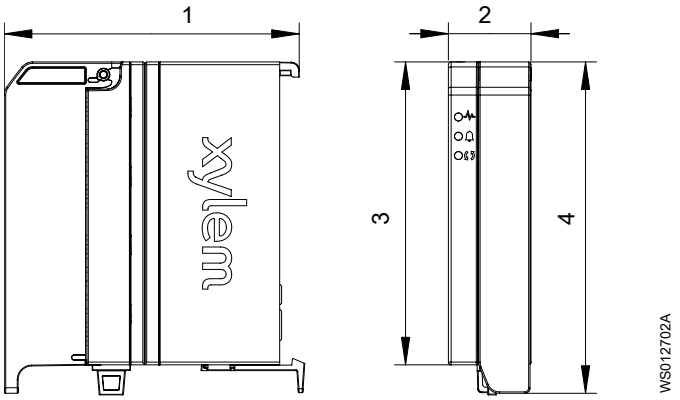
1.4 Product label



1. Product name
2. Power supply
3. Maximum power
4. Serial number
5. Part number
6. Manufactured by
7. Approvals
8. Waste disposal symbol

2 Technical Reference

2.1 Dimensions and weight



1. 107 mm (4.2 in)
2. 30 mm (1.2 in)
3. 110 mm (4.3 in)
4. 120 mm (4.7 in)

Weight: 193 g (6.8 oz)

2.2 Environmental requirements

Parameter	Value
Operating temperature	-20°C – +60°C (-4°F – +140°F)
Storage temperature	-40°C – +85°C (-40°F – +185°F)
Operating humidity	20 – 85% relative humidity, non-condensing
Storage humidity	10 – 95% relative humidity, non-condensing
Maximum altitude	2000 m (6562 ft)
Pollution degree	2

2.3 IP rating

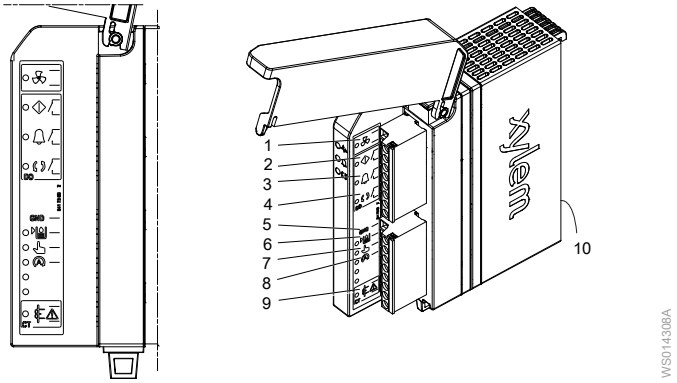
Degree of protection, IP20

Code	Description
IP	Ingress Protection
2	Protection against solid objects: • Finger or similar objects not greater than 80 mm in length • Solid objects greater than 12.5 mm in diameter
0	No protection against ingress of water

2.4 Electrical data

Parameter	Value
Supply voltage, through the backplane	+ 24 VDC
Input power	3 W + 4 W
Output power	4 W

2.5 Terminals



The LED next to each terminal is green when the terminal is electrically active.

No.	Terminal		Description	
1		T4	Machine interface (MI)	
		T3	Leakage and temperature sensors • Nominal voltage 12 VDC, range 4–16 VDC • Maximum current 0.3 A	
2		Contactor enabled	Digital outputs • Normally open • Potential free relay outputs • Maximum 3 A resistive load • Maximum 250 VAC, overvoltage category II. External fuse required, 5A, for voltage above 30 VAC • Maximum 30 VDC	
3		Fault		
4		Machine running		
5	GND		Common ground for the digital inputs	
6			High-level switch	Digital inputs • Active state, default – Enable threshold: Voltage <1.5 V – Closed: Load ≤250 ohms • Wetting current 5 mA (4.7 kilohms pull-up to +24 VDC)
7			The HOA-switch is in the hand mode	
8			The HOA-switch is in the auto mode	
9			Monitoring of the current Current transformer (CT), rated 5 A	
10	Backplane	+24 VDC	Internal power input, +24 VDC Communication	

2.6 LED indicators, pump module

LED	Color	Indication
Status	Green	Normal operation
	Yellow	• Startup • There is no software
	Flashing yellow	Software update is in progress
	Red	• Fault • Redundancy mode: The pump module has no connection with the application manager
	Unlit	There is no input power

LED	Color	Indication
 Fault	Steady red	A fault is active
	Unlit	There is no fault
 Pump running	Green	Pump running
	Yellow	• The pump is started but not running • The pump is running but was not started
	Unlit	Pump not running

10.1" TOUCHSCREEN HMI



10.1” Touchscreen HMI with IIoT Features

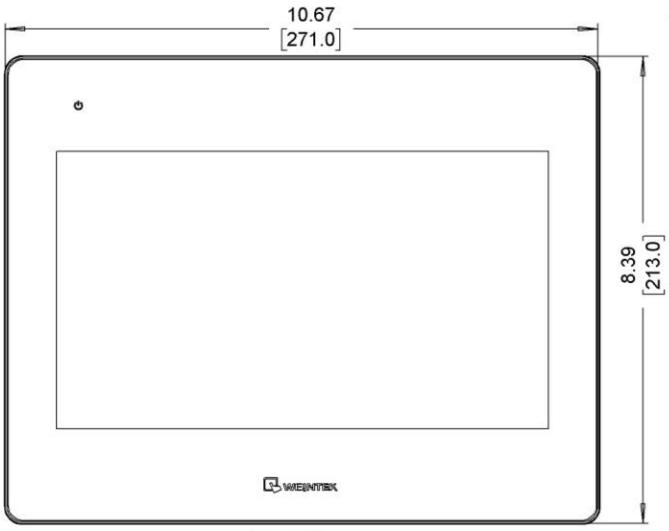
- Wireless Compatibility via M02 Wi-Fi Expansion Module*
- Quad Core processor allows for the HMI project and PLC project to run on its own processor
- High Speed Screen Update
- Built-in Edge Gateway Function
- Recipe Functionality, PDF Reader

System	**CPU**	Quad-Core RISC
	Memory (RAM)	1 GB
	Memory (Flash)	4 GB
	RTC	Built-in
I/O Ports	**Serial**	1 x DE9P COM1: RS-232, COM3: RS-232**,
		1 x DE9S COM2: RS-485 2 or 4 wire, COM3: RS-485 2 wires, CANbus
	LAN	1 x 10/100 Base-T RJ-45, 1x GbE RJ-45
	CANbus	Yes
	USB Host	1 x USB 2.0
	USB Client	N/A
	Audio	N/A
	Video	N/A
	Wi-Fi*	M02 Wi-Fi Expansion Module (optional – see notes)
	HDMI®	N/A
	SD Card Slot	N/A
Display	**Display Type**	10.1” TFT LCD
	Size (W x H)	8.82 x 4.96 inches [224 x 126 mm]
	Max. Resolution	1024 x 600
	Max. Color	16.7 M
	Luminance (cd/m²)	350
	View Angle (H°/V°)	160/140
	Contrast Ratio	500:1
	Backlight Lifetime (Hours)	50,000+
Touch Screen	**Type**	4-wire resistive touch
	Active Area Accuracy	Length (X) ±2%, width (Y) ±2%
Electrical	**Input Voltage**	24 ± 20% VDC
	Input Current	1 A @ 24 VDC
	Input Power	24 W
	Power Isolation	Built-in
	Isolation Resistance	Exceed 50 MΩ at 500 VDC
Mechanical	**Enclosure**	Plastic, charcoal grey
	PCB Coating	Yes
	Dimensions (W x H x D)	10.67 x 8.39 x 1.50 inches [271 x 213 x 38 mm]
	Panel Cutout (W x H)	10.24 x 7.95 inches [260 x 202 mm]
	Net Weight	Approx. 2.65 lbs. [1.2 kg]
	Mounting	Panel mounting, VESA 75 x 75 mm
Environmental	**Operating Temperature**	32° ~ 122°F [0° ~ 50°C]
	Storage Temperature	-4° ~ 140°F [-20° ~ 60°C]
	Relative Humidity	10% ~ 90% (non-condensing)
	Altitude (Air Pressure)	Below 3,000 meters (70.1kPa)
	Vibration Endurance	10 to 25 Hz (X, Y, Z direction, 2G, 30 minutes)
	Rating	UL Type 4X (indoor use only), NEMA 4, IP66 compliant front panel
	Certifications	cULus, CE, RoHS
Software	EBPro (v6.08.01 or later), EasyAccess 2.0 (optional), CODESYS (optional), IIoT Ready, MQTT, Sparkplug B, VNC, CMTViewer, WebView, SQL	
Notes	* M02 Wi-Fi Expansion Module (sold separately – see website Product Page or contact Maple Systems for information) ** Only Tx and Rx may be used for COM1 RS-232 while COM3 RS-232 is in use. CODESYS® is a trademark of CODESYS GmbH. Specifications subject to change without notice	

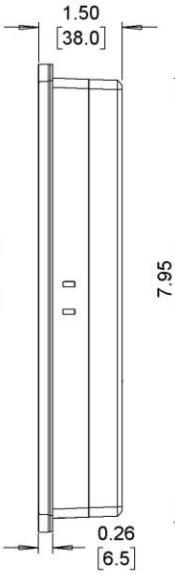


Top View

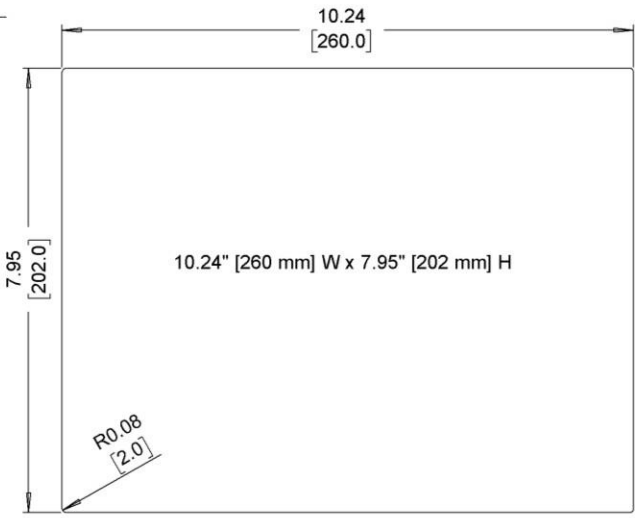
Dimensions are in inches [mm]



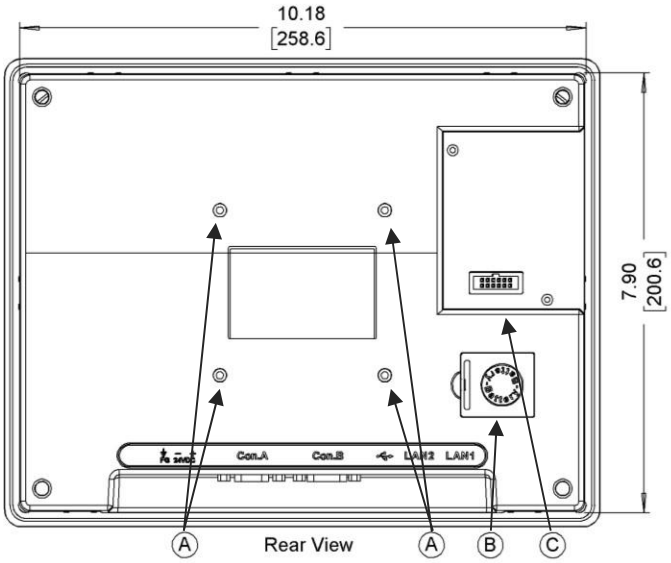
Front View



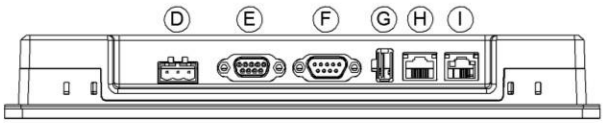
Side View



Cutout Dimensions



Rear View



Bottom View

A	VESA 75 mm Screw Holes
B	Battery Compartment (CR2032)
C	Expansion Module Connector
D	Power Connector
E	COM Port DE9P
F	COM Port DE9S
G	USB 2.0 Host Port
H	Ethernet Port
I	Gigabit Ethernet Port

Panel Mount HMI Feature Overview

With few exceptions, all our Standard HMIs support (this covers all the HMI prefix models, ex: HMI5043L/LB, HMI5070L/LB):	With few exceptions, all our Advanced HMIs support (this covers all the cMT2xxx series):	With few exceptions, all our High Performance HMIs support (this covers all the cMT3xxx series HMIs):
Alarm & Event Messages	Alarm & Event Messages	Alarm & Event Messages
Animation - Flow Block	Animation - Flow Block	Animation - Flow Block
ASCII Characters	ASCII Characters	ASCII Characters
Bar Graphs	Bar Graphs	Bar Graphs
Combo Button	Combo Button	Combo Button
Data Logging and Sampling	Data Logging and Sampling	Data Logging and Sampling
Date / Time	Date / Time	Date / Time
Dynamic Drawing	Dynamic Drawing	Dynamic Drawing
Dynamic Scale	Dynamic Scale	Dynamic Scale
EasyAccess 2.0	EasyAccess 2.0	EasyAccess 2.0
EasyWatch	EasyWatch	EasyWatch
Enhanced Security Mode	Enhanced Security Mode	Enhanced Security Mode
Event Alarm Log	Event Alarm Log	Event Alarm Log
File Browser	File Browser	File Browser
Grid Display	Grid Display	Grid Display
Languages (Up to 24)	Languages (Up to 24)	Languages (Up to 24)
Libraries	Libraries	Libraries
Macros	Macros	Macros
Meters & Gauges	Meters & Gauges	Meters & Gauges
Modbus	Modbus	Modbus
Objects (Grouping, Layering, Aligning, Flip)	Objects (Grouping, Layering, Aligning, Flip)	Objects (Grouping, Layering, Aligning, Flip)
Off-line / On-line Simulation	Off-line / On-line Simulation	Off-line / On-line Simulation
OPC UA Client	OPC UA Client	OPC UA Client
Operation Log	Operation Log	Operation Log
Pass-Through Mode	Pass-Through Mode	Pass-Through Mode
Picture Object	Picture Object	Picture Object
Picture Viewer	Picture Viewer	Picture Viewer
Pie Chart	Pie Chart	Pie Chart
PLC Tag Embedded in Project	PLC Tag Embedded in Project	PLC Tag Embedded in Project
Project Password	Project Password	Project Password
Recipes	Recipes	Recipes
Remote Access	Remote Access	Remote Access
Scheduler	Scheduler	Scheduler
Security Levels (Enhanced)	Security Levels (Enhanced)	Security Levels (Enhanced)
System Setting Editor	System Setting Editor	System Setting Editor
Table	Table	Table
Text Object	Text Object	Text Object
Timer Object	Timer Object	Timer Object
Trend Display (Graphs)	Trend Display (Graphs)	Trend Display (Graphs)
User-Defined Start-Up Screen	User-Defined Start-Up Screen	User-Defined Start-Up Screen
Utility Manager	Utility Manager	Utility Manager
VNC Server	VNC Server	VNC Server
XY Plot	XY Plot	XY Plot
Email (1)	Email	Email
Macro Windows Open / Cycle / Close (1)	Macro Windows Open / Cycle / Close	Macro Windows Open / Cycle / Close
MQTT (1)	MQTT	MQTT
String Table (1)	String Table	String Table
Time Synchronization (1)	Time Synchronization	Time Synchronization
USB Tethering	USB Tethering	USB Tethering
VNC Viewer (1)	VNC Viewer	VNC Viewer
	IP Camera	IP Camera
	USB Camera	USB Camera
	Animation (Objects, Word Lamp, GIFs, Moving Shape)	Animation (Objects, Word Lamp, GIFs, Moving Shape)
	BACnet	BACnet
	CANbus	CANbus
	cMT Diagnoser	cMT Diagnoser
	cMT Viewer Support	cMT Viewer Support
	CODESYS (2)	CODESYS
	Media Player	Media Player
	MQTT - Advanced JSON	MQTT - Advanced JSON
	MQTT - AWS IoT, Sparkplug B, Azure IoT Hub	MQTT - AWS IoT, Sparkplug B, Azure IoT Hub
	PDF Reader	PDF Reader
	Web Streaming	Web Streaming
	WebView	WebView
		Barcode Scanner (Android Camera)
		Database Server
		File Transfer Protocol (FTP)
		OPC UA Server
		PLC Web Browser
		SQL Database Server Integration

This table is for illustration only and subject to change. Always check the software to see if a feature is supported in your specific hardware.

(1) Not supported in the B Series (HMI 5040B, 5070B, 5100B)

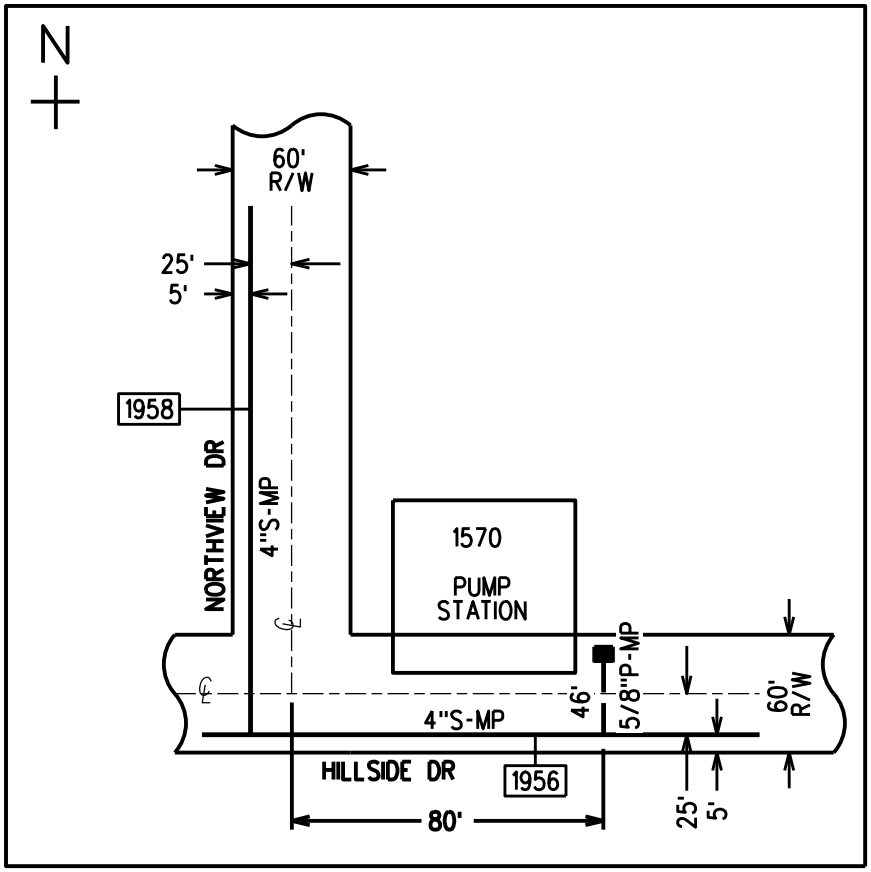
(2) Not supported on the cMT2166X

ADDRESS		
1570 HILLSIDE DR OKEM, GCNC NBS		
PROJECT TITLE		
HILLSIDE DR AND NORTHVIEW DR		
DESIGN NUMBER	AS-BUILT NUMBER	
11779132		
CONSTRUCTION MEASURE NUMBER		
100008023999		
NOTIFICATION NUMBER		
1074559082		
ORDER TYPE	ORDER NUMBER	
GCNC		
MAINTENANCE ACTIVITY TYPE		
NBS		
METER ORDER NUMBER	METER NUMBER	
READ	METER LOCATION	
[X] SET	[ ] REMOVE	[ ] EXCHANGE
COUNTY		
INGHAM		
CITY/TOWNSHIP		
OKEMOS/MERIDIAN		
TRS	DATE	
040122	6/30/2025	

PIPELINE COATING CERTIFICATION

ALL FIELD AND FACTORY COATING ON ALL SIZE STEEL PIPE HAS BEEN VISUALLY INSPECTED AND ALL NEW BURIED PIPE INSTALLATIONS THAT ARE 2" OR LARGER IN DIAMETER HAVE BEEN JEEPED AS OUTLINED IN GOM 11.12 [ ] YES

PERSON IN-CHARGE: _____ [ ] N/A



Consumers Energy

A CMS Energy Company SERVICE

CONSUMERS ENERGY CONTACTS

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