APPENDIX 1

Standard Detail Drawings

Township of King
Design Criteria and Standard Detail Drawings

Township of King

Drawing No.	Title	Revision Date
GN	General Notes	Jan. 2026
KS-171	Typical Drop Structure for Storm Manhole	Jan. 2026
KS-174	Beehive Catchbasin - Frame and Cover	Jan. 2026
KS-175	Service Location Single Family Residential	Jan. 2026
KS-176	Service Location Semi-Detached Residential	Jan. 2026
KS-177	Storm Sewer Service Connection	Jan. 2026
KS-178	Storm Sewer Riser Connection	Jan. 2026
KS-179	Service Location Multi / Townhouse Service Connection	Jan. 2026
KS-180	Bedding Detail for Plastic Sanitary Service Connections	Jan. 2026
KS-181	Bedding Detail for Flexible Sanitary Sewers	Jan. 2026
KS-190	Sanitary Sewer House Connections	Jan. 2026
KS-191	Sanitary Sewer Riser Connections for Residential Development	Jan. 2026
KS-193	Sanitary Sewer Surface Cleanout	Jan. 2026
KS-194	Sanitary Sewer Connections for Residential Development	Jan. 2026
KS-202	20.0m Estate Residential Roadway	Jan. 2026
KS-205	20.0m Local Roadway	Jan. 2026
KS-210	26.0m Collector Roadway (incl. Bike Lanes)	Jan. 2026
KS-218	Typical Cul-De-Sac for Residential Streets	Jan. 2026
KS-219	Typical Cul-De-Sac for Industrial Streets	Jan. 2026
KS-220	Temporary Turning Circle for Residential Streets	Jan. 2026
KS-231	Concrete Sidewalk	Jan. 2026
KS-302	Precast Concrete Splash Pad Detail	Jan. 2026
KS-313	Wood Privacy Fence	Jan. 2026
KS-331	Traffic Sign Details and Pavement Markings	Jan. 2026
KS-340	Standard Driveway Culvert	Jan. 2026
KS-341	Driveway Approach Paving for Residential Driveways	Jan. 2026
KS-342	Driveway Approach Paving for ICI and Apartment Driveways	Jan. 2026
KS-346	Joint Use Utility Trench	Jan. 2026
KS-400	Typical Legend for Lot Grading Plan	Jan. 2026
KS-401	Front Lot Drainage	Jan. 2026
KS-402	Split Lot Drainage	Jan. 2026
KS-403	Rear Lot Drainage for Walkout or Back Split House	Jan. 2026
KS-405	Lot Grading Plan Requirements for Infill Lots	Jan. 2026
KS-701	Typical Pole and Luminaire (Decorative)	Jan. 2026
KS-802	Watermain Trench Detail Under Watercourse	Jan. 2026
KS-803	50mm Blow-off for Watermain with Restrained Joints	Jan. 2026
KS-804	Methods of Insulating Watermains	Jan. 2026
KS-805	Supports for Watermains and Sewers Crossing Watermain Trenches	Jan. 2026
KS-820	19mm to 25mm Water Meter Installation in Building	Jan. 2026

Township of King

Drawing No.	Title	Revision Date
KS-830	Joint Restraining Length for P.V.C Pipe	Jan. 2026
KS-840	150mm to 250mm Gate Valve & Box	Jan. 2026
KS-841	Semi-precast Concrete Valve Chamber for 300mm Pipe or Larger	Jan. 2026
KS-843	Air Release Chamber	Jan. 2026
KS-844	Combination Air & Valve Chamber-Model	Jan. 2026
KS-845	Water Meter Installation in Chamber (For Combined Fire & Domestic)	Jan. 2026
KS-846	Water Service Connections for Single ICI Building	Jan. 2026
KS-847	Water Meter Chamber Details (50 mm Service Line)	Jan. 2026
KS-851	Water Service (20 mm to 50 mm)	Jan. 2026
KS-854	Corrosion Protection for Hydrant Cut Into an Existing D.I. or C.I Watermain	Jan. 2026
KS-860	Tracer Wire Arrangement at Valve Box for P.V.C. or C.P.P Watermain	Jan. 2026
KS-870	Corrosion Protection for Tracer Wires on P.V.C. or C.P.P Watermain	Jan. 2026
KS-871	Corrosion Protection for Valves & Fittings on Non-ferrous Pipe	Jan. 2026
KS-873	Corrosion Protection for Existing Ferrous Watermain Connected to Proposed Non-Ferrous Watermain	Jan. 2026
KS-874	Corrosion Protection for Hydrant Assembly on Non-Ferrous Pipe	Jan. 2026
KS-875	Corrosion Protection for Hydrants Off of New D.I Watermain	Jan. 2026
KS-877	Watermain Configuration for Dead End Cul-De-Sacs	Jan. 2026
KS-878	Side View of Sampling Station Installation	Jan. 2026
KS-900	Benchmark Monument Details	Jan. 2026
SD-501 (modified)	Chain Link Fence (Parks Recreation and Culture Department)	Jan. 2026

Region of York
Sanitary Sewer Standard Drawings

Drawing No.	Title	Revision Date
I&I-104	Waterproofing Membrane System for Maintenance Holes Within Areas Susceptible to High Groundwater or Located Within Floodplains, Areas of Concentrated Runoff	Oct. 29, 2021
I&I-105	Sewer Trench Plug	Oct. 29, 2021
I&I-106A	Sanitary Sewer Mainliine to Maintenance Hole Connection for Flexible Sewer Pipe	Oct. 29, 2021
I&I-106B	Sanitary Sewer Mainliine to Maintenance Hole Connection for Rigid Sewer Pipe	Oct. 29, 2021

Region of York
Sanitary Sewer Standard Drawings

Drawing No.	Title	Revision Date
I&I-107A	Maintenance Hole Drop Structure Type A	Oct. 29, 2021
I&I-107B	Maintenance Hole Drop Structure Type B	Oct. 29, 2021
I&I-109	Sanitary Maintenance Hole Internal Drop Structure	Oct. 29, 2021
I&I-111	Typical Steel Strap Details for Precast Maintenance Holes	Oct. 29, 2021

Toronto Region Conservation Authority
ESC Drawings and Figure

Drawing / Figure No.	Title	Revision Date
Fig. B2-21	Sediment Control Pond	March 2019
Dwg. 03	Sediment Fence (unfrozen conditions)	March 2019
Dwg. 04	Sediment Fence (frozen conditions)	March 2019
Dwg. 05	Mud Mat	March 2019
Dwg. 06	Sediment Trap in Earthen Ditch	March 2019

GENERAL NOTES

1. THE NOTES ON THIS SHEET APPLY TO ALL WORKS UNDER THIS CONTRACT UNLESS OTHERWISE NOTED ON THE PLAN AND PROFILE DRAWINGS AND/OR SPECIFIC DETAIL DRAWINGS.
2. THE STANDARD DRAWINGS OF THE TOWNSHIP OF KING, ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS (OPSS) AND THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) CONSTITUTE PART OF THE PLANS OF THIS CONTRACT.
3. ORDER OF PRECEDENCE OF STANDARD DRAWINGS IS FIRSTLY TOWNSHIP OF KING STANDARD DRAWINGS, AND SECONDLY ONTARIO PROVINCIAL STANDARD DRAWINGS.
4. IT IS THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN ALL RELEVANT STANDARD DRAWINGS AND SPECIFICATIONS AS REQUIRED FOR THIS CONTRACT.
5. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS SHOWN ON THE ENGINEERING DRAWINGS ARE IN METRES OR MILLIMETERS.
6. ALL DIMENSIONS AND ELEVATIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION AND ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER.
7. EXISTING SERVICES AND UTILITIES SHOWN ON THESE CONTRACT DRAWINGS ARE BASED ON THE BEST INFORMATION AVAILABLE AND THEIR LOCATIONS ARE NOT GUARANTEED. THE CONTRACTOR SHALL INTERPRET THIS INFORMATION AS HE WISHES WITH THE UNDERSTANDING THAT THE OWNER DISCLAIMS ALL RESPONSIBILITY FOR ITS ACCURACY AND/OR SUFFICIENCY. THE CONTRACTOR IS REQUIRED TO NOTIFY THE VARIOUS UTILITY COMPANIES 48 HOURS PRIOR TO THE COMMENCEMENT OF ANY WORK.
8. ALL PRIMARY HYDRO, TELECOMMUNICATION CABLE, GAS LINES AND CABLE T.V. SHALL BE PLACED UNDERGROUND IN LOCATIONS SHOWN ON THE ROAD SECTIONS LISTED IN THE STANDARD DRAWINGS.
9. ALL SILT CONTROL AND EROSION PROTECTION DEVICES ARE TO BE IN PLACE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION AND SHALL REMAIN IN PLACE AND BE MAINTAINED BY THE CONTRACTOR UNTIL CONSTRUCTION IS COMPLETE AND VEGETATION HAS BEEN FULLY RE-ESTABLISHED. SILT CONTROL AND EROSION PROTECTION MEASURES SHALL BE REMOVED ONLY WHEN APPROVED BY THE TOWNSHIP.
10. NATIVE MATERIAL, SUITABLE FOR BACKFILL, SHALL BE COMPACTED TO 95% STANDARD PROCTOR MAXIMUM DRY DENSITY. OR AS NOTED IN THE ACCEPTED GEOTECHNICAL INVESTIGATION REPORT, WHICHEVER IS MORE ASTRINGENT.
11. GRANULAR MATERIAL USED FOR BACKFILL, SHALL BE PLACED IN LAYERS 150mm IN DEPTH MAXIMUM AND COMPACTED TO 100% STANDARD PROCTOR MAXIMUM DRY DENSITY, OR AS NOTED IN THE ACCEPTED GEOTHECNICAL INVESTIGATION REPORT, WHICHEVER IS MORE STRINGENT.
12. ALL DISTURBED AREAS ARE TO BE REINSTATED TO THEIR ORIGINAL CONDITION OR BETTER, AS DETERMINED BY THE ENGINEER. ALL GRASS AND VEGETATION COVERED AREAS SHALL BE RESTORED BY PLACING 200mm (MINIMUM) OF APPROVED TOPSOIL AND NURSERY SOD.
13. ALL FENCING SHALL BE CONSTRUCTED IN ACCORDANCE WITH TOWNSHIP STANDARDS.
14. THE STREET LIGHTING SYSTEM SHALL BE DESIGNED BY A QUALIFIED CONSULTING ENGINEER IN ACCORDANCE WITH THE ILLUMINATION ENGINEERING SOCIETY OF NORTH AMERICA (IESNA) LATEST EDITION STANDARDS AND APPROVED BY THE TOWN. STREET LIGHTING SYSTEMS FOR ROADWAYS IN THE TOWNSHIP OF KING SHALL MEET THE REQUIREMENTS OF HYDRO ONE.
15. ALL TRENCHING ARE TO BE IN ACCORDANCE WITH OCCUPATIONAL HEALTH AND SAFETY ACT. TRENCH SIDES SHOULD BE FLATTENED AS DIRECTED BY THE SOILS CONSULTANT
16. DECOMMISSIONING OF WELLS AND SEPTIC SYSTEMS SHALL BE IN ACCORDANCE WITH MECP GUIDELINE PROCEDURES.

ROADS

1. THE ROAD PAVEMENT MINIMUM STRUCTURE SHALL CONSIST OF THE FOLLOWING AND WILL BE CONFIRMED BY A SOILS CONSULTANT AND APPROVED BY THE TOWN:

   LOCAL ROAD :
   - 40mm HL3 SURFACE COURSE ASPHALT
   - 50mm HL8 BASE COURSE ASPHALT
   - 150mm GRANULAR 'A' OR 19mm CRUSHER RUN LIMESTONE
   - 300mm GRANULAR 'B' OR 50mm CRUSHER RUN LIMESTONE

   COLLECTER ROAD :
   - 40mm HL1 SURFACE COURSE ASPHALT
   - 80mm HL8HS BASE COURSE ASPHALT
   - 150mm GRANULAR 'A' OR 19mm CRUSHER RUN LIMESTONE
   - 450mm GRANULAR 'B' OR 50mm CRUSHER RUN LIMESTONE

   BOULEVARD AND DITCHES: - 200mm TOPSOIL AND SOD
2. NATIVE SUBGRADE SHALL HAVE A CROSS-FALL OF 3% AND THE MATERIAL SHALL BE APPROVED BY A SOILS CONSULTANT AND IS SUBJECT TO APPROVAL BY THE TOWN ENGINEER. NATIVE SUBGRADE TO BE COMPACTED TO MINIMUM 95% STANDARD PROCTOR MAXIMUM DRY DENSITY AND SHALL BE PROOF ROLLED.
3. CONTINUOUS 150mm DIAMETER PERFORATED FILTER CLOTH WRAPPED PLASTIC CORRUGATED SUB-DRAINS WITH GRANULAR 'A' BEDDING AND BACKFILL ARE TO BE CONSTRUCTED BY TRENCHING.
4. CONCRETE CURB AND GUTTER CONFORMING TO OPSD 600.040 OR 600.070 (TWO STAGE) SHALL BE USED. CONCRETE STRENGTH IS TO BE A MINIMUM OF 32MPa AT 28 DAYS WITH 7% ± 1.5% AIR ENTRAINMENT.
5. RESIDENTIAL DRIVEWAYS AS PER TOWNSHIP STD. KS-341. THE OUTSIDE EDGE OF ALL DRIVEWAYS ARE TO BE LOCATED A MIN. 1.0m FROM STREET LIGHT AND UTILITY POLES, CATCHBASINS, WATERMAIN VALVES, WATER SERVICE BOXES, SIDE LOT LINES AND OTHER DRIVEWAYS AND A MIN. 1.5m FROM TREES AND HYDRO TRANSFORMERS AND A MIN. 3.0m FROM HYDRANTS AND COMMUNITY MAIL BOXES.
6. DRIVEWAY DEPRESSIONS SHALL BE FORMED IN THE CURB AS PER OPSD 351.010.
7. SIDEWALK CONSTRUCTION SHALL COMPLY WITH KS-231 AND SHALL BE CONSTRUCTED ON 150mm OF GRANULAR 'A' ON A COMPACTED FOUNDATION. CONCRETE STRENGTH IS TO BE A MINIMUM OF 32MPa AT 28 DAYS WITH 7% ± 1.5% AIR ENTRAINMENT.
8. SIDEWALK SHALL BE AS PER TOWNSHIP STD. KS-231. SIDEWALK RAMPS PER OPSD 310.033 FOR UNSIGNALIZED INTERSECTIONS.
9. PROVIDE FROST TAPERS FOR ROAD CROSSING CULVERTS AS PER OPSD 803.030.
10. RESIDENTIAL DRIVEWAYS TO BE CONSTRUCTED WITH A MINIMUM OF 150mm GRANULAR 'A', OR AS APPROVED BY THE TOWNSHIP. DRIVEWAYS ARE TO BE PAVED WITH 80mm HL3A IN TWO LIFTS OR ALTERNATIVELY 50mm HL8 BASE ASPHALT AND 30mm TOP ASPHALT FROM STREET TO GARAGE, OR TO DWELLING. DRIVEWAY SLOPES TO BE BETWEEN 1% AND 6%.
11. ROAD OCCUPANCY PERMIT IS REQUIRED FROM THE TOWNSHIP WORKS DEPARTMENT PRIOR TO THE COMMENCEMENT OF ANY WORK IN THEIR RESPECTIVE RIGHT-OF-WAYS. A MINIMUM 48 HOUR NOTICE IS REQUIRED.
12. ALL ASPHALT AND GRANULAR MATERIALS ARE TO BE MANUFACTURED, SUPPLIED AND PLACED IN ACCORDANCE WITH OPSS 310 AND 1150 SPECIFICATIONS. HOT MIX ASPHALT (HMA) BASE LAYERS MAY CONTAIN RECLAIMED (RAP) MATERIALS; HOWEVER, SURFACE LAYERS SHALL BE CONSTITUTED OF VIRGIN MATERIAL WITH NO ADDED RAP. THE USE OF UP TO 30% BY MASS OF RAP SHALL BE PERMITTED FOR HL4, HL8, AND MEDIUM DUTY BINDER MIXES.

STORM SEWERS AND STORM SERVICE LATERALS

1. STORM SEWER TO BE LOCATED TYPICALLY 1.5m TO THE WEST OR SOUTH OF CENTRELINE OF THE ROAD.
2. STORM SEWERS UP AND INCLUDING 375mm TO 300mm DIAMETER SHALL BE PVC SDR 35 CONFORMING TO C.S.A. SPECIFICATION B182.4-M1990 AND B182.4-M1992 OR LATEST REVISION THEREOF. EXTERIOR RIBBED PIPE PRODUCTS ARE NOT ACCEPTABLE.

   STORM SEWER PIPES LARGER THAN 375mm DIAMETER SHALL BE REINFORCED CONCRETE CONFORMING TO C.S.A. SPECIFICATION A257.2-M1982 OR LATEST REVISION THEREOF.

   PIPE JOINTS SHALL BE BY MEANS OF APPROVED RUBBER GASKETS CONFORMING TO C.S.A. SPECIFICATION A257.3-M1982 OR LATEST REVISION THEREOF.
3. STORM SERVICES SHALL BE 150mm DIAMETER PVC SDR 28, WHITE IN COLOR. A PVC CLEAN OUT IS TO BE INSTALLED AT THE STREET LINE AND THE END OF THE SERVICE EXTENDED 1.5m INTO THE PROPERTY AND TERMINATED WITH A WATER TIGHT PLUG. A WOOD MARKER IS TO EXTEND FROM THE PLUG INVERT TO 1.2m ABOVE THE FINISHED GRADE AND PAINTED BLACK.
4. SEWERS SHALL BE CONSTRUCTED WITH BEDDING AS PER OPSD 802.010, AND 802.030, UNLESS OTHERWISE SPECIFIED BY A GEOTECHNICAL CONSULTANT AND APPROVED BY THE TOWN.
5. TRENCH BACKFILL SHOULD BE PLACED IN 200mm LIFTS AND COMPACTED TO 95% SPMDD.
6. ALL STORM SEWER MANHOLES TO BE BENCHED IN ACCORDANCE WITH OPSD 701.021.
7. DROP STRUCTURES SHALL CONFORM WITH TOWNSHIP STANDARD DRAWING KS-171.
8. MANHOLE TOPS ARE TO BE SET TO BASE COURSE ASPHALT GRADE AND THEN ADJUSTED TO FINAL GRADE. FRAME AND COVER TO BE PER OPSD 401.010, TYPE 'A'. GRADE AND CROSSFALL ADJUSTMENT SHALL BE MADE USING PRODUCTS SPECIFICALLY MANUFACTURED FOR THAT PURPOSE. CONCRETE MODULAR ADJUSTMENT RINGS ARE TO BE USED TO ADJUST THE MANHOLE TO FINAL GRADE.
9. CATCHBASINS MUST BE OF THE PRECAST TYPE AS SHOWN ON THE OPSD DRAWINGS 705.01 OR 705.02.
10. SINGLE CATCHBASIN LEADS SHALL BE HIGH DENSITY POLYETHYLENE PIPE OR PVC SDR35 PIPE CONSTRUCTED AT A MINIMUN GRADE OF 2.0% WITH MINIMUM SIZES AS FOLLOWS:

SINGLE CATCHBASIN	250mm DIAMETER
DOUBLE CATCHBASIN	300mm DIAMETER
REAR LOT CATCHBASIN	250mm DIAMETER
11. THE FRAME AND GRATE FOR CATCHBASINS SHALL BE OPSD 400.110. CATCHBASIN GRATES ARE TO BE RAMPED USING HOT-MIX ASPHALT. CATCHBASINS AT LOW POINTS SHALL BE SET TO BASE ASPHALT AND ADJUSTED TO SURFACE COURSE.
12. REAR LOT CATCHBASIN LEADS TO BE CONCRETE ENCASED FROM THE STREET LINE TO THE CATCHBASIN. FRAME AND GRATE TO BE BEEHIVE, KS-174 STYLE.
13. WHERE CATCHBASINS ARE CONNECTED DIRECTLY TO SEWERS, PRE-MANUFACTURED TEES SHALL BE USED.
14. CATCHBASIN INLET CONTROL DEVICES AS APPROVED BY THE TOWNSHIP SHALL BE INSTALLED AS SHOWN ON THE DRAWINGS.
15. ALL PVC STORM SEWERS SHALL BE TESTED FOR DEFLECTION WITH A SEWER MANDREL. ALL STORM SEWERS SHALL BE INSPECTED BY CCTV. ALL TESTING AND INSTALLATION OF ALL REQUIRED CATCHBASIN INLET CONTROL DEVICES SHALL BE CERTIFIED BY THE PROFESSIONAL ENGINEER PRIOR TO THE ISSUANCE OF BUILDING PERMITS. ALL STORM SEWERS SHALL ALSO BE INSPECTED BY CCTV AND THE FUNCTIONING OF ALL REQUIRED CATCHBASIN INLET CONTROL DEVICES SHALL BE CERTIFIED BY THE PROFESSIONAL ENGINEER PRIOR TO FINAL ACCEPTANCE.

GRADING

1. ALL LOT AND SWALE GRADES SHALL BE A MINIMUM 2.0% AND MAXIMUM 5.0%. SWALE SIDESLOPES SHALL BE A MAXIMUM 3:1 (H:V).
2. SWALE DEPTH TO BE ACCORDING TO FLOW - MINIMUM 150mm. MAXIMUM 450mm.
3. WHERE SLOPES EXCEED 5.0%, 3:1 SLOPES SHALL BE USED UP TO AN ELEVATION DIFFERENCE OF 1.0m AND 4:1 SLOPES SHALL BE USED FOR AN ELEVATION DIFFERENCE GREATER THAN 1.0m.
4. DRIVEWAY GRADES SHALL BE A MINIMUN 2.0% AND A MAXIMUM 6.0%. MAXIMUM AS-CONSTRUCTED DRIVEWAY GRADE SHALL BE 8.0%.
5. MINIMUM SEPARATION OF 150mm SHALL BE PROVIDED BETWEEN THE BRICKLINE AND THE FINAL GROUND ELEVATION AND 200mm BETWEEN SIDING AND THE FINAL GROUND ELEVATION.
6. ALL ROOF DRAINS SHALL DISCHARGE ONTO SPLASH PADS TO GRASSED AREAS, OR TO A LID COLLECTOR PIPE WITH AN OVERFLOW OUTLET WHERE APPROVED BY THE TOWNSHIP.
7. ALL LOTS TO HAVE MINIMUM 150mm TOPSOIL AND No.1 NURSERY SOD.
8. THE OUTSIDE EDGE OF ALL DRIVEWAYS ARE TO BE LOCATED A MIN. 1.0m FROM STREET LIGHT AND UTILITY POLES, CATCHBASINS, WATERMAIN VALVES, WATER SERVICE BOXES, SIDE LOT LINES AND OTHER DRIVEWAYS AND A MIN. 1.5m FROM TREES AND HYDRO TRANSFORMERS AND A MIN. 3.0m FROM HYDRANTS AND COMMUNITY MAIL BOXES.
9. WHERE RETAINING WALLS ARE NECESSARY AND AGREED TO BY THE TOWNSHIP, THE STRUCTURES SHALL BE FREE STANDING GRAVITY WALLS CONSTRUCTED OF ONLY REINFORCED POURED CONCRETE, LARGE SIZE HEAVY PRE-CAST CONCRETE BLOCKS (MIN. 135 KG SECTIONS) OR ARMOUR STONE. WOOD OR GABION BASKETS ARE NOT ACCEPTABLE. TIEBACK SYSTEMS ARE TO BE AVOIDED IN ALL APPLICATIONS. IF IN THE SOLE OPINION OF THE TOWNSHIP THAT TIEBACKS CAN NOT BE AVOIDED, THEY SHALL BE LOCATED ENTIRELY ON THE SAME PROPERTY AS THE RETAINING WALL. A RESTRICTIVE COVENANT WILL BE REQUIRED OVER THE CONSTRUCTED TIEBACKS TO PROTECT THE INTEGRITY OF THE STRUCTURE FROM FUTURE DISTURBANCE INCLUDING ALTERED GRADING, SWIMMING POOLS, DECKS, PLANTING OF LANDSCAPES, ETC.
10. ALL RETAINING WALLS REGARDLESS OF HEIGHT ARE TO BE DESIGNED AND STAMPED BY A PROFESSIONAL ENGINEER. CERTIFICATION FROM A PROFESSIONAL ENGINEER IS REQUIRED FOR EACH WALL CONSTRUCTED CLEARLY STATING THAT THE WALL HAS BEEN DESIGNED TO SUIT THE SITE CONDITIONS, THAT CONSTRUCTION OF THE WALL HAS BEEN INSPECTED BY THE ENGINEER AND THAT IS HAS BEEN CONSTRUCTED IN ACCORDANCE WITH THE DESIGN.
11. LOTS SITING PLANS WITH RETAINING WALLS ARE TO BE SUBMITTED IN GROUPS WITH NEIGHBOURING AFFECTED LOTS.
12. CLEAR STONE (19mm GRADATION) AT A MINIMUM DEPTH OF 100mm SHALL BE PLACE IN SIDE YARD AREAS BETWEEN FACE OF HOUSES WITH DISTANCE LESS THAN 2.6m INSTEAD OF SOD.
13. A TRANSITION RUN-OUT AREA TO DRAIN THE SUB-GRADE SHALL BE PROVIDED AT THE CLEARSTONE/SOD INTERFACE.
14. WHERE FENCE IS BETWEEN PRIVATE AND PUBLIC LANDS, 1.8m HIGH CHAIN LINK FENCE WITH 9 GAUGE WIRE AND NO LARGER THAN 37mm OPENING IS REQUIRED. THE POSTS ARE TO BE ON THE PRIVATE SIDE, INCLUDING THE ENTIRETY OF FOOTINGS. MESH IS TO BE ON THE PUBLIC SIDE OF THE POSTS.
15. ON SPLIT DRAINING LOTS AND WALKOUT LOTS THAT ARE BACKING ONTO ANOTHER LOT, ROOF DOWNSPOUTS SHOULD BE DIRECTED TO THE FRONT YARD AS MUCH AS POSSIBLE.

SANITARY SEWERS

1. SANITARY SEWERS UP TO AND INCLUDING 375 MM DIAMETER SHALL BE CONSTRUCTED OF POLYVINYL CHLORIDE (PVC) SDR 35 PIPE. PVC PIPE SHALL CONFORM WITH ASTM D3034 / F679 AND BE CERTIFIED TO CSA SPECIFICATION CSA B182.2 OR LATEST REVISIONS THEREOF. EXTERIOR RIBBED PIPE PRODUCTS ARE NOT ACCEPATABLE. PVC FITTINGS SHALL BE HEAVY WALL SDR 26 GASKETTED FITTINGS. PIPES GREATER THAN 375 MM DIAMETER SHALL BE REINFORCED CONCRETE PIPE. REINFORCED CONCRETE PIPES SHALL CONFORM TO CSA SPECIFICATION A275.2 M1982 OR LATEST REVISION THEREOF, CLASS 50 D, 65 D, 100 D OR 140 D, AS REQUIRED. ALL SANITARY SEWERS AND FITTINGS SHALL HAVE GASKETTED JOINTS.
2. MINIMUM BEDDING REQUIREMENTS FOR ALL SANITARY SEWER MAINS AND ALL RELATED CONNECTIONS SHALL BE CLASS "B" PER OPSD 802.010, EXCEPT WHERE OTHERWISE NOTED ON PROFILE. BEDDING MATERIAL IS SUBJECT TO RECOMMENDATIONS OF A PROFESSIONAL GEOTECHNICAL ENGINEER AND TOWNSHIP APPROVAL AND MAY INCLUDE GRANULAR 'A' (PER OPSS.MUNI 1010),19MM CRUSHER RUN LIMESTONE (PER OPSS.MUNI 1010 GRANULAR 'A' SPECIFICATION TABLE 2), HL6 LIMESTONE (PER CSA S6 - LATEST EDITION - TABLE 7.9) AND 19MM CLEAR 100 PERCENT CRUSHED LIMESTONE (PER OPSS.MUNI 1004) AND FULLY WRAPPED IN FILTER CLOTH PER TERRAFIX 270R OR APPROVED EQUAL. WRAPPED CLEAR LIMESTONE BEDDING IS ONLY TO PE PLACED UNDER OTHER BEDDING MATERIALS TO PROVIDE SUPPORT IN WATER BEARING SAND AND SILT. IN WATER BEARING SAND, IF EXTENSIVE DEWATERING IS REQUIRED, A CLASS "A" BEDDING CONSISTING OF CONCRETE MAY BE REQUIRED.
3. SANITARY SEWER MAINTENANCE HOLES SHALL BE CONSTRUCTED OF PRECAST CONCRETE WITH A MONOLITHIC BASE CONFORMING TO CSA A257.4-M1982 AND IN ACCORDANCE WITH THE LATEST OPS SPECIFICATIONS AND STANDARD DRAWINGS. MAINTENANCE HOLES ARE TO BE PRE-BENCHED BY THE SUPPLIER. PRECAST STRUCTURES ARE TO BE GASKETTED PER OPSS. MUNI 1351 AND CSA 257.3
4. MAINTENANCE HOLES ARE TO BE WATERPROOFED PER THE REGION OF YORK SPECIFICATIONS FOR REDUCTION OF INFLOW AND INFILTRATION. ALL LIFT HOLES ARE TO BE FILLED WITH 3:1 NON-SHRINK MORTAR MIX. THE MINIMUM REQUIREMENT OF WATERPROOFING JOINTS IN PRECAST SECTIONS FROM 0.5 M ABOVE TO 0.5 M BELOW THE JOINTS IS TO BE CARRIED OUT ON ALL STRUCTURE. WHERE GROUNDWATER CONDITIONS CONSIST OF A MINIMUM 85 kPA OF WATER PRESSURE ON THE STRUCTURE OR SEASONALLY HIGH GROUNDWATER IS GREATER THAN 0.6 M ABOVE THE TOP OF THE LOWEST SEWER THE COMPLETE MAINTENANCE HOLE STRUCTURE IS TO BE WATERPROOFED PER REGION OF YORK STANDARD DRAWING I&I-104. THE STRUCTURES THAT REQUIRE COMPLETE WATERPROOFING ARE TO BE IDENTIFIED ON THE ENGINEERING DRAWINGS. WATERPROOFING IS TO CONSIST OF MAINTENANCE HOLE SURFACE PREPARATION, PRIMING IF REQUIRED, INSTALLING APPROVED WATERPROOFING MEMBRANE AND PROTECTION BOARD MATERIALS AND BACKFILLING IN ACCORDANCE WITH THE REGION OF YORK SPECIFICATIONS.
5. WATERPROOFING MEMBRANES AND PRIMER ARE TO BE SELECTED BASED ON WARM OR COLD WEATHER CONDITIONS DURING APPLICATION. APPROVED WATERPROOFING PRODUCTS INCLUDE BITHUTHENE 3000 OR LOW TEMPERATURE MEMBRANE, BLUESKIN WP200, COLPHENE 3000, MEL-ROL OR MEL-ROL LOW TEMP, OR APPROVED EQUAL BY THE TOWNSHIP. APPROVED GEOCOMPOSITE PROTECTION BOARD PRODUCTS ARE PROTECTION 03, POLYPROPYLENE PROTECTION BOARD, PROTECTION COURSE, SOPRABOARD, OR APPROVED EQUAL BY THE TOWNSHIP.
6. FRAMES AND COVERS SHALL BE OPSD 401.010 TYPE A (CLOSED) MODIFIED WITH A SINGLE LIFT HOLE ONLY. WHERE SPECIFIED WATERTIGHT COVERS PER OPSD 410.030 SHALL BE PROVIDED
7. ALL DOMESTIC CONNECTIONS SHALL BE CONSTRUCTED IN ACCORDANCE WITH TOWNSHIP STANDARD DRAWINGS AND ALL APPLICABLE OPSD DETAILS TO A MAXIMUM DEPTH OF 4.5 m. CONTROLLED SETTLEMENT JOINTS ARE REQUIRED ON ALL RISERS GREATER THAN 4.5 m DEPTH.
8. INSTALL SEWER DROP CONNECTIONS TO MANHOLES AS PER YORK REGION STANDARD DRAWINGS I&I-107A AND I&I-107B.
9. APPROVED GRANUALR BEDDING SHALL BE PLACED AROUND FLEXIBLE SEWER PIPE OUTSIDE OF MAINTENANCE HOLES IN ACCORDANCE WITH STANDARD DRAWING I&I-106A. CONCRETE BEDDING SHALL ENCASE CONCRETE SEWER PIPE TO THE FIRST PIPE JOINT OUTSIDE OF MAINTENANCE HOLES IN ACCORDANCE WITH STANDARD DRAWING I&I-106B.
10. ALL MAINTENANCE HOLE ADJUSTMENT RINGS SHALL BE MORTARED BETWEEN ALL RINGS AND FROM THE OUTSIDE OF THE STRUCTURE PRIOR BACKFILLING. MAINTENANCE HOLE JOINTS TO BE FURTHER WATERPROOFED FROM THE OUTSIDE USING APPROVED WATERPROOF MEMBRANE AND PROTECTION BOARD PRIOR TO BACKFILLING.
11. ALL SANITARY MAINTENANCE HOLES TO BE PRE-BENCHED TO THE PIPE OBVERT AS PER OPSD 701.021 AND I&I-106A.
12. ALL TESTING OF THE SANITARY SYSTEM IS TO BE COMPLETED IN ACCORDANCE WITH THE "INFLOW AND INFILTRATION REDUCTION STANDARD FOR SEWERS SERVICING NEW DEVELOPMENT" (FEBRUARY 2022) AS PREPARED BY THE REGION OF YORK, OR LATEST AMENDMENT THERETO.
13. FLOW MONITORING WILL BE REQUIRED AT THE DIRECTION OF THE DIRECTOR OF ENGINEERING AND PUBLIC WORKS IF DEEMED NECESSARY TO VERIFY INFILTRATION FLOWS ARE WITHIN ACCEPTABLE LEVELS.
14. TRENCH PLUGS PER STANDARD DRAWING I&I-105 SHALL BE USED IN THE TRENCH AND BE PLACED WHERE DIRECTED BY THE GEOTECHNICAL ENGINEER AT A MAXIMUM SPACING OF 80 M AND 2 TO 3 METERS UPSTREAM FROM ANY MAINTENANCE HOLE WHICH IS SUSPECTED OF BEING SUSCEPTIBLE TO HIGH WATER LEVELS OF INFLOW/INFILTRATION.
15. MAINTENANCE HOLE TOPS (FRAMES) ARE TO BE SET TO BASE COURSE ASPHALT GRADE, AND THEN ADJUSTED TO FINAL GRADE WHEN TOP LIFT OF ASPHALT IS PLACED. GRADE AND CROSSFALL ADJUSTMENT SHALL BE MADE USING PRODUCTS SPECIFICALLY MANUFACTURED FOR THAT PURPOSE. CONCRETE MODULAR ADJUSTMENT RINGS ARE TO BE USED TO ADJUST THE MANHOLE TO FINAL GRADE.
16. ALL SEWERS MAINS ARE TO BE TESTED FOR DEFLECTION WITH A SEWER MANDRELL. SEWER MAINS AND SERVICE CONNECTIONS ARE TO BE INSPECTED CCTV. CCTV PROCEDURES AND EVALUATIONS ARE TO BE IN ACCORDANCE WITH NASSCO GUIDELINES 7.03 EDITION, OR AS AMENDED. SEWER MAINS AND SERVICE CONNECTIONS ARE TO BE TESTED BY LOW PRESSURE AIR EXFILTRATION TESTING. MAINTENANCE HOLES ARE TO BE VISUALLY INSPECTED AND WHERE DIRECTED FURTHER TESTED BY WATER EXFILTRATION TESTING AND WATER INFILTRATION TESTING, TESTED BY NEGATIVE AIR VACUME TESTING AND TESTING THE CHIMNEY SEAL FOR LEAKAGE IS APPLICABLE. WASTEWATER FLOW AND RAINFALL MONITORING MAYBE REQUIRED BY THE TOWNSHIP OF KING. ALL TESTING, EVALUATION OF RESULTS AND DEFICIENCIES IS TO BE CARRIED OUT AS OUTLINED IN THE REGION OF YORK "I&I REDUCTION STANDARD FOR SEWERS SERVICING NEW DEVELOPMENT" (FEBRUARY 2022).
17. ALL TESTS ARE TO BE COMPLETED BY THE PROFESSIONAL ENGINEER THAT THE SANITARY SERVICING MEETS ALL TOWNSHIP REQUIREMENTS PRIOR TO THE ISSUANCE OF BUILDING PERMITS. PRIOR TO FINAL ACCEPTANCE, ALL SEWERS ARE TO BE FLUSHED AND INSPECTED BY CCTV. THE PROFESSIONAL ENGINEER SHALL CERTIFY THAT THE SANITARY SERVICING MEETS ALL TOWNSHIP REQUIREMENTS PRIOR TO THE ISSUANCE OF FINAL ACCEPTANCE.

SANITARY SERVICE LATERALS

1. ALL PVC SANITARY LATERAL PIPES MUST BE GREEN - 125 mm DIAMETER, SDR 28. ALL LATERALS REQUIRING RISERS SHALL BE AS PER TOWNSHIP OF KING STANDARD KS-191.
2. LOCATIONS OF SANITARY SERVICE CONNECTION ARE TO BE AS PER TOWNSHIP OF KING STANDARDS. SANITARY SERVICE CONNECTIONS TO BE INSTALLED AS SHOWN ON DRAWINGS OR AS DIRECTED BY THE ENGINEER AND THE TOWNSHIP OF KING.
3. ELEVATION OF SANITARY SERVICE CONNECTIONS AT THE STREET LINE IS TO BE 2.5m MINIMUM BELOW THE FINISHED CENTERLINE OF ROAD GRADE AND TERMINATED WITH A WATER-PROOF PLUG. LOCATION STAKED WITH A 50mm x 100mm MARKER PAINTED GREEN.
4. ALL LATERALS ARE TO BE INSPECTED BY CCTV AND AIR PRESSURE FROM THE MAINLINE TO THE STREET LINE AND CERTIFIED BY THE PROFESSIONAL ENGINEER PRIOR TO THE ISSUANCE OF BUILDING PERMITS. SERVICE LATERALS CONSTRUCTED ON PRIVATE PROPERTY FROM THE STREET LINE TO THE BUILDING FACE ARE TO BE INSPECTED BY CCTV AND AIR PRESSURE AND CERTIFIED BY THE PROFESSIONAL ENGINEER BEFORE THE ISSUANCE OF AN OCCUPANCY CERTIFICATE.
5. SURFACE CLEANOUTS ARE TO BE INSTALLED AT THE STREET LINE ON ALL SANITARY SERVICES IN ACCORDANCE WITH THE STANDARD DRAWINGS.
6. EXISTING SANITARY SERVICES TO BE DECOMMISSIONED ARE TO BE CUT AND CAPPED AT THE MAIN.

WATERMAINS

1. WATERMAIN SHALL BE LOCATED AS SHOWN ON THE STANDARD TOWNSHIP OF KING ROADWAY CROSS SECTIONS. THIS LOCATION SHALL NORMALLY BE ON THE SOUTH AND EAST SIDE OF THE STREET. WATERMAIN SHALL BE OFFSET FROM STREET LINE AS PER STANDARD ROAD CROSS SECTION.
2. ALL WATERMAIN TO BE CLASS 235 PVC (DR18) IN ACCORDANCE WITH AWWA C900 OR PVCO PIPE MANUFACTURED TO AWWA C909 SPECIFICATIONS. ALL PIPE TO BE INSTALLED PER OPSS,MUNI 441.
3. A MINIMUM CLEARANCE BETWEEN THE WATERMAIN AND ALL UTILITIES MUST BE KEPT, WHILE STILL MAINTAINING A MINIMUM DEPTH OF COVER AT ALL TIMES.
4. WATERMAIN SHALL BE INSTALLED WITH A MINIMUM COVER OF 1.8m.
5. TEMPORARY DEAD-ENDS OF WATERMAINS SHALL BE EQUIPPED WITH A TEMPORARY FIRE HYDRANT.
6. PVC WATERMAIN SHALL INCLUDE #12 TRACER WIRE. A TRACER WIRE SHALL BE PROVIDED ALONG THE TOP OF ALL WATERMAINS. THE WIRE IS TO BE SECURED AT EVERY FITTING AND VALVE AND AT INTERVALS NOT TO EXCEED 3 METERS. ALL TRACING WIRES SHALL BE 12 GAUGE, STRANDED COPPER WIRE WITH OUTER PLASTIC COATING.
7. MECHANICAL JOINT RESTRAINTS ARE TO BE INSTALLED AT ALL TEES, HORIZONTAL AND VERTICAL BENDS, HYDRANTS, END OF MAINS AND VALVES. ALL HYDRANTS AND VALVES SHALL BE INSTALLED WITH CATHODIC PROTECTION, 175 GRAM ZINC CAPS OR APPROVED EQUIVALENT SHALL BE INSTALLED ON EACH BOLT OF ANY MECHANICAL CONNECTION. CONCRETE THRUST BLOCKS ARE NOT PERMITTED UNLESS APPROVED BY THE TOWN ENGINEER.
8. DUCTILE IRON, CEMENT-LINED MECHANICAL JOINT FITTINGS MEETING AWWA SPECIFICATIONS C110/C111 OR C153 SHALL BE USED ON PVC WATERMAIN 150 TO 300mm IN DIAMETER.
9. ALL VALVES SHALL BE RESILIENT WEDGE GATE VALVES WITH VALVE BOX UNLESS OTHERWISE APPROVED BY THE TOWN. VALVES SHALL HAVE A NON-RISING STEM AND A 50mm SQUARE OPERATING NUT, OPENING COUNTER-CLOCKWISE. ALL VALVES 300mm DIAMETER AND LARGER SHALL BE INSTALLED INSIDE VALVE CHAMBERS.
10. VALVES IN EXCESS OF 1.8m IN DEPTH SHALL REQUIRE A VALVE STEM EXTENSION.
11. FIRE HYDRANTS SHALL BE MUELLER CANADA VALVE "CENTURY" COMPRESSION TYPE COMPLETE WITH PUMPER NOZZLE FACING THE STREET. THE SIDE PORTS SHALL BE 65mm DIAMETER WITH 100mm DIAMETER STORZ. HYDRANT TEES TO BE ANCHOR STYLE. HYDRANTS SHALL BE PAINTED IN ACCORDANCE WITH TOWNSHIP SPECIFICATIONS.
12. HYDRANT FLANGE ELEVATIONS SHALL BE SET AT A GRADE THAT WILL GIVE A FLANGE ELEVATION OF 50 mm TO 150 mm ABOVE THE FINAL GRADE.
13. ALL HYDRANTS SHALL BE INSTALLED IN ACCORDANCE WITH OPSD 1105.010.
14. HYDRANTS SHALL BE LOCATED A MINIMUM OF 3.0 METRES FROM THE EDGE OF DRIVEWAYS, HOUSE WATER AND SEWER SERVICES, ABOVE GROUND UTILITIES SUCH AS LIGHT STANDARDS, TRANSFORMER, STREET SIGNS AND STREET TREES. A MINIMUM HORIZONTAL SEPARATION OF 2.5m SHALL BE MAINTAINED BETWEEN THE WATERMAIN AND ANY SEWER.
15. HYDRANTS SHALL BE LOCATED ON THE PROJECTION OF A LINE AND OFFSET FROM THE STREET LINE IN ACCORDANCE WITH THE STANDARD CROSS-SECTION.
16. PIPE DEFLECTION SHOULD BE USED WHEREVER POSSIBLE TO MINIMIZE THE USE OF BENDS. WHEREVER IT IS NECESSARY TO DEFLECT FROM A STRAIGHT LINE, EITHER IN THE VERTICAL OR HORIZONTAL PLANE, THE AMOUNT OF DEFLECTION SHALL NOT EXCEED THE RECOMMENDATIONS OF THE MANUFACTURER.
17. THE MAXIMUM SIZE OF CONNECTION THAT CAN BE TAPPED INTO A 150mm DIAMETER WATERMAIN IS 50mm IN DIAMETER. WATER SERVICE CONNECTIONS 75mm IN DIAMETER AND LARGER SHALL BE MADE BY INSTALLING A TEE ON THE SUPPLY MAIN.

WATER SERVICES

1. EACH HOUSING UNIT SHALL HAVE SEPARATE 25mm MINIMUM DIAMETER OR AS REQUIRED BY FIXTURE COUNTS PER OBC, TYPE K COPPER OR PEX WATER SERVICE.
2. WATER SERVICES TO BE LOCATED AT THE CENTRE OF THE LOT, WITH CURB STOP AT THE STREET LINE.
3. THE MINIMUM DEPTH OF COVER IS 1.8m.
4. WATER SERVICES SHALL BE INSTALLED TO AVOID DRIVEWAY APPROACHES.
5. NO COUPLINGS WILL BE ALLOWED BETWEEN THE CURB STOP AND MAIN STOP.
6. STAINLESS STEEL SERVICE SADDLES SHALL BE USED WHEN TAPPING INTO THE PVC WATERMAIN.
7. SERVICES SHALL BE INSTALLED ACCORDING TO KS-851.
8. A WATER METER WILL BE REQUIRED ON EACH RESIDENCE. MAKE AND MODEL IS TO BE PER TOWNSHIP REQUIREMENTS COMPLETE WITH A REMOTE READER LOCATED ON AN OUTSIDE WALL, ADJACENT TO THE HYDRO METER.
9. ALL EXISTING WATER SERVICES TO BE DECOMMISSIONED ARE TO BE CUT AND CAPPED AT MAIN.
10. CURB STOPS SHALL BE INSTALLED WITH STAINLESS STEEL COTTER PINS.

LEGEND

Symbol	Description
WM	EXISTING WATERMAIN
SAN	EXISTING SANITARY SEWER
STM	EXISTING STORM SEWER
CB	EXISTING CATCHBASIN LEAD
GAS	EXISTING GAS MAIN
BELL	EXISTING U/G BELL
HYDRO	EXISTING U/G HYDRO
CATV	EXISTING U/G CABLE TELEVISION
BELL	EXISTING BELL PEDESTAL
	EXISTING HYDRO TRANSFORMER & PAD
GW HP BP P	EXISTING UTILITY POLE WITH GUY WIRE
HYD	EXISTING HYDRANT AND VALVE
VC	EXISTING VALVE CHAMBER
WB	EXISTING VALVE & BOX
GV	EXISTING GAS VALVE
MH	EXISTING MH STORM OR SANITARY
CB	EXISTING CATCHBASIN SINGLE
DCB	EXISTING CATCHBASIN DOUBLE
IB	IRON BAR
SIB	STANDARD IRON BAR
	EXISTING CURB & GUTTER
	EXISTING CULVERT
P&W CL P&B	EXISTING FENCE
	EXISTING DECIDUOUS TREE
	EXISTING CONIFEROUS TREE
	EXISTING VEGETATION TO BE REMOVED
SIGN	EXISTING SIGN
MH1	PROPOSED STORM MAINTENANCE HOLES
CBMH1	PROPOSED CATCHBASIN MAINTENANCE HOLES
MH1	PROPOSED SANITARY MAINTENANCE HOLES
25m - 250mm ø	PROPOSED SEWER
200 DIA. PVC W/M	PROPOSED WATERMAIN
CB	PROPOSED CATCHBASIN
DCB	PROPOSED DOUBLE CATCHBASIN
CB	PROPOSED CATCHBASIN WITH I.C.D.______L/S MAX.
	PROPOSED HYDRANT & SECONDARY VALVE
VC	PROPOSED VALVE & CHAMBER
V.B.	PROPOSED VALVE & BOX
	PROPOSED CURB & GUTTER & DEPRESSION
1.5m CONC. S/W	PROPOSED SIDEWALK
	RESTORE DRIVEWAY WITH GRAVEL
	RESTORE DRIVEWAY WITH ASPHALT
	RESTORE DRIVEWAY WITH CONCRETE
	RESTORE DRIVEWAY WITH PAVING STONE
232.55	PROPOSED ELEVATION
232.43	EXISTING ELEVAITON
	EXISTING STRUCTURE TO BE REMOVED
W W EX SAN E E	EXISTING SAN LATERAL CONNECTIONS
	CONNECTIONS TO EXISTING WATER SERVICE AT PROP. AND EX. WATERMAINS

No.	Revision	Date	By	Appr'd
4				
3				
2				
1		JANUARY 2026		

Benchmarks

No.	Elevation	Description

CONSULTANT

LICENSED PROFESSIONAL ENGINEER PROVINCE OF ONTARIO

ACCEPTED
TOWNSHIP OF KING

SIGNATURE DATE

KING

(CONSULTANTS COMPANY INFO & LOGO)

(PROJECT NAME)
GENERAL NOTES

Surveyed by:	Checked by:	Project No. ??-??
Drawn by:	Approved by:	
Designed by:	Date:	Drawing No. GN
Scale Horz. 1:500 Vert. 1:50 (0m 10m 20m / 0m 1m 2m)		Sheet No. - OF -

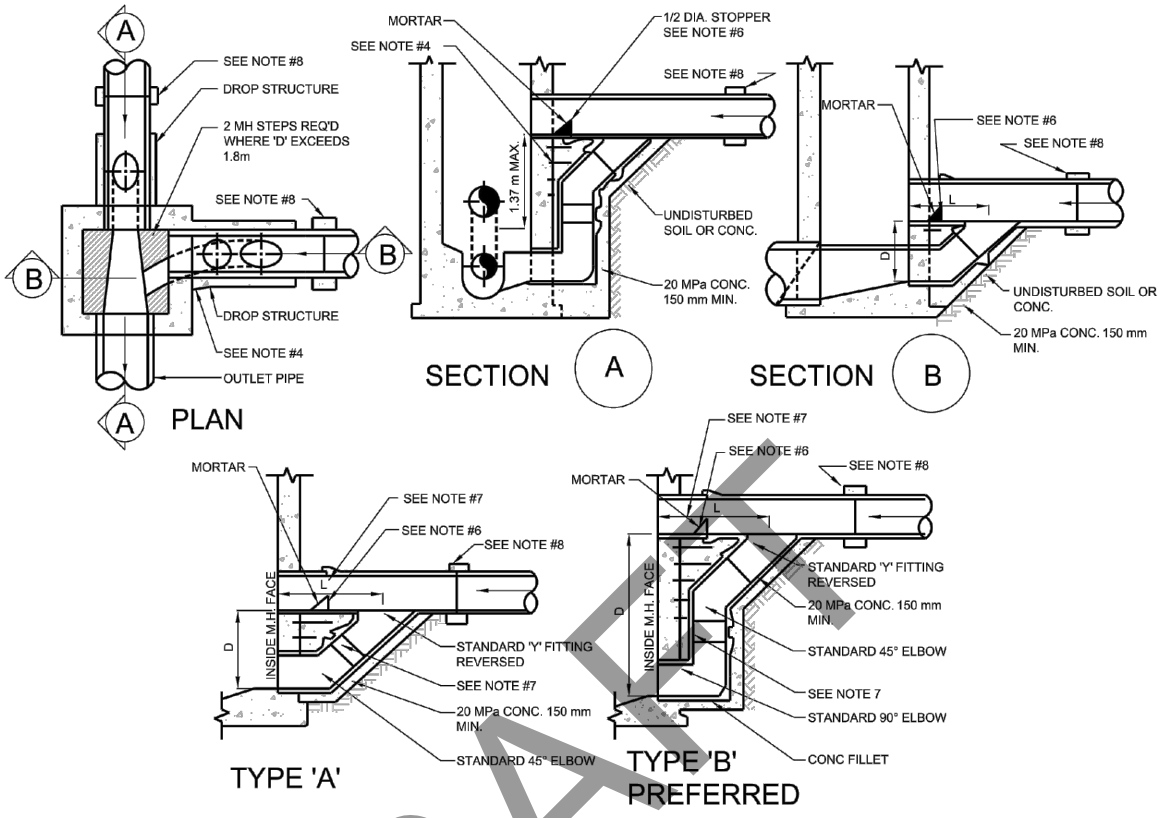
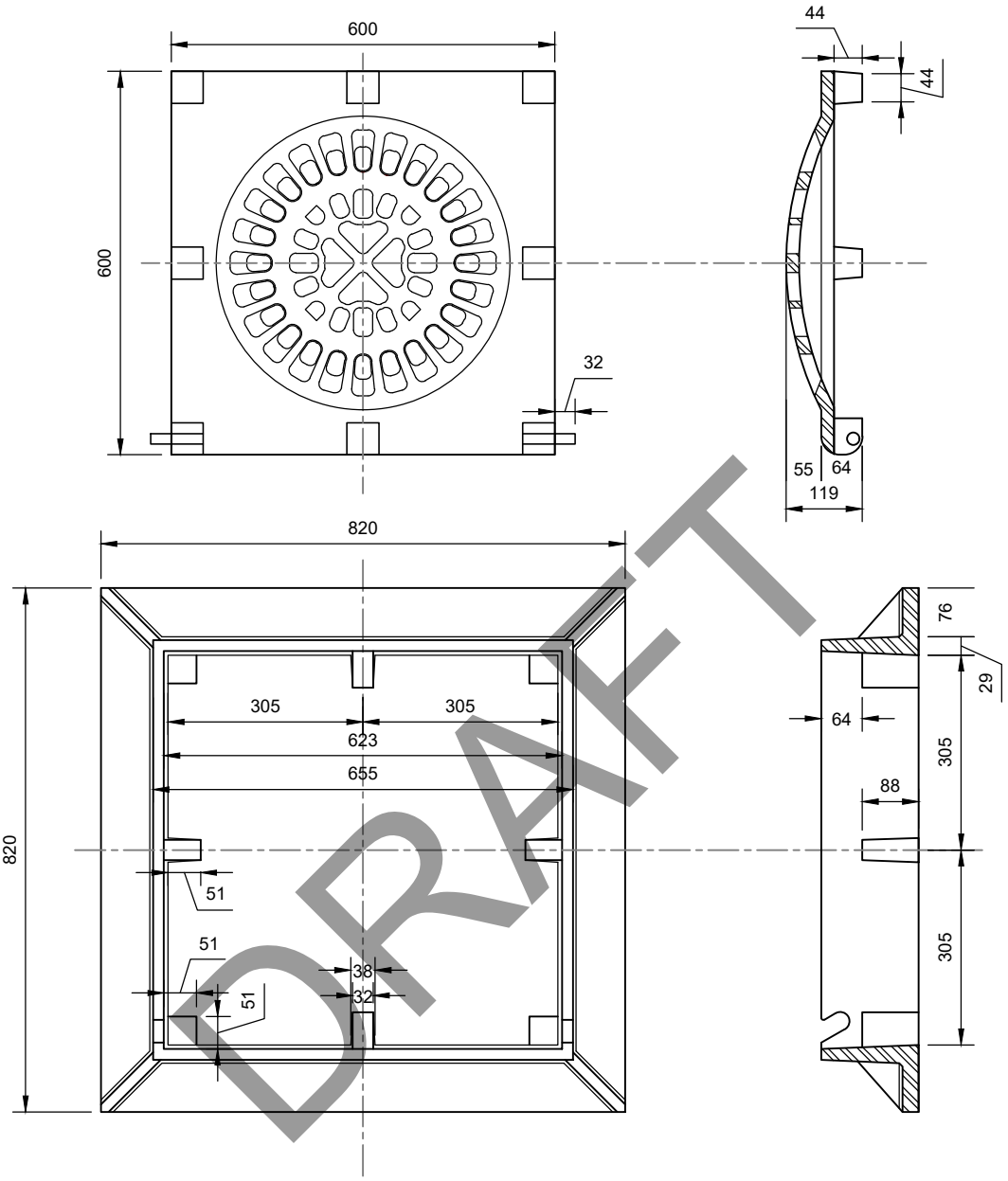


TABLE OF MINIMUM DIMENSIONS AND MAXIMUM VELOCITIES						
DROP PIPE (mm)	TYPE 'A'		TYPE 'B'		MAX. VELOCITY m/sec	
	'D'	'L'	'D'	'L'	NO STOPPER	STOPPER
200	.610	.760	1.22	1.07	1.42	3.78
250	.650	.815	1.30	1.07	1.55	4.05
300	.710	.915	1.45	1.14	1.71	4.11
375	.915	1.14	1.91	1.22	1.92	4.18
450	.990	1.22	2.06	1.30	2.16	4.27
525	1.07	1.30	2.21	1.45	2.35	4.45
600	1.14	1.37	2.44	1.52	2.53	4.60
675	1.22	1.45	2.51	1.60	2.70	4.72
750	1.30	1.52	2.67	1.68	2.83	5.00
DIMENSIONS IN METRES						

NOTES:

1. DROP PIPE TO BE ONE SIZE SMALLER THAN INLET UNLESS OTHERWISE NOTED. MIN= 200mm; MAX= 750mm
2. DROP PIPE TO HAVE CROWN LEVEL WITH OUTLET PIPE AND BENCHED TO CROWN.
3. DROP PIPE TO BLEND WITH FLOW.
4. DROP STRUCTURE TO BE ENCASED IN A MINIMUM OF 150mm OF 20 MPa CONCRETE AND DOWELLED TO MAINTENANCE HOLE WITH 12mm DIA. DOWELS, 450mm LONG, EITHER SIDE OF DROP PIPE AND AT 300mm C TO C.
5. MAXIMUM VELOCITIES SHOWN IN TABLE INDICATE MAXIMUM VELOCITY IN INCOMING PIPE WITH NO OVERSHOOTING.
6. WHEN USED ON STORM SEWERS 375mm DIA. OR LARGER, A ½ DIA. CONCRETE STOPPER MAY BE INSERTED IN THE INVERT OF THE MAIN LINE AS INDICATED.
7. ADJUSTMENT IN 'D' AND 'L' TO BE MADE WITH PLAIN END STRAIGHT PIPE.
8. WHERE 'Y' FITTING JOINS FIRST PIPE, A 300mm WIDE BY 15mm THICK 20 MPa CONCRETE COLLAR IS TO BE CONSTRUCTED.
9. ALL CONCRETE IN DROP STRUCTURE TO BE 20 MPa AT 28 DAYS.
10. MINIMUM DIMENSIONS BASED ON USE OF STANDARD CONCRETE FITTINGS.
11. ALL DIMENSIONS ARE SUBJECT TO MANUFACTURER'S PERMISSIBLE VARIATIONS.

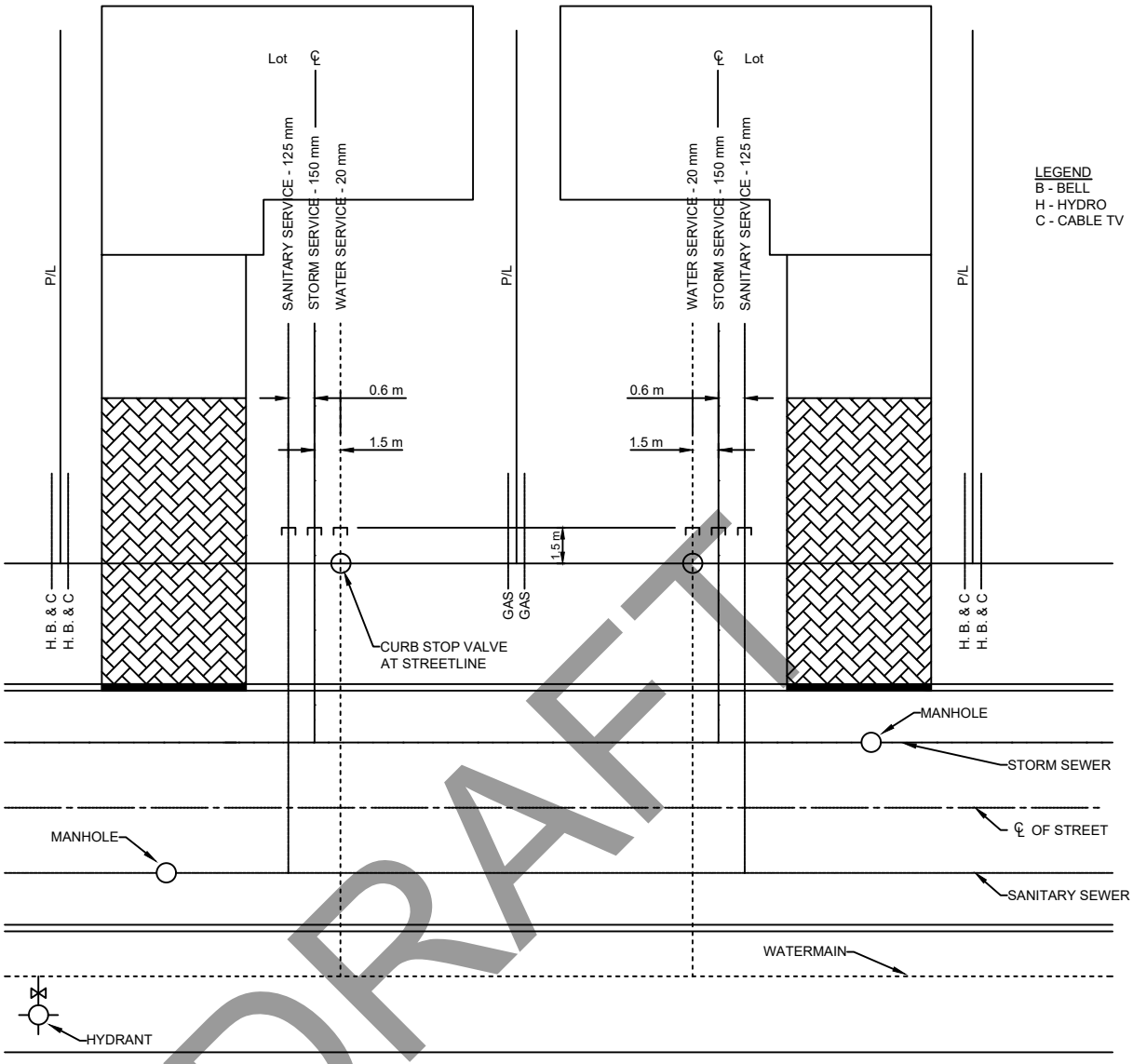
KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE FEB. 2017
	TYPICAL DROP STRUCTURES FOR STANDARD STORM MANHOLES	REVISION	DRAWING No. KS-171
		DATE OF REVISION JANUARY 2026	

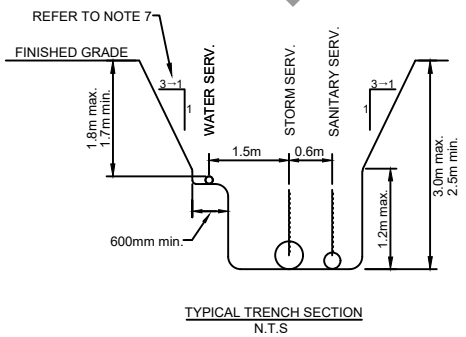


NOTES:

1. ALLOWABLE TOLERANCE: DIMENSIONS 300mm OR LESS + 3mm
   DIMENSIONS OVER 300mm UP TO AND INCLUDING 900mm +6mm
2.. THE INITIALS OR MARK OF THE MANUFACTURER ARE TO BE DISTINCTLY CAST IN RAISED LETTERS ON BOTH FRAME AND COVER
3. STEEL FOR HINGE PINS TO BE AS ASTM DESIGNATION A-7 OR EQUIVALENT
4. CAST IRON TO CONFORM TO ASTM DESIGNATION A-48-74 CLASS 30-C
5. DIMENSIONS IN mm EXCEPT AS NOTED

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE APRIL 2015
	BEEHIVE CATCHBASIN FRAME and COVER	REVISION	DRAWING No. KS-174
		DATE OF REVISION JANUARY 2026	



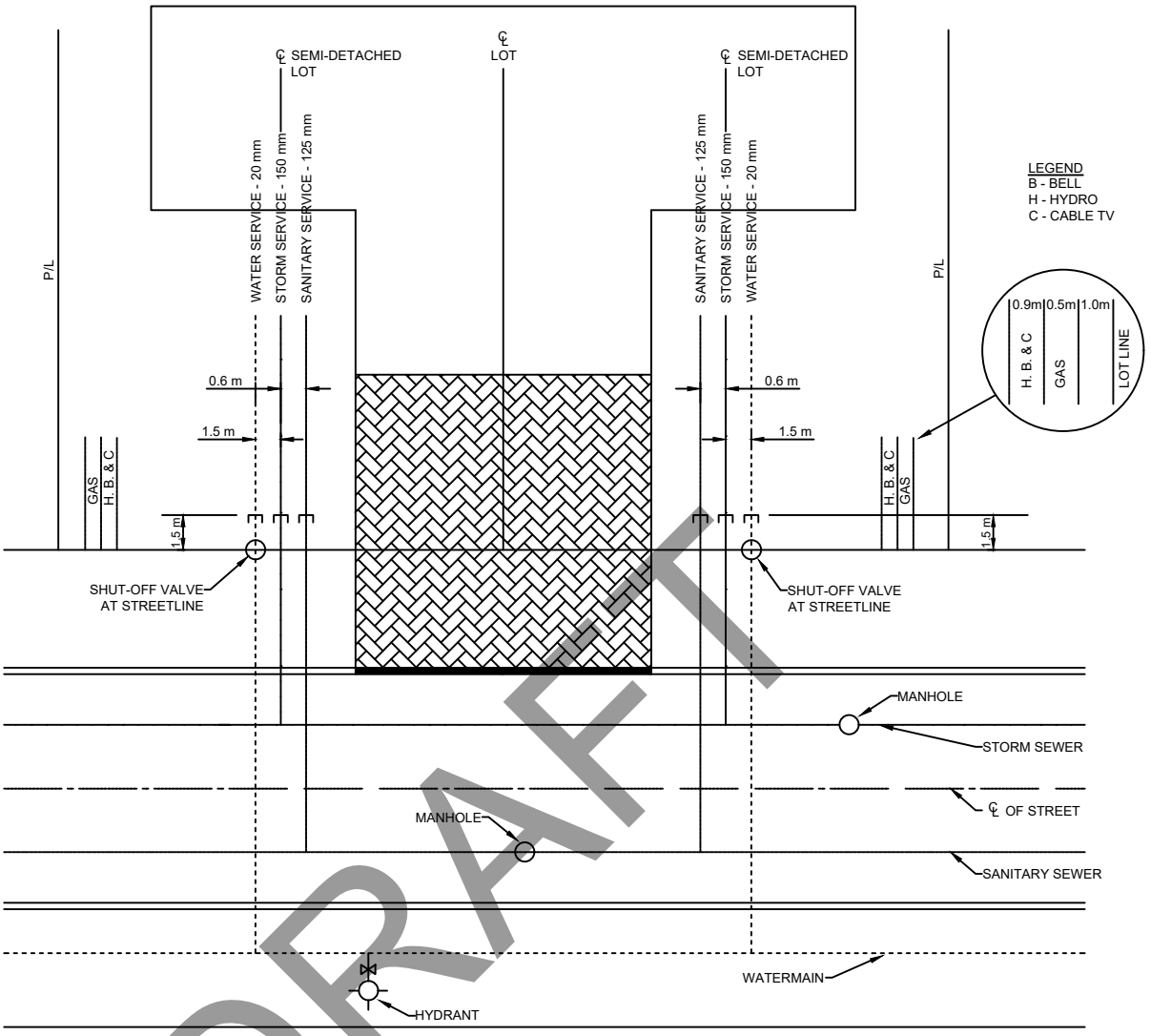


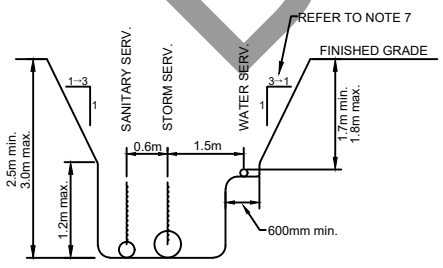
TYPICAL TRENCH SECTION
N.T.S

NOTES:

1. SERVICES TO EXTEND 1.5m INSIDE PROPERTY LINE AND CAPPED.
2. UNDER NO CIRCUMSTANCES SHALL SERVICES CROSS ONE ANOTHER.
3. THE MINIMUM SIZE FOR STORM DRAIN CONNECTIONS SHALL BE 150mm Ø INSTALLED AT A MINIMUM GRADE OF 2% FROM THE STORM SEWER TO THE BUILDING ENVELOPE.
4. THE MINIMUM SIZE FOR SANITARY LATERALS SHALL BE 125mm Ø INSTALLED AT A MINIMUM GRADE OF 2% FROM THE SANITARY SEWER TO THE BUILDING ENVELOPE.
5. ALL UNDERGROUND SERVICE CABLES TO BE PLACED A MINIMUM 1.0m BELOW FINISHED GRADE OF LOTS.
6. ALL DIMENSIONS ARE IN METRES EXCEPT WHERE NOTED.
7. TRENCH DIMENSIONS AND SLOPING OF WALLS TO BE UNDERTAKEN IN ACCORDANCE WITH REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT, AS AMENDED.
8. CURB STOPS SHALL NOT BE LOCATED WITHIN DRIVEWAYS (0.6m MINIMUM OFFSET).
9. SURFACE CLEANOUTS FOR SANITARY SEWER SERVICES IN ACCORDANCE WITH STANDARD DWG. KS-193 ARE TO BE PROVIDED WHERE DIRECTED BY THE TOWNSHIP.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE JAN. 1990
	SERVICE LOCATION SINGLE FAMILY RESIDENTIAL	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-175



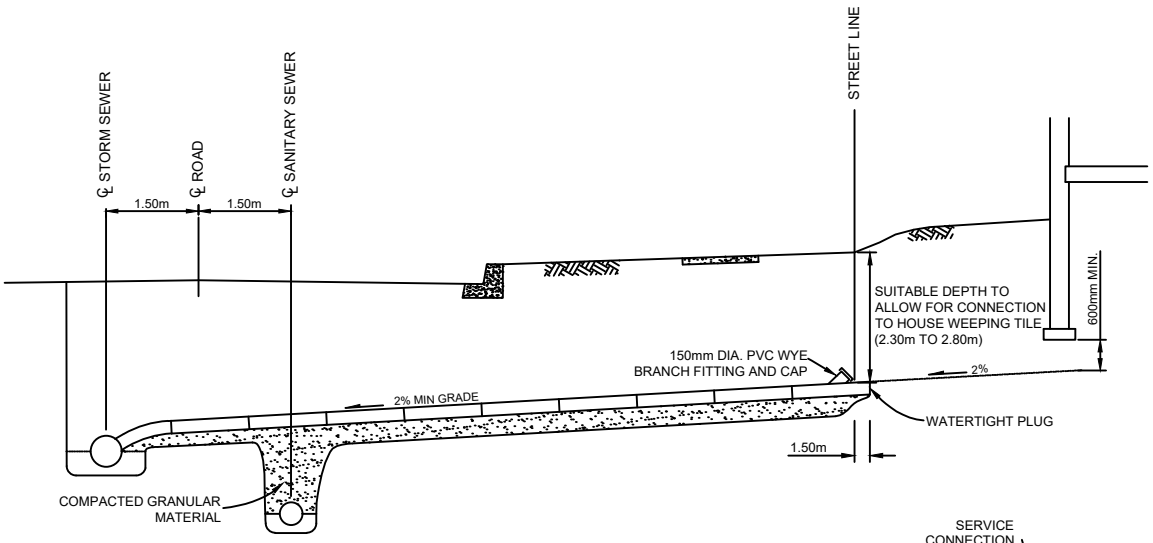


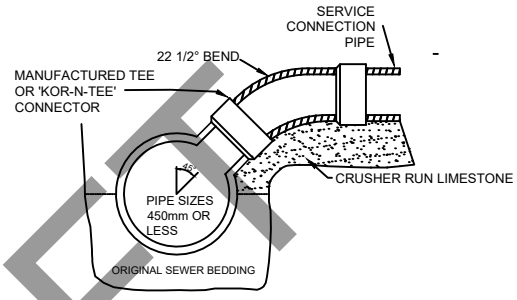
TYPICAL TRENCH SECTION
N.T.S

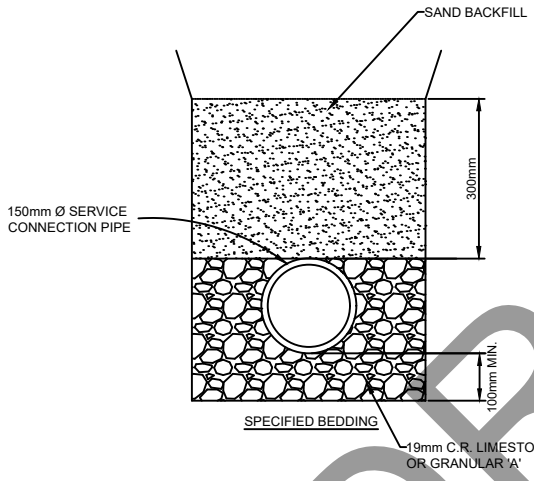
NOTES:

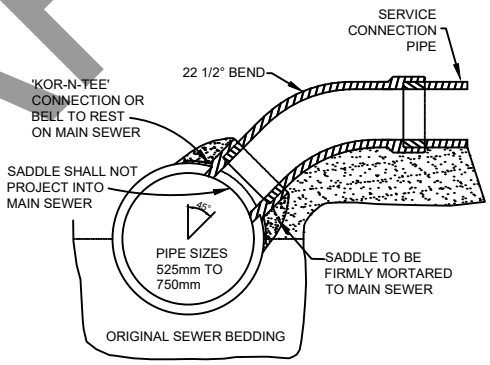
1. SERVICES TO EXTEND 1.5m INSIDE PROPERTY LINE AND CAPPED
2. UNDER NO CIRCUMSTANCES SHALL SERVICES CROSS ONE ANOTHER.
3. THE MINIMUM SIZE FOR STORM DRAIN CONNECTIONS SHALL BE 150mm Ø INSTALLED AT A MINIMUM GRADE OF 2% FROM THE STORM SEWER TO THE BUILDING ENVELOPE.
4. THE MINIMUM SIZE FOR SANITARY LATERALS SHALL BE 125mm Ø INSTALLED AT A MINIMUM GRADE OF 2% FROM THE SANITARY SEWER TO THE BUILDING ENVELOPE.
5. ALL UNDERGROUND SERVICE CABLES TO BE PLACED A MINIMUM 1.0m BELOW FINISHED GRADE OF LOTS.
6. ALL DIMENSIONS ARE IN METRES EXCEPT WHERE NOTED.
7. TRENCH DIMENSIONS AND SLOPING OF WALLS TO BE UNDERTAKEN IN ACCORDANCE WITH REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT, AS AMENDED.
8. CURB STOPS SHALL NOT BE LOCATED WITHIN DRIVEWAYS (0.6m MINIMUM OFFSET).
9. SURFACE CLEANOUTS FOR SANITARY SEWER SERVICES IN ACCORDANCE WITH STANDARD DWG. KS-193 ARE TO BE PROVIDED WHERE DIRECTED BY THE TOWNSHIP.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE JAN. 1990
	SERVICE LOCATION SEMI DETACHED RESIDENTIAL	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-176



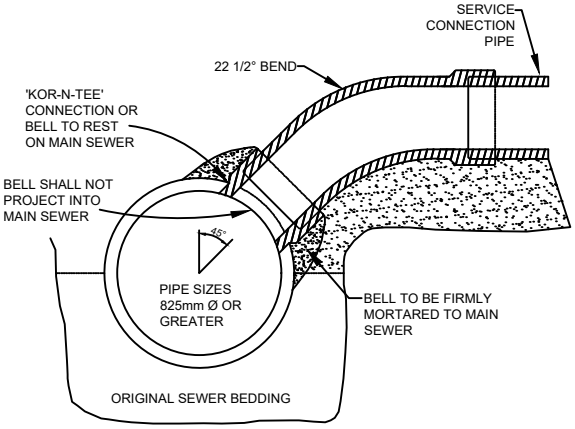




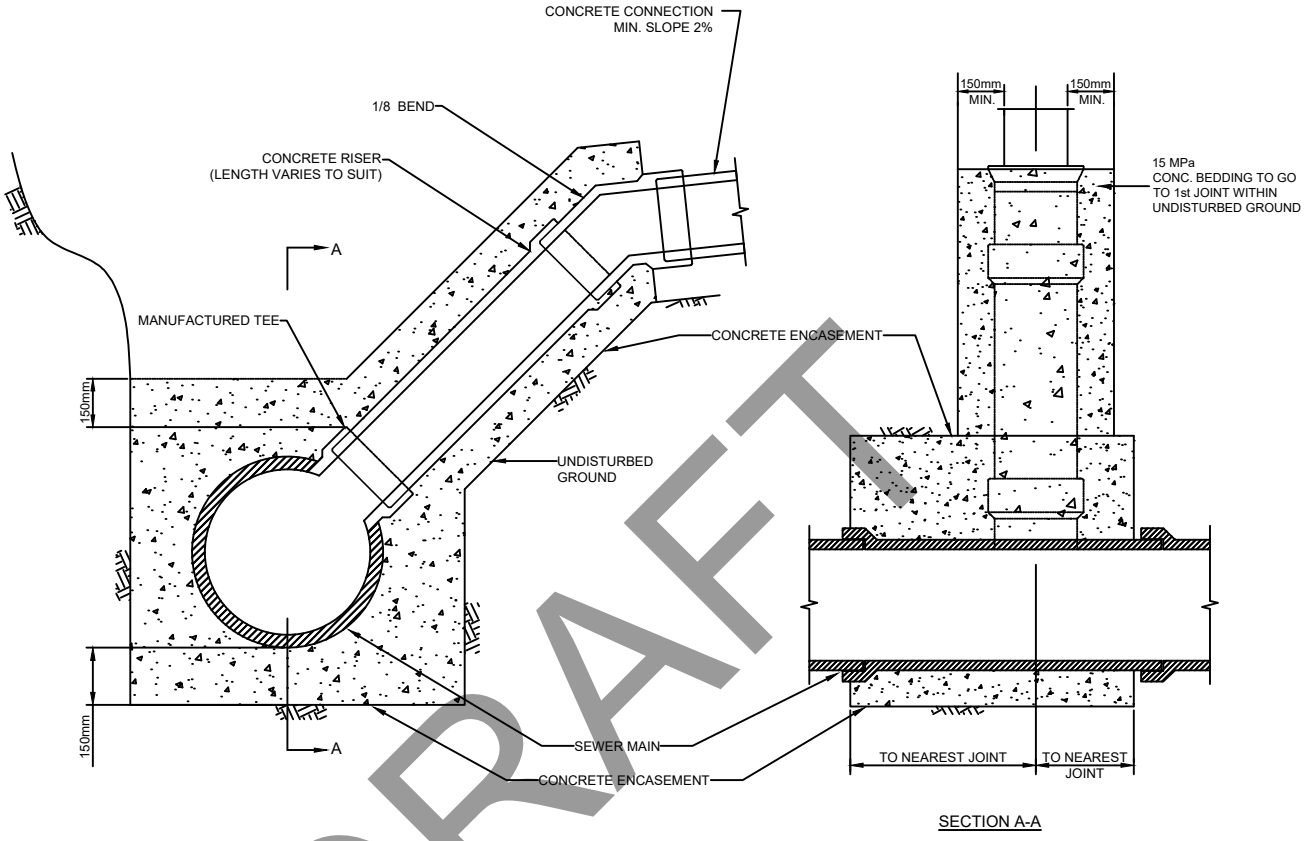


NOTES:

1. STORM SERVICE CONNECTION PIPE TO BE FITTED WITH APPROVED RUBBER GASKET JOINTS.
2. IF CONTRACTOR TUNNELS UNDER WATERMAIN, MINIMUM LENGTH OF TUNNEL TO BE 1.8m AND ALL VOIDS TO BE FILLED WITH H.L.8 BLEND CLEAR STONE.
3. RISERS TO BE INSTALLED WHERE SPECIFIED ON THE ENGINEERING DRAWINGS OR WHEN DEPTH TO TOP OF SEWER EXCEEDS 4.5m. (SEE KS-178)
4. SERVICE CONNECTION TO BE INSTALLED IN A STRAIGHT LINE FROM SEWER TO STREETLINE. A PVC CLEANOUT IS TO BE INSTALLED AT THE STREET LINE.
5. ALL DIMENSIONS ARE IN MILLIMETRES OR METRES.
6. FLOOR DRAIN CONNECTIONS WITHIN BUILDING ENVELOPE SHALL NOT BE CONNECTED TO STORM SEWER SERVICE.
7. AS AN ALTERNATIVE 'KOR-N-TEE' CONNECTORS MAY BE USED FOR 150mm AND 200mm Ø STORM DRAIN CONNECTIONS.
8. TRENCH DIMENSIONS AND SLOPING OF WALLS TO BE UNDERTAKEN IN ACCORDANCE WITH REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT, AS AMENDED.



KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: FEB. 1980
	STORM SEWER SERVICE CONNECTION	REVISION	DRAWING No.: KS-177
		DATE OF REVISION: JANUARY 2026	

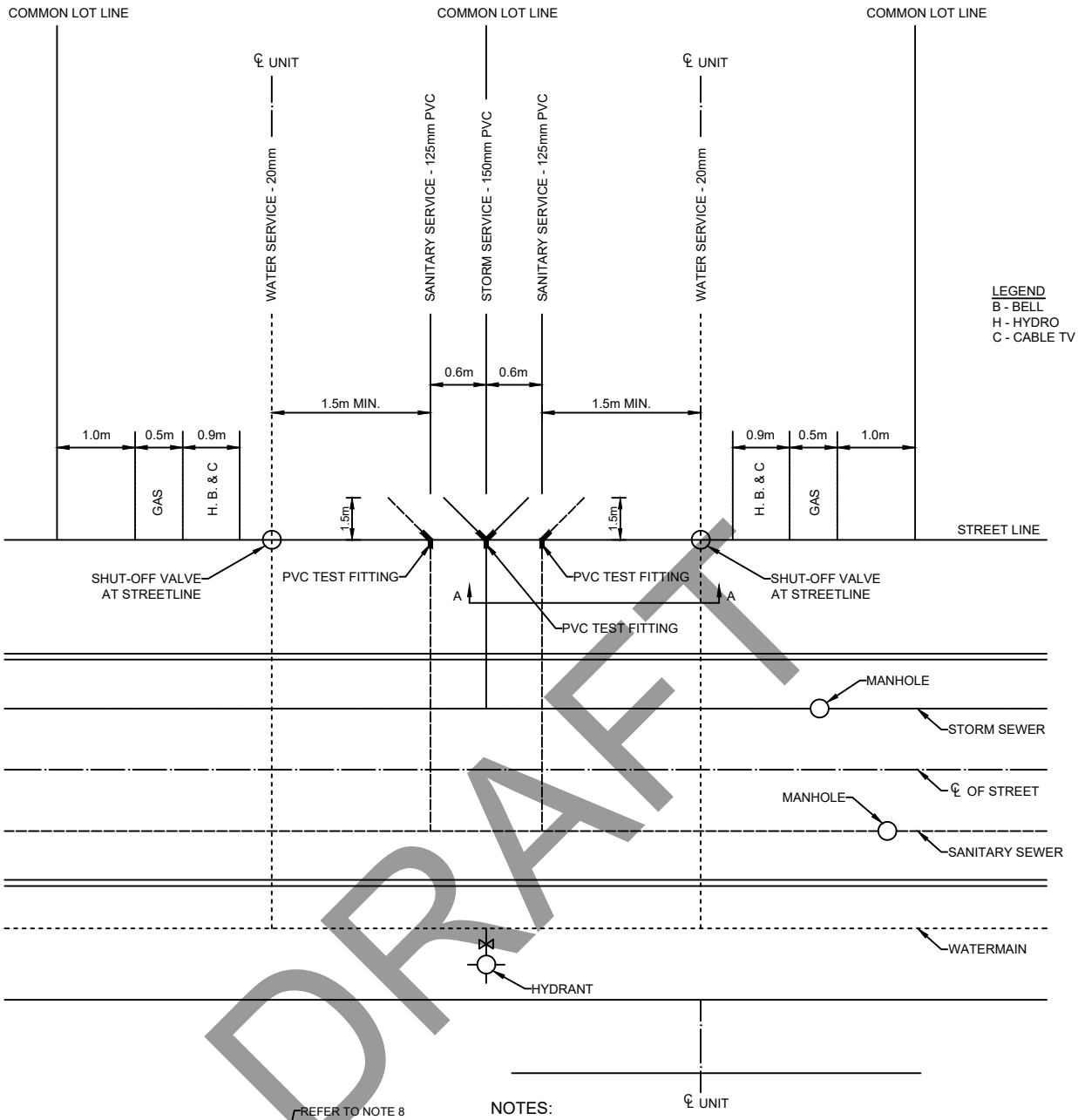


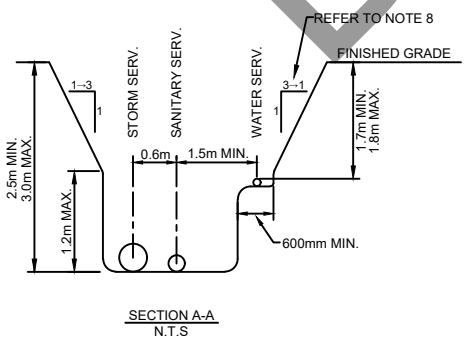
SECTION A-A

NOTES:

1. ALL CONCRETE BEDDING TO BE MINIMUM 15 MPa.
2. FOR SEWER SIZES UP TO AND INCLUDING 450mm Ø, THE CONNECTION TO THE MAIN IS TO BE MADE BY MEANS OF A MANUFACTURED TEE.
3. RISERS MUST NOT EXCEED 3.0m IN DEPTH.
4. RISER CONNECTION DETAIL MUST BE USED WHEN DEPTH TO INVERT OF SEWER MAIN EXCEEDS 4.5m.
5. ALL DIMENSIONS ARE IN MILLIMETRES AND METRES.
6. POLYVINYL CHLORIDE (SDR 28) IS AN APPROVED EQUIVALENT TO CONCRETE PIPE FOR SERVICE CONNECTIONS. WHERE P.V.C. PIPE IS USED, BEDDING MATERIAL SHALL BE HL 8 BLEND CLEAR STONE. A CONTROLLED SETTLEMENT JOINT IS TO BE USED FOR P.V.C. SEWERS EQUAL TO OR GREATER THAN 4.5m IN DEPTH. REFER TO DRAWING No. KS-198.
7. TRENCH DIMENSIONS AND SLOPING OF WALLS TO BE UNDERTAKEN IN ACCORDANCE WITH REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT, AS AMENDED.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE FEB. 1980
	STORM SEWER RISER CONNECTION	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-178



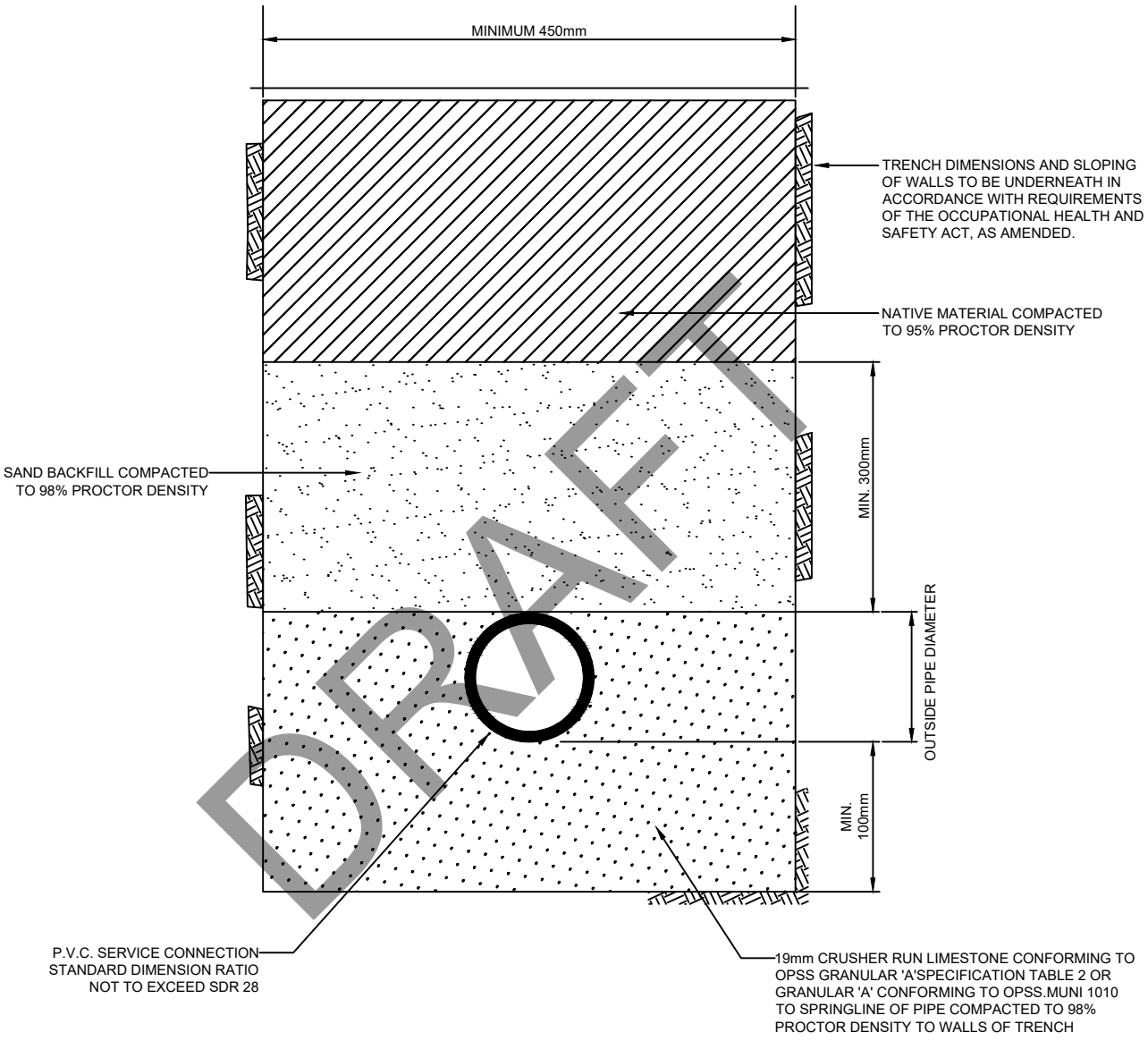


SECTION A-A
N.T.S

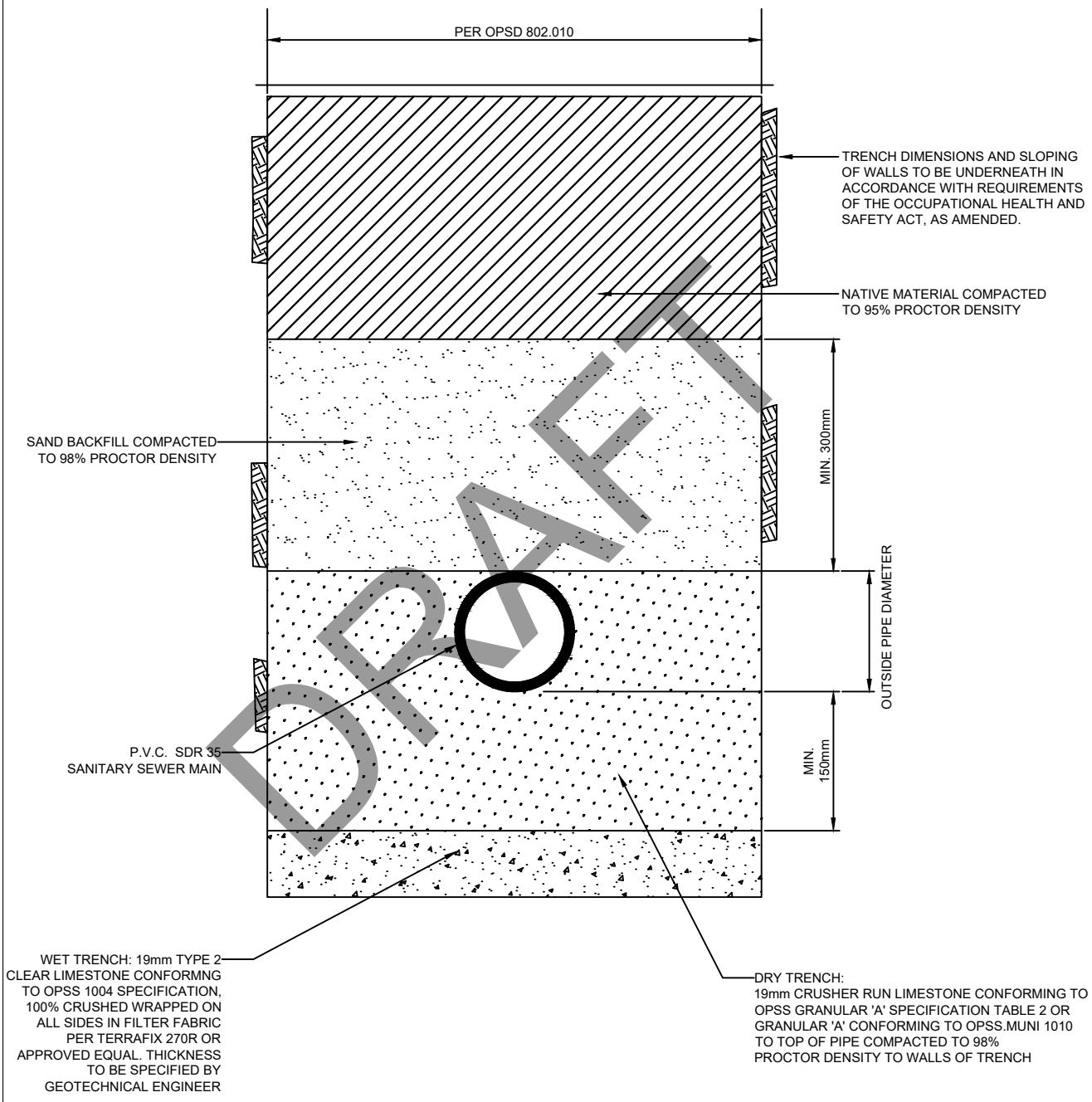
NOTES:

1. SERVICES TO EXTEND 1.5m INSIDE PROPERTY LINE.
2. UNDER NO CIRCUMSTANCES SHALL SERVICES CROSS ONE ANOTHER.
3. EACH HOUSE MUST BE SUPPLIED WITH A 150mm Ø STORM SEWER SERVICE LATERAL.
4. THE MINIMUM SIZE FOR STORM DRAIN CONNECTIONS SHALL BE 150mm Ø INSTALLED AT A MINIMUM GRADE OF 2% FROM THE STORM SEWER TO THE BUILDING ENVELOPE.
5. THE MINIMUM SIZE FOR SANITARY LATERALS SHALL BE 125mm Ø INSTALLED AT A MINIMUM GRADE OF 2% FROM THE SANITARY SEWER TO THE BUILDING ENVELOPE.
6. ALL UNDERGROUND SERVICE CABLES TO BE PLACED A MINIMUM 1.0m BELOW FINISHED GRADE OF LOTS.
7. ALL DIMENSIONS ARE IN METRES EXCEPT WHERE NOTED.
8. TRENCH DIMENSIONS AND SLOPING OF WALLS TO BE UNDERTAKEN IN ACCORDANCE WITH REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT, AS AMENDED.
9. SURFACE CLEANOUTS FOR SANITARY SEWER SERVICES IN ACCORDANCE WITH STANDARD DWG. KS-193 ARE TO BE PROVIDED WHERE DIRECTED BY THE TOWNSHIP.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: NOV. 2010
	SERVICE LOCATION MULTI / TOWN HOUSE SERVICE CONNECTION	REVISION	DRAWING No.: KS-179
		DATE OF REVISION: JANUARY 2026	

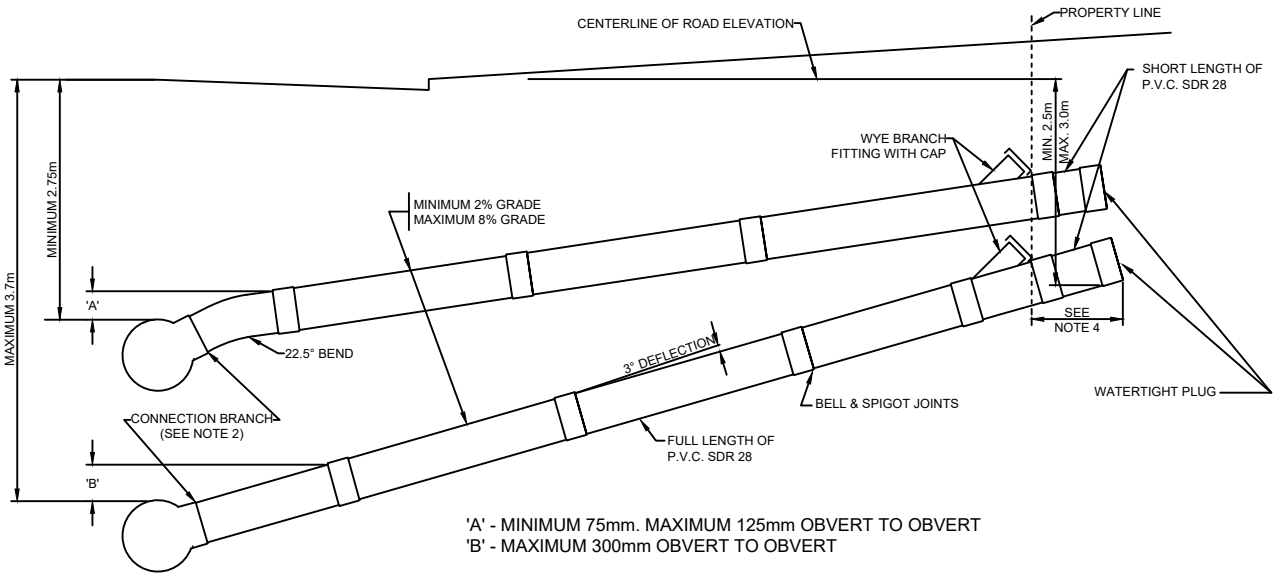


KING	**TOWNSHIP OF KING**	**APPROVED**	**DATE OF ISSUE** JAN. 1990
	BEDDING DETAIL FOR PLASTIC SANITARY SEWER SERVICE CONNECTIONS	**REVISION**	**DRAWING No.** KS-180
		DATE OF REVISION JANUARY 2026	

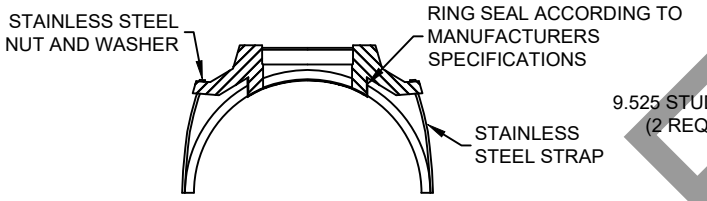


NOTE:
STANDARD IS TO BE READ IN CONJUNCTION WITH OPSD 802.010

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: DEC. 2023
	BEDDING DETAIL FOR FLEXIBLE SANITARY SEWERS	REVISION	DRAWING No.: KS-181
		DATE OF REVISION: JANUARY 2026	

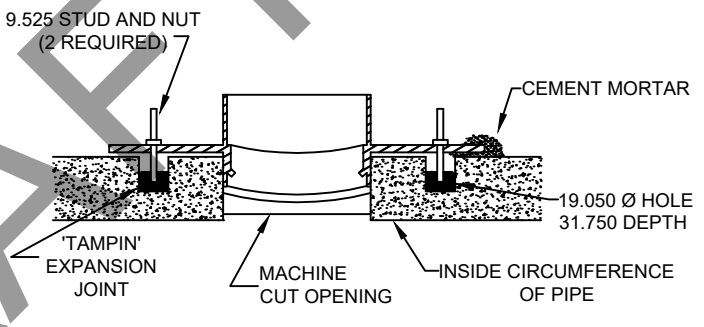


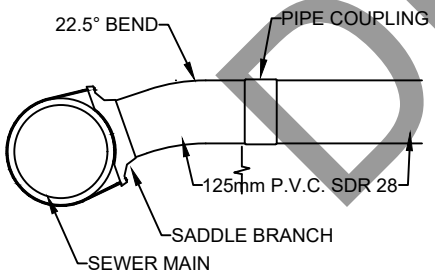
'A' - MINIMUM 75mm. MAXIMUM 125mm OBVERT TO OBVERT
'B' - MAXIMUM 300mm OBVERT TO OBVERT

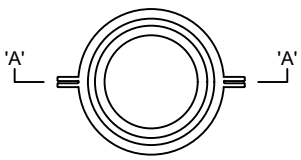


SECTION 'A-A'

CAST IRON SADDLE BRANCH FOR CONNECTION TO EXISTING MAINS OTHER THAN P.V.C. OR A.B.S. TRUSS PIPE





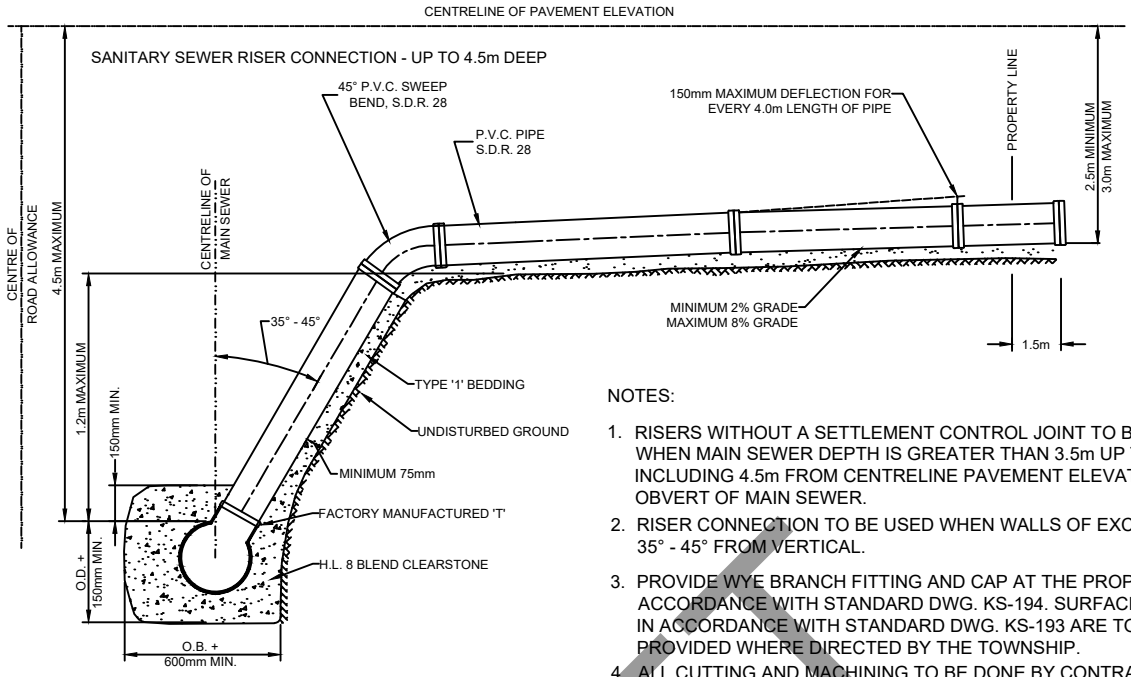


TOP VIEW

NOTES:

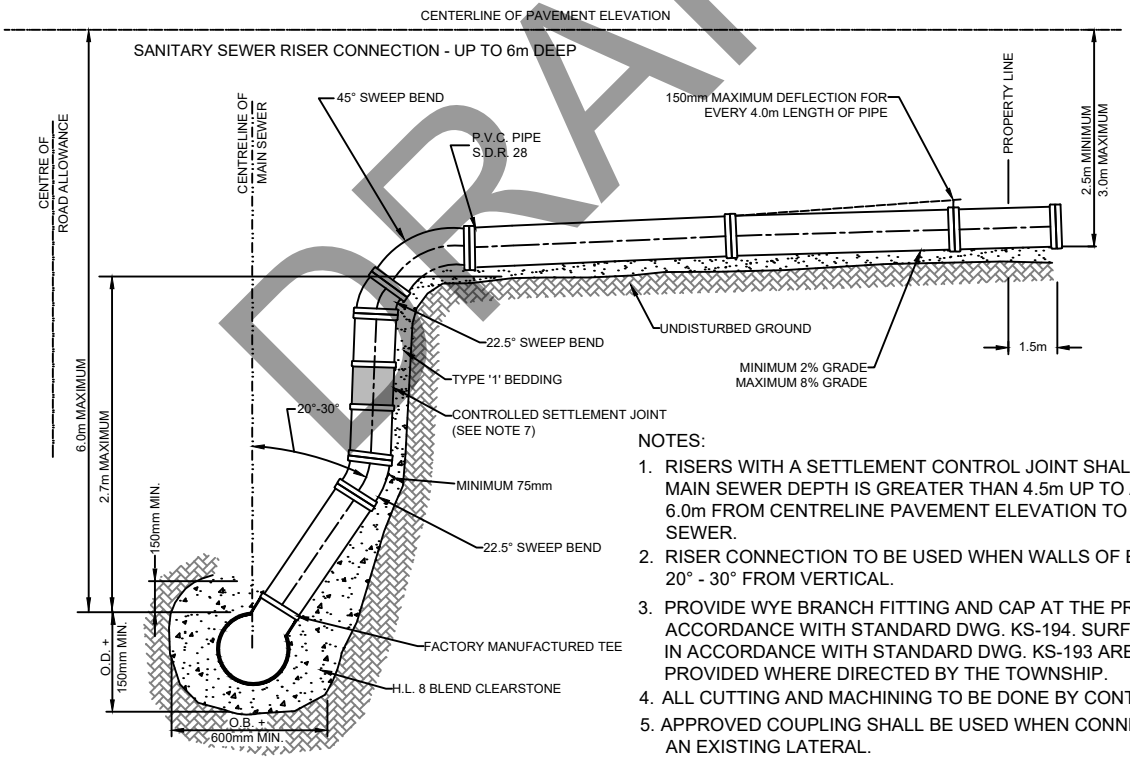
1. IN NEW SUBDIVISIONS THE SANITARY SEWER AND WATER SERVICE CONNECTIONS ARE TO BE INSTALLED IN COMMON TRENCHES AS PER STANDARD DETAILS KS-175 AND KS-176.
2. IN NEW SUBDIVISIONS ALL CONNECTIONS TO THE SEWERS ARE TO BE MADE WITH A FACTORY MANUFACTURED TEE. FOR CONNECTIONS TO EXISTING SANITARY SEWERS, OTHER THAN P.V.C. OR A.B.S. TRUSS PIPE, A SADDLE CONNECTION MAY BE USED. MORTAR-ON SADDLES TO BE USED ON CONCRETE PIPE GREATER THAN 450mm Ø. CONNECTIONS TO EXISTING P.V.C. SEWERS ARE TO BE MADE WITH A FACTORY MANUFACTURED TEE. CONNECTIONS TO EXISTING A.B.S. PIPE ARE TO BE MADE WITH A SOLVENT WELDED SADDLE.
3. 45° STRAP ON SADDLE TO BE USED ON SEWERS OTHER THAN P.V.C. OR A.B.S. TRUSS PIPE, WHEN LATERAL INTERSECTS SEWER MAIN AT AN ACUTE ANGLE.
4. THE SEWER CONNECTION SHALL BE LAID FROM THE MAIN TO 1.5m BEYOND THE PROPERTY LINE IN NEW SUBDIVISIONS ONLY.
5. THE ENDS OF ALL SEWER PIPE MUST BE MACHINED. ALL CUTTING AND MACHINING TO BE DONE BY THE CONTRACTOR.
6. A COUPLING SHALL BE INSTALLED AT DEAD ENDS AND SHALL BE PLUGGED USING A WATER TIGHT PLUG.
7. DEFLECTIONS AT PIPE JOINTS IS NOT TO EXCEED 3° IE.
8. PIPE COUPLING TO BE 'RING-TITE' OR EQUIVALENT P.V.C. BELL AND SPIGOT JOINT WITH RUBBER GASKETS.
9. REFER TO STANDARD KS-180 FOR BEDDING REQUIREMENTS FOR P.V.C. SERVICE CONNECTIONS.
10. WHEN MORTAR-ON SADDLES ARE USED, A MACHINE CUT OPENING IS TO BE MADE IN THE SANITARY SEWER WITH A CORING MACHINE.
11. ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE NOTED.
12. SURFACE CLEAOUTS IN ACCORDANCE WITH STANDARD DWG. KS-193 ARE TO BE PROVIDED WHERE DIRECTED BY THE TOWNSHIP.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: JAN. 1990
	SANITARY SEWER HOUSE CONNECTIONS (125 & 150mm PIPE)	REVISION	DRAWING No.: KS-190
		DATE OF REVISION: JANUARY 2026	



NOTES:

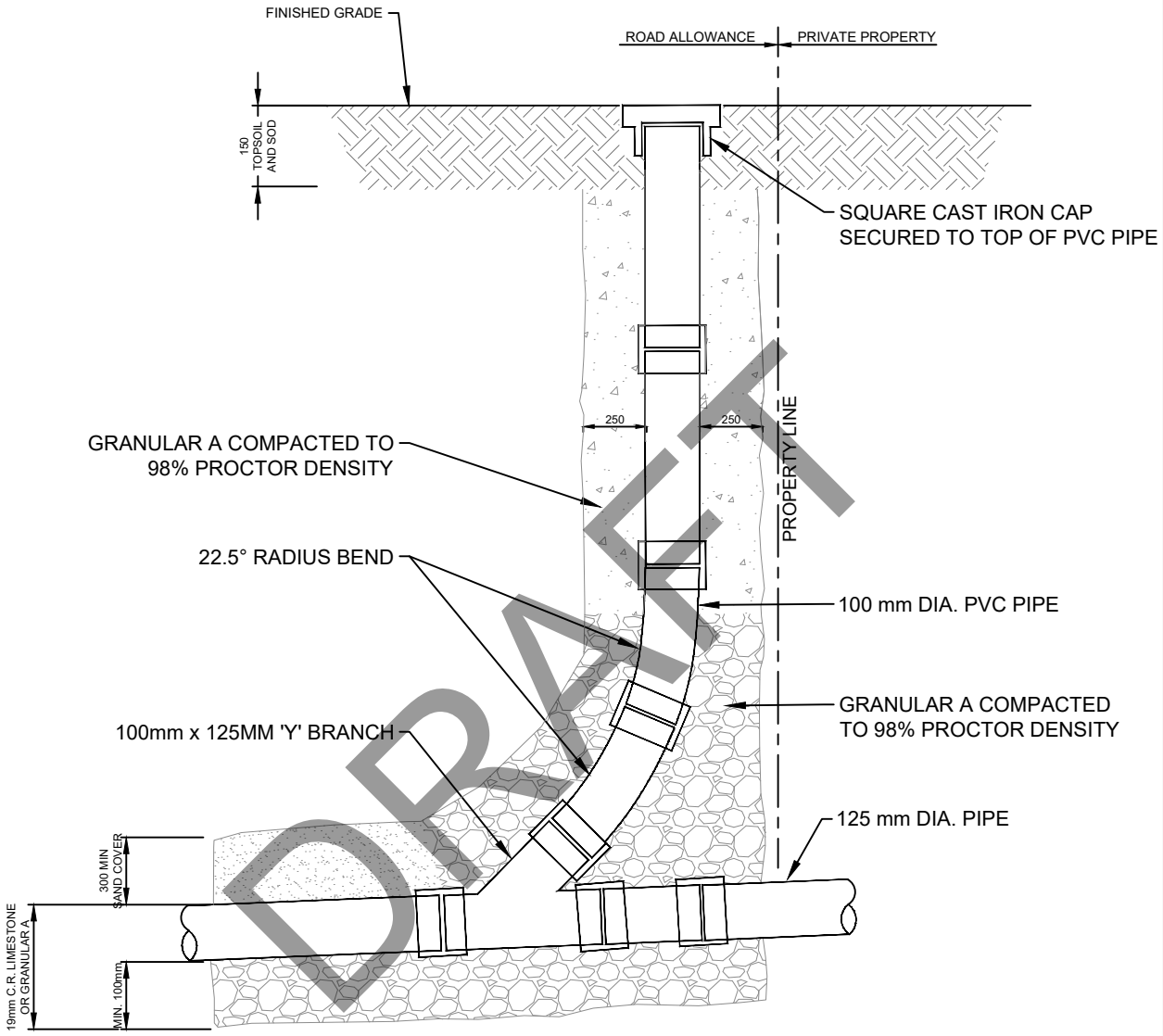
1. RISERS WITHOUT A SETTLEMENT CONTROL JOINT TO BE USED WHEN MAIN SEWER DEPTH IS GREATER THAN 3.5m UP TO AND INCLUDING 4.5m FROM CENTRELINE PAVEMENT ELEVATION TO OBVERT OF MAIN SEWER.
2. RISER CONNECTION TO BE USED WHEN WALLS OF EXCAVATION ARE 35° - 45° FROM VERTICAL.
3. PROVIDE WYE BRANCH FITTING AND CAP AT THE PROPERTY LINE IN ACCORDANCE WITH STANDARD DWG. KS-194. SURFACE CLEANOUTS IN ACCORDANCE WITH STANDARD DWG. KS-193 ARE TO BE PROVIDED WHERE DIRECTED BY THE TOWNSHIP.
4. ALL CUTTING AND MACHINING TO BE DONE BY CONTRACTOR.
5. 'KWICK' COUPLING OR APPROVED EQUAL SHALL BE USED WHEN CONNECTION IS MADE TO EXISTING LATERAL.
6. ALL DIMENSIONS IN MILLIMETERES EXCEPT WHERE NOTED.



NOTES:

1. RISERS WITH A SETTLEMENT CONTROL JOINT SHALL BE USED WHEN MAIN SEWER DEPTH IS GREATER THAN 4.5m UP TO AND INCLUDING 6.0m FROM CENTRELINE PAVEMENT ELEVATION TO OBVERT OF MAIN SEWER.
2. RISER CONNECTION TO BE USED WHEN WALLS OF EXCAVATION ARE 20° - 30° FROM VERTICAL.
3. PROVIDE WYE BRANCH FITTING AND CAP AT THE PROPERTY LINE IN ACCORDANCE WITH STANDARD DWG. KS-194. SURFACE CLEANOUTS IN ACCORDANCE WITH STANDARD DWG. KS-193 ARE TO BE PROVIDED WHERE DIRECTED BY THE TOWNSHIP.
4. ALL CUTTING AND MACHINING TO BE DONE BY CONTRACTOR.
5. APPROVED COUPLING SHALL BE USED WHEN CONNECTION IS MADE TO AN EXISTING LATERAL.
6. WHEN CONNECTING TO AN EXISTING SANITARY SEWER, CRUSHER RUN LIMESTONE IS TO EXTEND FROM SPRINGLINE OF THE SEWER TO TOP OF SWEEP BEND.
7. SEWERS GREATER THAN 6.0m DEEP REQUIRE CONNECTIONS TO BE PROVIDED TO A LOCAL SEWER CONSTRUCTED ABOVE A DEEPER COLLECTOR SEWER.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: JAN. 1990
	SANITARY SEWER RISER CONNECTIONS FOR RESIDENTIAL DEVELOPMENT	REVISION	DRAWING No.: KS-191
		DATE OF REVISION: JANUARY 2026	

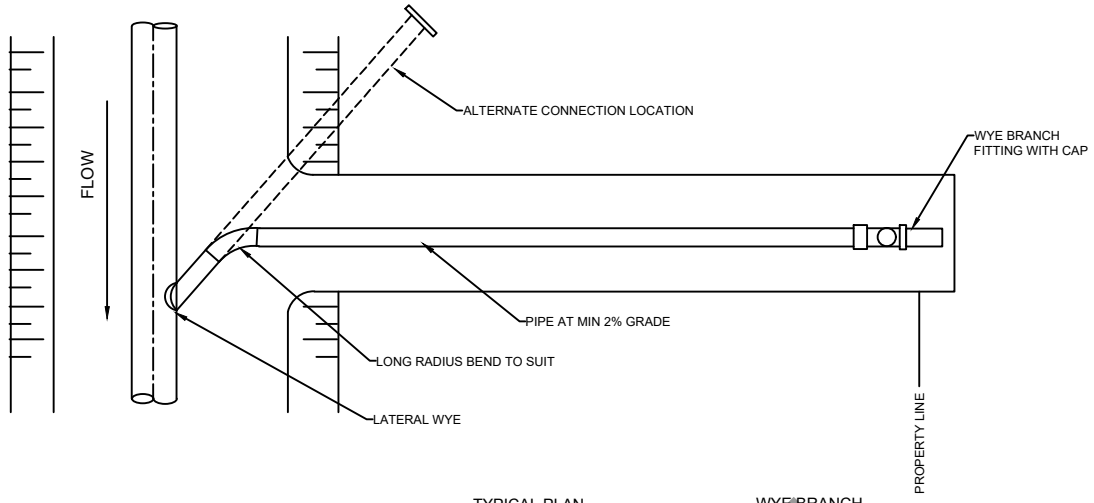


SURFACE CLEANOUT

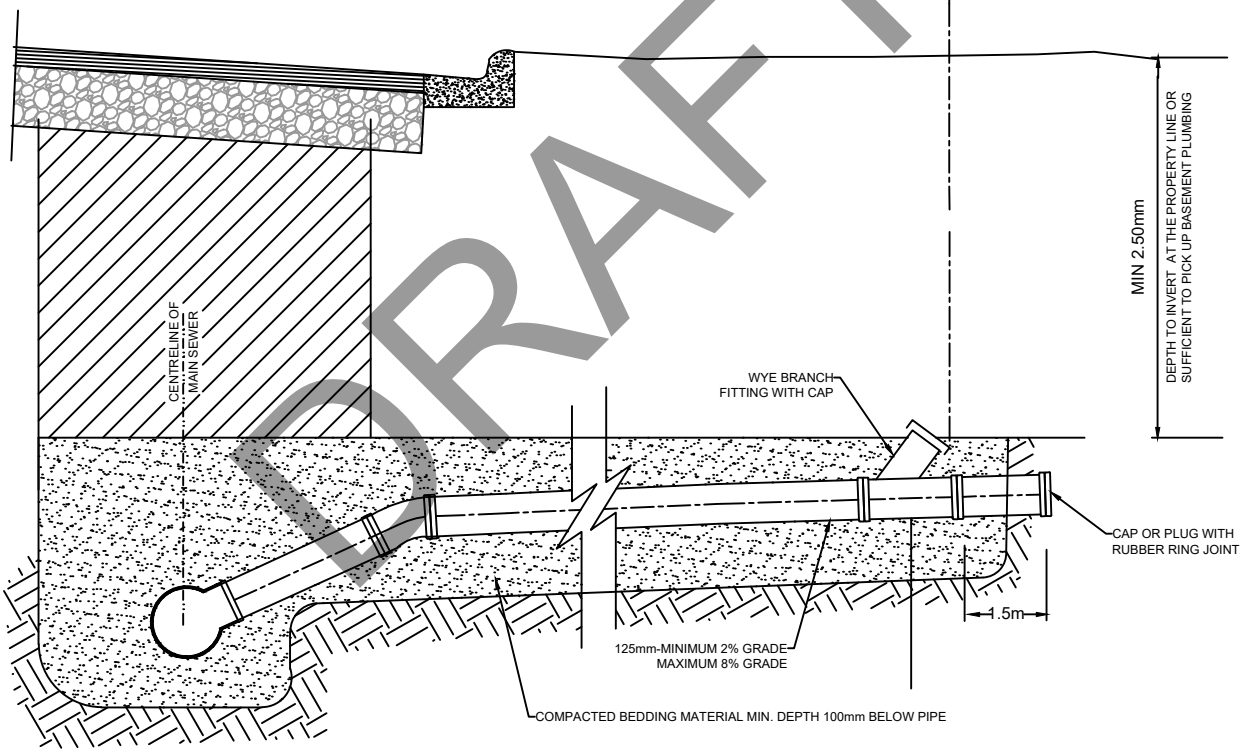
NOTES:

1. SURFACE CLEANOUT TO BE PROVIDED WHERE DIRECTED BY THE TOWNSHIP.
2. FITTINGS ARE TO BE PVC SDR 26
3. SURFACE CLEANOUTS SHALL NOT BE LOCATED IN DRIVEWAYS

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE JAN. 1990
	SANITARY SEWER SURFACE CLEANOUT	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-193



TYPICAL PLAN

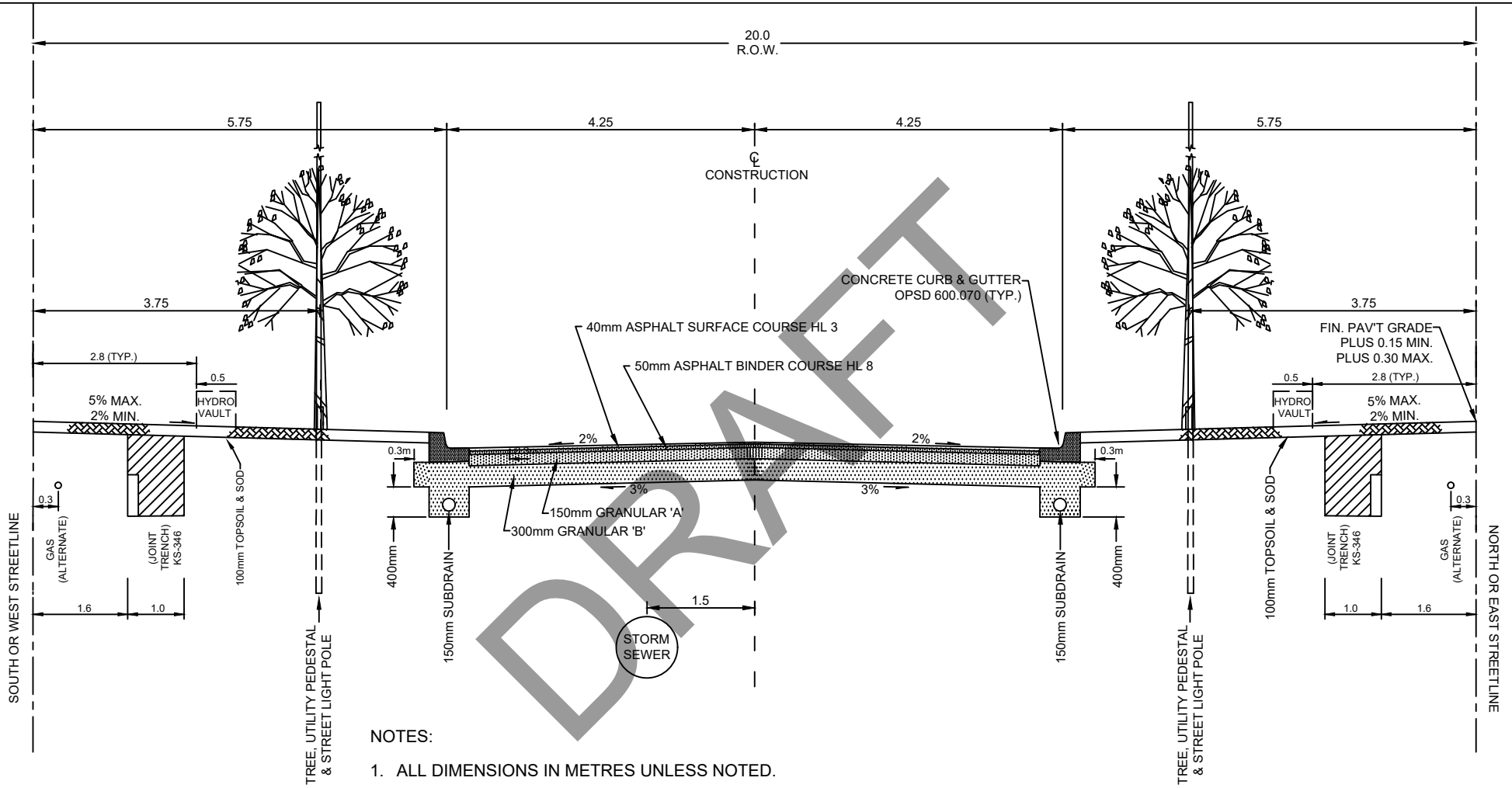


ELEVATION

NOTES:

1. RISER CONNECTIONS TO THE SEWER MAIN ARE TO BE USED ONLY WHERE SERVICE IS GREATER THAN 2M ABOVE WYE INVERT OR WHERE APPROVED
2. MINIMUM SERVICE CONNECTION TO BE 125mm IN DIAMETER.
3. SURFACE CLEANOUTS IN ACCORDANCE WITH STANDARD DWG. KS-193 ARE TO BE PROVIDED WHERE DIRECTED BY THE TOWNSHIP.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: JAN. 1990
	SANITARY SEWER CONNECTIONS FOR RESIDENTIAL DEVELOPMENT	REVISION	DRAWING No.: KS-194
		DATE OF REVISION: JANUARY 2026	



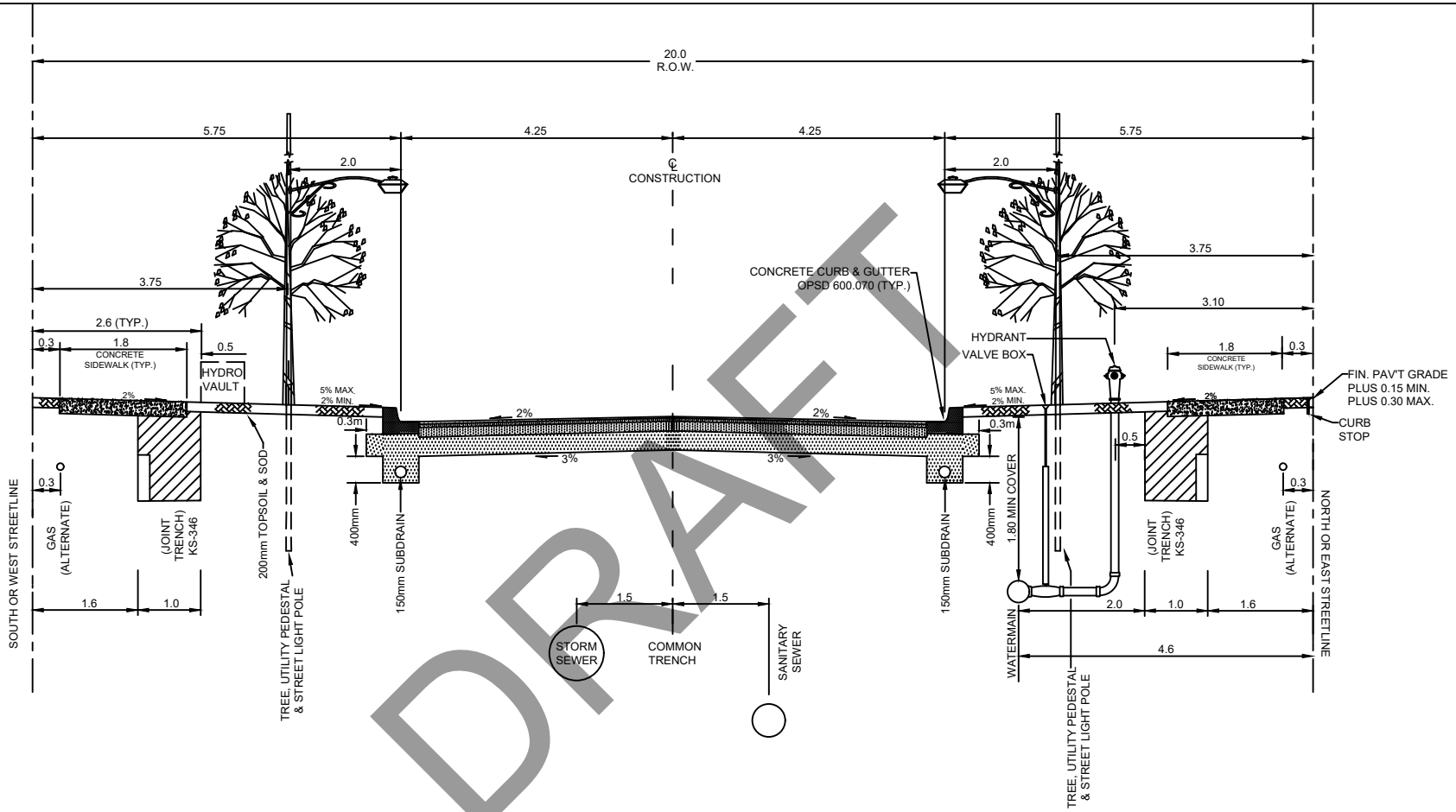
NOTES:

1. ALL DIMENSIONS IN METRES UNLESS NOTED.
2. ALL GRANULAR MATERIALS TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY.
3. ALL ASPHALT AND GRANULAR DEPTHS SPECIFIED ARE MINIMUM DEPTHS AND ARE SUBJECT TO INCREASE BASED ON SOIL CONDITIONS.
4. BELL, HYDRO, COAXIAL, AND GASMAIN TO BE LOCATED IN COMMON TRENCH. (SEE KS-346)

TOWNSHIP OF KING

20.0m ESTATE RESIDENTIAL ROADWAY
8.5m PAVEMENT WIDTH

APPROVED	DATE OF ISSUE: FEB. 1980
REVISION	DRAWING No.: KS-202
DATE OF REVISION: JANUARY 2026	



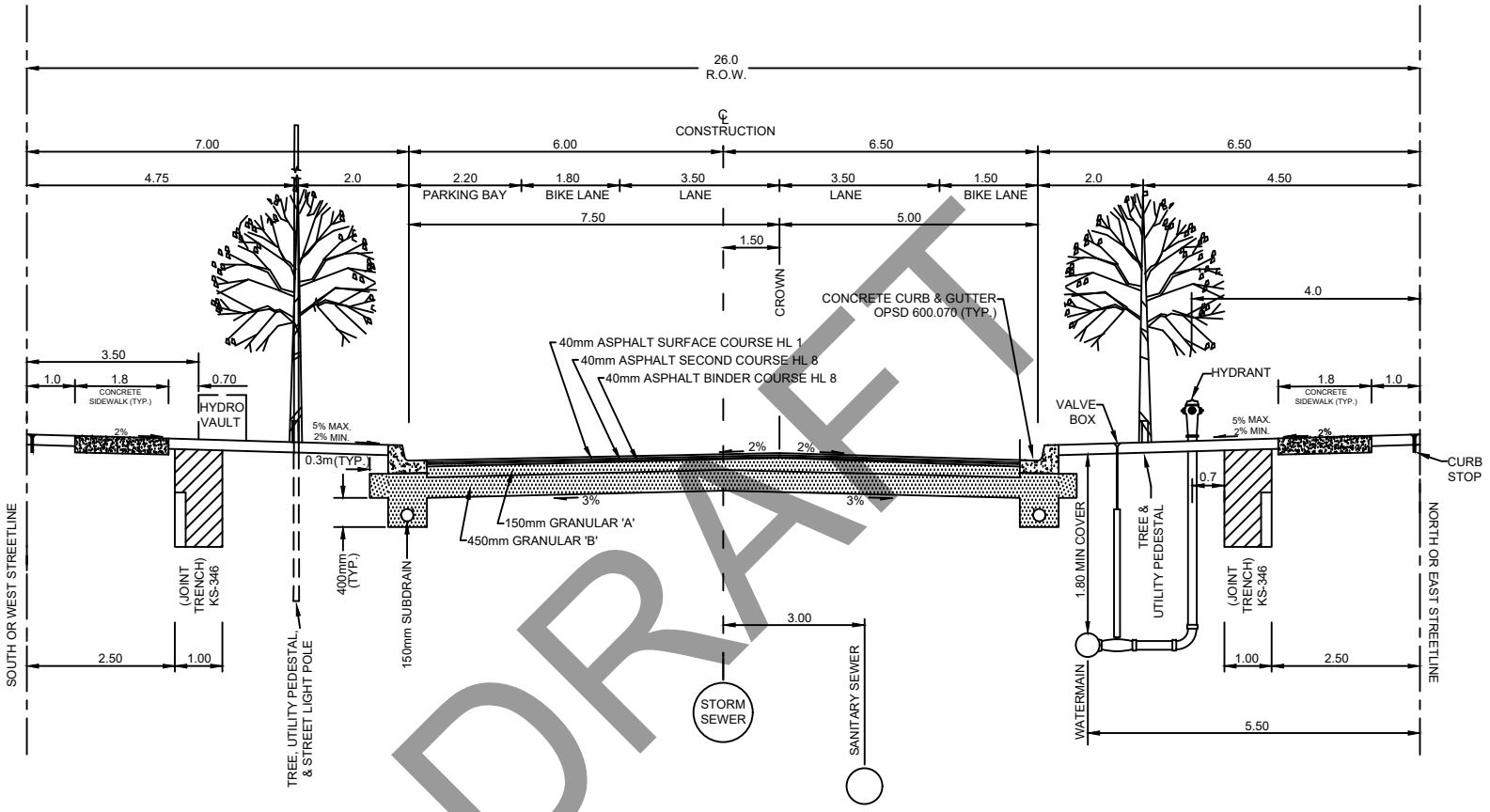
NOTES:

1. ALL DIMENSIONS IN METRES UNLESS NOTED.
2. SEE SECTION B OF DESIGN CRITERIA FOR MINIMUM PAVEMENT REQUIREMENTS.
3. ALL ASPHALT AND GRANULAR DEPTHS SPECIFIED ARE MINIMUM DEPTHS AND ARE SUBJECT TO INCREASE BASED ON SOIL CONDITIONS.
4. ALL GRANULAR MATERIALS TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY.
5. BELL, HYDRO, COAXIAL, AND GASMAIN TO BE LOCATED IN COMMON TRENCH. (SEE KS-346)

TOWNSHIP OF KING

20.0m LOCAL R.O.W.
8.5m PAVEMENT, SIDEWALK ONE SIDE

APPROVED	DATE OF ISSUE
	FEB. 1980
REVISION	DRAWING No.
	KS-205
DATE OF REVISION	
JANUARY 2026	



NOTES:

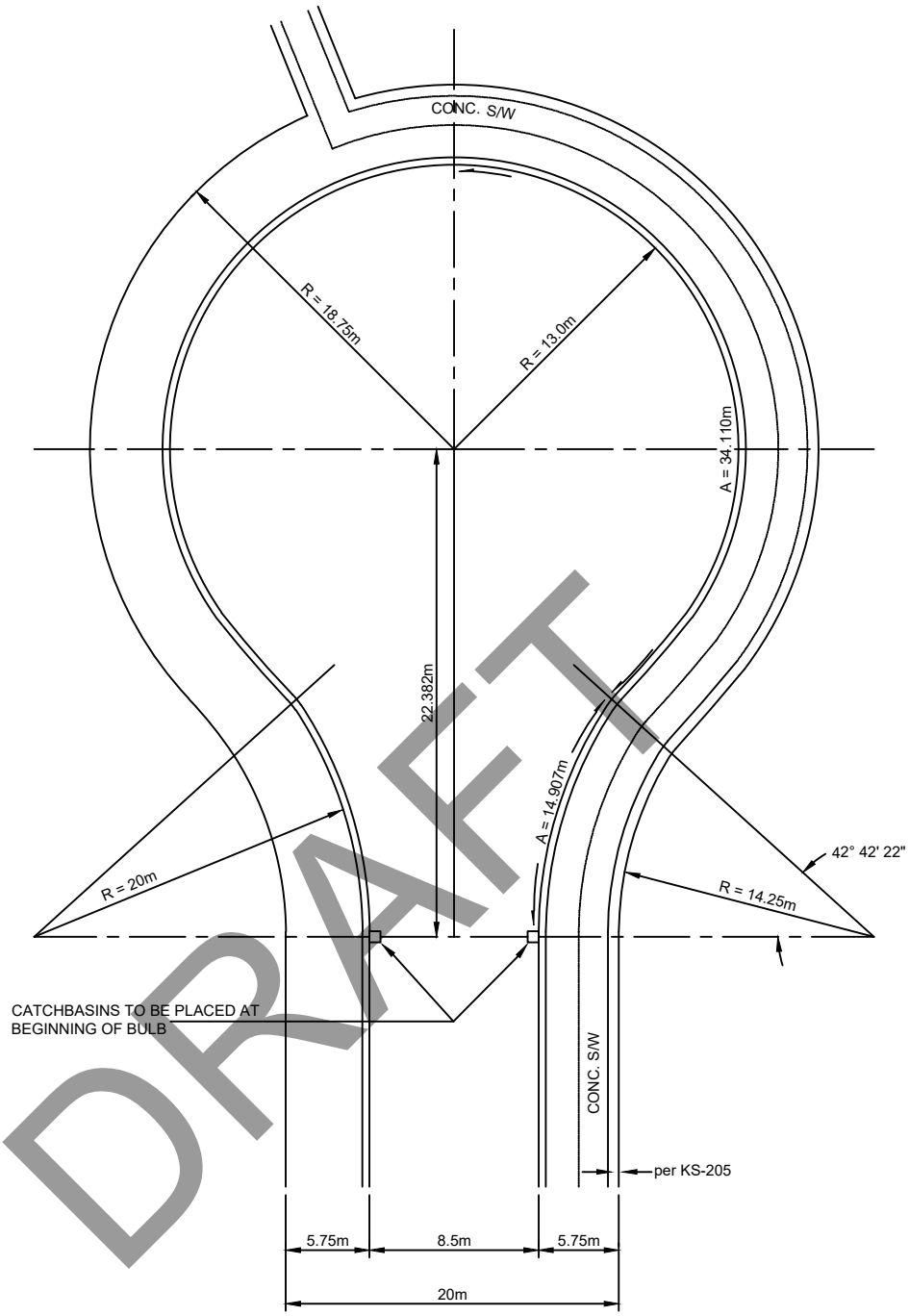
1. ALL DIMENSIONS IN METRES UNLESS NOTED.
2. ALL GRANULAR MATERIALS TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY.
3. ALL ASPHALT AND GRANULAR DEPTHS SPECIFIED ARE MINIMUM DEPTHS AND ARE SUBJECT TO INCREASE BASED ON SOIL CONDITIONS.
4. BELL, HYDRO, COAXIAL, AND GASMAIN TO BE LOCATED IN COMMON TRENCH. (SEE KS-346)

KING

TOWNSHIP OF KING

26.0m COLLECTOR ROADWAY
12.5m PAVEMENT WIDTH (BIKE LANES)

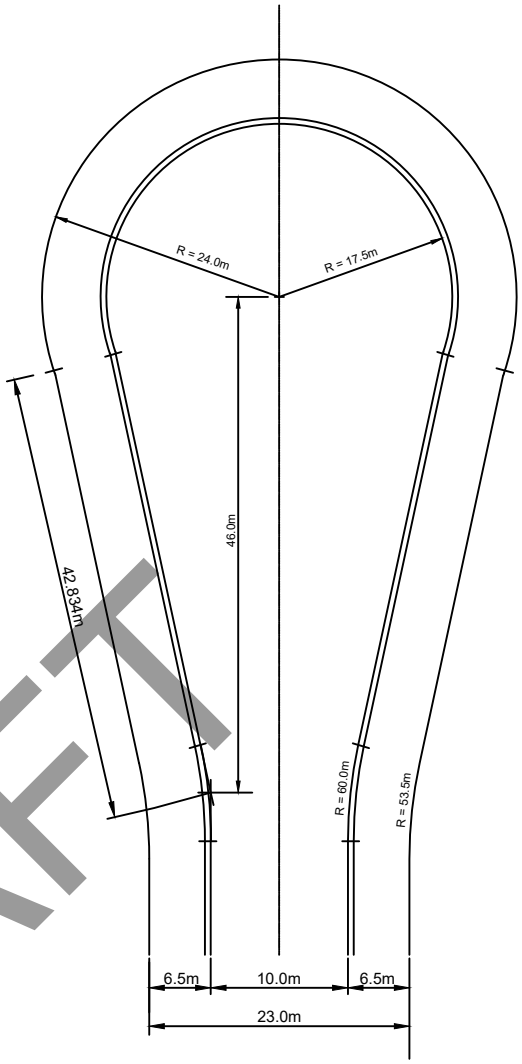
APPROVED	DATE OF ISSUE: FEB. 2017
REVISION	DRAWING No.: KS-210
DATE OF REVISION: JANUARY 2026	



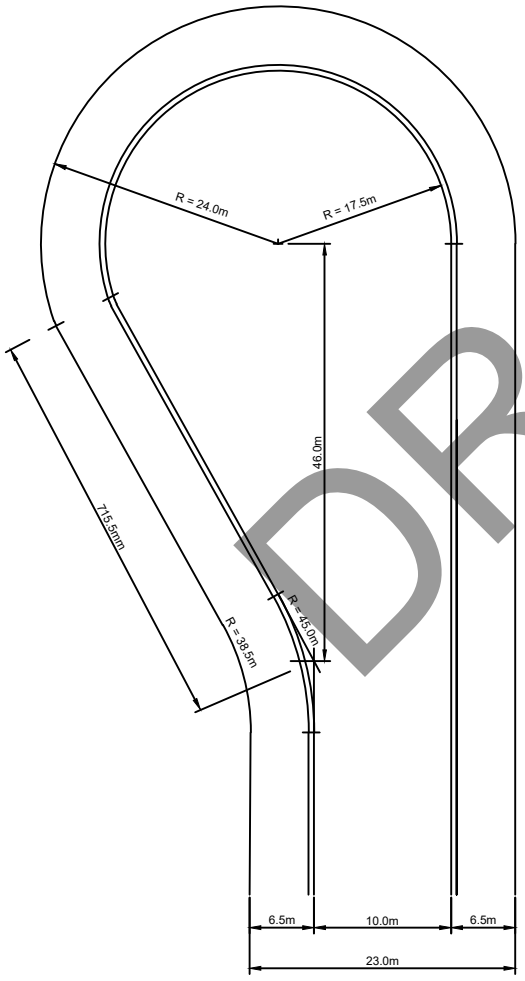
NOTES:

1. MINIMUM GUTTER SLOPE TO BE 1.00%
2. DETAIL OF GRADING OF BULB AREAS OF CUL-DE-SACS TO BE SHOWN ON PROFILE DRAWINGS.
3. CUL-DE-SAC DRAINAGE TO BE DIRECTED TOWARDS THE BEGINNING OF THE BULB.
4. SIDEWALKS PROVIDED FOR WALKWAY CONNECTIONS AND/OR WHERE 25 UNITS OR MORE.
5. ALL DIMENSIONS ARE IN METRES.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE FEB. 1980
	TYPICAL CUL-DE-SAC FOR RESIDENTIAL STREETS	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-218



SYMMETRICAL



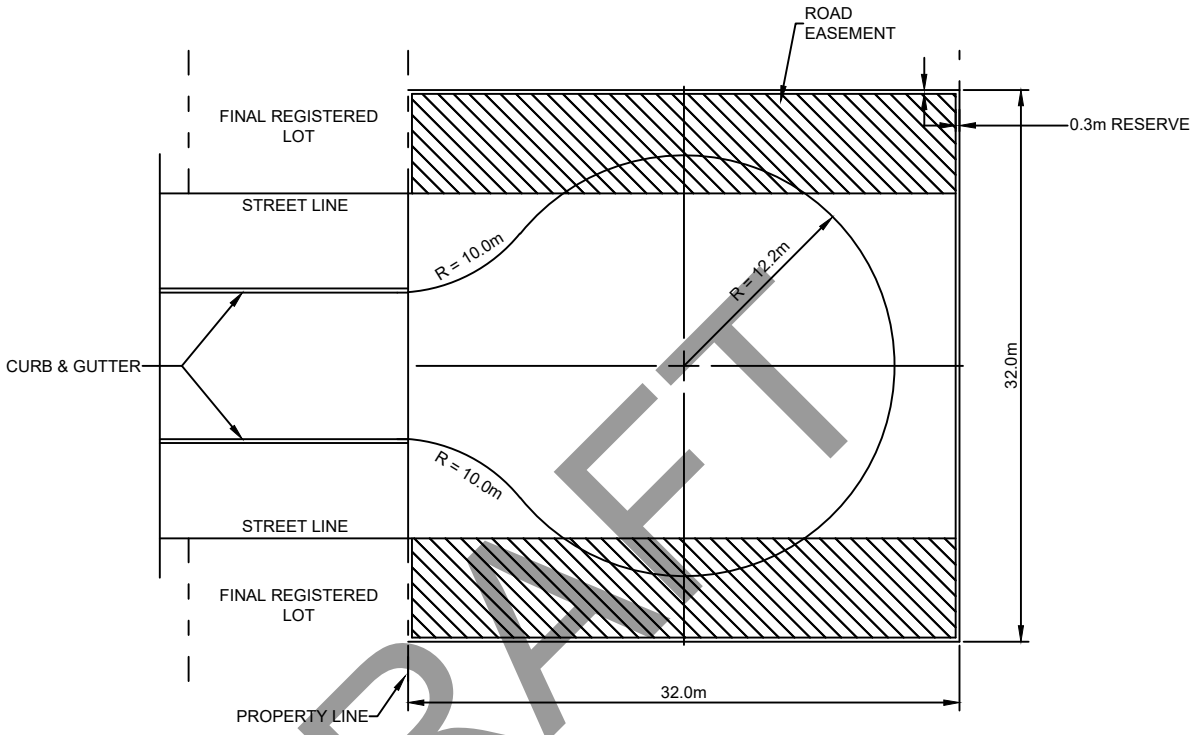
OFFSET

NOTES:

1. MINIMUM GUTTER SLOPE TO BE 1.00%
2. DETAIL OF GRADING OF BULB AREAS OF CUL-DE-SACS TO BE SHOWN ON PROFILE DRAWINGS.
3. CUL-DE-SAC DRAINAGE TO BE DIRECTED TOWARDS THE BEGINNING OF THE BULB.
4. ALL DIMENSIONS ARE IN METRES.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE FEB. 1980
	TYPICAL CUL-DE-SAC FOR INDUSTRIAL STREETS	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-219

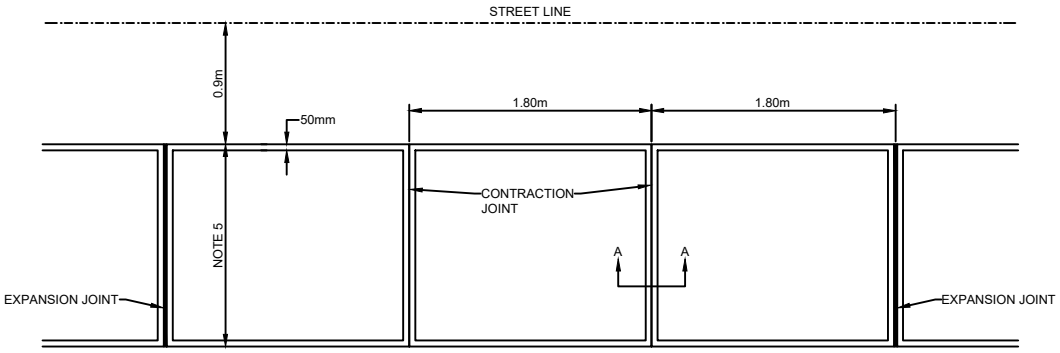
TURNING CIRCLE PAVEMENT DESIGN: 32mm HL3 ASPHALT SURFACE COURSE
50mm HL8 ASPHALT BINDER COURSE
150mm GRANULAR 'A'
300mm GRANULAR 'B'



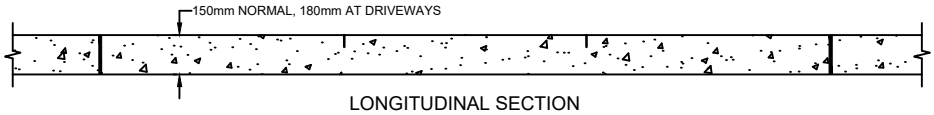
NOTES:

1. TEMPORARY TURNING CIRCLES SHALL BE USED ONLY FOR PHASING OF RESIDENTIAL SUBDIVISIONS, SUBJECT TO THE TOWNSHIP ENGINEER'S APPROVAL.
2. ALL DIMENSIONS ARE IN MILLIMETRES OR METRES.
3. THE SUBDIVIDER WILL DEPOSIT WITH THE TOWNSHIP AN AMOUNT WHICH THE TOWNSHIP ENGINEER CALCULATES TO BE THE COST OF REMOVING THE TURNING CIRCLE AND CONSTRUCTING THE STANDARD ROAD FROM THE START OF THE TURNING CIRCLE TO THE LIMIT OF THE SUBDIVISION.

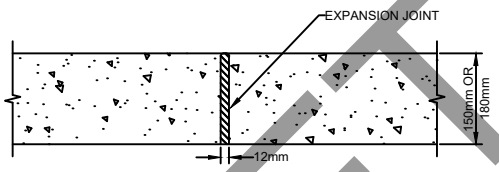
KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE FEB. 1980
	TEMPORARY TURNING CIRCLE FOR RESIDENTIAL STREETS	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-220



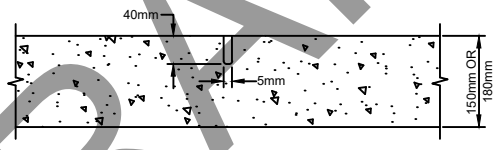
PLAN VIEW



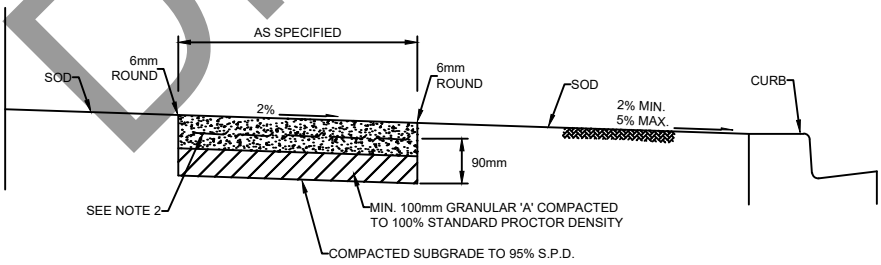
LONGITUDINAL SECTION



SECTION B-B
EXPANSION JOINT DETAIL



SECTION A-A
CONTRACTION JOINT DETAIL

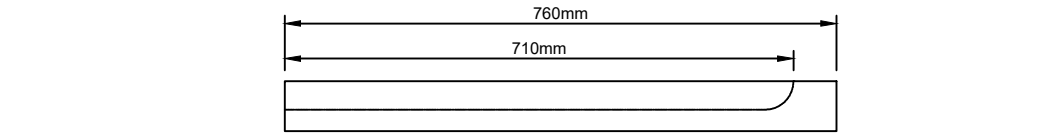


BOULEVARD SECTION

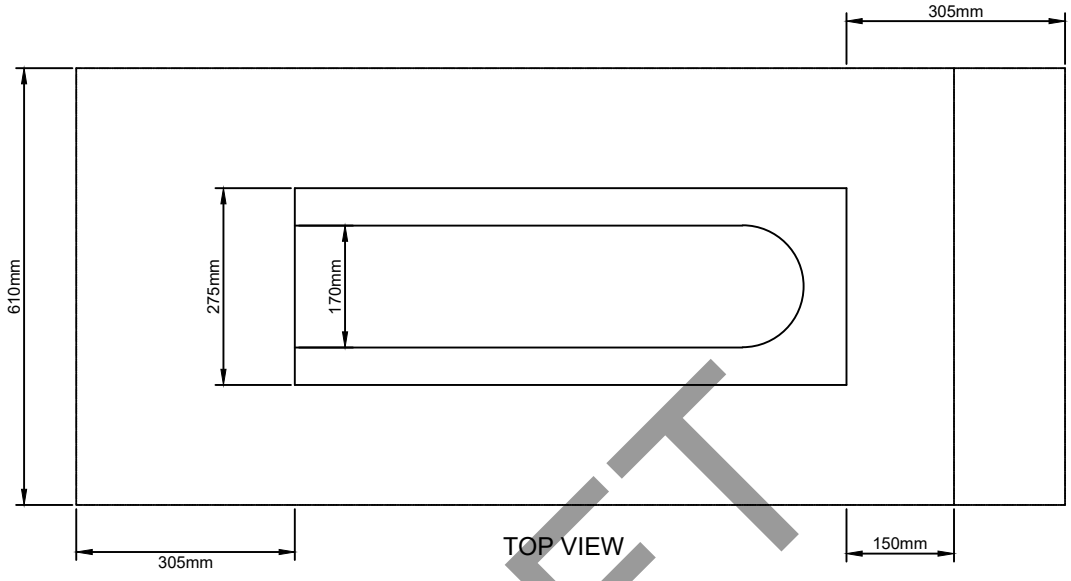
NOTES:

1. CONCRETE TO BE 32 MPa; 7% AIR ENTRAINED WITH A 20mm MAX. AGGREGATE SIZE.
2. FOR COMMERCIAL, INDUSTRIAL, AND APARTMENT DRIVEWAYS, SIDEWALK TO BE REINFORCED WITH 152 x 152 MW 18.7/18.7 METRIC WELDED WIRE.
3. EXPANSION JOINTS ARE ALSO REQUIRED WHERE THE SIDEWALK ABUTS OTHER CONCRETE STRUCTURE, WALKS, CURBS, UTILITY POLES, HYDRANTS, MANHOLES, AND AT CERTAIN LOCATIONS AT DISCRETION OF THE ENGINEER.
4. CONTRACTION JOINTS TO BE SAW CUT AFTER CONCRETE HAS SET.
5. SIDEWALKS 1.8m WIDE ON ALL ROADS.
6. ALL DIMENSIONS ARE IN MILLIMETRES OR METRES

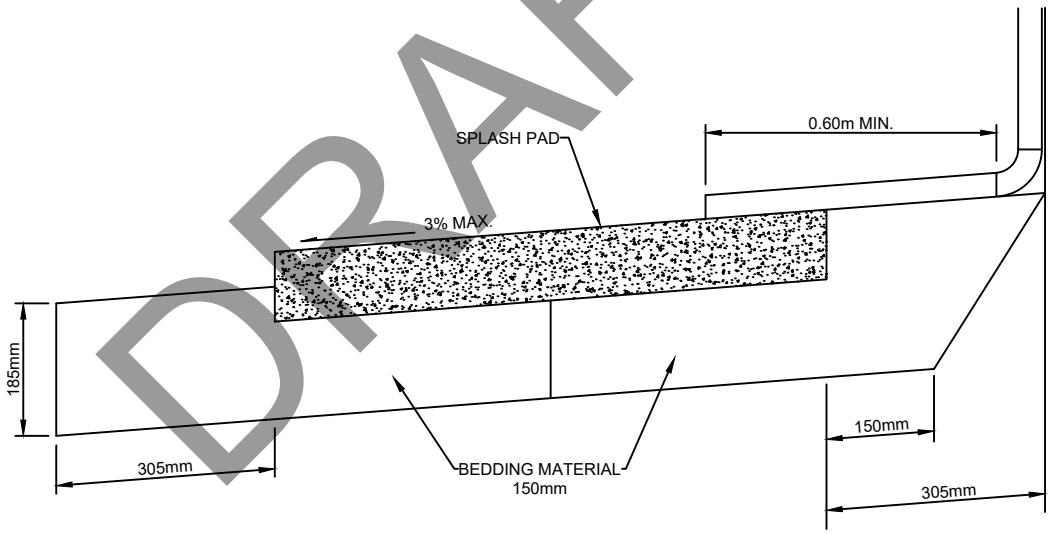
KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE FEB. 1980
	CONCRETE SIDEWALK	REVISION	DRAWING No. KS-231
		DATE OF REVISION JANUARY 2026	



SIDE VIEW



TOP VIEW

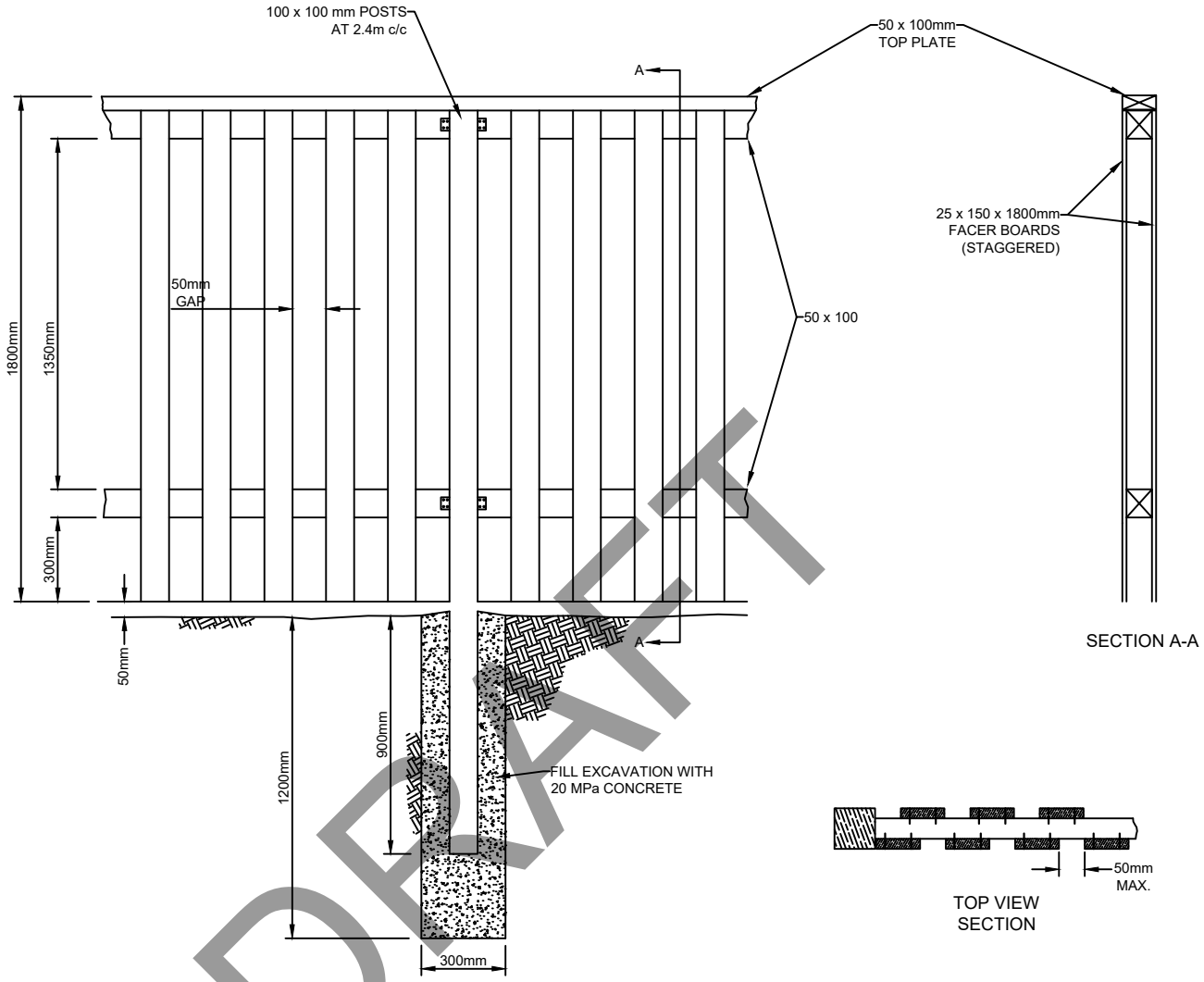


TOP VIEW

NOTES:

1. MINIMUM CONCRETE STRENGTH SHALL BE 20 MPa.
2. BEDDING MATERIAL SHALL BE 19mm CLEAR STONE OR EQUIVALENT.
3. SPLASH PADS TO BE USED TO DIRECT DRAINAGE FROM ALL RAINWATER DOWNSPOUTS.
4. ALL DIMENSIONS ARE IN MILLIMETRES OR METRES UNLESS OTHERWISE SPECIFIED.

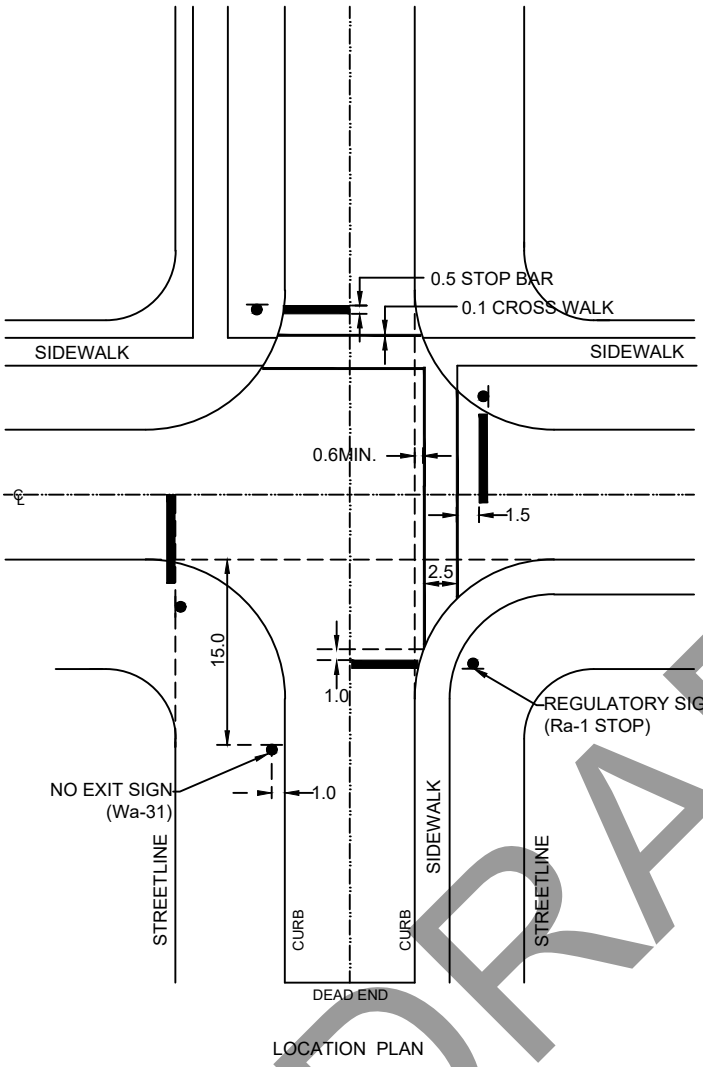
KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE FEB. 1980
	PRECAST CONCRETE SPLASH PAD DETAIL	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-302



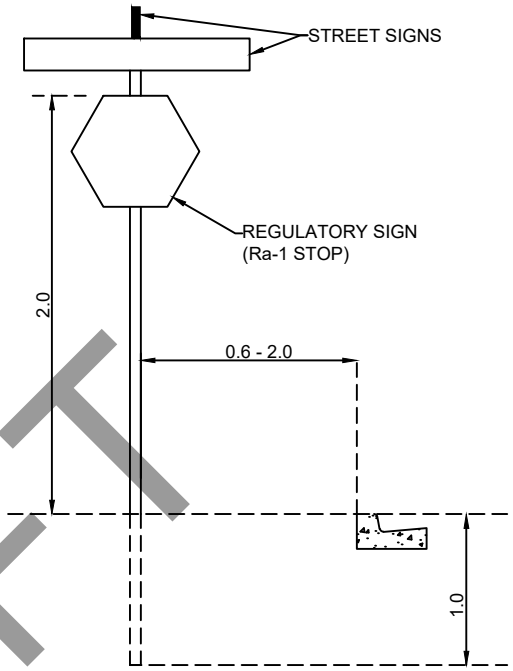
NOTES:

1. USE CONSTRUCTION GRADE CEDAR, CALIFORNIA RED WOOD OR PRESSURE TREATED LUMBER ONLY. DO NOT USE SPRUCE OR HEMLOCK.
2. ALL FASTENERS AND HANGERS TO BE GALVANIZED.
3. ALL DIMENSIONS ARE IN MILLIMETRES OR METRES.

XING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE JUNE. 1993
	WOOD PRIVACY FENCE	REVISION	DRAWING No. KS-313
		DATE OF REVISION JANUARY 2026	



LOCATION PLAN



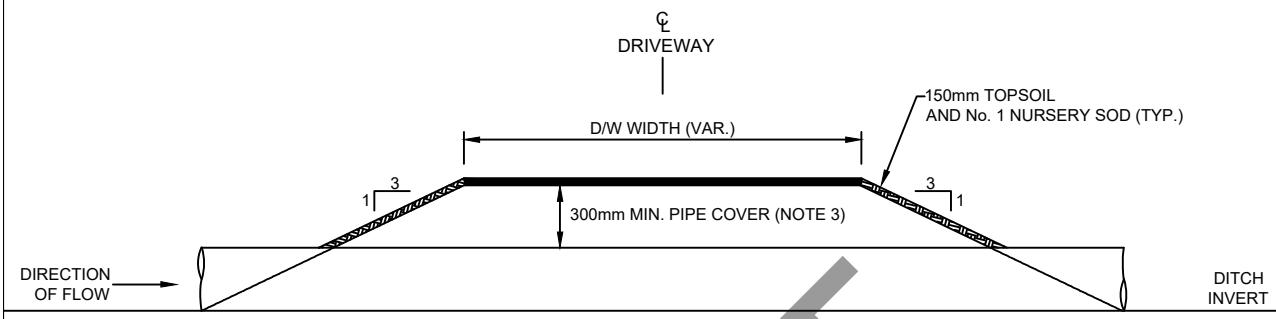
INSTALLATION DETAIL

NOTES:

1. REGULATORY/WARNING SIGNS AS PER OHTA REG. 615/616 OR AMENDMENTS THEREOF.
2. STOP SIGNS (Ra-1) POSTS SHALL BE 75mm x 3.66m ALUMINUM COMPLETE WITH TOP CAP.
3. STOP SIGNS SHALL BE BANDED TO THE POST WITH MINIMUM 12.7mm x .76mm STAINLESS STEEL BANDING AND FLARED LEG STAINLESS STEEL BRACKETS (BANDRIT BRACKETS OR EQUIVALENT).
4. ALL OTHER REGULATORY/WARNING SIGNS SHALL BE MOUNTED ON 3.66M 80,000psi U-FLANGE POSTS WHICH HAVE THE TOP 1200mm PUNCHED ON 50mm CENTRES WITH 11mm HOLES.
5. ALL REGULATORY SIGNS SHALL CONFORM WITH THE CURRENT VERSION OF THE ONTARIO TRAFFIC MANUAL (O.T.M).
6. ALL WARNING SIGNS AND INSTALLATIONS SHALL CONFORM WITH THE CURRENT VERSION OF THE O.T.M
7. ALL WARNING AND REGULATORY SIGNS SHALL BE MOUNTED A MINIMUM OF 2.0M ABOVE FINISHED GROUND ELEVATION.
8. ALL REGULATORY AND WARNING SIGN BLANKS SHALL BE ALUMINUM AND BE HIGH DENSITY REFLECTORIZED SURFACES.

ALL DIMENSIONS ARE EXPRESSED IN METRES (m) UNLESS OTHERWISE NOTES.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE FEB. 1980
	TRAFFIC SIGN DETAILS & PAVEMENT MARKINGS	REVISION	DRAWING No. KS-331
		DATE OF REVISION JANUARY 2026	

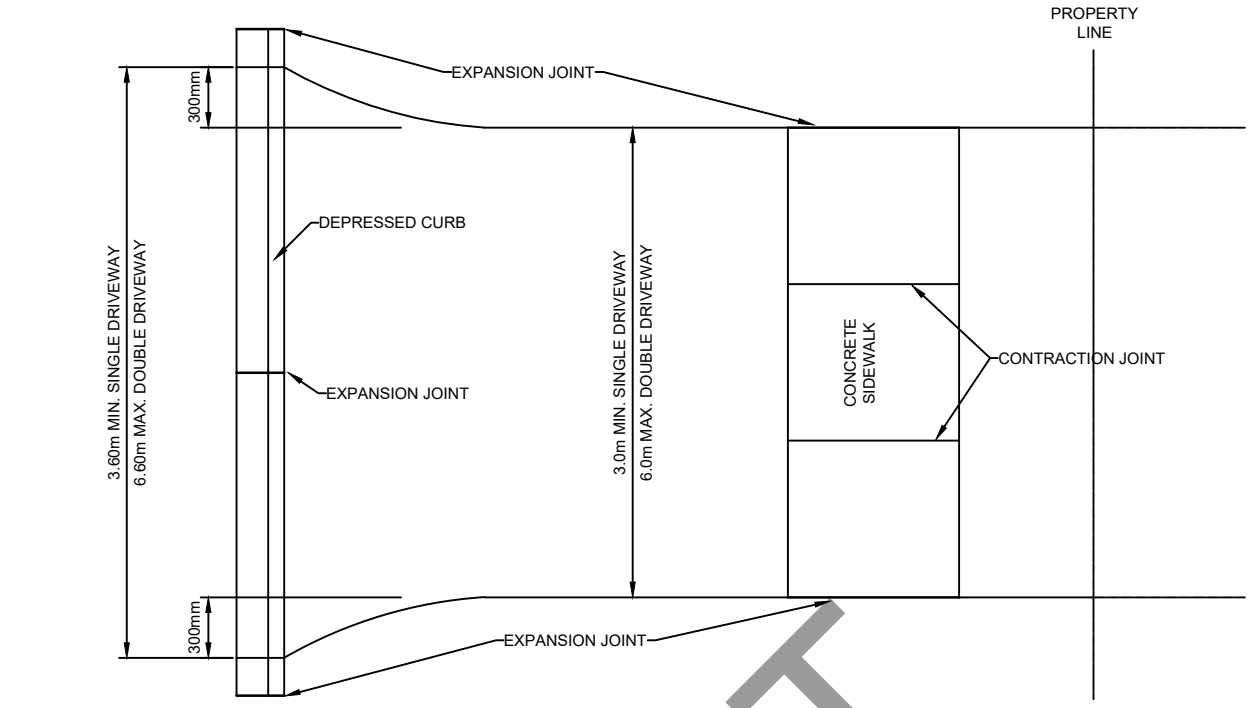


CORRUGATED STEEL RIVETED PIPE AT MINIMUM 1.0% GRADE

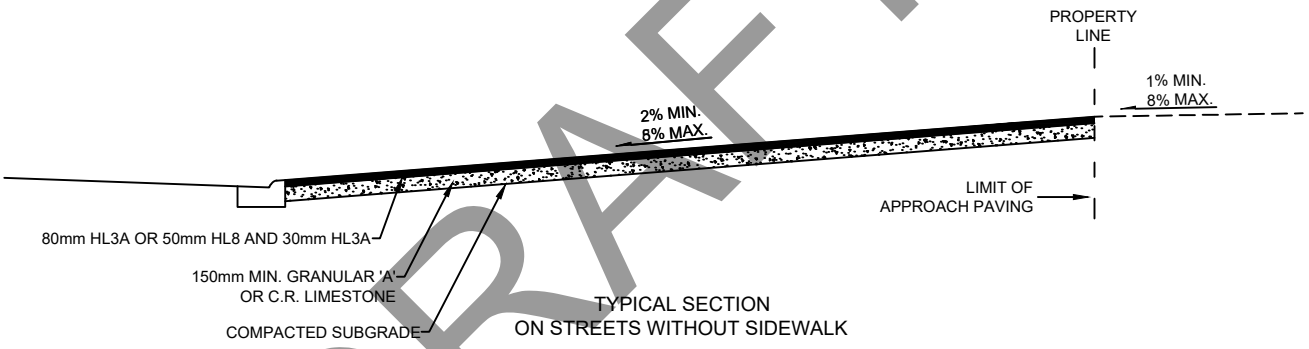
NOTES:

1. BARREL LENGTH TO BE D/W WITH PLUS 5.0m. MINIMUM LENGTH SHALL BE 8.5m.
2. MINIMUM DIAMETER SHALL BE 400mm AND THE MINIMUM METAL THICKNESS SHALL BE 1.6mm.
3. THE MINIMUM DEPTH OF COVER SHALL BE 300mm OR DIAMETER OF C.S.P. CULVERT DIVIDED BY 6.0, WHICHEVER IS GREATER.
4. BEDDING FOR C.S.P. CULVERTS SHALL BE CONSTRUCTED IN ACCORDANCE WITH O.P.S.D. 802.04. GRANULAR 'A' BACKFILL SHALL BE PLACED AND COMPACTED TO 100% STANDARD PROCTOR DENSITY.
5. CORRUGATED STEEL PRODUCTS SHALL CONFORM WITH OPSS.MUNI 1801 AND THE REQUIREMENTS OF CSA 3-G401.
6. HELICAL C.S.P. CULVERTS ARE NOT APPROVED FOR USE IN THE TOWNSHIP OF KING.
7. ALL NEW DRIVEWAYS ARE TO BE STAKED AS TO THEIR PROPOSED LOCATION AND APPORVED BY THE TOWNSHIP.
8. HOMEOWNERS ARE RESPONSIBLE TO LOCATE ALL UNDERGROUND SERVICE AND UTILITY PLANTS IN THE AREA OF THE DRIVEWAY ENTRANCES, PRIOR TO INSTALLATION.

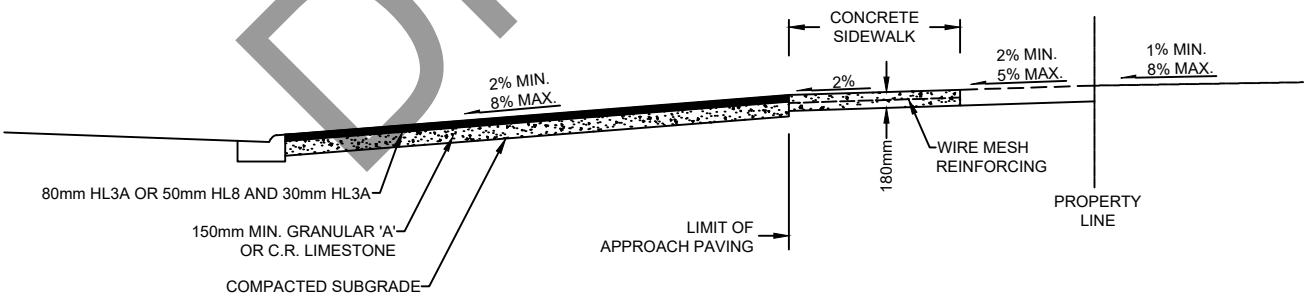
KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE JAN. 1990
	STANDARD DRIVEWAY CULVERT	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-340



PLAN VIEW



TYPICAL SECTION
ON STREETS WITHOUT SIDEWALK

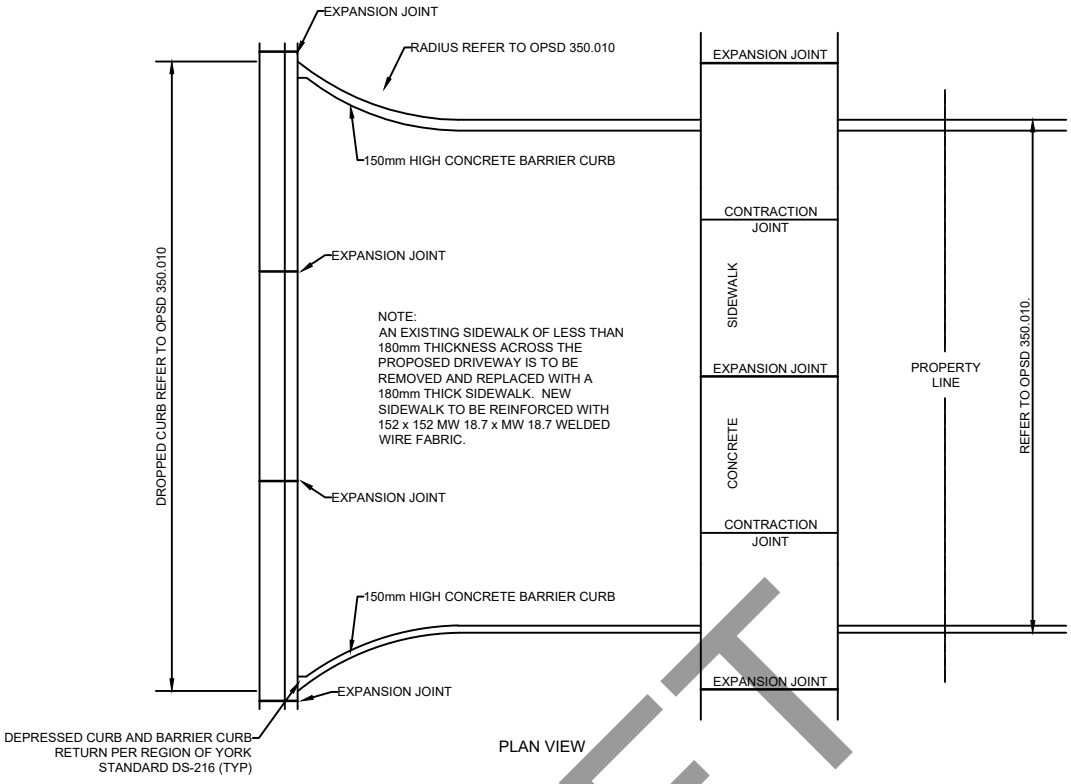


TYPICAL SECTION
ON STREETS WITH SIDEWALK

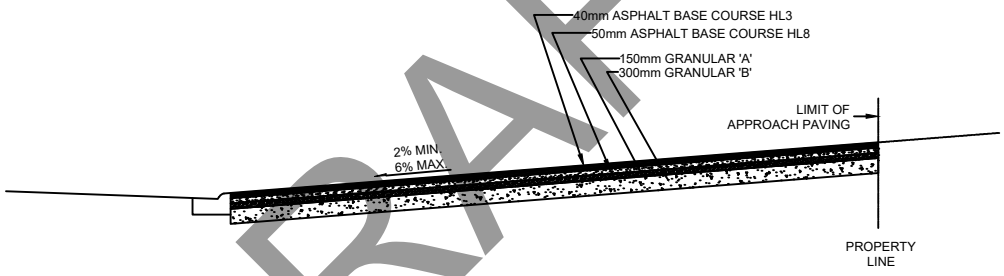
NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES OR METRES.
2. THE OUTSIDE EDGE OF ALL DRIVEWAYS ARE TO BE LOCATED A MIN. 1.0m FROM STREET LIGHT AND UTILITY POLES, CATCHBASINS, WATERMAIN VALVES, WATER SERVICE BOXES, SIDE LOT LINES AND OTHER DRIVEWAYS AND A MIN. 1.5m FROM TREES AND HYDRO TRANSFORMERS AND A MIN. 3.0m FROM HYDRANTS AND COMMUNITY MAIL BOXES.
3. THE NUMBER OF DRIVEWAY LANES SHALL NOT EXCEED THE NUMBER OF GARAGE LANES (i.e. SINGLE CAR GARAGE/SINGLE DRIVEWAY: DOUBLE CAR GARAGE/DOUBLE DRIVEWAY) TO THE MAXIMUM WIDTH NOTED ON THE ABOVE PLAN VIEW.

XING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: FEB. 1980
	DRIVEWAY APPROACH PAVING FOR RESIDENTIAL DRIVEWAYS	REVISION	DRAWING No.: KS-341
		DATE OF REVISION: JANUARY 2026	

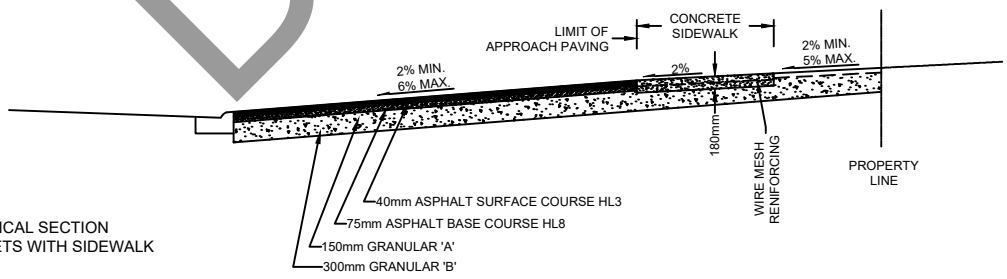


PLAN VIEW



TYPICAL SECTION
ON STREETS WITHOUT SIDEWALK

COMMERCIAL, LIGHT INDUSTRIAL, APARTMENTS



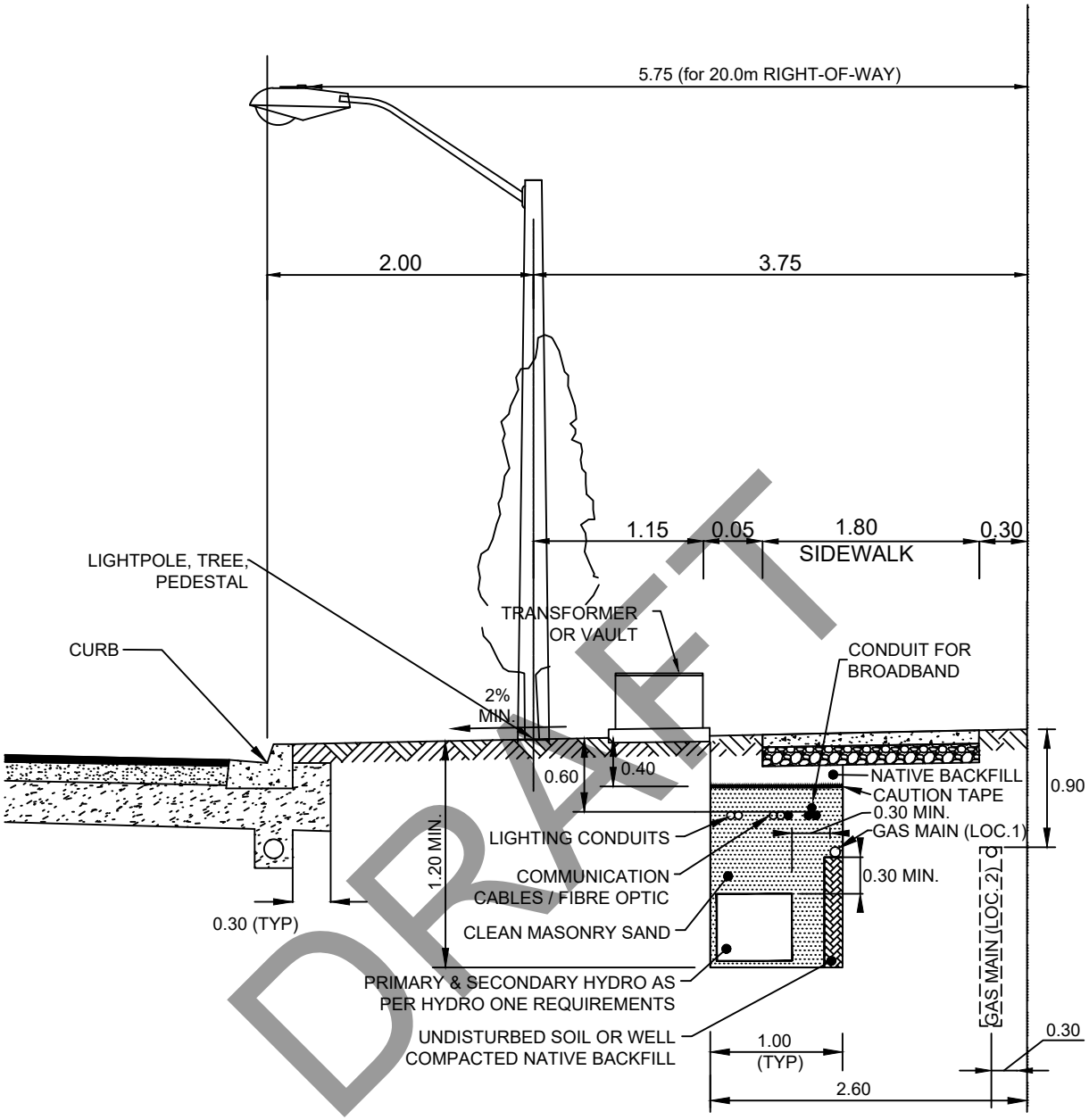
TYPICAL SECTION
ON STREETS WITH SIDEWALK

HEAVY INDUSTRIAL

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES OR METRES.
2. IN ADDITION TO THE REQUIREMNTS OF THIS STANDARD DRAWING, DRIVEWAYS IDENTIFIED AS A FIRE ACCESS ROUTE SHALL MEET ALL ONTARIO BUILDING CODE REQUIREMENTS.
3. DRIVEWAY PAVEMENT REQUIREMENTS ARE TO BE AS NOTED OR TO THE RECOMMENDATIONS OF A GEOTECHNICAL ENGINEER WHICHEVER ARE MORE STRINGENT.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE FEB. 1980
	DRIVEWAY APPROACH PAVING FOR COMMERCIAL, INDUSTRIAL, & APARTMENTS	REVISION	DRAWING No. KS-342
		DATE OF REVISION JANUARY 2026	

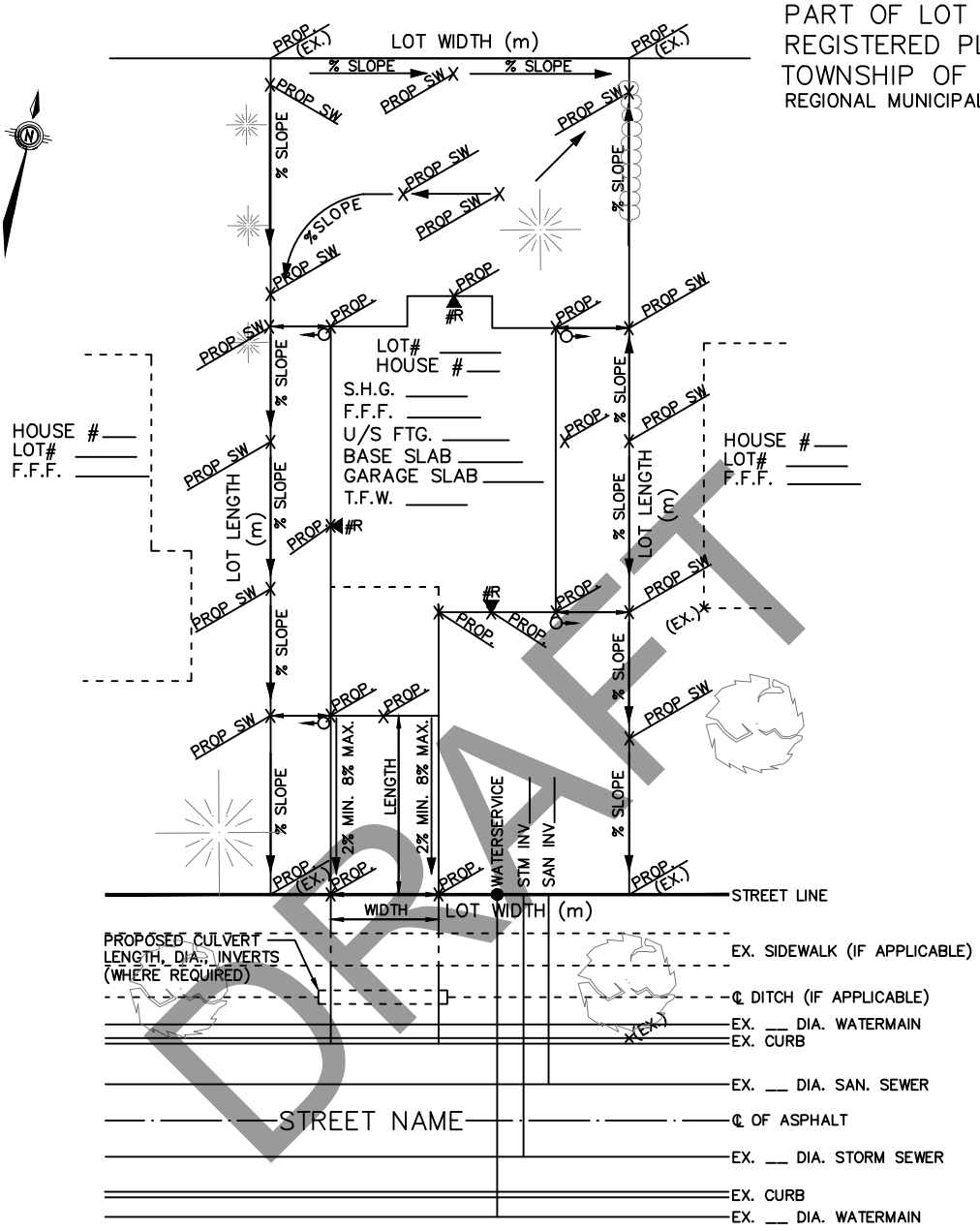


NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ALL SEPARATIONS TO BE AS PER OPSD 2101.01.
3. STREETLIGHT WIRE DUCT MAY BE INSTALLED AT A REDUCED DEPTH UP TO A MINIMUM DEPTH OF 600mm.
4. GAS MAIN TO BE INSTALLED IN LOC. 1 SUBJECT TO AGREEMENT AND APPROVAL BY THE TOWNSHIP AND GAS UTILITY.
5. CONDUIT FOR FUTURE BROADBAND SHALL BE 75mm DIA. RIGID PVC WITH A WALL THICKNESS OF 5.5mm.
6. FOR ROAD ALLOWANCE WIDTH THAT ARE NOT 20.0m, DESIGNER IS TO PREPARE A DETAIL BASED ON SIMILAR CONFIGURATION FROM THIS DRAWING.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: DEC 2015
	JOINT USE UTILITY TRENCH Including conduit for broadband fibre	REVISION	DRAWING No.: KS-346
		DATE OF REVISION: JANUARY 2026	

PLAN OF
PART OF LOT _____
REGISTERED PLAN _____
TOWNSHIP OF KING
REGIONAL MUNICIPALITY OF YORK



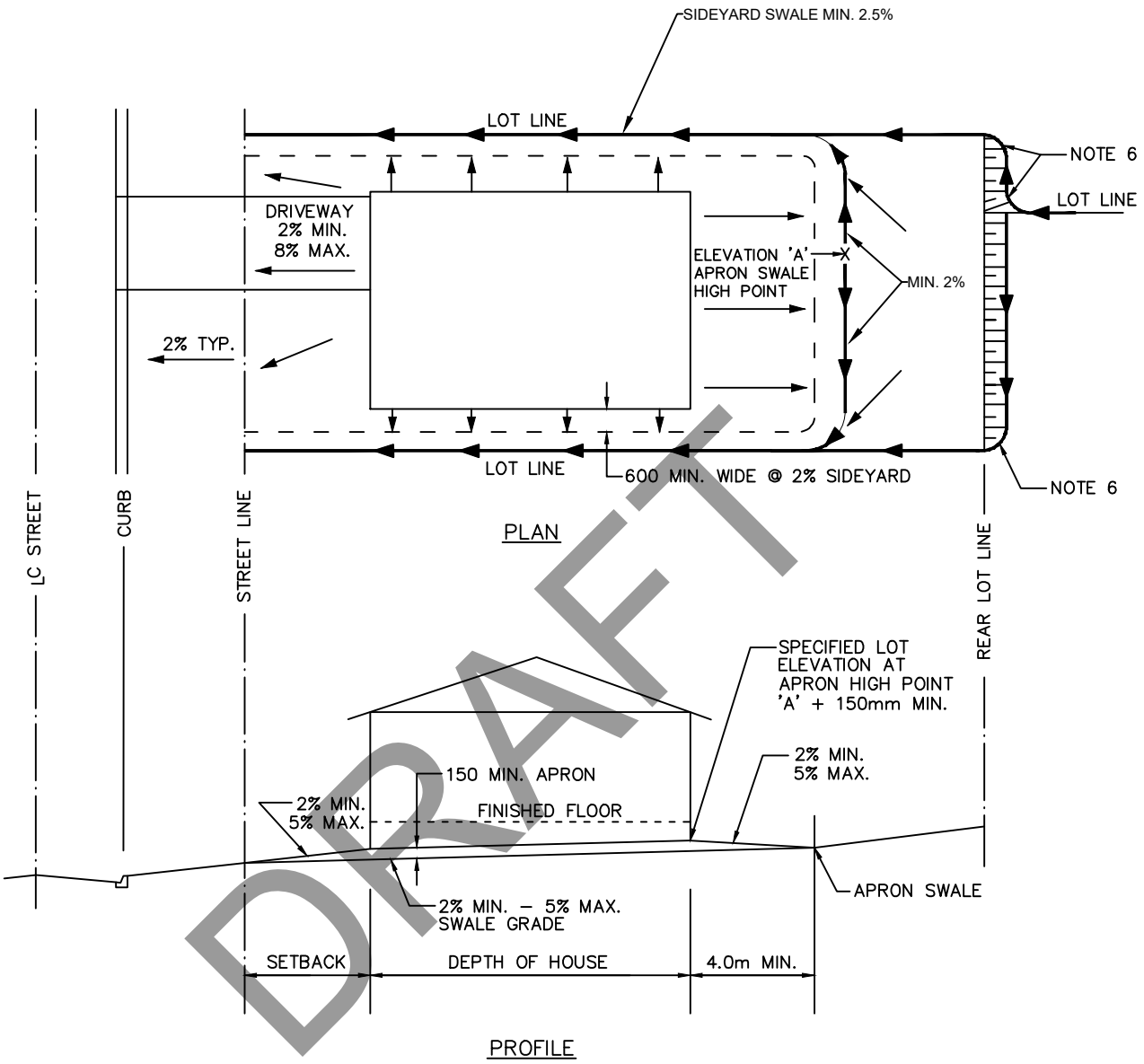
LEGEND

ROOF WATER LEADER TO SPLASHPAD	O►
EXISTING ELEVATION REQUIRED	×(EX.)
PROPOSED ELEVATION REQUIRED	×PROP.
PROPOSED SWALE ELEVATION REQUIRED	×PROP SW
FINISHED FIRST FLOOR ELEVATION REQUIRED	F.F.F.
SPECIFIED HOUSE GRADE (FROM ENGINEER DRAWINGS)	S.H.G.
TOP OF FOUNDATION WALL	T.F.W.
EXTENDED UNDERSIDE OF FOOTING	U/S FTG.
BASEMENT SLAB ELEVATION REQUIRED	BASE SLAB
GARAGE SLAB ELEVATION REQUIRED	GARAGE SLAB
℄OF PROPOSED SWALE & FLOW DIRECTION	
SWALE GRADIENT REQUIRED	% SLOPE

NOTES:

1. GRADING PLANS SHALL BE DRAWN AT 1:250 SCALE.
2. GRADING DESIGN SHALL BE CONSISTENT WITH THE APPROVED SUBDIVISION GRADING PLAN
3. REFER TO DRAWINGS KS-401, KS-402 AND KS-403 FOR DETAILED LOT GRADING SPECIFICATIONS.
4. ALL ABOVE GROUND SEWER AND WATER SERVICES, POLES, SERVICE BOXES AND UTLILTIES FRONTING THE LOT ARE TO BE SHOWN ON THE PLAN
5. EDGE OF DRIVEWAY SHALL MINIMUM 1.0m FROM LIGHT POLES, CATCHBASINS, WATERMAIN VALVES, TELEPHONE MANHOLES, UTLILTY JUNCTION BOXES, WATER SERVICE VALVE BOXES, SIDE LOT LINES AND OTHER DRIVEWAYS, AND MINIMUM 1.5m FROM BOULEVARD TREES AND HYDRO TRANSFORMERS, AND 3.0m FROM HYDRANTS AND COMMUNITY MAILBOXES.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE FEB. 1980
	LOT GRADING PLAN REQUIREMENTS FOR SUBDIVISION LOTS	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-400

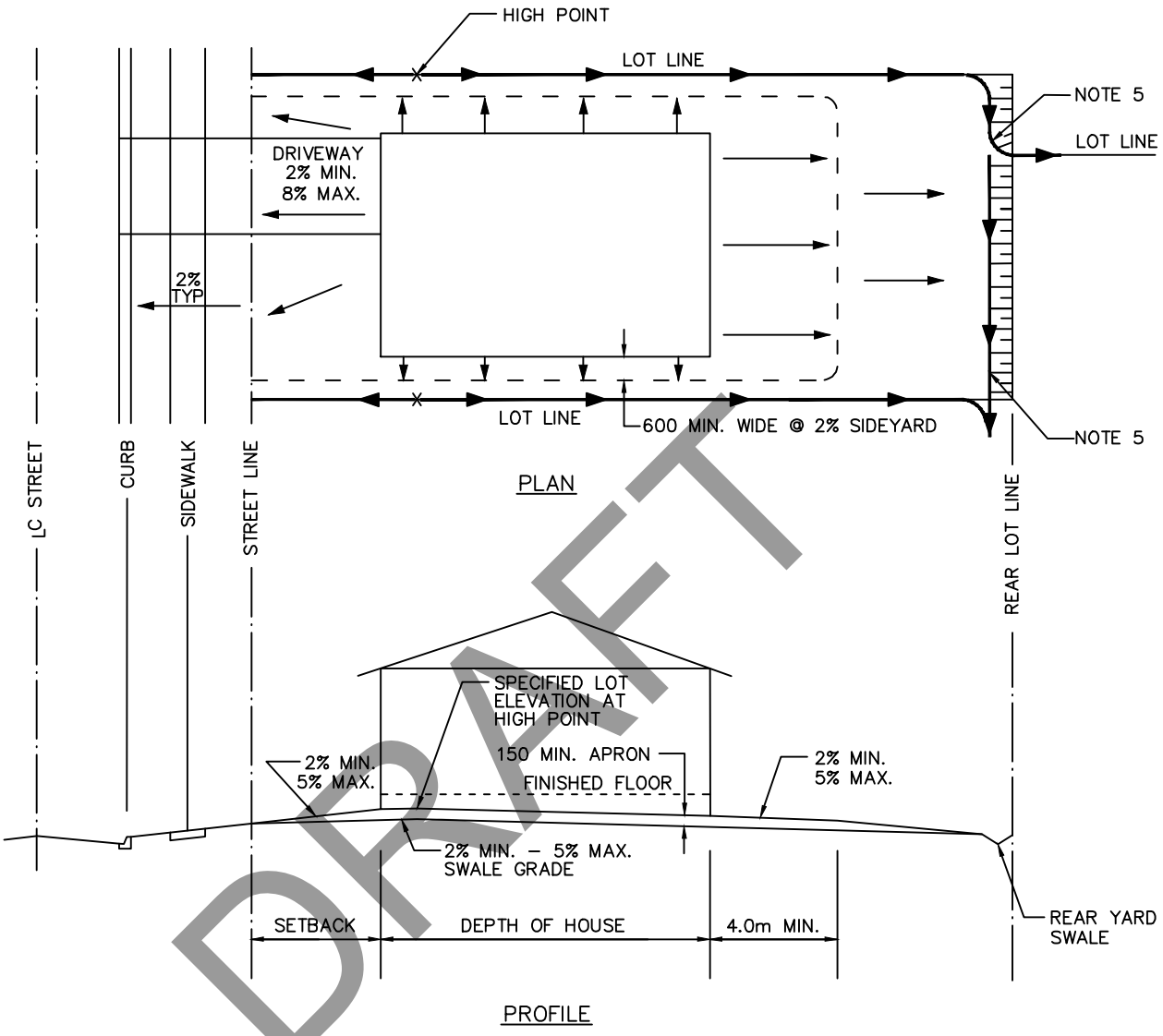


NOTES:

1. DRIVEWAY SHALL NOT EXCEED THE WIDTH OF THE GARAGE.
2. ALL EMBANKMENTS SHALL BE 3:1 MAX.
3. SIDEWALKS MAY BE PERMITTED IF THE ADJACENT LOT TO THE REAR IS ALSO A REAR TO FRONT DRAINING LOT
4. ALL DOWNSPOUTS SHALL DISCHARGE ON TO CONCRETE SPLASH PADS.
5. DRIVEWAYS SHALL NOT BE USED FOR OUTLETS FROM SIDEYARD SWALES.
6. DRAINAGE FROM REAR ADJOINING LOTS SHALL BE CONVEYED BY SWALES TO SIDE LOT LINES.

ALL DIMENSIONS ARE EXPRESSED IN MILLIMETRES (mm) UNLESS OTHERWISE NOTED.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE FEB. 1980
	FRONT LOT DRAINAGE	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-401

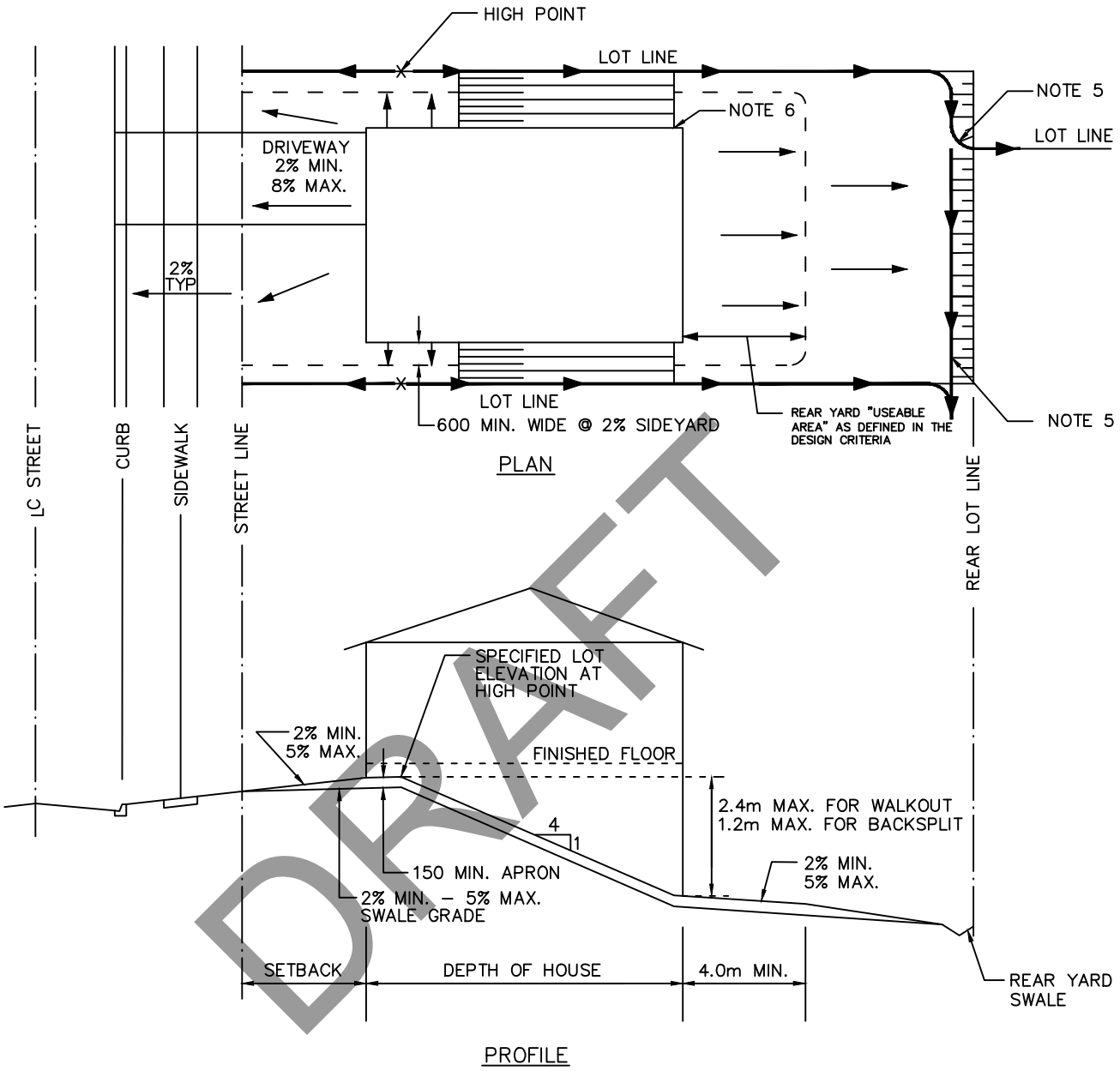


NOTES:

1. DRIVEWAY SHALL NOT EXCEED THE WIDTH OF THE GARAGE
2. ALL EMBANKMENTS SHALL BE 3:1.
3. ALL DOWNSPOUTS SHALL DISCHARGE ONTO CONCRETE SPLASH PADS.
4. DRIVEWAYS SHALL NOT BE USED FOR OUTLETS FOR SIDEYARD SWALES.
5. DRAINAGE TO REAR ADJOINING LOTS SHALL BE CONVEYED BY SWALES TO THE SIDE LOTS LINES
6. A MINIMUM OF 50% OF THE ROOF SHALL DRAIN TO THE FRONT OF THE LOT, AS MUCH AS PRACTICALLY POSSIBLE.

ALL DIMENSIONS ARE EXPRESSED IN MILLIMETRES (mm) UNLESS OTHERWISE NOTED.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: FEB. 1980
	SPLIT LOT DRAINAGE	REVISION	DRAWING No.: KS-402
		DATE OF REVISION: JANUARY 2026	

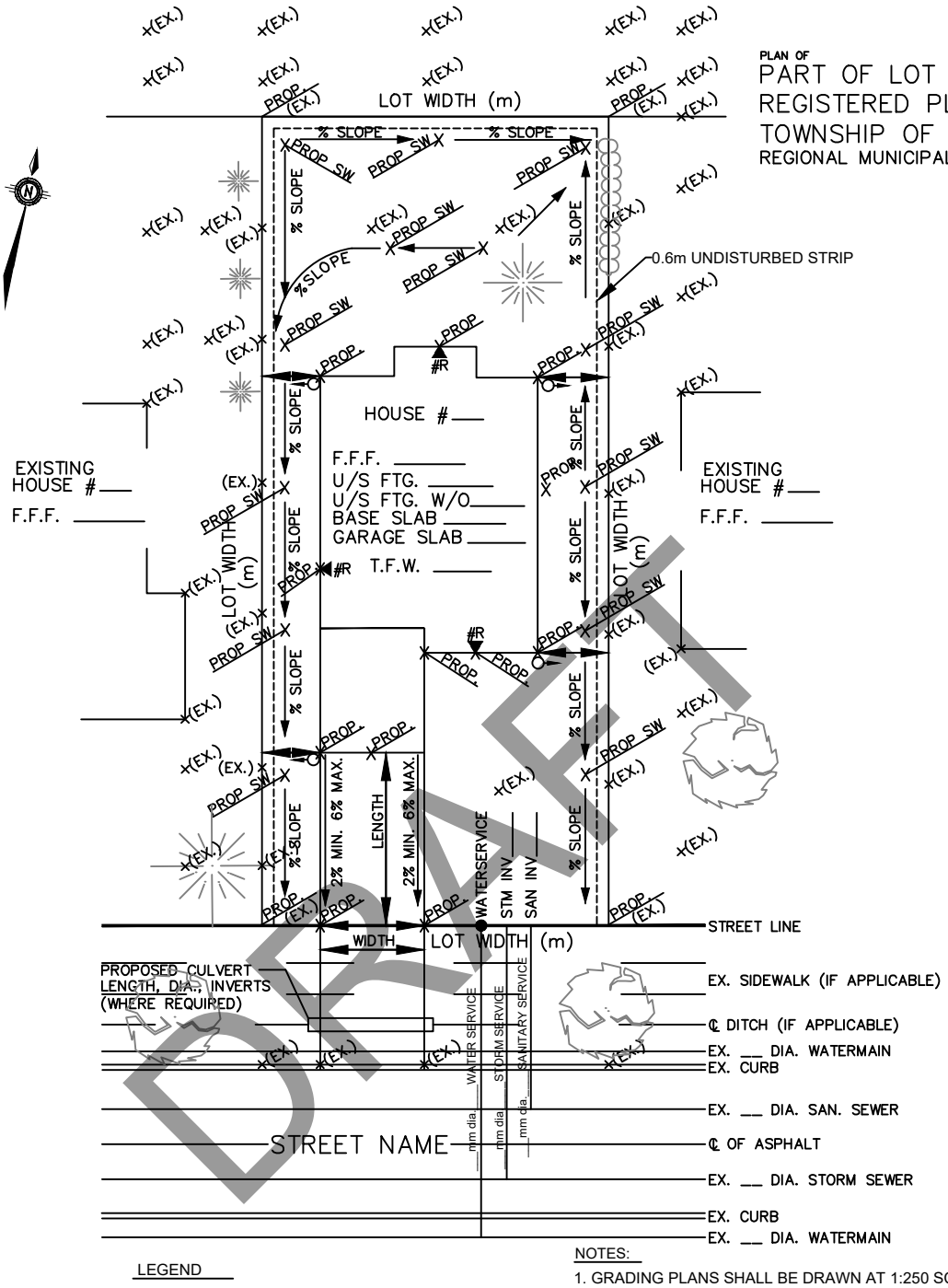


NOTES:

1. DRIVEWAY SHALL NOT EXCEED THE WIDTH OF THE GARAGE
2. ALL EMBANKMENTS SHALL BE 4:1.
3. ALL DOWNSPOUTS SHALL DISCHARGE ONTO CONCRETE SPLASH PADS.
4. DRIVEWAYS SHALL NOT BE USED FOR OUTLETS FOR SIDEYARD SWALES.
5. DRAINAGE TO REAR ADJOINING LOTS SHALL BE CONVEYED BY SWALES TO THE SIDE LOTS LINES.
6. SIDEYARD 4:1 SLOPES SHALL NOT EXTEND BEYOND REAR FACE OF DWELLING.
7. A MINIMUM OF 50% OF THE ROOF SHALL DRAIN TO THE FRONT OF THE LOT, AS MUCH AS PRACTICALLY POSSIBLE.

ALL DIMENSIONS ARE EXPRESSED IN MILLIMETRES (mm) UNLESS OTHERWISE NOTED.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE FEB. 1980
	LOT DRAINAGE FOR WALKOUT AND BACKSPLIT DWELLINGS	REVISION	DRAWING No. KS-403
		DATE OF REVISION JANUARY 2026	



LEGEND

ROOF WATER LEADER OUTLET TO SPLASHPAD	O–
EXISTING ELEVATION REQUIRED	×(EX.)
PROPOSED ELEVATION REQUIRED	×PROP.
PROPOSED SWALE ELEVATION REQUIRED	×PROP SW
FINISHED FIRST FLOOR ELEVATION REQUIRED	F.F.F.
UNDERSIDE OF FOOTING ELEVATION REQUIRED	U/S FTG.
UNDERSIDE OF FOOTING ELEVATION FOR WALKOUT REQUIRED	U/S FTG. W/O
BASEMENT SLAB ELEVATION REQUIRED	BASE SLAB
GARAGE SLAB ELEVATION REQUIRED	GARAGE SLAB
℄ OF PROPOSED SWALE & FLOW DIRECTION	→
SWALE GRADIENT REQUIRED	% SLOPE

NOTES:

1. GRADING PLANS SHALL BE DRAWN AT 1:250 SCALE.
2. ALL DRAINAGE SWALES TO BE LOCATED WITHIN THE LOT. MAINTAIN A MINIMUM 0.6m UNDISTURBED STRIP INSIDE THE PROPERTY LINES.
3. REFER TO DRAWINGS KS-401, KS-402 AND KS-403 FOR DETAILED LOT GRADING SPECIFICATIONS.
4. EXISTING GRADES SHALL BE MAINTAINED WITHIN 0.6m FROM ALL PROPERTY LINES ON PROPOSED LOT.
5. ALL DRIVEWAYS ARE TO ALIGN WITH THE TOWNSHIP'S ZONING BY-LAW. ALSO REFER TO DRIVEWAY DESIGN CRITERIA SECTION B8.03 AND B8.04 FOR MINIMUM DRIVEWAY REQUIREMENTS.
6. EXISTING SERVICES TO BE DECOMMISSIONED ARE TO BE SHOWN AND DECOMMISSIONING PROCEDURE IS TO BE NOTED AS OUTLINED IN THE DESIGN CRITERIA
7. DRIVEWAY ENTRANCE IS TO BE IN ACCORDANCE WITH STANDARD DETAIL DRAWING KS-341. THE DRIVEWAY APRON IS TO BE PERPENDICULAR TO THE CENTERLINE OF ROAD PAVEMENT.

TOWNSHIP OF KING

APPROVED

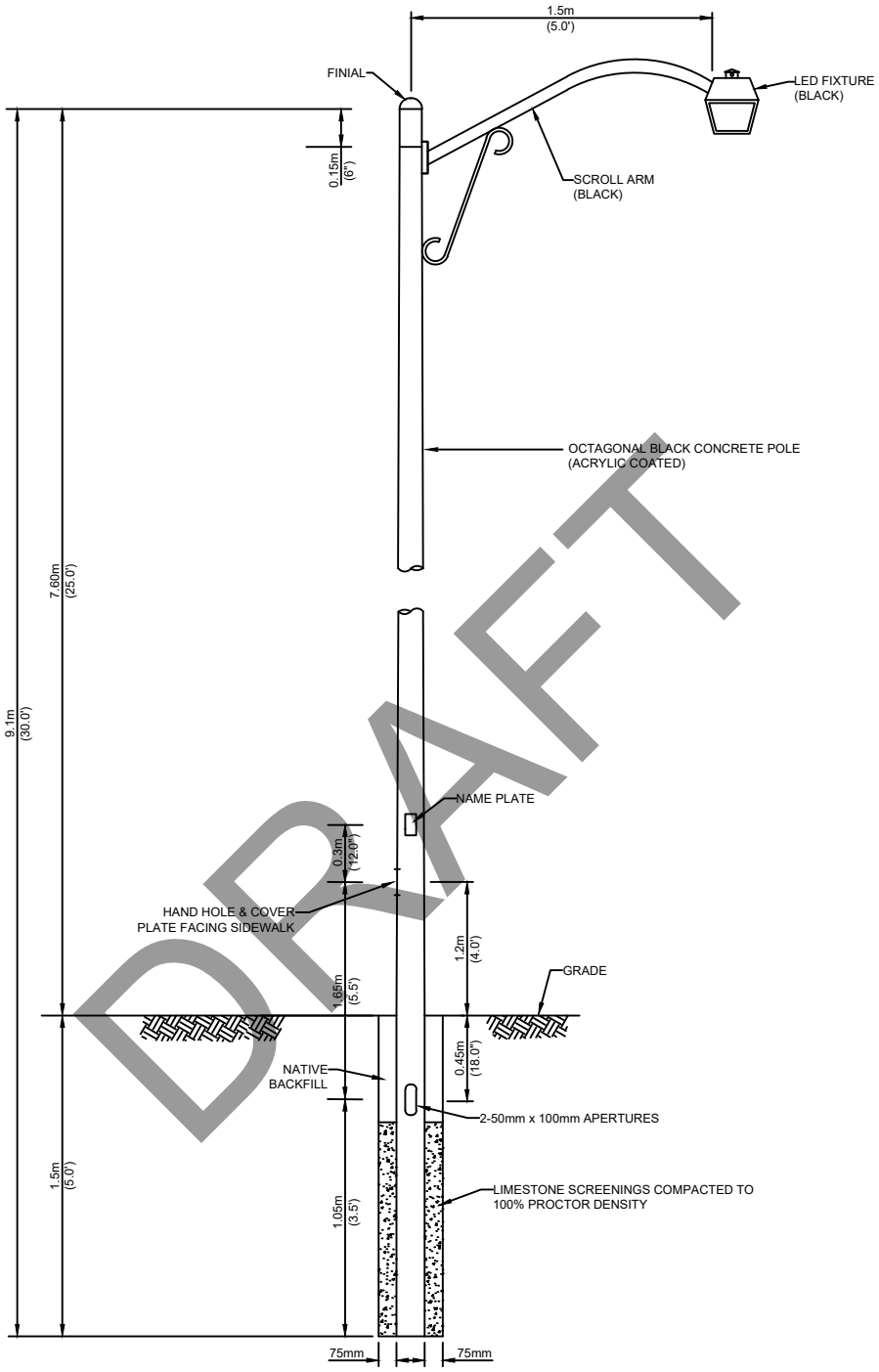
DATE OF ISSUE: JAN. 2026

LOT GRADING PLAN REQUIREMENTS FOR INFILL LOTS

REVISION:

DATE OF REVISION: JANUARY 2026

DRAWING No.: KS-405

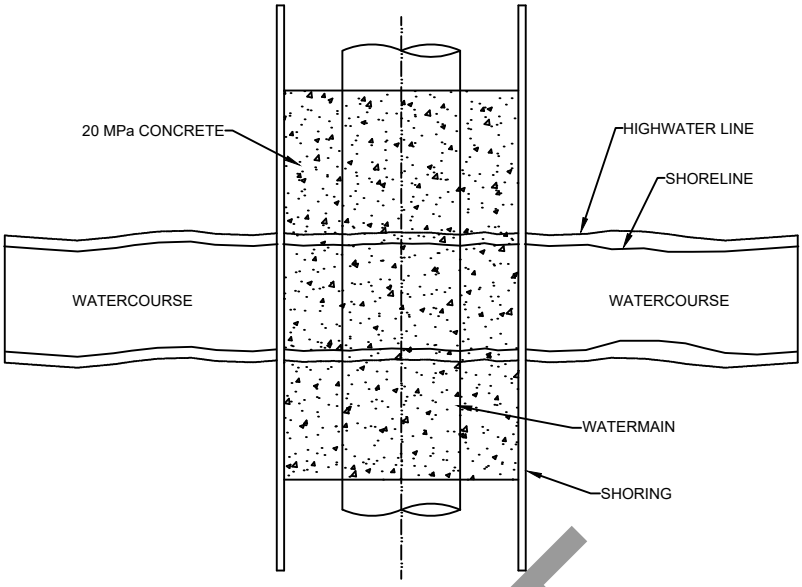


NOTES:

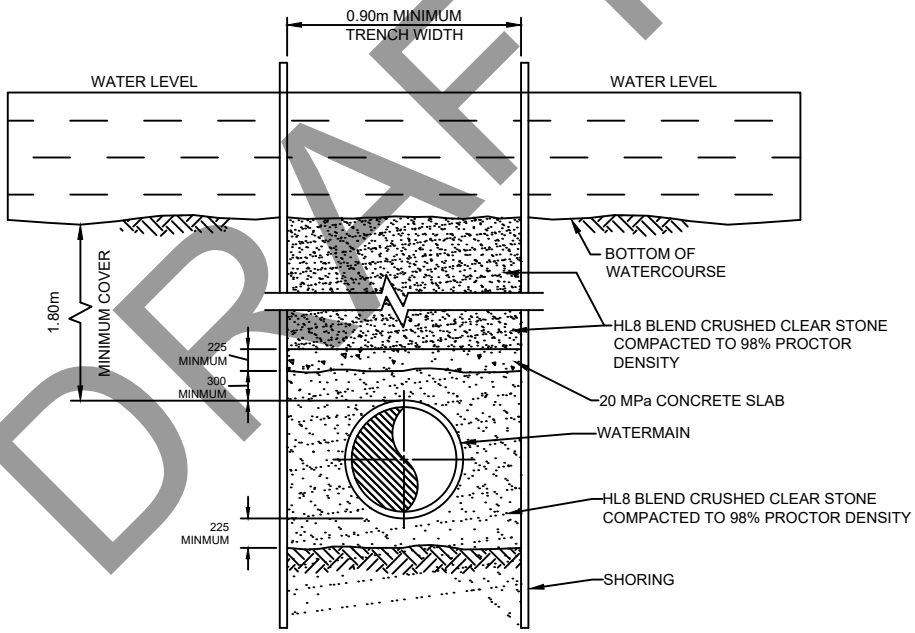
1. DIMENSIONS ARE TYPICAL AND SUBJECT TO ADJUSTMENT TO SUIT SPECIAL LIGHTING DESIGN.

2. SEE SECTION J FOR DETAILS AND SPECIFICATIONS

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: AUG. 1981
	TYPICAL POLE & LUMINAIRE (DECORATIVE)	REVISION	DRAWING No.: KS-701
		DATE OF REVISION: JANUARY 2026	



PLAN

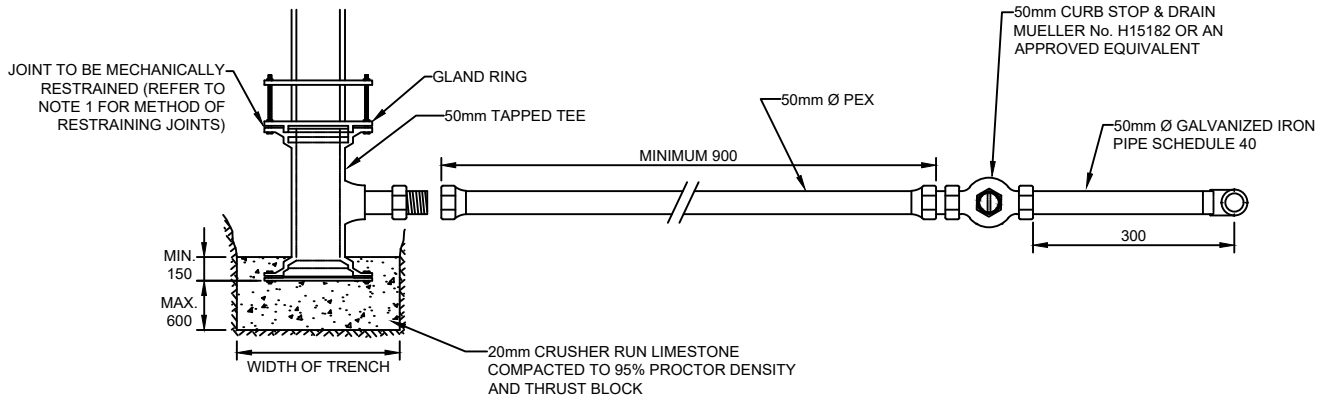


ELEVATION

NOTES:

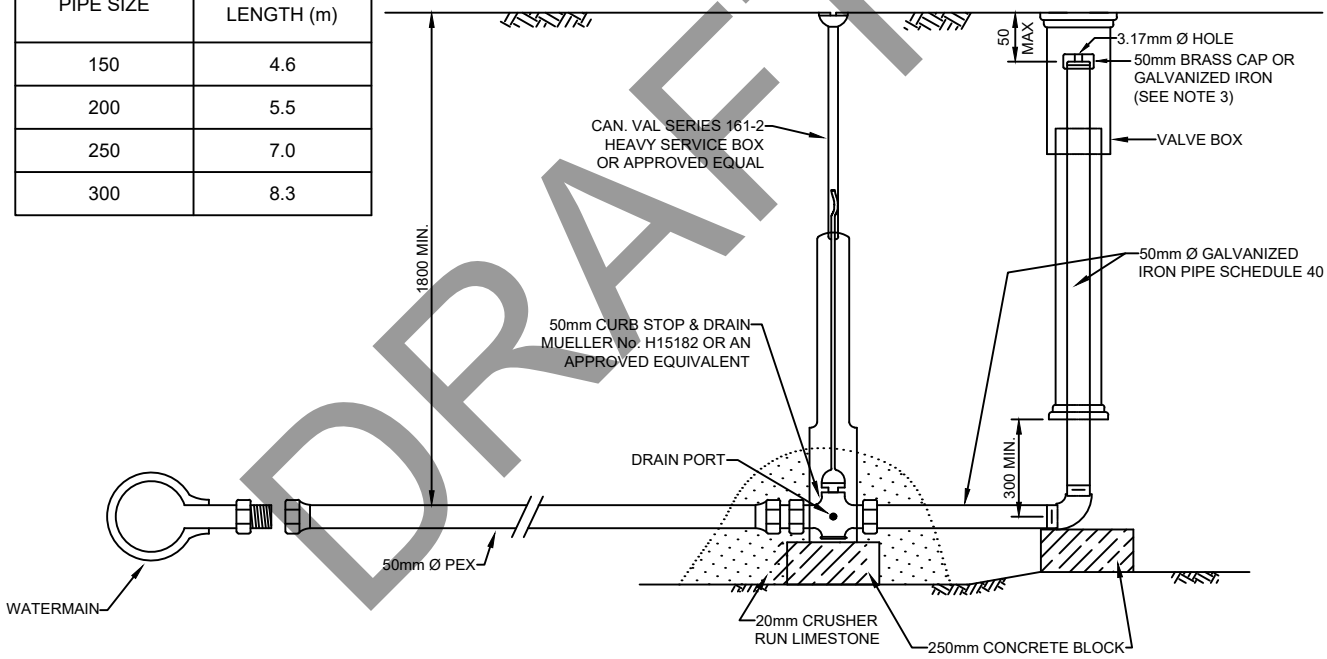
1. ALL SLOPING MUST BE CUT OFF AT CREEK BED WHEN CONSTRUCTION IS COMPLETED.
2. VALVES WILL BE PROVIDED AT BOTH ENDS OF WATER CROSSING ABOVE THE HIGHWATER LINE AT THE DISCRETION OF THE TOWNSHIP ENGINEER.
3. ALL DIMENSIONS ARE IN MILLIMETRES OR METRES UNLESS OTHERWISE SPECIFIED.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE FEB. 1980
	WATERMAIN TRENCH DETAIL UNDER WATERCOURSE	REVISION	DRAWING No. KS-802
		DATE OF REVISION JANUARY 2026	



PLAN

TABLE 1	
PIPE SIZE	MIN. RESTRAINED LENGTH (m)
150	4.6
200	5.5
250	7.0
300	8.3

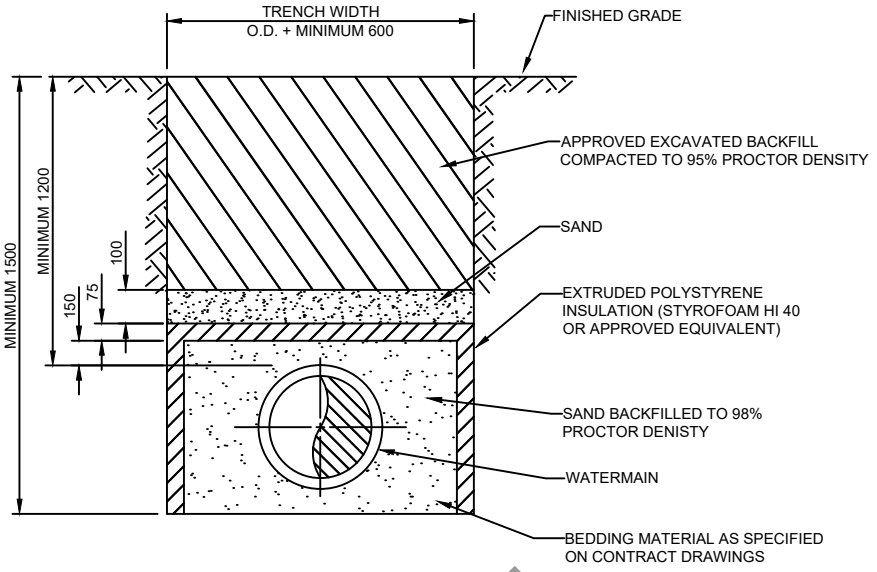


ELEVATION

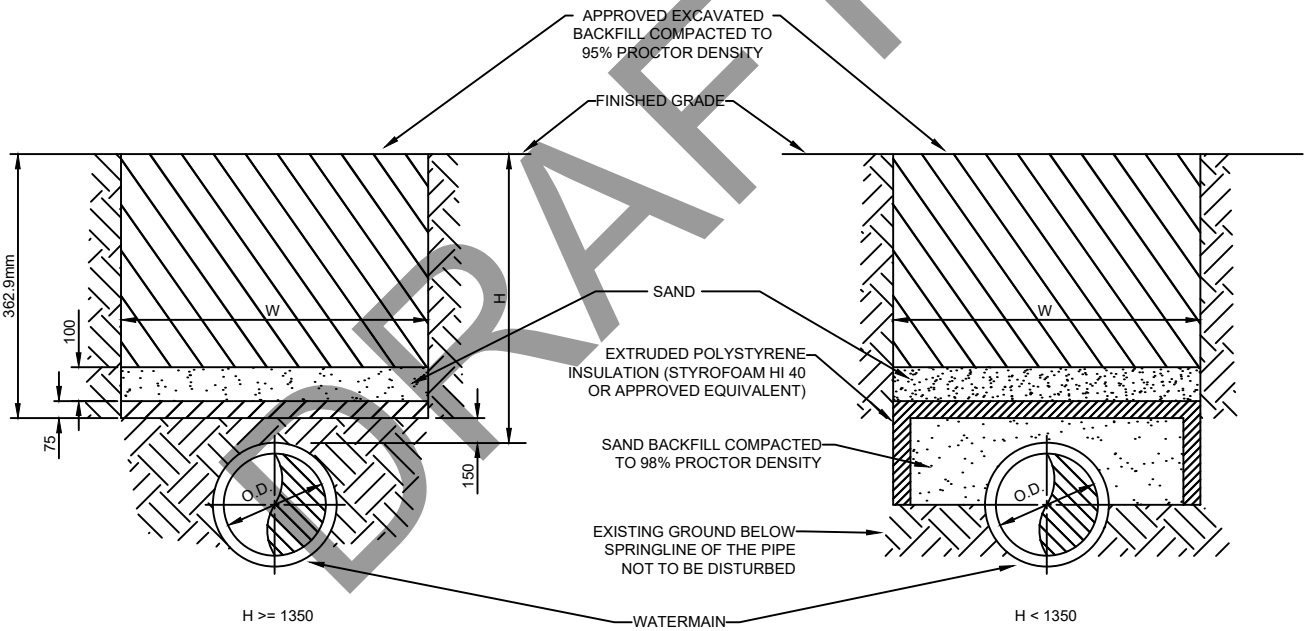
NOTES:

1. JOINTS ON PVC MAIN ARE TO BE RESTRAINED USING UNI-FLANGE SERIES 1300 RESTRAINER (OR APPROVED EQUAL).
2. ALL JOINTS ENCOUNTERED WITHIN THE SPECIFIED RESTRAINING LENGTH ON TABLE 1, FROM THE FIRST RESTRAINED JOINT SHALL BE RESTRAINED.
3. THREADS ON CAP TO BE GREASED AND CAP TO BE INSTALLED LOOSELY.
4. BLOW-OFF AND TAPPED TEE TO BE COMPLETELY BACKFILLED WITH HL8 STONE.
5. ALL DIMENSIONS ARE IN MILLIMETRES.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE FEB. 1980
	50mm BLOWOFF FOR WATERMAIN WITH MECHANICALLY RESTRAINED JOINTS	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-803



INSULATION OF NEW SERVICES



INSULATION OF EXISTING SERVICES

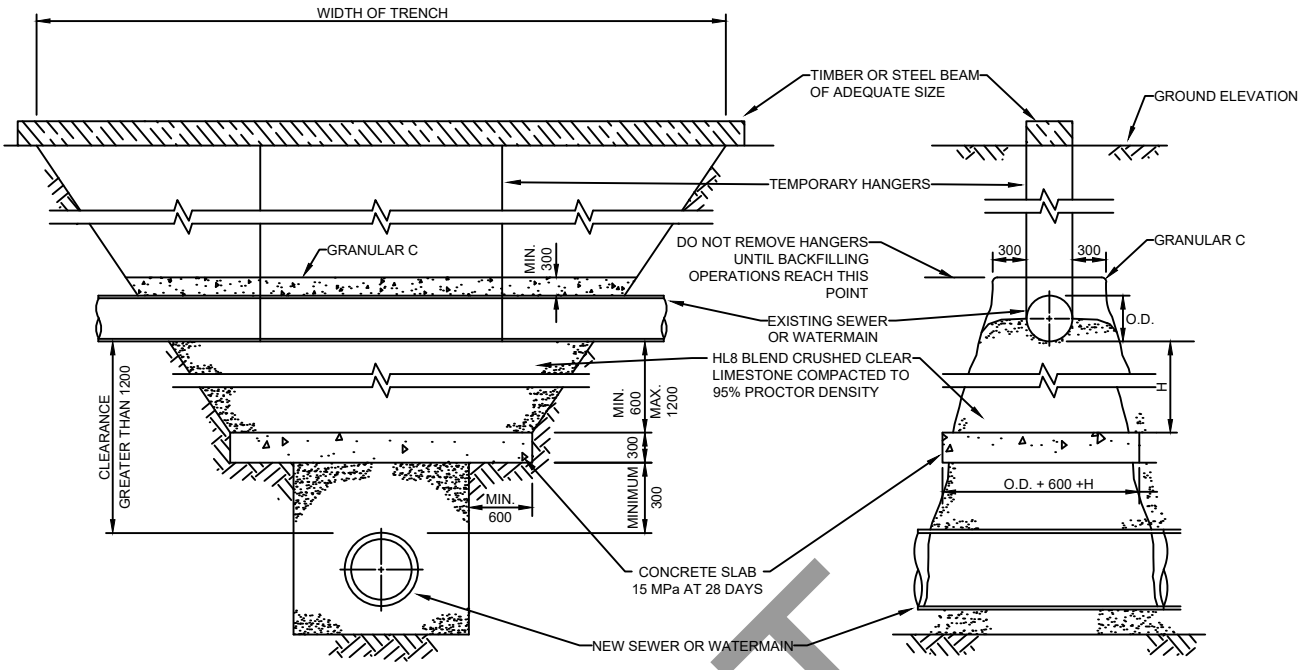
W = O.D. + 2(1500-H) OR O.D. + 600mm WHICHEVER IS GREATER

WHERE: W = INSULATION WIDTH
O.D. = OUTSIDE DIAMETER OF PIPE TO BE INSULATED
H = DEPTH OF PIPE TO BE INSULATED
(MINIMUM = 1200mm)

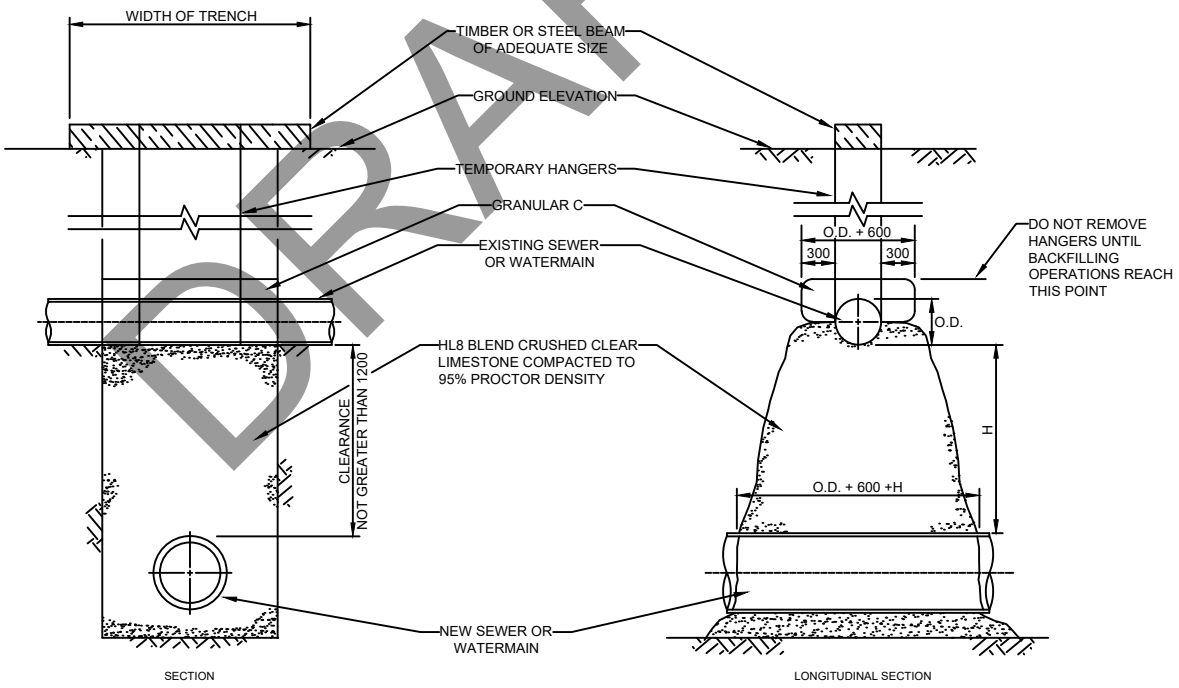
NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE JAN. 1990
	METHODS OF INSULATING WATERMAINS	REVISION	DRAWING No. KS-804
		DATE OF REVISION JANUARY 2026	



CLEARANCE GREATER THAN 1200



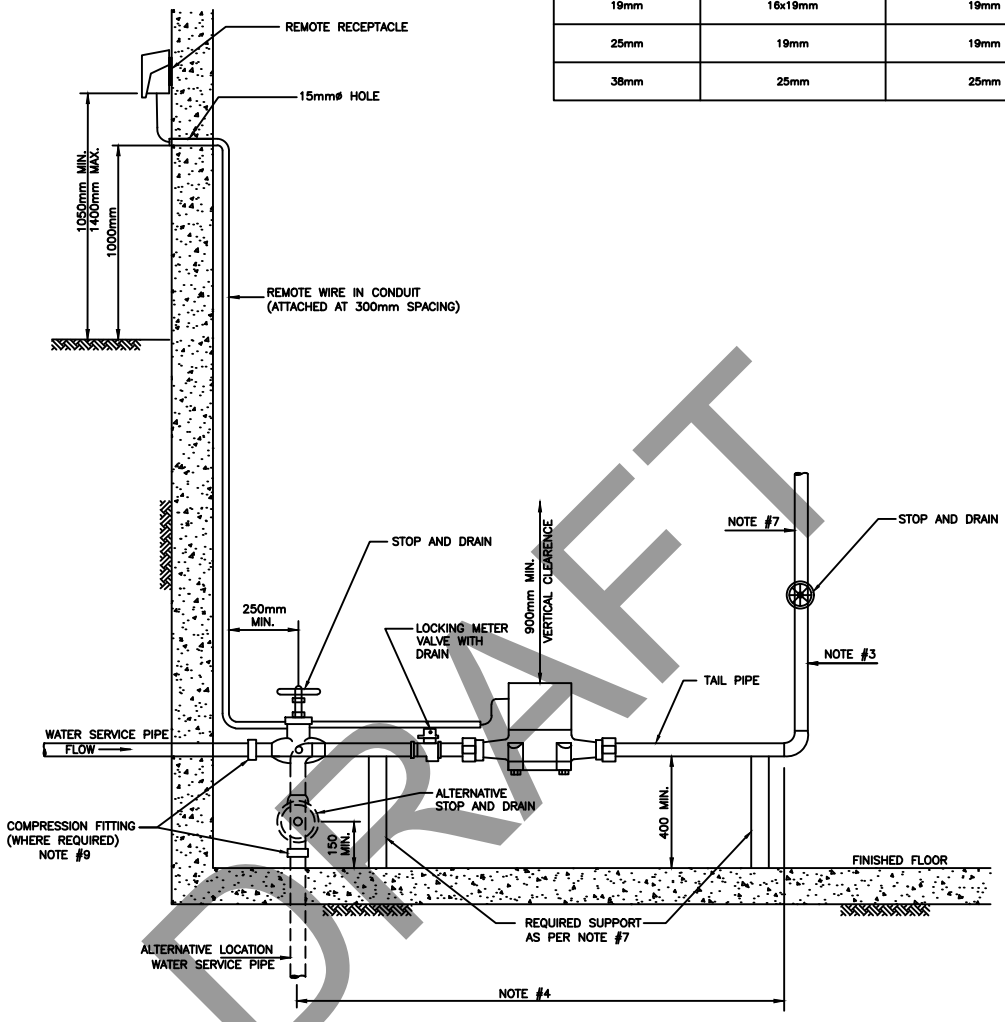
CLEARANCE NOT GREATER THAN 1200

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: JAN. 1990
	SUPPORTS FOR WATERMAINS AND SEWERS CROSSING WATERMAIN TRENCHES	REVISION	DRAWING No.: KS-805
		DATE OF REVISION: JANUARY 2026	

TABLE		
PIPE SIZE IN	METER SIZE	PIPE SIZE OUT
19mm	16x19mm	19mm
25mm	19mm	19mm
38mm	25mm	25mm



NOTES:

1. 175mm MINIMUM CLEARANCE BETWEEN WALL AND C/L OF PIPE AND 75mm HORIZONTAL CLEARANCE BETWEEN WALL AND METER.
2. STOP AND DRAIN TO BE THE SAME SIZE AS INCOMING PIPE; VALVE TO BE PER BUILDING CODE.
3. MAINTAIN SERVICE PIPE DIAMETER TO CONNECTION AT HOT WATER TANK (OBC 7.6.3.4).
4. ALL COPPER PIPING AFTER THE STOP AND DRAIN SHALL BE TYPE "L" COPPER.
   PIPING FOR METER TO BE RUN HORIZONTALLY & METER TO BE INSTALLED ON HORIZONTAL PIPING ONLY.
5. METER MUST NOT BE LOCATED BEHIND FURNACES, PARTITION WALLS, WATER TANKS, ETC.
6. WHERE REQUIRED, DUAL CHECK VALVE BACKFLOW PREVENTER IS TO BE INSTALLED DOWNSTREAM OF THE METER.
7. IF PLUMBING RISER/WATER SERVICE IS PLASTIC, SUPPORTS SHALL BE REQUIRED FOR METER ASSEMBLY AREA.
   TO AVOID INSTALLING SUPPORTS, RISER SHALL BE COPPER AND ATTACHED TO LOWER FLOOR LEVEL JOISTS.
8. METER AND TOUCHPAD TO BE SUPPLIED BY KING TOWNSHIP.
9. COMPRESSION FITTING TO BE SUFFICIENTLY STAYED, CLAMPED, ANCHORED OR BUTTRESSED IN ACCORDANCE WITH 7.3.4.8 OF THE OBC.

KING

TOWNSHIP OF KING

19mm to 25mm WATER METER
INSTALLATION IN BUILDING

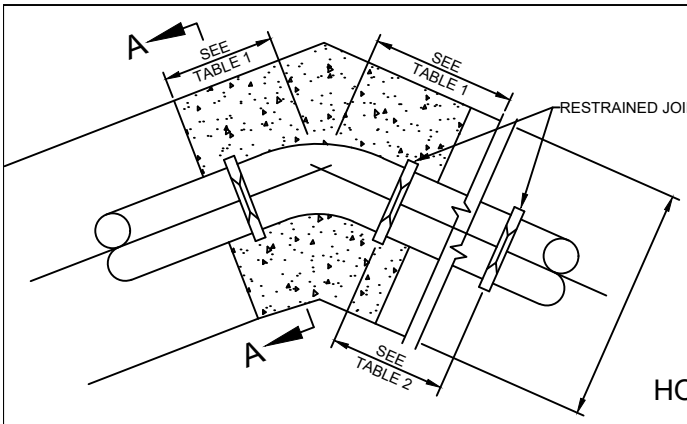
APPROVED

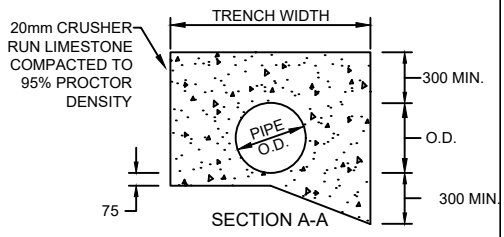
DATE OF ISSUE
JAN. 2017

REVISION

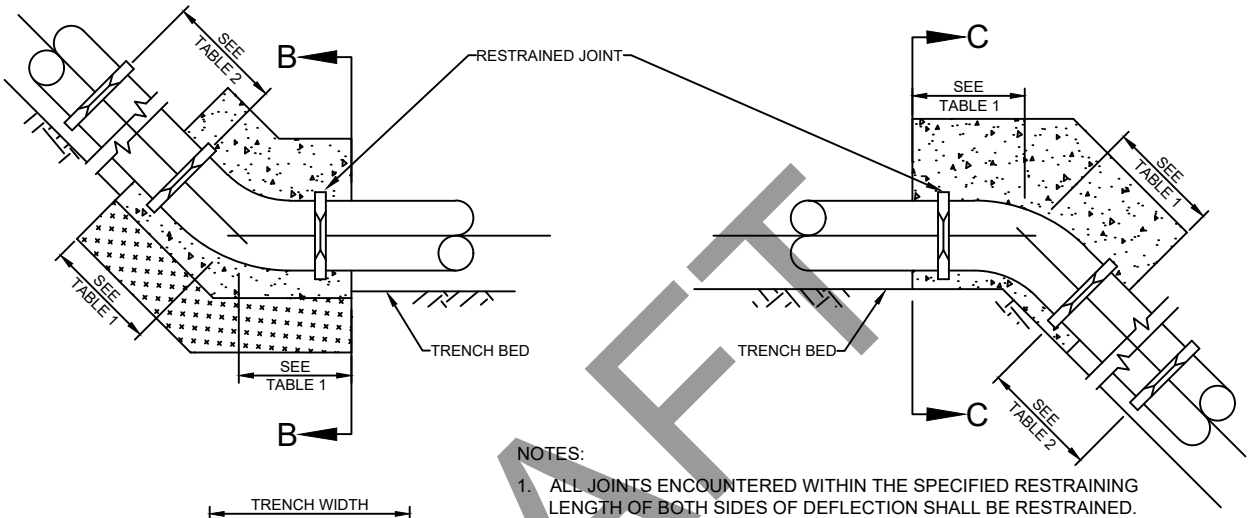
DATE OF REVISION
JANUARY 2026

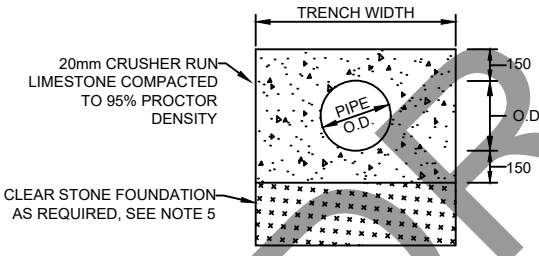
DRAWING No.
KS-820





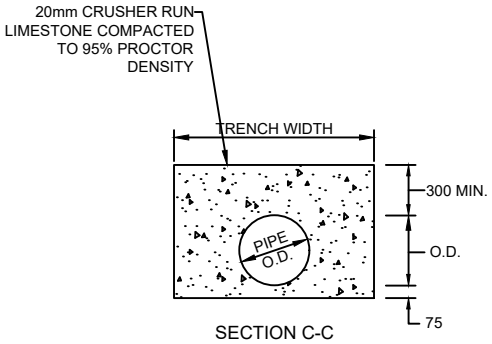
HORIZONTAL DEFLECTION





DOWNWARD THRUST

VERTICAL DEFLECTION



UPWARD THRUST

NOTES:

1. ALL JOINTS ENCOUNTERED WITHIN THE SPECIFIED RESTRAINING LENGTH OF BOTH SIDES OF DEFLECTION SHALL BE RESTRAINED.
2. REFER TO OPSD FOR JOINT RESTRAINING DETAIL.
3. GRANULAR THRUST BLOCKS SHALL BE FULLY EXTENDED AND COMPACTED AGAINST TRENCH WALLS.
4. GRANULAR THRUST BLOCKS SHALL BE ENCLOSED WITH FILTER FABRIC IF GROUND WATER TABLE IS ABOVE THE TRENCH BED OR IF GROUND WATER IS SEEPING THROUGH TRENCH WALLS.
5. IF THE BEARING CAPACITY OF TRENCH BED RESISTING DOWNWARD THRUST IS LESS THAN 100 KN/m2, CLEAR STONE FOUNDATION SHALL BE PROVIDIED AS REQUIRED.
6. CORROSION PROTECTION SHALL ALSO BE PROVIDED.
7. ALL DIMENSIONS IN MILLIMETRES.

TABLE No. 1

DEFLECTION ANGLE	PIPE DIAMETER			
	150	200	250	300
11.25°	400	500	550	600
22.5°	400	500	550	600
45°	450	550	600	650
90°	600	700	750	850

TABLE 2

MINIMUM RESTRAINING LENGTH (m)

PIPE DATA	VERTICAL DELFECTION						HORIZONTAL DEFLECTION			
	DOWNWARD THRUST			UPWARD THRUST						
	11.25°	22.5°	45°	11.25°	22.5°	45°	11.25°	22.5°	45°	90°
150	1.2	2.1	4.0	4.8	7.6	9.2	1.2	2.1	4.0	6.0
200	1.5	3.0	4.9	6.7	9.7	11.3	1.5	3.0	4.9	7.9
250	1.8	3.6	6.4	9.0	12.2	14.0	1.8	3.6	6.4	9.0
300	2.1	4.3	7.3	10.9	14.7	16.6	2.1	4.3	7.3	11.9

KING

TOWNSHIP OF KING

APPROVED:

DATE OF ISSUE: JAN. 1990

JOINT RESTRAINING LENGTH

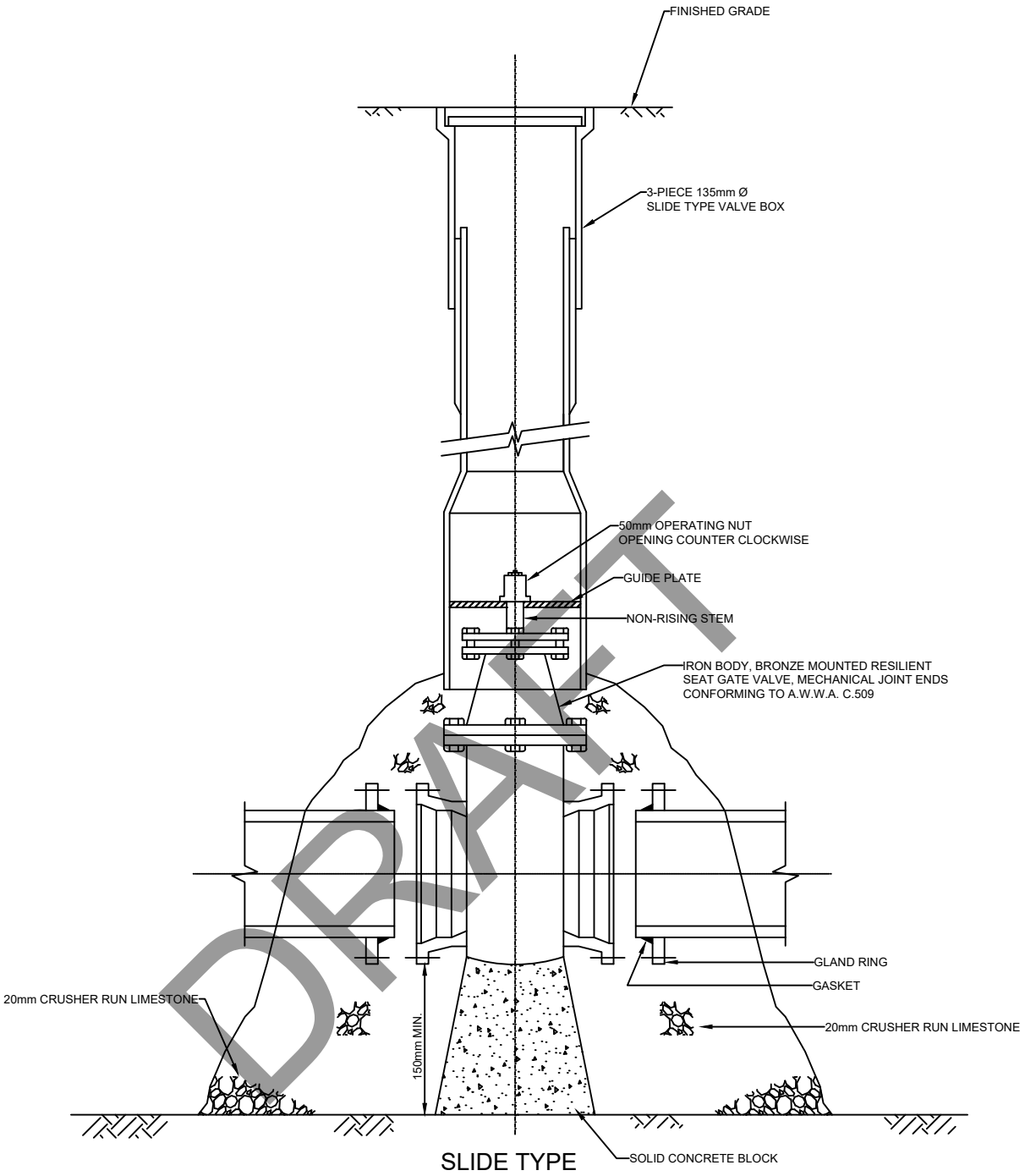
(IN COMBINATION WITH GRANULAR THRUST BLOCK)

FOR P.V.C. PIPE

REVISION:

DATE OF REVISION: JANUARY 2026

DRAWING No.: KS-830

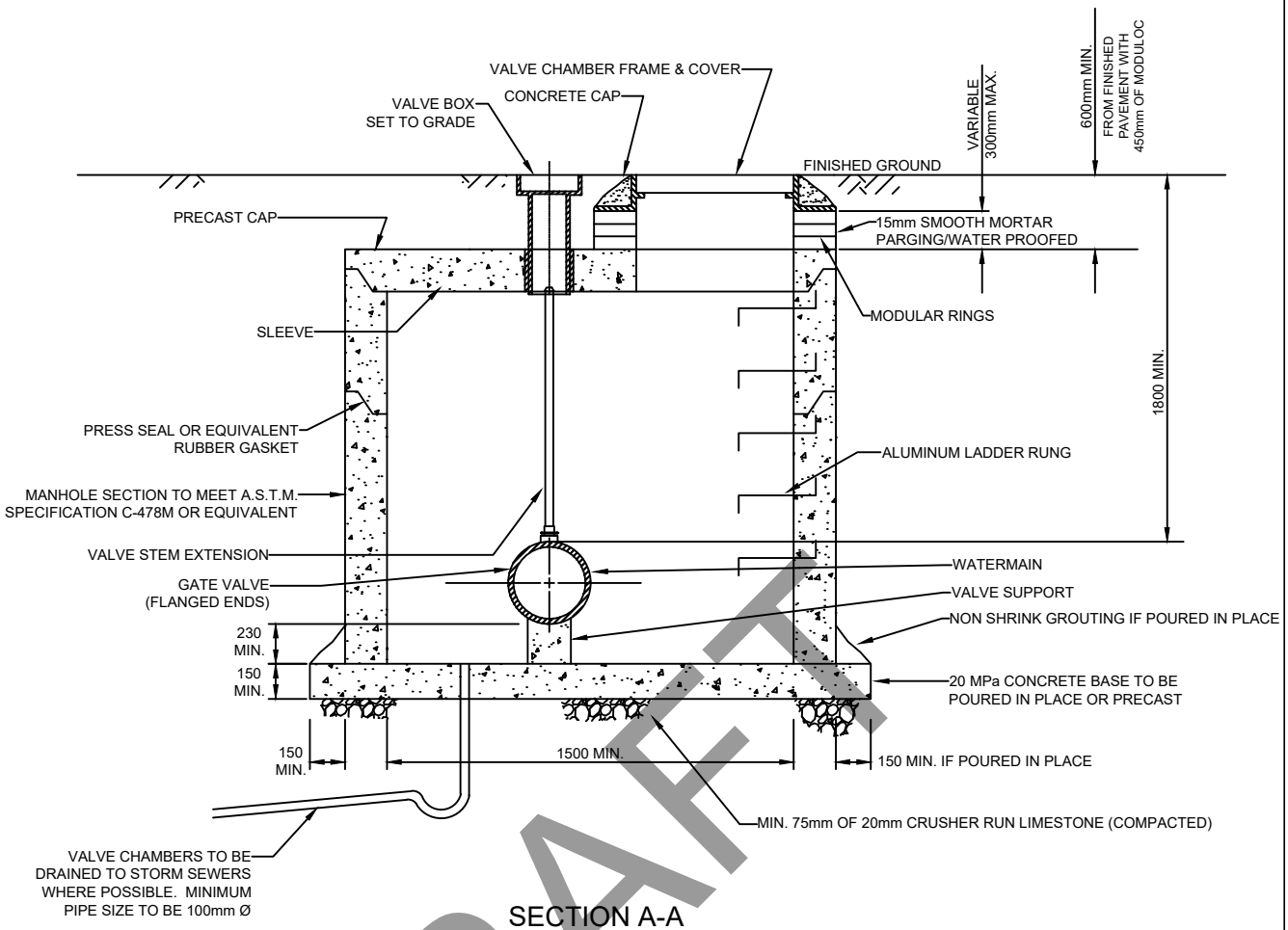


SLIDE TYPE

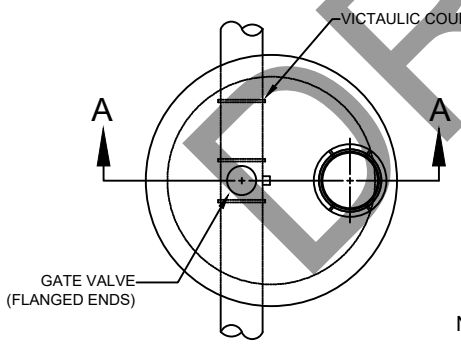
NOTES:

1. VALVE BOX TO BE ADEQUATELY BRACED WHILE BACKFILLING AND MUST REMAIN PLUMB.
2. VALVE BOX EXTENSION TO BE USED ONLY IF REQUIRED.
3. A 50x100x1500 MARKER STAKE PAINTED BLUE SHALL BE INSTALLED BESIDE EACH VALVE AT THE TIME OF INSTALLATION.
4. ALL DIMENSIONS ARE IN MILLIMETRES.
5. VALVE TO BE COMPLETELY BACKFILLED WITH 20mm CRUSHER RUN LIMESTONE.
6. CORROSION PROTECTION SHALL ALSO BE PROVIDED.

XING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: FEB. 1980
	150mm TO 250mm DIAMETER GATE VALVE & BOX	REVISION	DRAWING No.: KS-840
		DATE OF REVISION: JANUARY 2026	



SECTION A-A

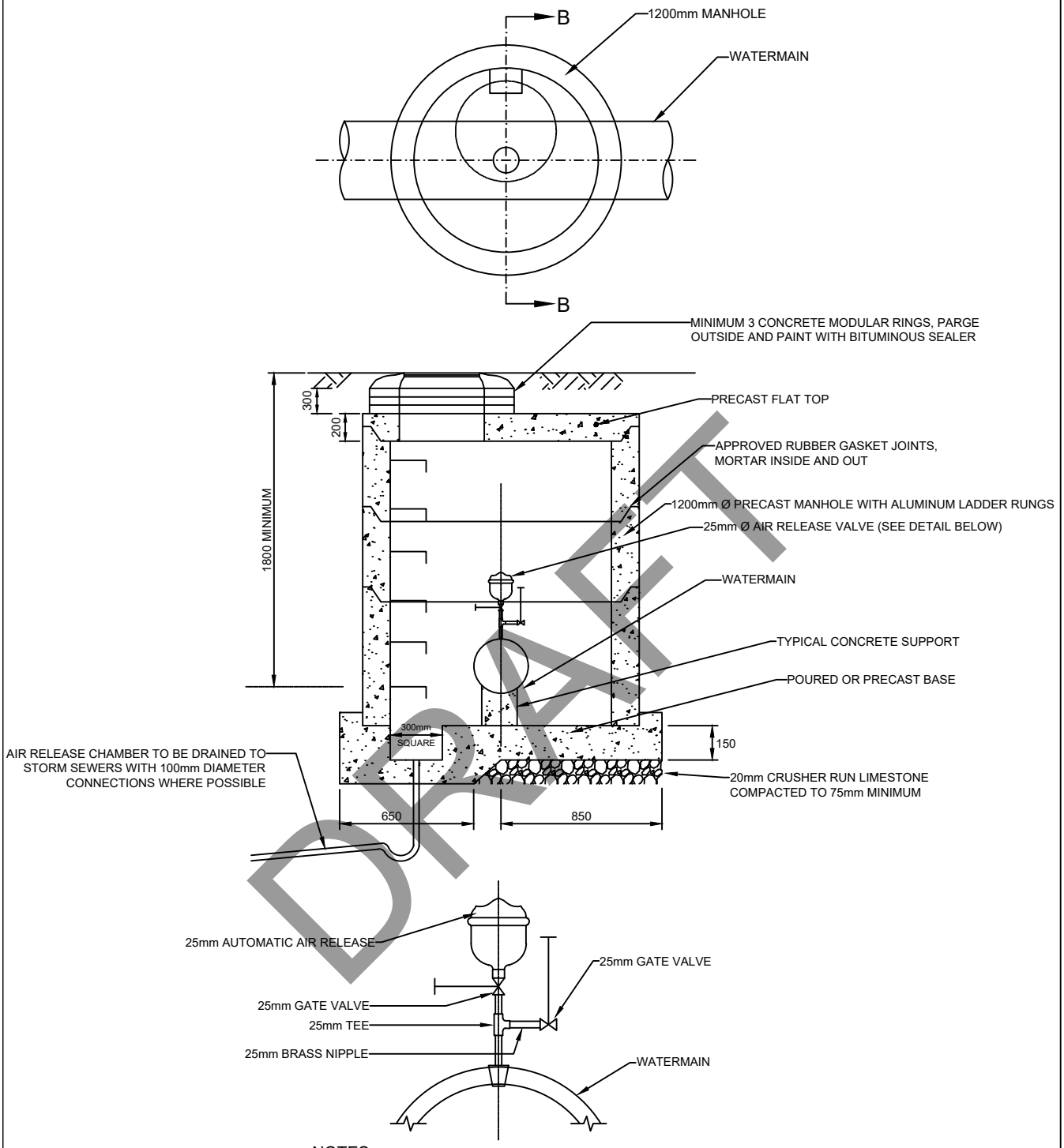


PLAN

NOTES:

1. LIFTING HOLES IN PRECAST SECTIONS TO BE COMPLETELY FILLED WITH 3 PARTS SAND, 1 PART CEMENT MORTAR AND POINTED BEFORE BACK-FILLING.
2. FIRST MANHOLE STEP TO BE 75mm BELOW FRAME. LAST STEP TO BE 300mm ABOVE CHAMBER FLOOR.
3. GASKET TO BE PLACED AS PER SPECIFICATIONS.
4. VALVE CHAMBER TO HAVE A MAXIMUM OF 300mm MODULAR RINGS.
5. ALL DIMENSIONS ARE IN MILLIMETRES.
6. GRANULAR 'C' BACKFILL TO BE PLACED TO A MINIMUM THICKNESS OF 300mm ON ALL SIDES AND COMPACTED TO 100% STANDARD PROCTOR DENSITY.
7. ALL VALVE CHAMBERS ARE TO BE WATERPROOFED.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: FEB. 1980
	SEMI-PRECAST CONCRETE VALVE CHAMBER FOR 300mm DIA. PIPE OR LARGER	REVISION	DRAWING No.: KS-841
		DATE OF REVISION: JANUARY 2026	



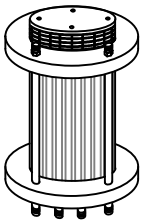
NOTES:

1. ALL FITTINGS TO BE BRASS.
2. ALL DIMENSIONS ARE IN MILLIMETRES.
3. GRANULAR 'C' BACKFILL TO BE PLACED TO A MINIMUM THICKNESS OF 300mm ON ALL SIDES AND COMPACTED TO 100% STANDARD PROCTOR DENSITY.
3. SEE APPROVED MATERIAL LISTING FOR AIR RELEASE VALVE

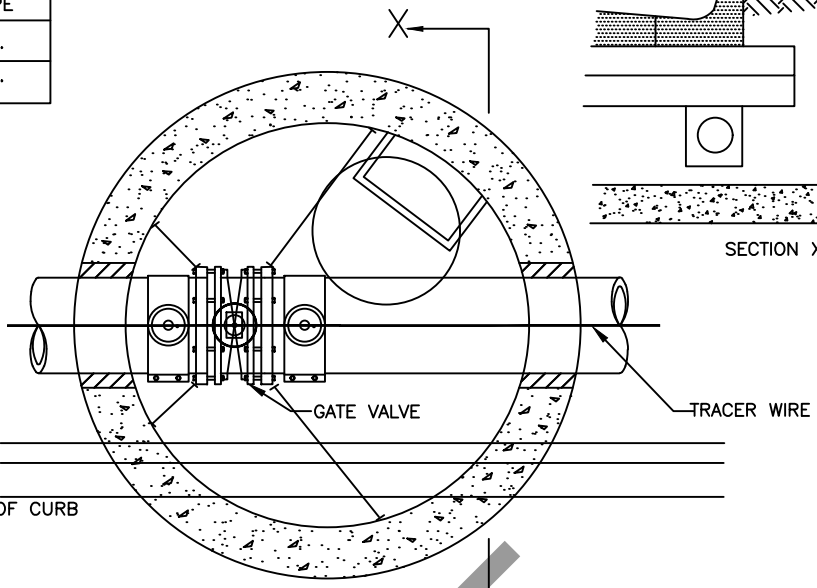
KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE JAN. 1990
	AIR RELEASE CHAMBER	REVISION	DRAWING No. KS-843
		DATE OF REVISION JANUARY 2026	

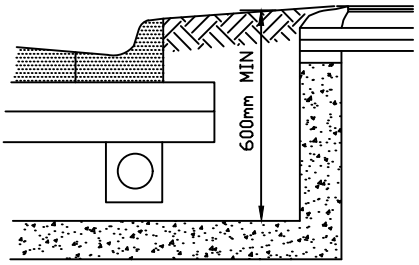
VALVE SIZE	CHAMBER I.D.	VALVE TYPE
100–300	1500	G.V.
400	1800	G.V.

VENT–O–MAT

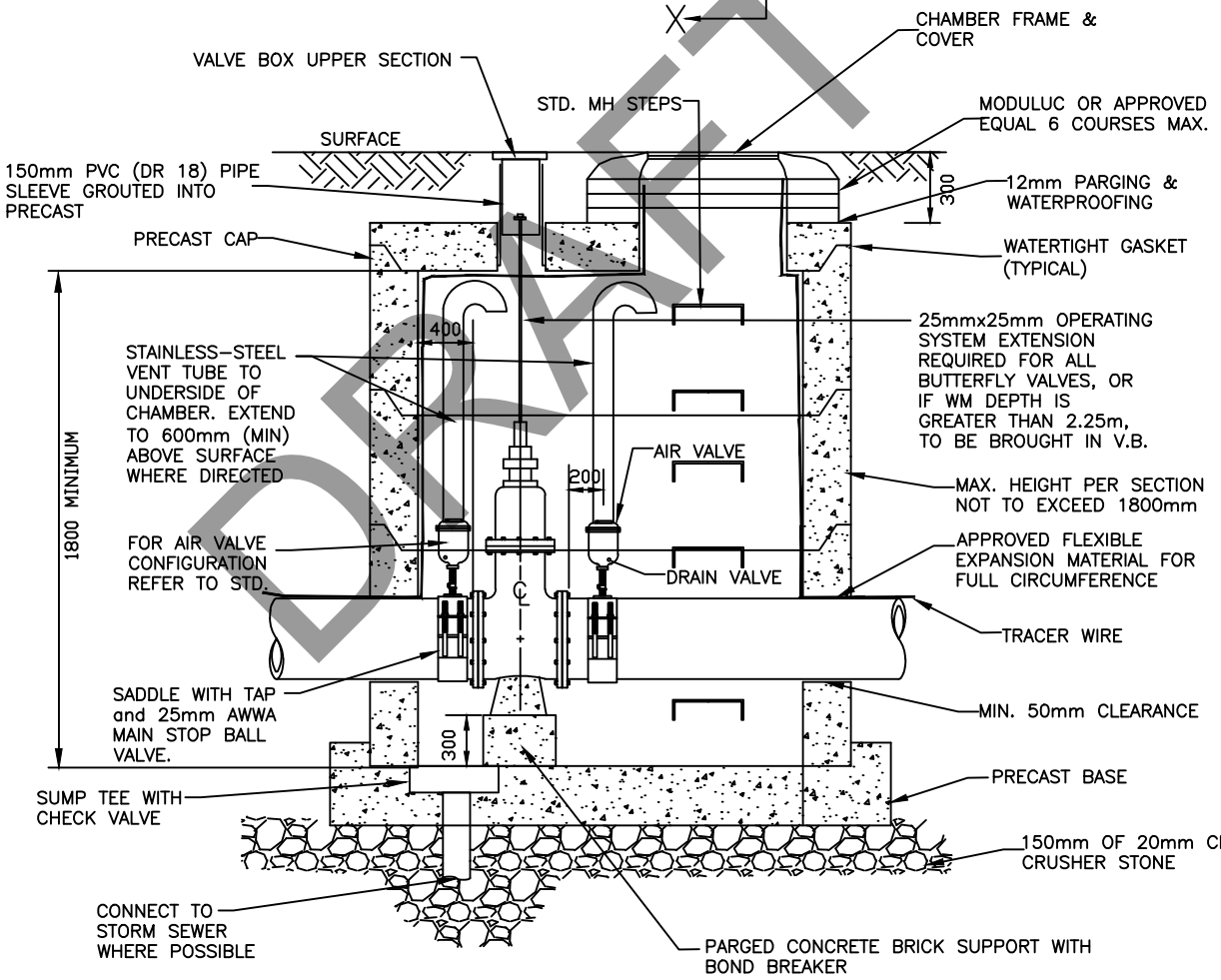


RBX
AIR RELEASE AND
VACUUM BREAK VALVES





SECTION X–X



GENERAL NOTES:

ALL RESTRAINTS IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS

ALL DIMENSION ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN

KING

TOWNSHIP OF KING

COMBINATION AIR AND VALVE CHAMBER

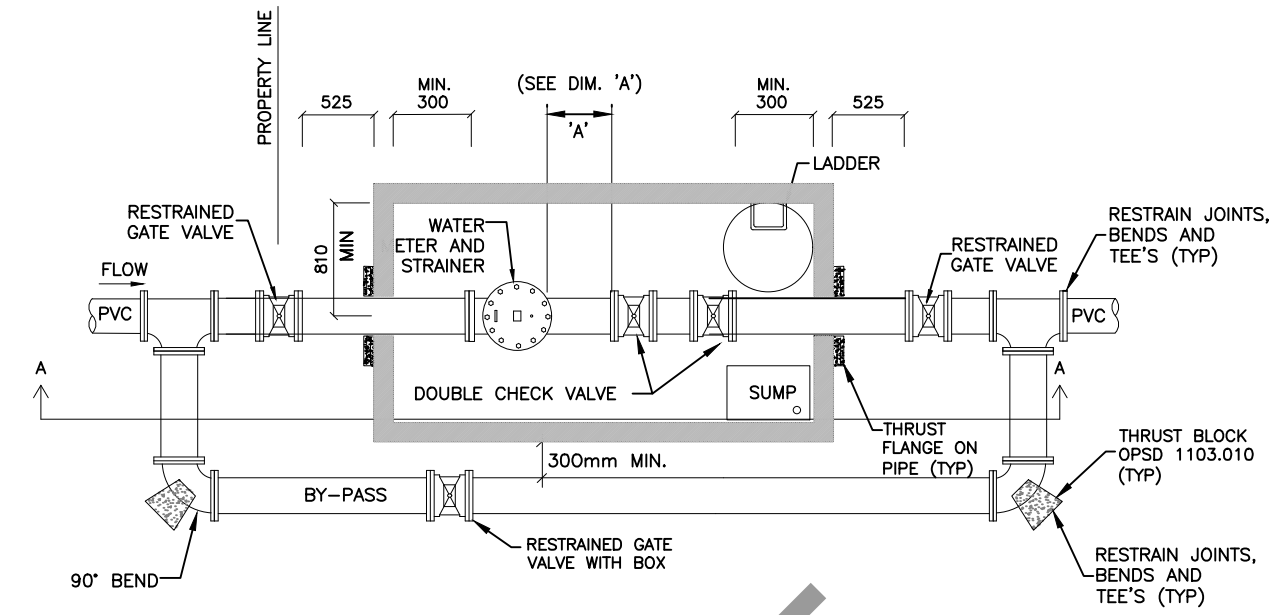
APPROVED

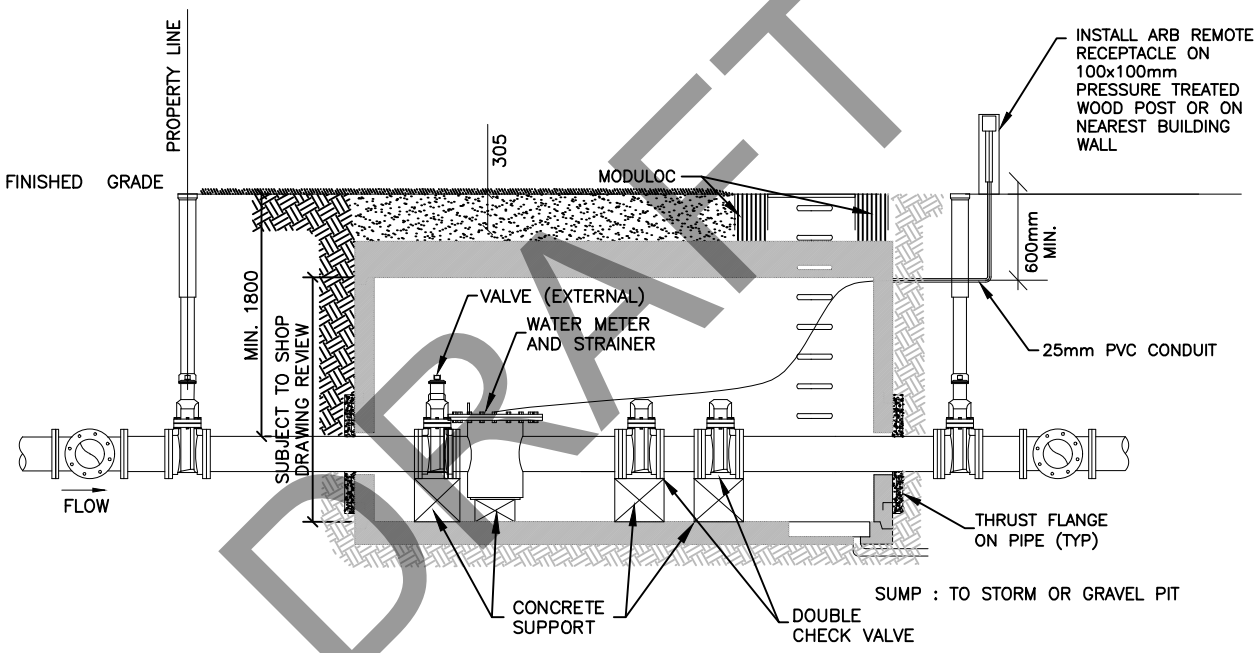
DATE OF ISSUE: OCT. 2010

REVISION:

DATE OF REVISION: JANUARY 2026

DRAWING No.: KS-844





SECTION A–A

NOTES:

1. CONCRETE TO BE 40MPa COMPRESSIVE STRENGTH.
2. MAINTAIN MINIMUM SEPARATION BETWEEN METER AND CHECK VALVE PER DIMENSION 'A'.
3. 25mm PVC OR GALVANIZED METAL CONDUIT TO BE INSTALLED FROM WATER METER TO A SUITABLE LOCATION.
4. DIMENSIONS OF THE CHAMBER, THE WATER METER APPROVED BY THE TOWNSHIP AND THE CHECK VALVE SHALL BE VERIFIED BEFORE INSTALLATION. A SHOP DRAWING PREPARED BY A PROFESSIONAL ENGINEER IS TO BE SUBMITTED TO THE TOWNSHIP FOR APPROVAL.
5. ALL VALVE CHAMBER CUT–OUTS TO BE FILLED WITH CONCRETE BRICKS AND MORTAR THEN PARGED INSIDE AND OUTSIDE WITH 1:3 MORTARS MIX.
6. POURED BASE SHOULD BE TROWEL FINISHED.
7. ALL PIPE JOINTS INSIDE METER CHAMBER SHALL BE FLANGE TO FLANGE.
8. BACKFLOW PREVENTION SHALL BE BY DOUBLE CHECK VALVE ASSEMBLY (DCVA) APPROVED BY THE TOWNSHIP MEETING REQUIREMENTS OF OBC AND CSA–B64.10, WITH ALL TEST PORTS PLUGGED.

CHAMBER OPSD	METER SIZE	DIM. A
1101.012 (1800 X 2400mm)	100mm	410mm
1101.016 (2400 X 3000mm)	150mm	610mm
1101.040 (3600 X 3000mm)	200mm	820mm

TOWNSHIP OF KING

WATER METER INSTALLATION IN CHAMBER (FOR COMBINED FIRE & DOMESTIC)

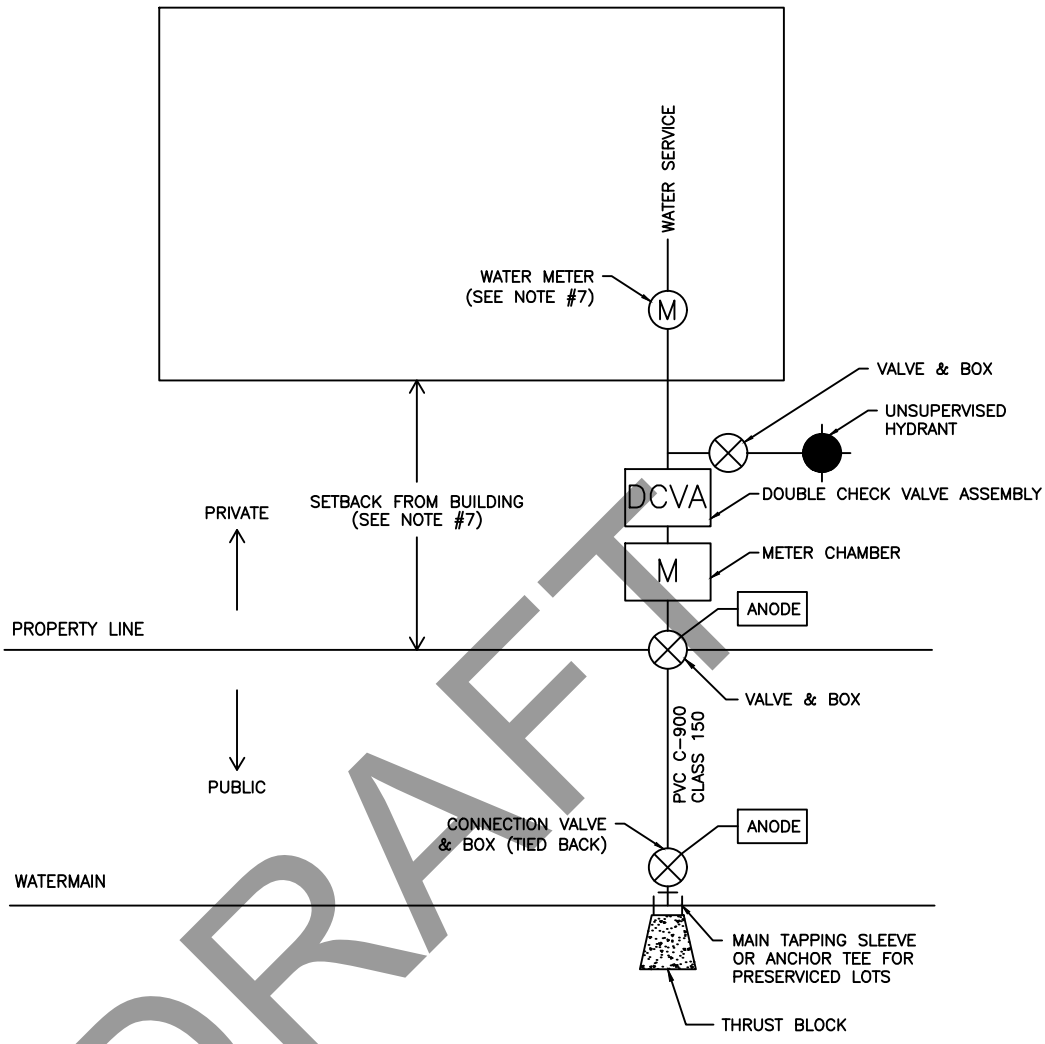
APPROVED

DATE OF ISSUE: JULY 2012

REVISION:

DATE OF REVISION: JANUARY 2026

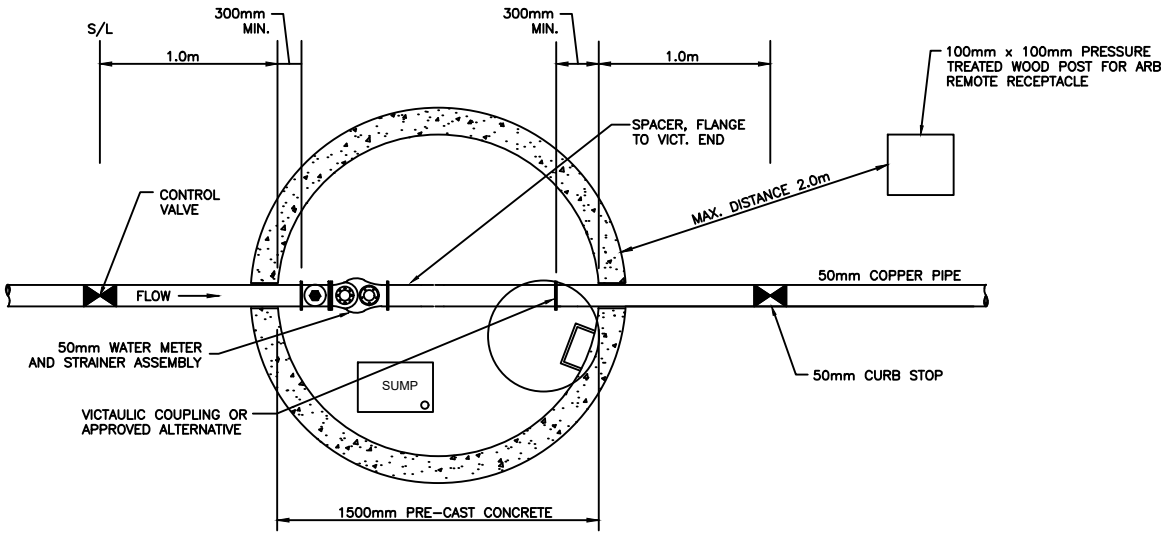
DRAWING No.: KS-845



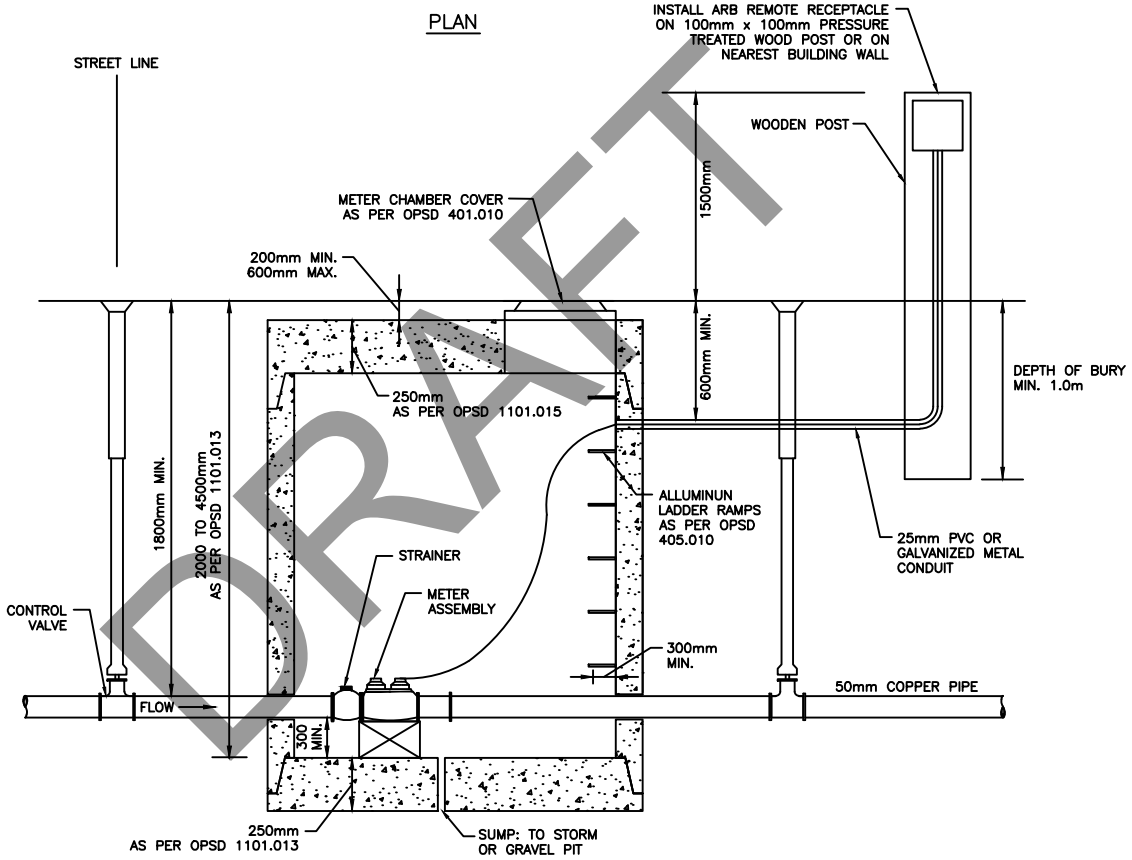
NOTES:

1. REFER TO WATERWORKS MATERIAL SPECIFICATIONS.
2. ANODES TO BE PROVIDED ON ALL IRON FITTINGS.
3. ALL FITTINGS TO BE PROTECTED WITH CORROSION COATINGS.
4. VALVE AT MAIN MUST BE RESTRAINED.
5. TRACER WIRE TO COME UP AT STREET LINE VALVE BOX/CHAMBER.
6. FOR APPROVED WATER METER AND DOUBLE CHECK VALVE ASSEMBLY (DCVA) EQUIPMENT, CONTACT THE WATERWORKS DEPARTMENT.
7. THE SEPARATION DISTANCE BETWEEN THE OUTLET OF A WATER METER AND THE INLET OF A DCVA SHALL MEET MANUFACTURER'S SPECIFICATIONS HOWEVER SHALL BE NO LESS THAN 4 PIPE DIAMETERS.
8. METER AND DCVA CHAMBER SIZES ARE TO BE DETERMINED BY THE DESIGNER AND ARE SUBJECT TO TOWNSHIP APPROVAL. INSTALLATIONS ARE TO BE BASED ON OPSD FOR VALVE CHAMBERS AND ARE TO MEET SITE SPECIFIC CONDITIONS AND MANUFACTURER'S SPECIFICATIONS. DETAILS FOR EACH CHAMBER ARE TO BE INCLUDED ON THE DESIGN DRAWINGS.
9. FOR BUILDINGS WITH MINIMAL SETBACK, THE BACKFLOW PREVENTOR & METER MAY BE LOCATED INSIDE THE BUILDING ACCORDING TO THE BUILDING CODE, AT THE DISCRETION OF THE DIRECTOR.
10. WATER CONNECTIONS ON PRIVATE SIDE ARE GOVERNED BY BUILDING CODES AND ARE SUBJECT TO REQUIREMENTS FROM THE DIRECTOR.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE
	WATER SERVICE CONNECTIONS FOR SINGLE ICI / COMMON ELEMENT CONDOMINIUM BUILDING	REVISION	DRAWING No. KS-846
		DATE OF REVISION JANUARY 2026	



PLAN

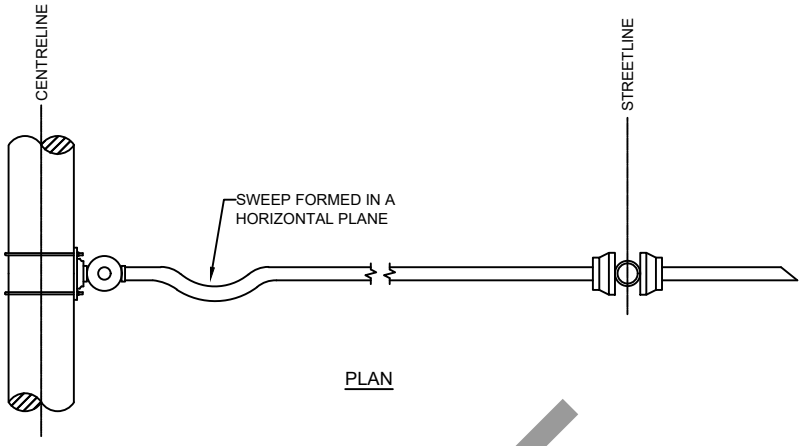


SECTION

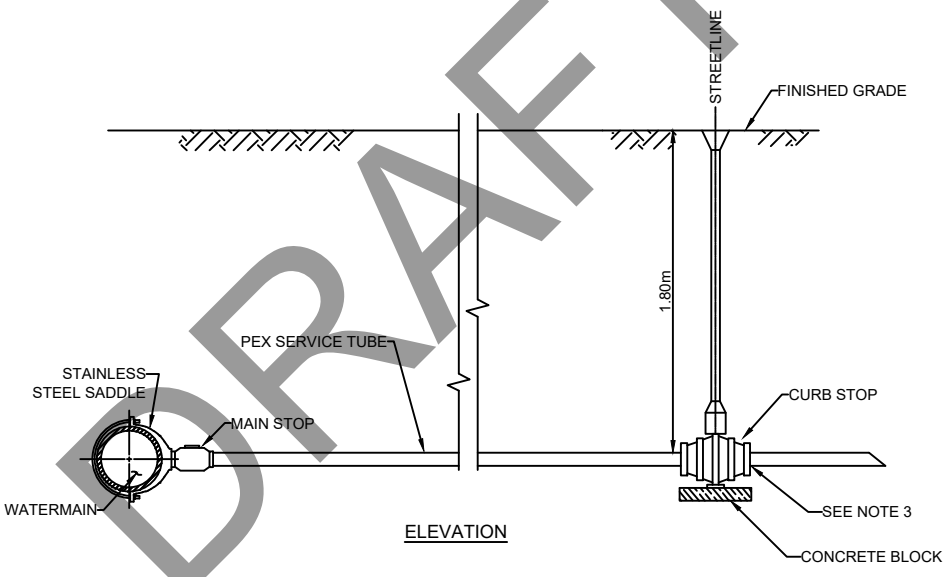
NOTES:

1. ALL PIPE JOINTS INSIDE THE METER CHAMBER SHALL BE FLANGE TO FLANGE UNLESS NOTED OTHERWISE.
2. CONTACT THE WATERWORKS DEPARTMENT FOR APPROVED WATER METER EQUIPMENT.
3. THE CHAMBER SIZING AND DESIGN IS SUBJECT TO THE TOWNSHIP'S APPROVAL OF A STAMPED SHOP DRAWING PREPARED BY THE DESIGN ENGINEER SHOWING THE LAYOUT OF THE APPROVED METER EQUIPMENT.
4. CONCRETE RISER SECTIONS TO BE 32MPa COMPRESSIVE STRENGTH.
5. POURED BASE SHOULD BE TROWEL FINISHED.
6. BACKFLOW PREVENTION SHALL BE PROVIDED IN A SEPARATE CHAMBER BY A DOUBLE CHECK VALVE ASSEMBLY (DCVA) HAVING AWWA CERTIFICATION AND MEETING REQUIREMENTS OF OBC AND CSA-B64.10, WITH ALL TEST PORTS PLUGGED USING A MEANS THAT IS WATER-TIGHT. CONTACT WATERWORKS DEPARTMENT FOR APPROVED DCVA EQUIPMENT.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: MAY 2015
	WATER METER CHAMBER DETAILS (50mm SERVICE LINE)	REVISION	DRAWING No.: KS-847
		DATE OF REVISION: JANUARY 2026	



PLAN

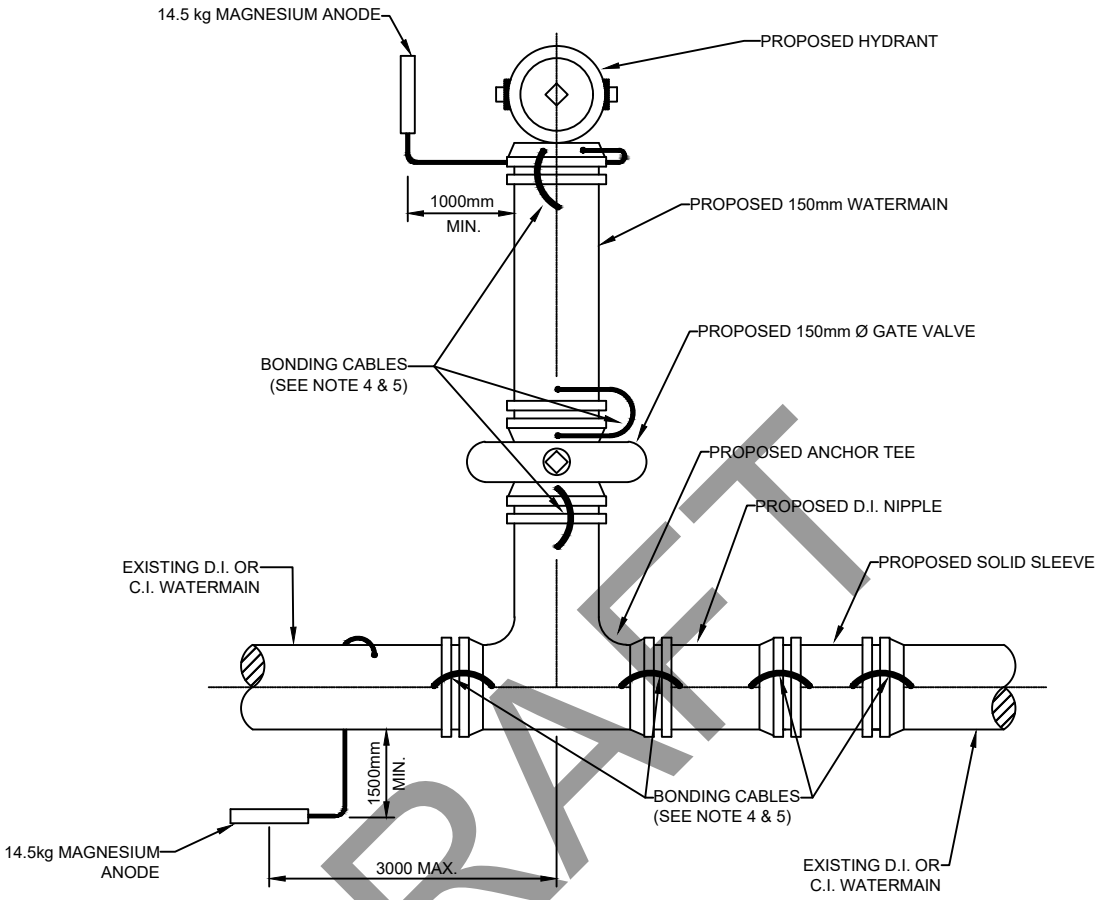


ELEVATION

NOTES:

1. ALL SERVICES TO BE AT 90° TO WATER MAIN UNLESS OTHERWISE SPECIFIED.
2. SERVICE DEPTH TO MEET MINIMUM COVER AS SPECIFIED BY DESIGN STANDARDS.
3. INSTALL 'FORD' SERVICE INSULATOR OR APPROVED EQUAL BETWEEN THE CURB STOP AND THE STREET LINE ONLY IF THE SERVICED BUILDING IS LOCATED 7.6m OR MORE FROM THE STREETLINE.
4. NO DIRECT TAPPING OF PVC WATER MAINS. ALL CONNECTIONS TO PVC PIPE TO BE MADE USING AN APPROVED WIDE BAND SERVICE SADDLE.
5. TRACER WIRE FOR PEX PIPE SHALL BE PROVIDED PER SECTION D6.02 OF THE DESIGN CRITERIA INCLUDING CONNECTIONS BY A SET SCREW AT EACH MAIN STOP AND CURB STOP AND BRINGING THE WIRE TO THE SURFACE AT EACH WATER BOX.
6. CATHODIC PROTECTION TO BE PROVIDED PER SECTION D7 OF THE DESIGN CRITERIA.
7 COPPER SERVICES ARE TO BE TYPE K SOFT COPPER MATERIAL.

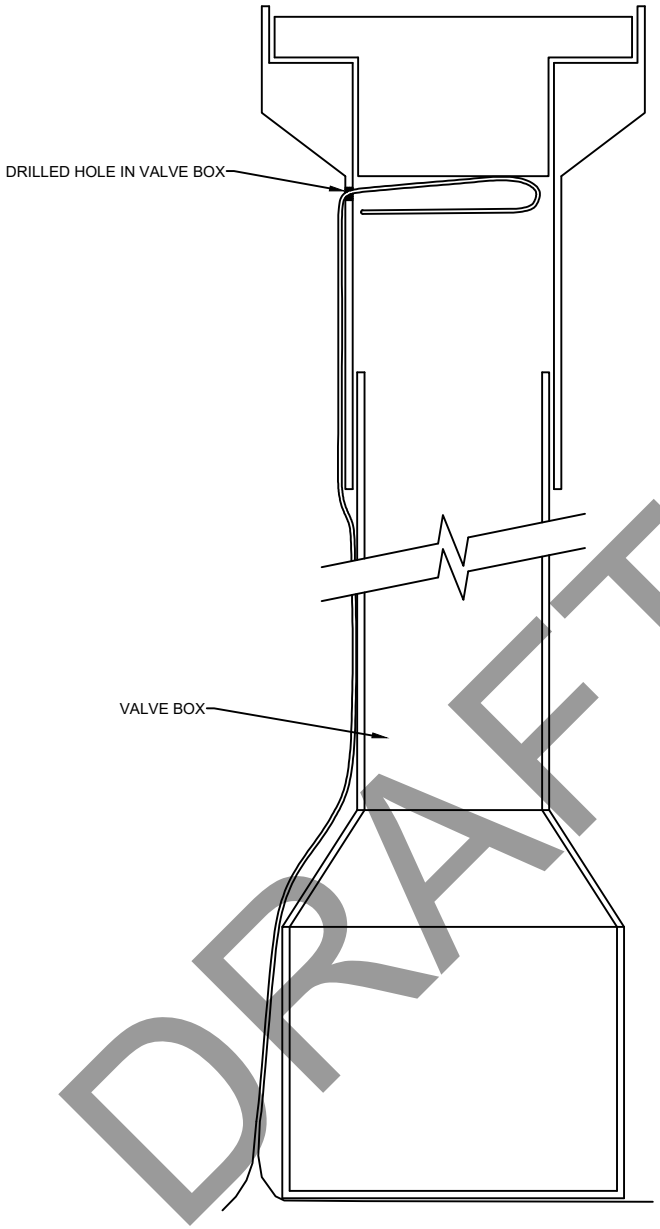
KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: JAN. 1990
	WATER SERVICE (20mm - 50mm DIAMETER)	REVISION	DRAWING No.: KS-851
		DATE OF REVISION: JANUARY 2026	



NOTES:

1. ANODE TO BE PLACED AT LEAST 1.0m AWAY FROM THE FITTINGS AND AS DEEP AS THE BOTTOM OF THE FITTINGS. MINIMUM DISTANCE BETWEEN ANODES TO BE 1.0m.
2. ALL FITTINGS TO BE COATED WITH BITUMINOUS SEALER ON SITE.
3. PROVIDE 0.20mm POLYETHYLENE BOND BREAKER BETWEEN CONCRETE AND FITTINGS.
4. ALL THERMITE WELD CONNECTIONS TO BE COATED WITH "ROYBOND 747" PRIMER AND ROYSTON "HANDY CAP" OR APPROVED EQUAL.
5. BONDING CABLE TO BE NO. 6, SEVEN STRAND COATED COPPER WIRE, CAD WELD TO FITTINGS.

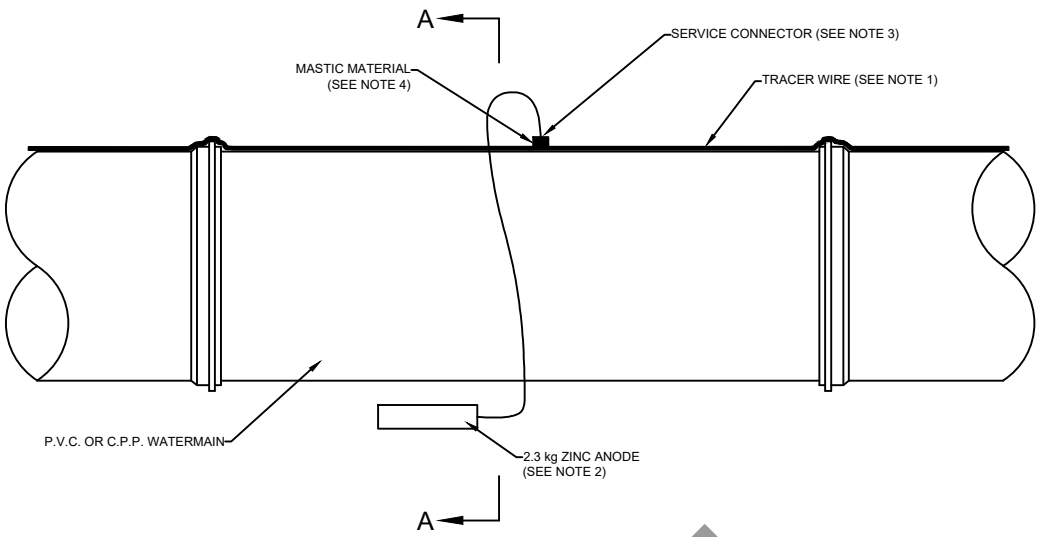
XING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE JAN. 1990
	CORROSION PROTECTION FOR HYDRANT CUT INTO AN EXISTING D.I. OR C.I. WATERMAIN	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-854



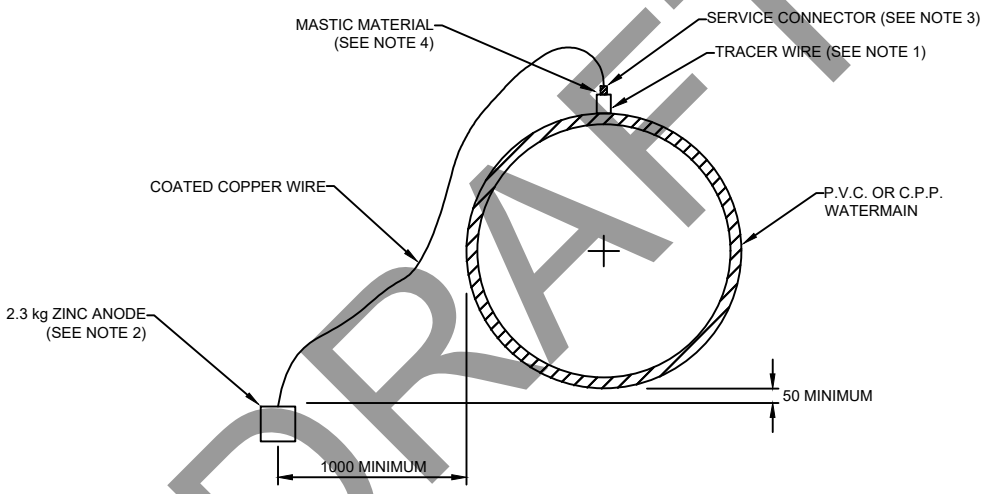
NOTES:

1. TRACER WIRE - #12 GAUGE STRANDED, C.S.A. TYPE T.W.H.
2. TRACER WIRE TO BE INSTALLED OUTSIDE LOWER VALVE BOX AND BROUGHT INTO UPPER SECTION OF VALVE BOX AND LOOPED AT TOP. LOOP TO BE A MINIMUM 450mm IN LENGTH.
3. CONNECTORS USED FOR SPLICING TRACER WIRE SHALL BE WING NUT TYPE, WITH NYLON SHELL AND NON-CORROSIVE STEEL WIRE SPRING.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: JAN. 1990
	TRACER WIRE ARRANGEMENT AT VALVE BOX FOR P.V.C OR C.P.P. WATERMAIN	REVISION	DRAWING No.: KS-860
		DATE OF REVISION: JANUARY 2026	



ELEVATION

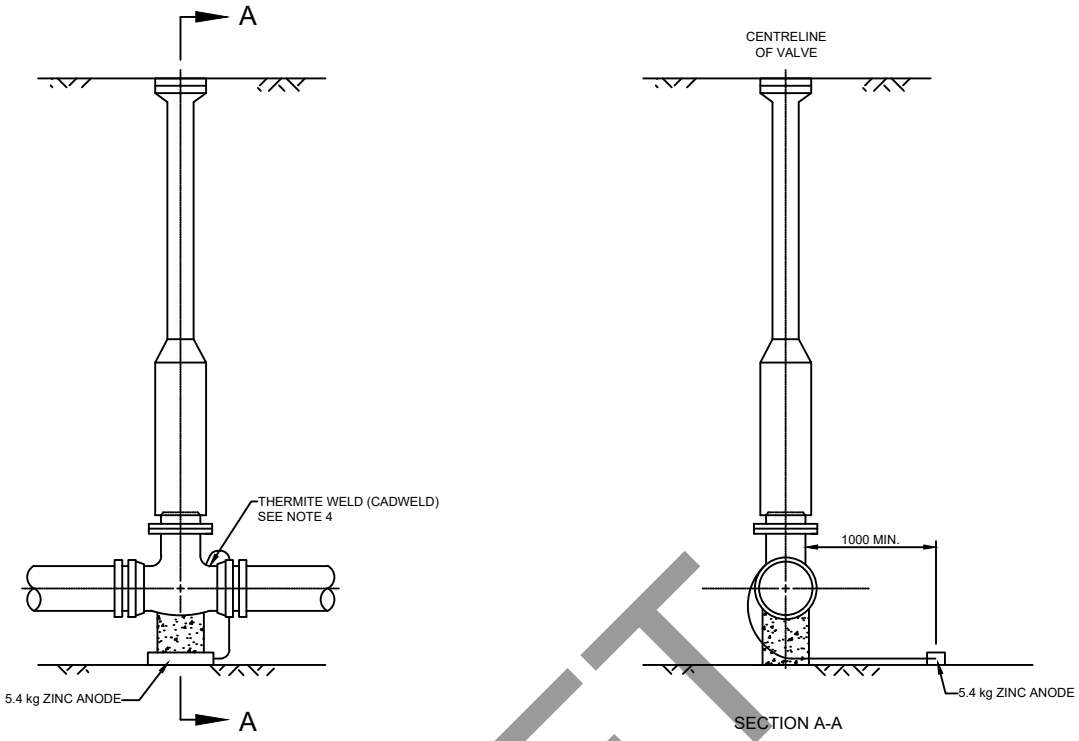


SECTION A-A

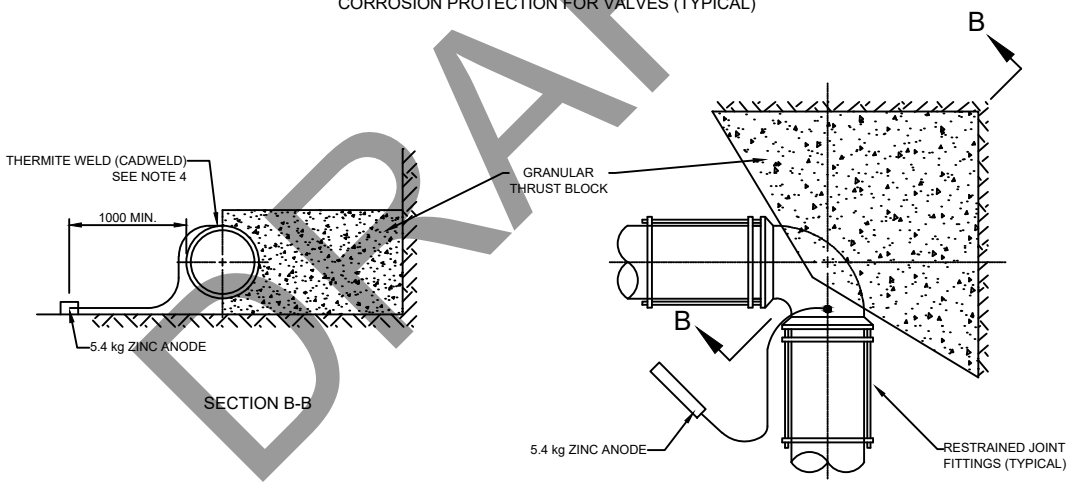
NOTES:

1. TRACER WIRE - #12 GAUGE STRANDED, C.S.A. TYPE T.W.H.
2. ONE 2.3 kg ZINC ANODE TO BE SUPPLIED AND INSTALLED IN A MANNER APPROVED BY THE TOWNSHIP ENGINEER FOR EVERY 500m OF TRACER WIRE INSTALLED.
3. SERVICE CONNECTOR TO BE A 'BURNDY SERVIT' TYPE K.S. MODEL KS20 COPPER OR APPROVED EQUAL.
4. CONNECTOR SPLICE TO BE WRAPPED WITH 'SCOTCHFILL' ELECTRICAL PUTTY OR APPROVED EQUAL.
5. ALL DIMENSIONS ARE IN MILLIMETRES.
6. THE LOCATION OF EACH TRACER WIRE ANODE MUST BE DETAILED ON THE CONTRACT DRAWINGS.

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE JAN. 1990
	CORROSION PROTECTION FOR TRACER WIRES ON P.V.C. OR C.P.P. WATERMAINS	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-870



CORROSION PROTECTION FOR VALVES (TYPICAL)

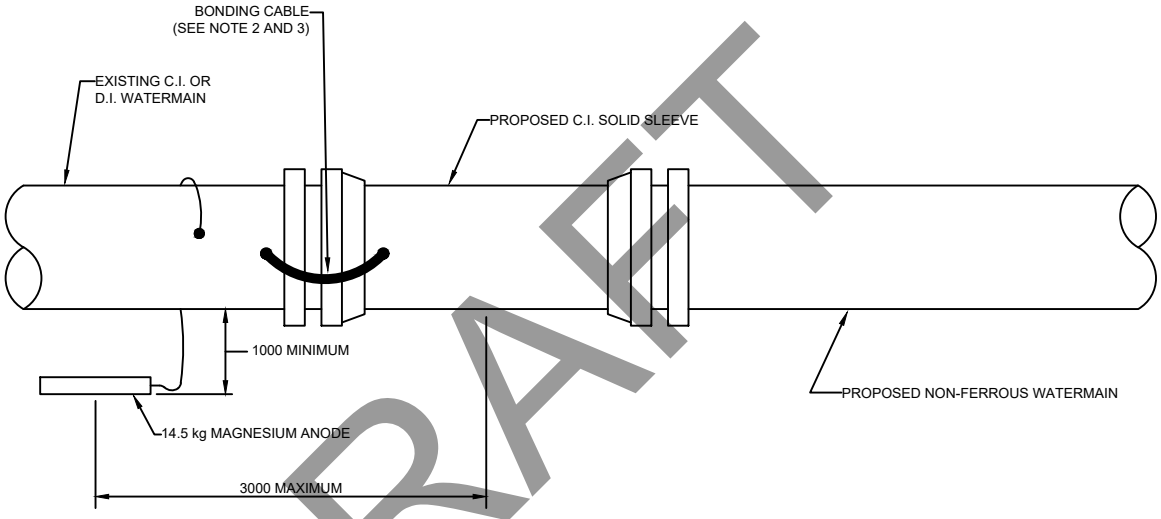


CORROSION PROTECTION FOR FITTINGS (TYPICAL)

NOTES:

1. ANODE TO BE PLACED AT LEAST 1.0m AWAY FROM THE FITTING AND AS DEEP AS THE BOTTOM OF THE FITTINGS. MINIMUM DISTANCE BETWEEN ANODES TO BE 1.0m.
2. ALL VALVES AND FITTINGS TO BE COATED WITH BITUMINOUS SEALER PRIOR TO INSTALLATION ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES.
4. PROVIDE 0.2m POLYETHYLENE BOND BREAKER BETWEEN CONCRETE AND FITTINGS.
5. ALL THERMITE WELD CONNECTIONS TO BE COATED WITH 'ROYBOND 747' PRIMER AND ROYSTON 'HANDY CAP' OR APPROVED EQUAL.

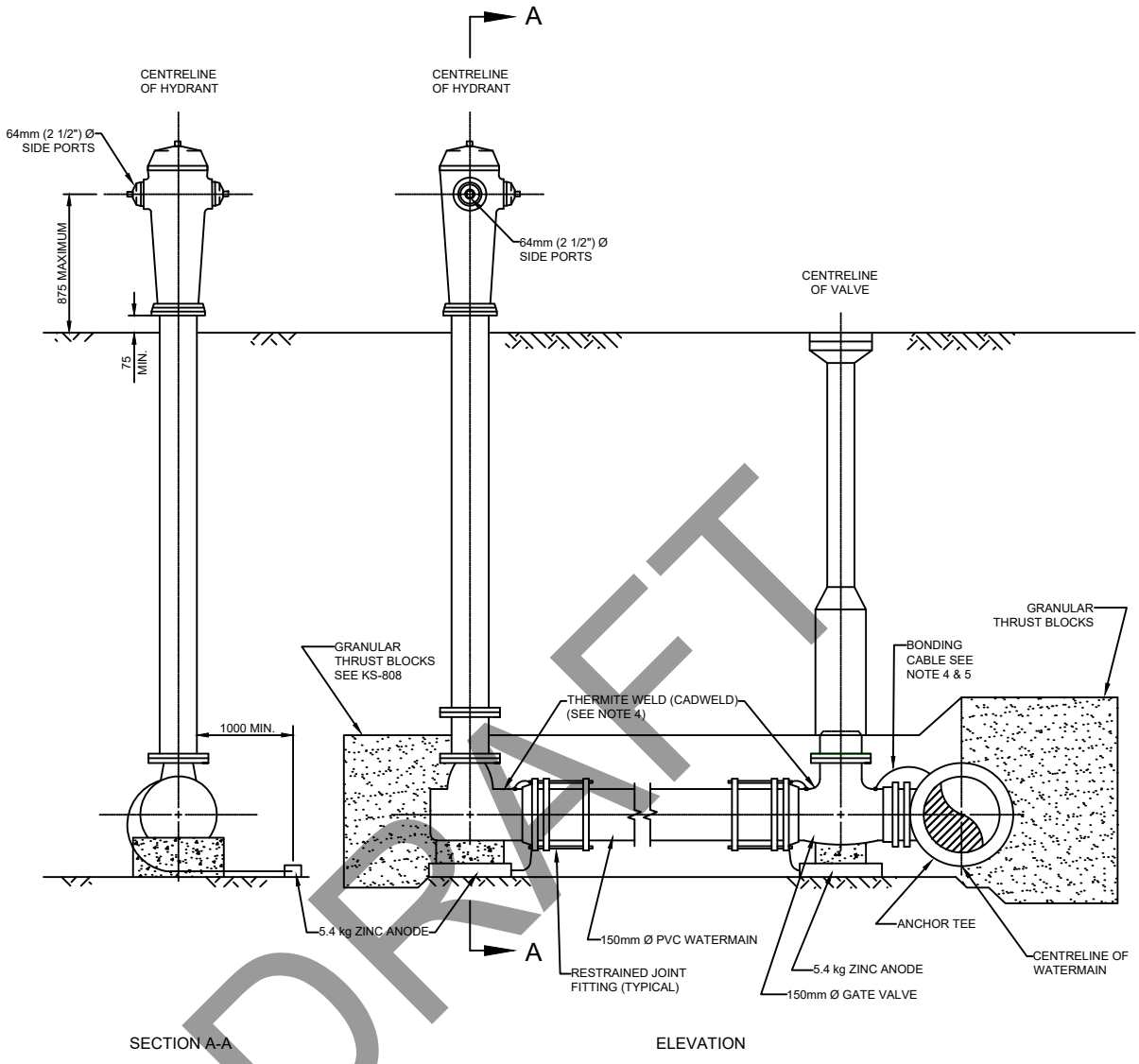
KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE JAN. 1990
	CORROSION PROTECTION FOR VALVES & FITTINGS ON NON-FERROUS PIPE	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-871



NOTES:

1. ANODE TO BE PLACED AT LEAST 1.0m AWAY FROM THE FITTING AND AS DEEP AS THE BOTTOM OF THE FITTINGS. MINIMUM DISTANCE BETWEEN ANODES TO BE 1.0m.
2. ALL THERMITE WELD CONNECTIONS TO BE COATED WITH 'ROYBOND 747' PRIMER AND ROYSTON 'HANDY CAP' OR APPROVED EQUAL.
3. BONDING CABLE TO BE No. 6 SEVEN STRAND COATED COPPER WIRE, CADWELDED TO FITTINGS.
4. ALL DIMENSIONS IN MILLIMETRES.

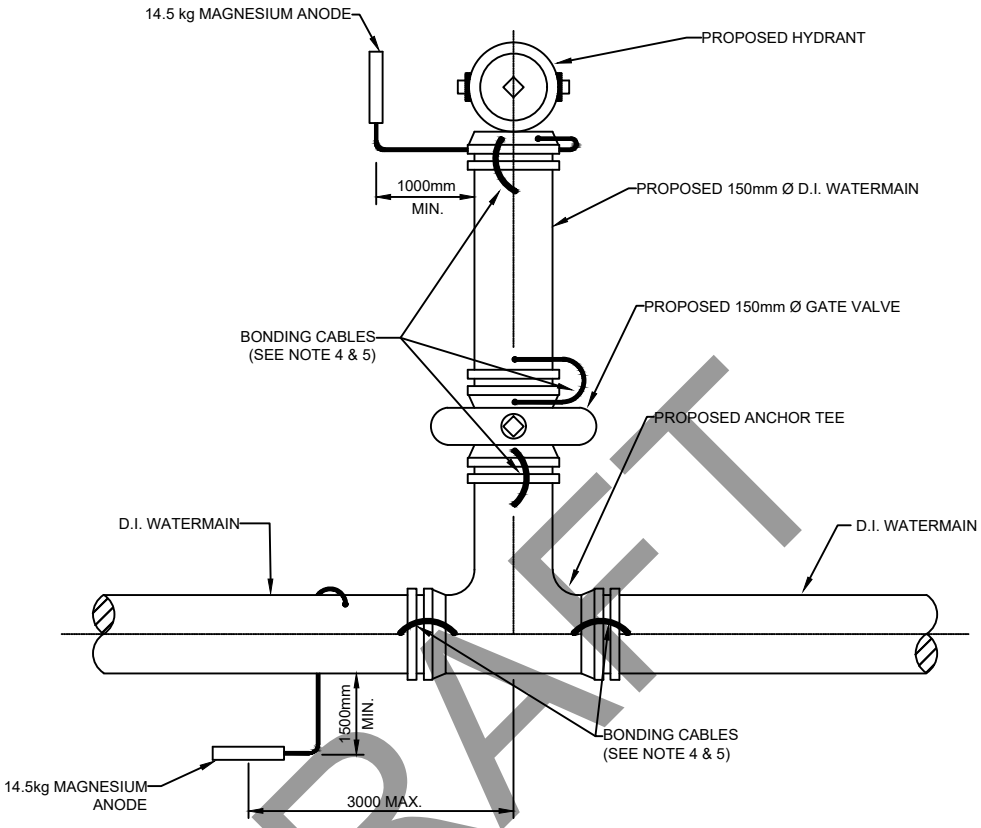
KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: JAN. 1990
	CORROSION PROTECTION FOR EXISTING FERROUS WATERMAIN CONNECTED TO PROPOSED NON-FERROUS WATERMAIN	REVISION	DRAWING No.: KS-873
		DATE OF REVISION: JANUARY 2026	



NOTES:

1. ANODE TO BE PLACED AT LEAST 1.0m AWAY FROM THE FITTINGS AND AS DEEP AS THE BOTTOM OF THE FITTINGS. MINIMUM DISTANCE BETWEEN ANODES TO BE 1.0m
2. ALL FITTINGS TO BE COATED WITH BITUMINOUS SEALER ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES.
4. ALL THERMITE WELD CONNECTIONS TO BE COATED WITH 'ROYBOND 747' PRIMER AND ROYSTON 'HANDY CAP' OR APPROVED EQUAL.
5. BONDING CABLE TO BE No. 6 SEVEN STRAND COATED COPPER WIRE, CADWELDED TO FITTINGS.

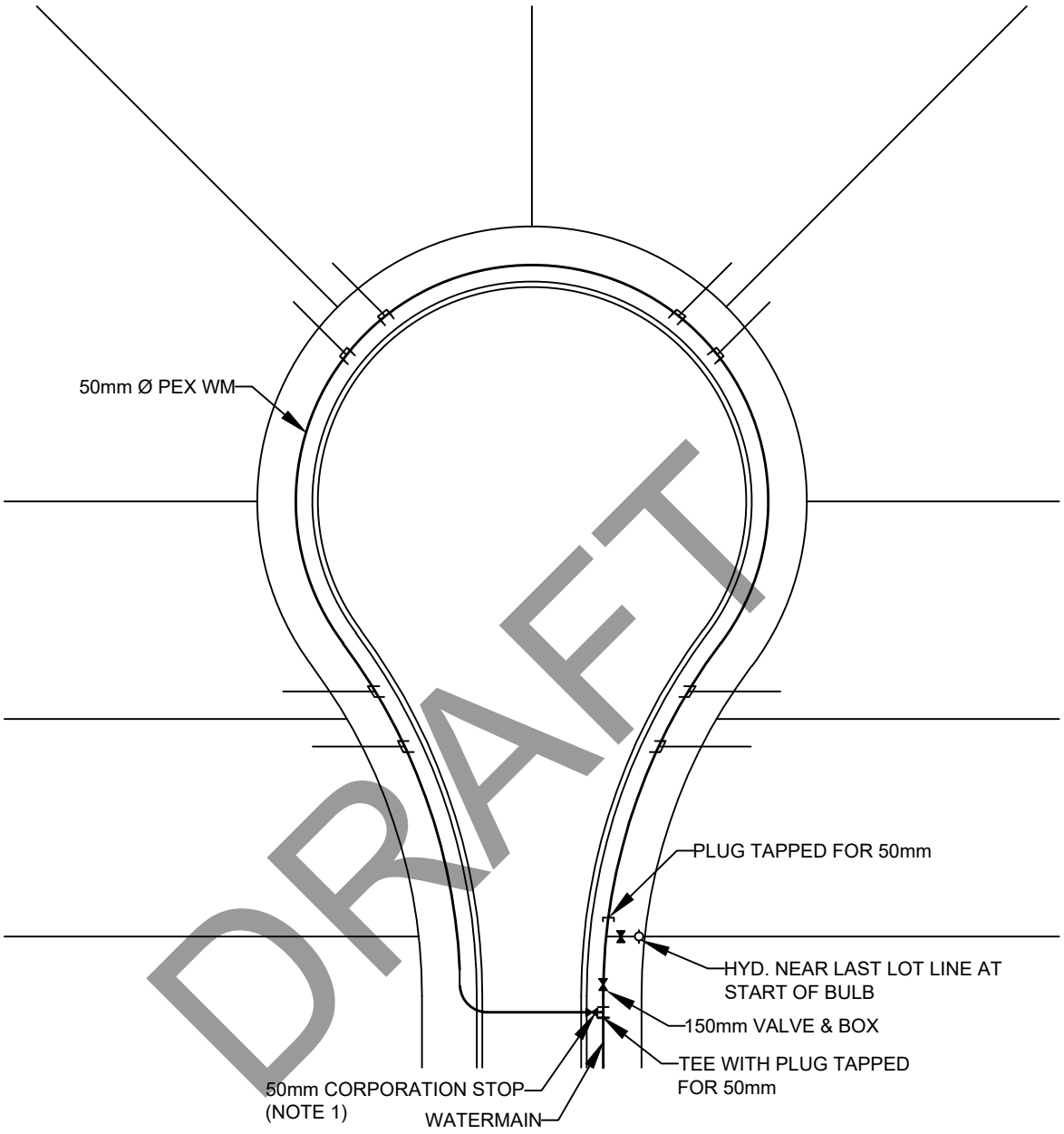
KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE JAN. 1990
	CORROSION PROTECTION FOR HYDRANT ASSEMBLY ON NON-FERROUS PIPE	REVISION DATE OF REVISION JANUARY 2026	DRAWING No. KS-874



NOTES:

1. ANODE TO BE PLACED AT LEAST 1.0m AWAY FROM THE FITTINGS AND AS DEEP AS THE BOTTOM OF THE FITTINGS. MINIMUM DISTANCE BETWEEN ANODES TO BE 1.0m
2. ALL FITTINGS TO BE COATED WITH BITUMINOUS SEALER ON SITE.
3. PROVIDE 0.20mm POLYETHYLENE BOND BREAKER BETWEEN CONCRETE AND FITTINGS.
4. ALL THERMITE WELD CONNECTIONS TO BE COATED WITH "ROYBOND 747" PRIMER AND ROYSTON "HANDY CAP" OR APPROVED EQUAL.
5. BONDING CABLE TO BE No. 6, SEVEN STRAND COATED COPPER WIRE, CAD WELD TO FITTINGS.

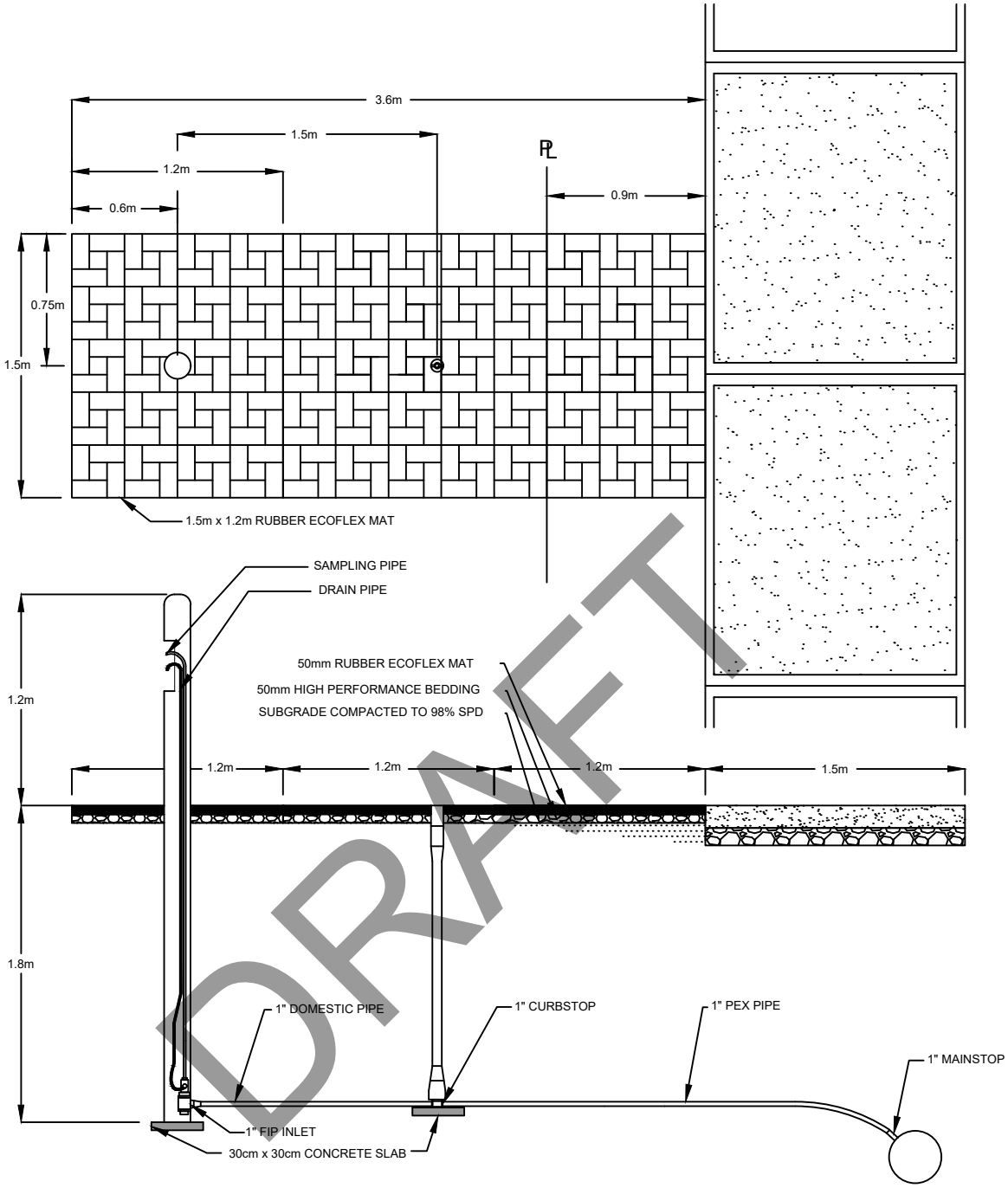
KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: JAN. 1990
	CORROSION PROTECTION FOR HYDRANTS OFF OF D.I. WATERMAINS	REVISION	DRAWING No.: KS-875
		DATE OF REVISION: JANUARY 2026	



NOTES:

1. VALVE AND BOX IS NOT TO BE LOCATED WITHIN TRAVELED PORTION OR ROAD.

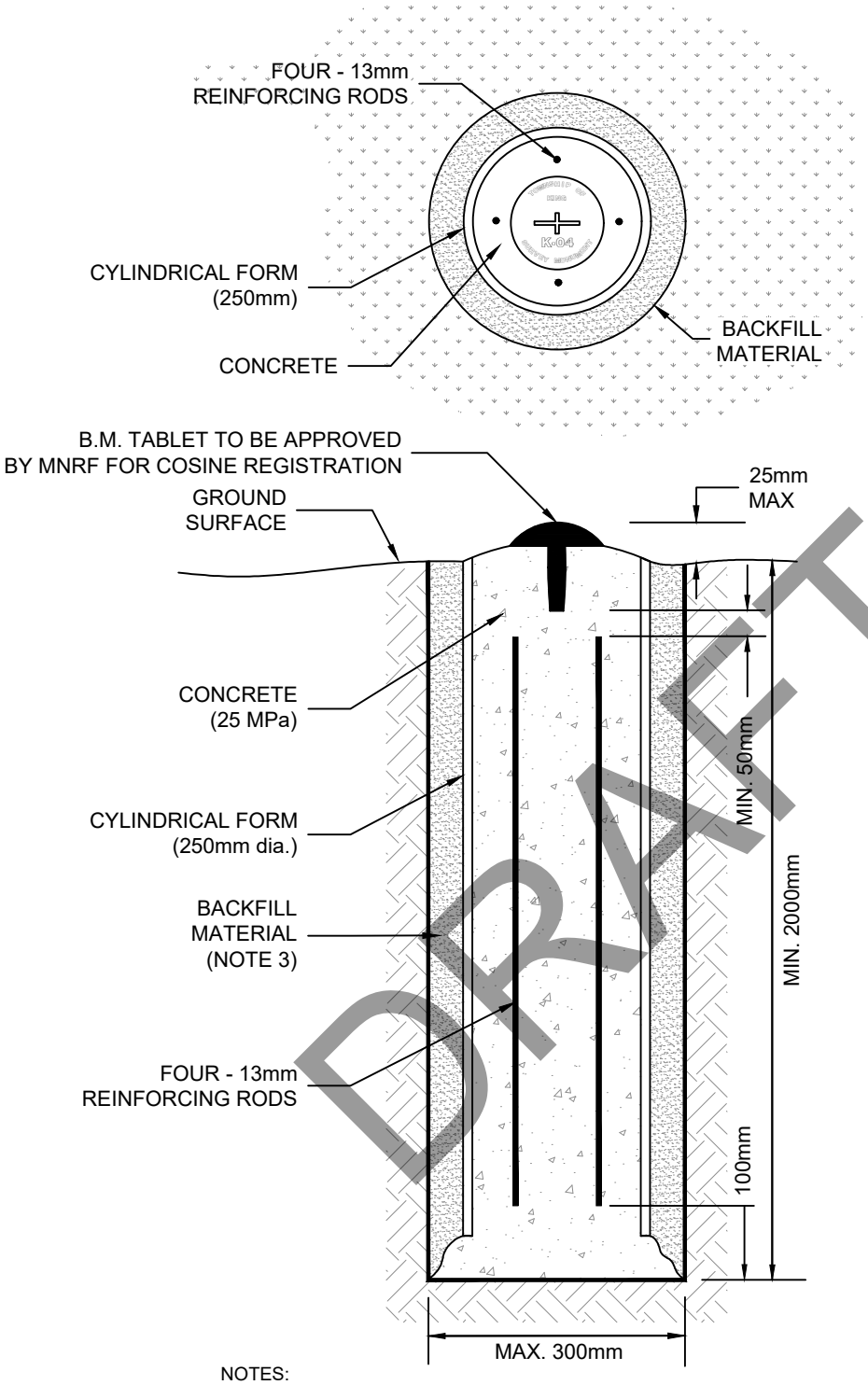
KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE
	WATERMAIN CONFIGURATION FOR DEAD END CUL-DE-SACS	REVISION	DRAWING No. KS-877
		DATE OF REVISION JANUARY 2026	



NOTES:

1. SAMPLING STATIONS TO BE WITH 'TEST TAP' (CROMER), OR EQUIVALENT.
2. SAMPLING STATION INSTALLATION SHALL BE WITH A 25mm FIP INLET AND 12.5mm UNTHREADED BLOW OFF AND SAMPLING BIB.
3. STATION SHALL INCLUDE A LOCKABLE CAST ALUMINUM ENCLOSURE WITH HINGED OPENINGS AND A CAST ALLUMINUM PEDESTAL ALL GREEN IN COLOUR.
4. THE STATION SHALL NOT REQUIRE A KEY FOR OPERATION ONCE THE ENCLOSURE IS OPEN.
5. ALL OPERATIONAL COMPONENTS AND WETTED MATERIALS OF THE STATION SHALL BE STAINLESS STEEL AND OPERATIONAL AND REPLACEABLE FROM THE GROUND SURFACE WITHOUT EXCAVATION.
6. GASKET AVAILABLE FROM THE SUPPLIER IS TO BE INSTALLED BETWEEN THE CONCRETE SURFACE AND THE PEDESTAL BASE.
7. CONFIRM WITH SUPPLIER AND INCLUDE WITH THE INSTALLATION A 100mm DIA. PVC PIPE FOR THE ENCLOSURE BASE CLAMP WHERE REQUIRED.
8. CORROSION PROTECTION OF BURIED PIPE COMPONENTS IS REQUIRED PRIOR TO INSTALLATION PER MANUFACTURER'S SPECIFICATIONS USING BITUMINOUS SPRAY TAR OR APPROVED EQUAL.
9. NO LEAD FITTINGS (MAINSTOP, CURBSTOP ETC.) ARE TO BE USED.

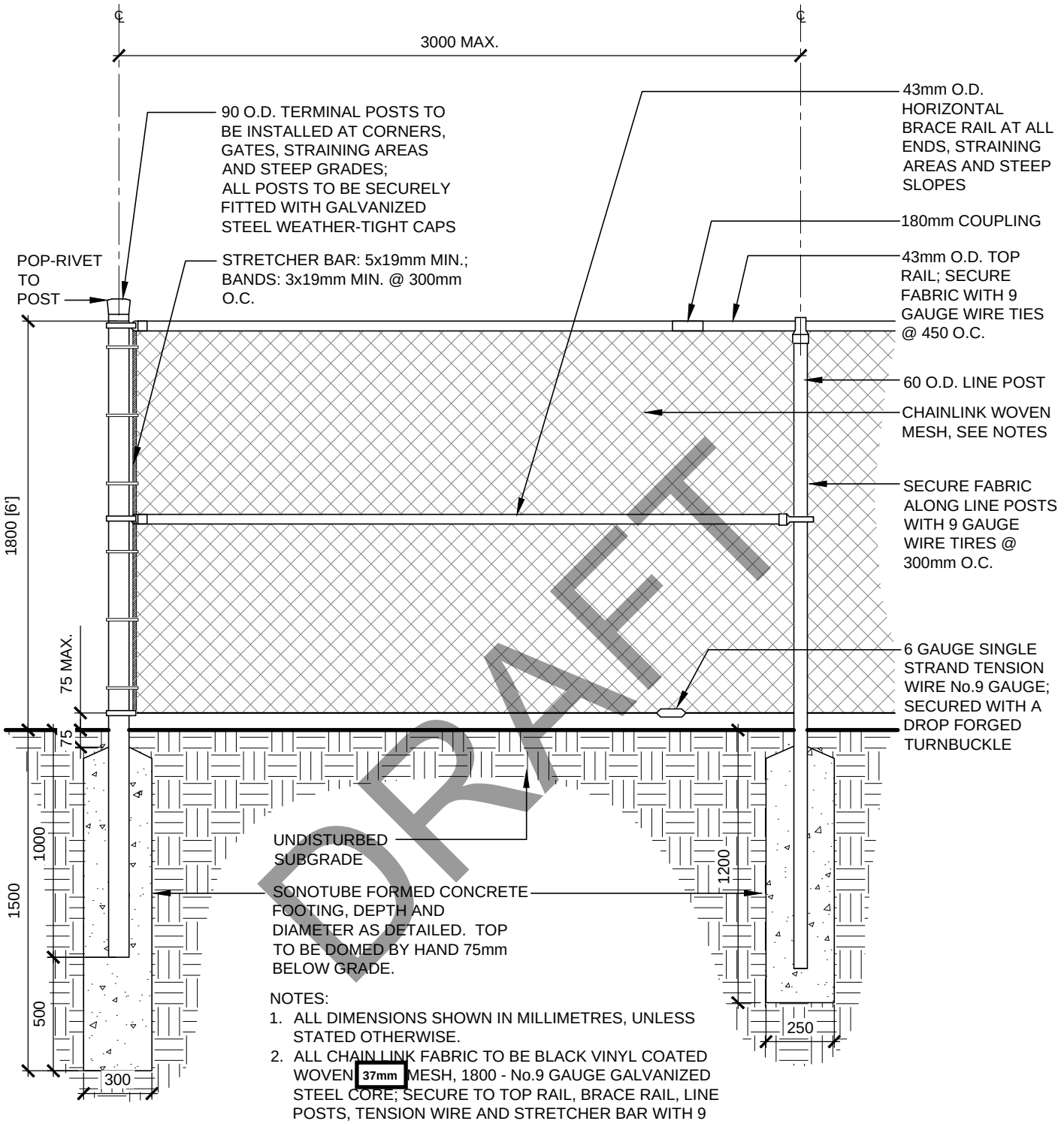
KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: FEB. 2010
	SIDE VIEW OF SAMPLING STATION INSTALLATION	REVISION	DRAWING No. KS-878
		DATE OF REVISION: JANUARY 2026	



NOTES:

1) CONTACT THE TOWNSHIP OF KING FOR SUBMISSION REQUIREMENTS AND FOR LOCATION OF BENCHMARK MONUMENT
2) NOTIFY THE TOWNSHIP OF KING FOR INSPECTION PRIOR TO POURING OF CONCRETE.
3) BENCH MARK (B.M.) NUMBER MUST BE PUNCHED BY INSTALLER ON THE TABLET PRIOR TO INSTALLATION
4) BACKFILL MATERIAL TO BE LIMESTONE SCREENING OR FINE GRAVEL AND REQUIRED TO BE WELL TAMPED

KING	**TOWNSHIP OF KING**	APPROVED	DATE OF ISSUE: NOV. 2007
	BENCHMARK MONUMENT DETAILS	REVISION	DRAWING No.: KS-900
		DATE OF REVISION: JANUARY 2026	



NOTES:

1. ALL DIMENSIONS SHOWN IN MILLIMETRES, UNLESS STATED OTHERWISE.
2. ALL CHAIN LINK FABRIC TO BE BLACK VINYL COATED WOVEN **37mm** MESH, 1800 - No.9 GAUGE GALVANIZED STEEL CORE; SECURE TO TOP RAIL, BRACE RAIL, LINE POSTS, TENSION WIRE AND STRETCHER BAR WITH 9 GAUGE WIRE TIES, KNUCKLED.
3. ALL FENCE POSTS AND PIPE TO BE SCHEDULE '40' GALVANIZED PIPE.
4. ALL FENCE COMPONENTS TO BE FINISHED WITH BLACK GLOSS ENAMEL ELECTROSTATICALLY APPLIED.
5. NO PLASTIC FITTINGS OR COMPONENTS TO BE USED.
6. CONCRETE FOOTINGS TO BE 30 MPa AT 28 DAYS.

DWG. TITLE

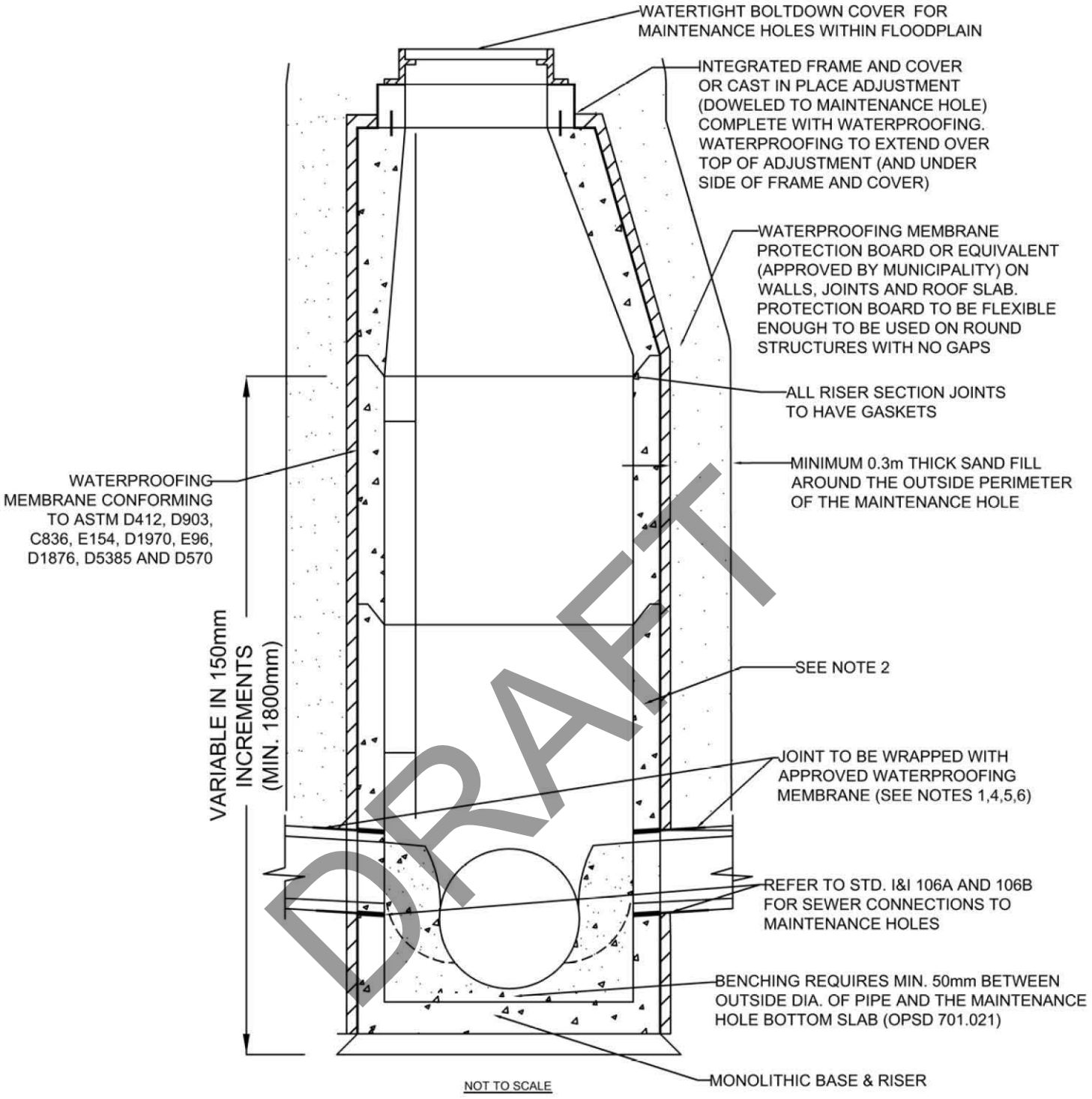
CHAIN LINK FENCE

KING

PARKS, RECREATION AND CULTURE

STANDARD DETAIL

DATE	JANUARY	DWG. No.
SCALE	N.T.S.	MODIFIED SD-501
REVISION No.	1	

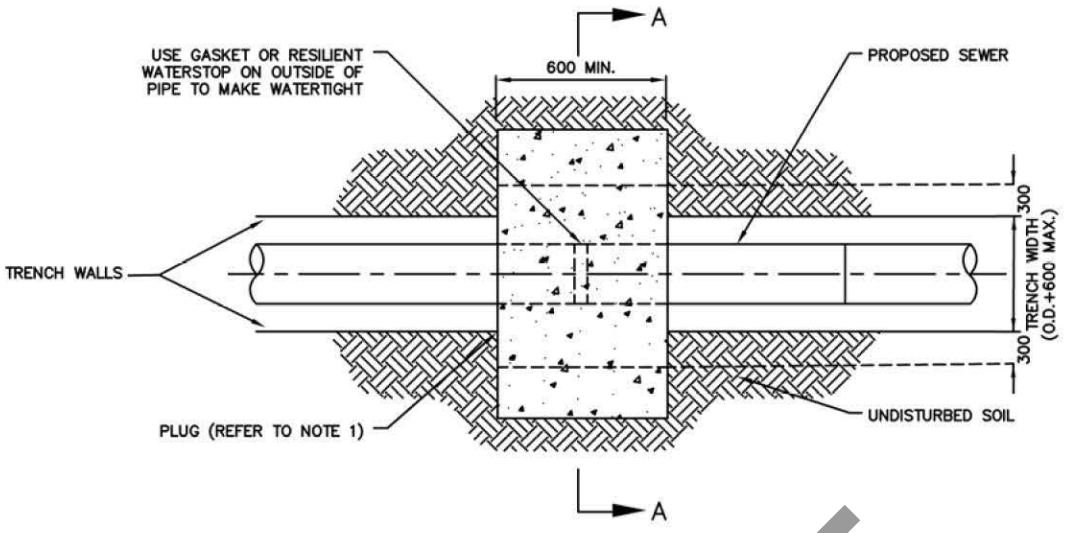


NOT TO SCALE

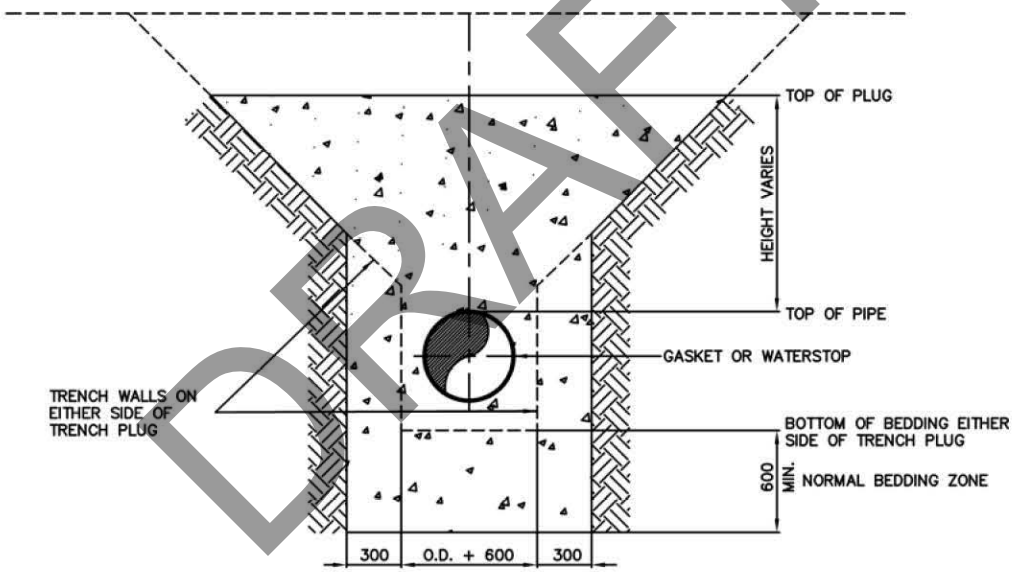
NOTES:

1. MAINTENANCE HOLES LOCATED WITHIN FLOODPLAINS AND/OR AREAS WITH HIGH GROUNDWATER, DEFINED AS, HYDROSTATIC ORESSURE GREATER THAN 85 KPA AND/OR WHERE THE SEWER OBVERT IS 0.5M OR MORE BELOW THE SEASON HIGH GROUNDWATER TABLE ARE TO BE FULLY WATERPROOFED. THE ENTIRE EXTERNAL SURFACE AREA OF THE MAINTENANCE HOLE, INCLUDING ALL WALLS, JOINTS, ADJUSTMENT SECTIONS AND ROOF SLAB SHALL BE WRAPPED IN A WATERPROOFING MEMBRANE. WACH WATERPROOFING MEMBRANE LAYER SHALL OVERLAP A MINIMUM OF 0.15M.
2. MAXIMUM RISER HEIGHT AS PRACTICAL SHALL BE USED TO ALLEVIATE INFILTRATION THROUGH RISER SEGMENT JOINTS
3. REFER TO STANDARDS NO. I&I-106A/B FOR MAINLINE TO MAINTENANCE HOLE CONNECTIONS
4. FLEXIBLE SEWER PIPE CONNECTIONS TO NEW MAINTENANCE HOLES SHALL HAVE FACTORY INSTALLED RESILIENT CONNECTORS IN THE STRUCTURE OPENINGS
5. FLEXIBLE SEWER PIPE CONNECTIONS TO EXISTING MAINTENANCE HOLES SHALL HAVE WATER STOPS INSTALLED AND THE ANNULAR SPACE FILLED WITH PRE-PACKAGED NON-SHRINK GROUT FLUSH WITH THE EXTERNAL WALLS OF THE MAINTENANCE HOLES. WATERPROOFING MEMBRANE SHALL BE INSTALLED AND EXTEND 0.3m BEYOND THE POINT OF CONNECTION AROUND THE PIPE AND ON THE MAINTENANCE HOLES EXTERNAL WALLS
6. RIGID SEWER PIPE MAINLINE CONNECTIONS TO MAINTENANCE HOLES SHALL BE WITH A RESILIENT CONNECTOR FOR NEW INSTALLATIONS WHERE PIPE SIZES PERMIT. THE ANNULAR SPACE SHALL BE MORTARED WITH PRE-PACKAGED NON-SHRINK GROUT WHERE A RESILIENT CONNECTOR CANNOT BE INSTALLED OR FOR CONNECTIONS TO EXISTING MAINTENANCE HOLES. WATERPROOFING MEMBRANE SHALL BE INSTALLED AND EXTEND 0.3M BEYOND THE POINT OF CONNECTION AROUND THE PIPE AND ON THE MAINTENANCE HOLE EXTERNAL WALL.
7. BENCHING DETAILS REFER TO OPSD 701.021
8. REFER TO OTHER MAINTENANCE HOLE STANDARDS FOR SIZING, CONFIGURATIONS AND STRUCTURAL ELEMENTS

	WATERPROOFING MEMBRANE SYSTEM FOR MAINTENANCE HOLES WITHIN AREAS SUSCEPTIBLE TO HIGH GROUNDWATER OR LOCATED WITHIN FLOODPLAINS, AREAS OF CONCENTRATED RUNOFF	DRAWN–BY
		DATE 10 - 29 - 21
		STANDARD NO. I&I - 104



PLAN



SECTION A–A

LEGEND: O.D. = OUTSIDE DIAMATER
SDR = STANDARD DIMENSION RATIO

NOT TO SCALE

NOTES:

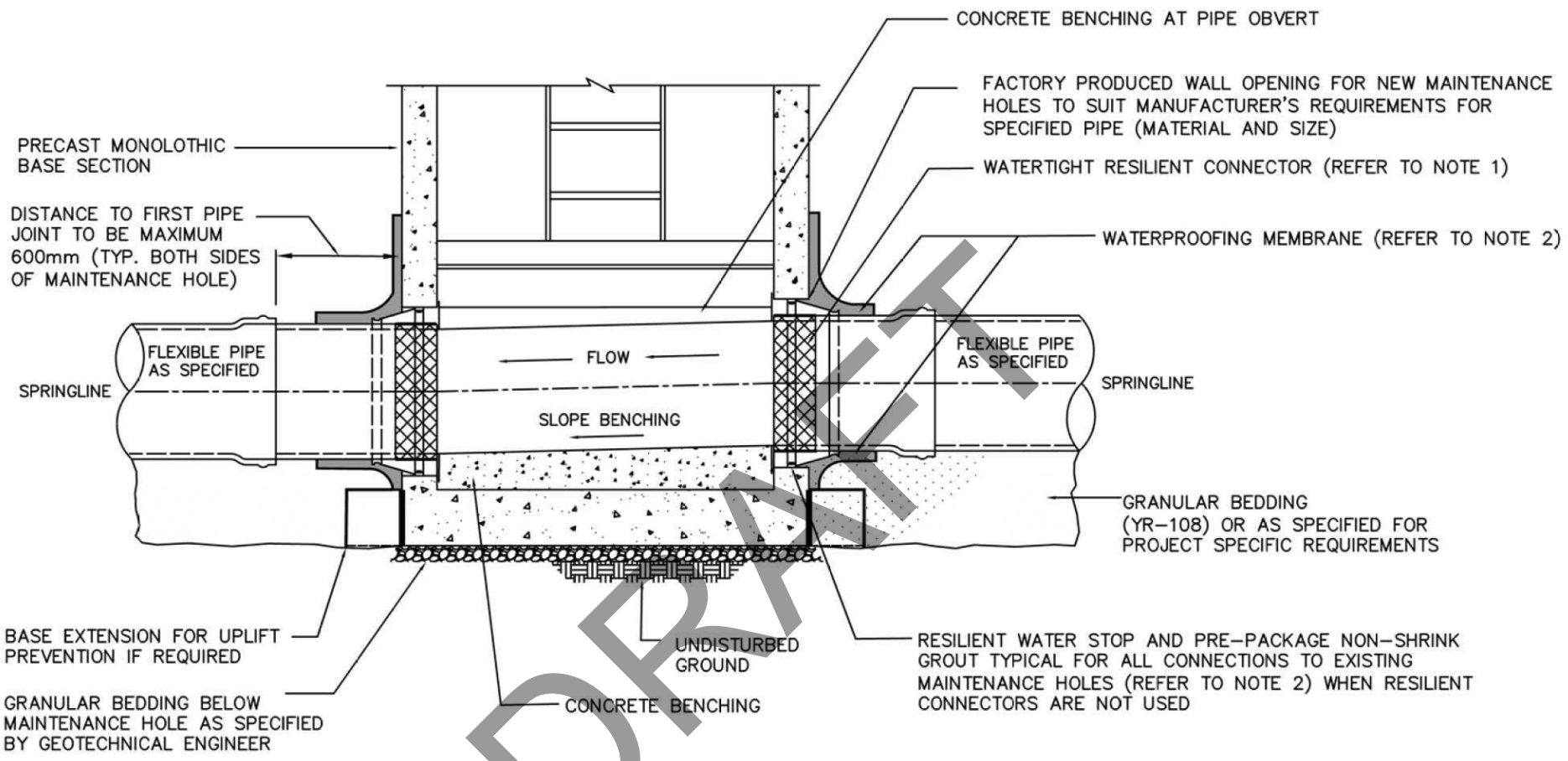
1. TRENCH PLUGS SHALL BE CONSTRUCTED OF A BENTONITE MIXTURE, IMPORTED OR NATIVE CLAYS, O.REG. 153/04 AS APPROVED BY A GEOTECHNICAL ENGINEER. ALL NATIVE AND IMPORTED MATERIAL TO MEET MECP SOIL, GROUNDWATER AND SEDIMENT STANDARDS FOR USE UNDER PART XV.1 OF THE EPA TABLE 1 CRITERIA.
2. PLUGS SHALL EXTEND 300mm INTO UNDISTURBED GROUND ON SIDES OF TRENCH WHETHER OPEN CUT OR VERTICAL TRENCH.
3. TRENCH PLUGS SPACING AND HEIGHT AS PER GEOTECHNICAL ENGINEER RECOMMENDATIONS.
4. LOCATIONS OF PLUGS MAY BE ADJUSTED TO AVOID OBSTACLES.
5. ALL DIMENSIONS IN mm

SEWER TRENCH PLUG

DRAWN–BY

DATE 10 – 29 – 21

STANDARD NO. I&I – 105



NOTES:

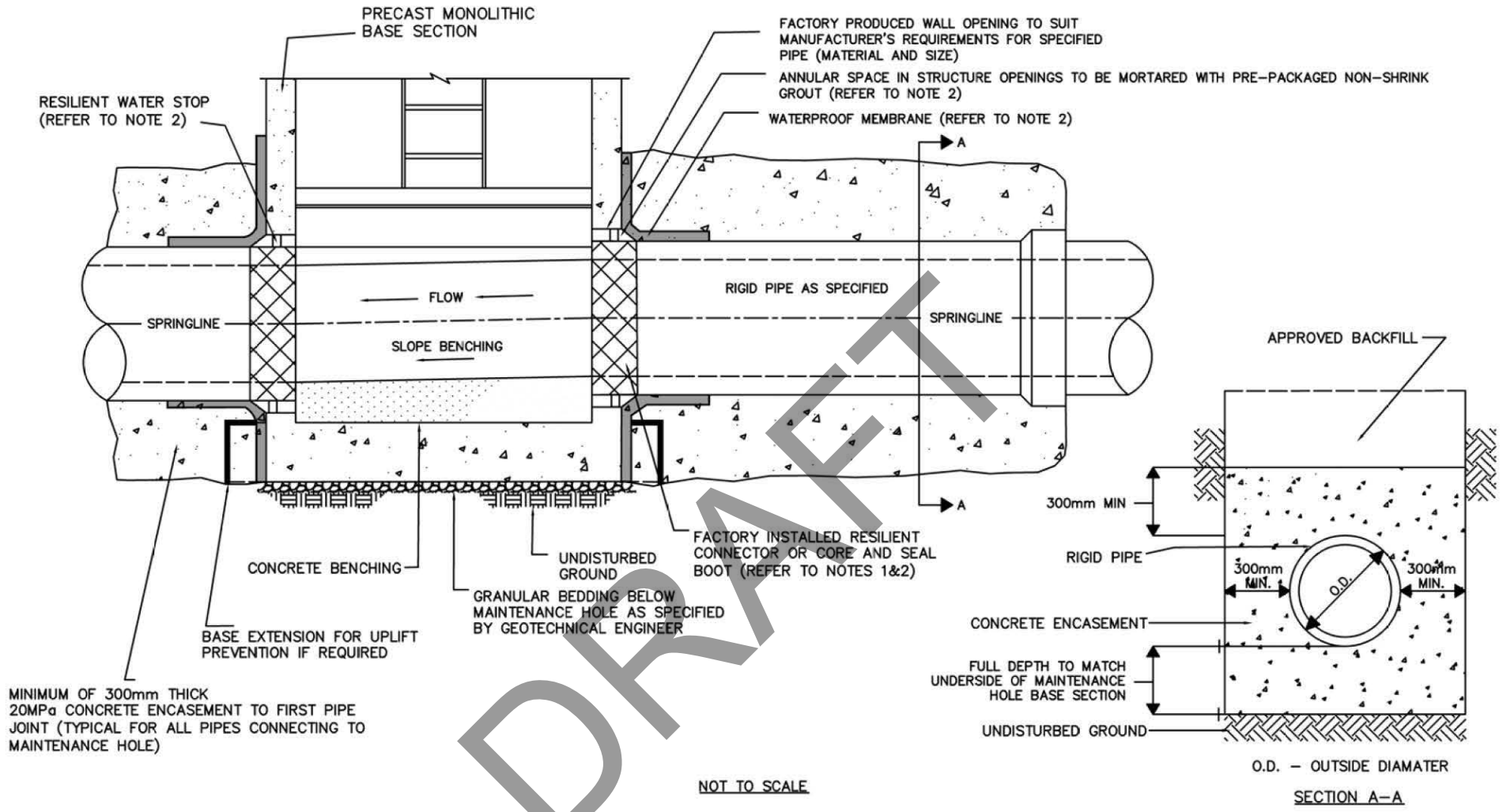
1. FLEXIBLE SEWER PIPE CONNECTIONS TO NEW MAINTENANCE HOLES SHALL HAVE FACTORY INSTALLED RESILIENT CONNECTORS IN STRUCTURE OPENING.
2. FLEXIBLE SEWER PIPE CONNECTIONS TO EXISTING MAINTENANCE HOLES SHALL HAVE RESILIENT WATER STOPS INSTALLED AND ANNULAR SPACE FILLED WITH PRE-PACKAGED NON-SHRINK GROUT FLUSH WITH EXTERNAL AND INTERNAL WALLS OF MAINTENANCE HOLES. WATERPROOFING SHALL BE INSTALLED AND EXTEND 0.3m BEYOND THE POINT OF CONNECTION AROUND THE PIPE
3. RESILIENT CONNECTORS AND WATERSTOPS SHALL CONFORM TO ASTM C923
4. PRE-PACKAGED NON-SHRINK GROUT SHALL CONFORM TO ASTM C1107
5. WATERPROOFING MEMBRANE SHALL CONFORM TO ASTM D412, D903, C836, E154, D1970, E96, D1876, D5385 AND D570
6. BENCHING DETAILS REFER TO OPSD 701.021

SANITARY SEWER MAINLINE TO MAINTENANCE HOLE CONNECTION FOR FLEXIBLE SEWER PIPE

DRAWN-BY

DATE 10-29-21

STANDARD NO. I&I-106A



NOT TO SCALE

NOTES:

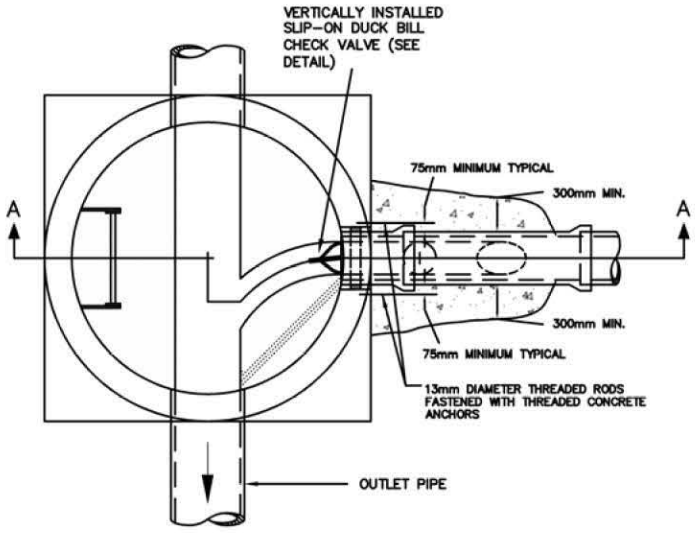
1. RIGID SEWER PIPE MAINLINE CONNECTIONS TO MAINTENANCE HOLES SHALL BE MADE WITH A RESILIENT CONNECTOR FOR NEW INSTALLATIONS WHERE PIPE SIZES PERMIT. THE ANNULAR SPACE SHALL BE MORTARED WITH PRE-PACKAGED NON-SHRINK GROUT WHERE A RESILIENT CONNECTOR CANNOT INSTALLED OR FOR CONNECTIONS TO EXISTING MAINTENANCE HOLES. THE WATERPROOFING MEMBRANE SHALL BE INSTALLED AND EXTEND 0.3m BEYOND THE POINT OF CONNECTION AROUND THE PIPE AND ON THE MAINTENANCE HOLE EXTERNAL WALL.
2. RIGID SEWER PIPE CONNECTIONS TO EXISTING MAINTENANCE HOLES AND SHALL HAVE RESILIENT WATER STOPS OR CORE AND SEAL BOOTS
3. RESILIENT CONNECTORS AND WATERSTOPS SHALL CONFORM TO ASTM C923
4. PRE-PACKAGED NON-SHRINK GROUT SHALL CONFORM TO ASTM C1107
5. WATERPROOFING MEMBRANE SHALL CONFORM TO ASTM D412, D903, C836, E154, D1970, E96, D1876, D5385 AND D570
6. BENCHING DETAILS REFER TO OPSD 701.021

SANITARY SEWER MAINLINE TO MAINTENANCE HOLE CONNECTION FOR RIGID SEWER PIPE

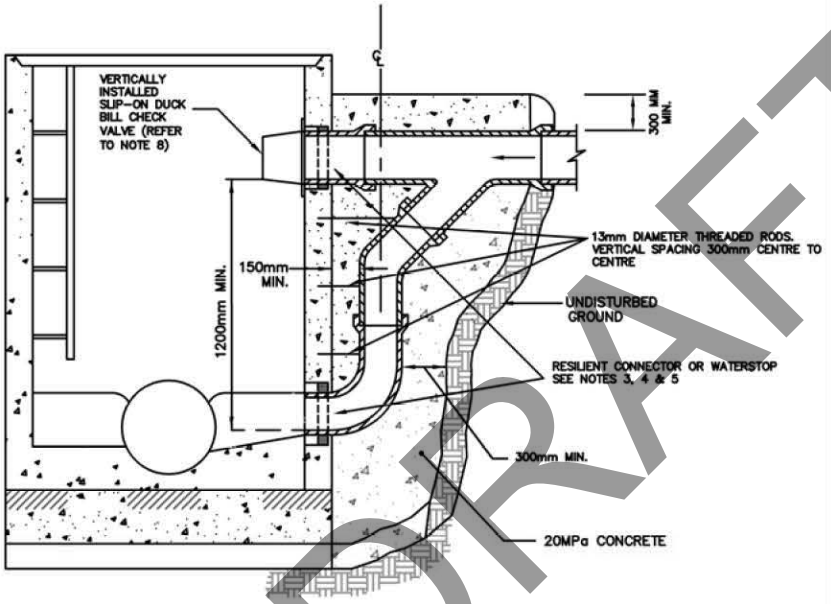
DRAWN–BY

DATE 10–29–21

STANDARD NO. I&I–106B



PLAN

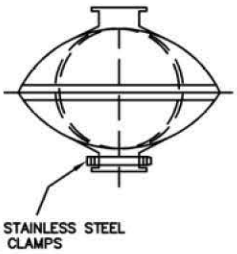


SECTION A-A

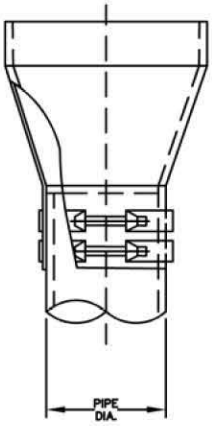
NOT TO SCALE

DETAIL

SLIP-ON DUCK BILL CHECK VALVE



FRONT VIEW



SIDE VIEW

NOTES:

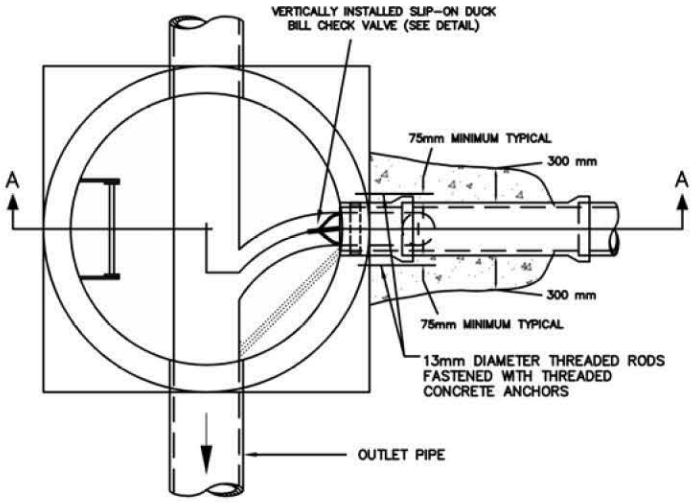
1. DROP STRUCTURE TO BE COMPLETELY ENCASED IN 300mm OF 20MPa CONCRETE AND SECURED TO THE MAINTENANCE HOLE WITH 450mm LONG, 13mm ø THREADED STAINLESS STEEL OR GALVANIZED RODS AND DRILLED EXPANSION ANCHORS DOWN BOTH SIDES OF THE DROP PIPE AT 300mm CENTRE TO CENTRE.
2. DROP PIPE TO BE ONE SIZE SMALLER THAN INCOMING MAIN LINE. DROP PIPE MINIMUM DIAMETER 200mm AND MAXIMUM DIAMETER 450mm.
3. FLEXIBLE SEWER PIPE DROP STRUCTURE CONNECTIONS TO NEW MAINTENANCE HOLES SHALL HAVE FACTORY INSTALLED RESILIENT CONNECTORS IN MAINTENANCE HOLE OPENINGS.
4. FLEXIBLE SEWER PIPE CONNECTIONS TO EXISTING MAINTENANCE HOLES SHALL HAVE RESILIENT WATERSTOPS INSTALLED AND ANNULAR SPACE FILLED WITH PRE-PACKAGED NON-SHRINK GROUT FLUSH WITH EXTERNAL WALLS OF MAINTENANCE HOLES. RESILIENT WATERSTOPS SHALL CONFORM TO ASTM C923.
5. RIGID SEWER PIPE DROP STRUCTURE CONNECTIONS TO MAINTENANCE HOLES SHALL BE MADE WITH A RESILIENT CONNECTOR FOR NEW INSTALLATIONS WHERE PIPE SIZES PERMIT. THE ANNULAR SPACE SHALL BE MORTARED WITH PRE-PACKAGED NON-SHRINK GROUT WHERE A RESILIENT CONNECTOR CANNOT BE INSTALLED OR FOR CONNECTIONS TO EXISTING MAINTENANCE HOLES. PRE-PACKAGED NON-SHRINK GROUT SHALL CONFORM TO ASTM C1107.
6. FOR ITEMS 4 AND 5 ABOVE, WATERPROOFING MEMBRANE SHALL BE INSTALLED AT THE CONNECTION OF THE PIPE TO THE MAINTEANCE HOLE EXTERNAL WALL. THE WATERPROOFING MEMBRANE SHALL EXTEND 0.3M BEYOND THE POINT OF CONNECTION AROUND THE PIPE AND ON THE MAINTENANCE HOLE EXTERNAL WALL.
7. MAINTENANCE HOLES LOCATED WITHIN AREAS SUSCEPTIBLE TO HIGH GROUND WATER OR FLOOD PLAINS SHALL HAVE WATERPROOFING MEMBRANES INSTALLED AT ALL SECTION JOINTS OR WHEN SPECIFIED , THE ENTIRE MAINTENANCE HOLE PER STD I&I-104.
8. OVERFLOW PIPE TO PROTRUDE SUFFICIENTLY BEYOND THE MAINTENANCE HOLE INTERNAL WALL FACE TO FACILITATE FULL INSERTION OF DUCK BILL CHECK VALVE.
9. PRE-CAST DROP STRUCTURES INTEGRAL WITH MAINTENANCE HOLE RISER SECTIONS ARE PERMITTED. WATERPROOFING MEMBRANE SHALL BE INSTALLED PER ITEM 6.
10. BENCHING DETAILS REFER TO OPSD 701.021

MAINTENANCE HOLE DROP STRUCTURE TYPE A

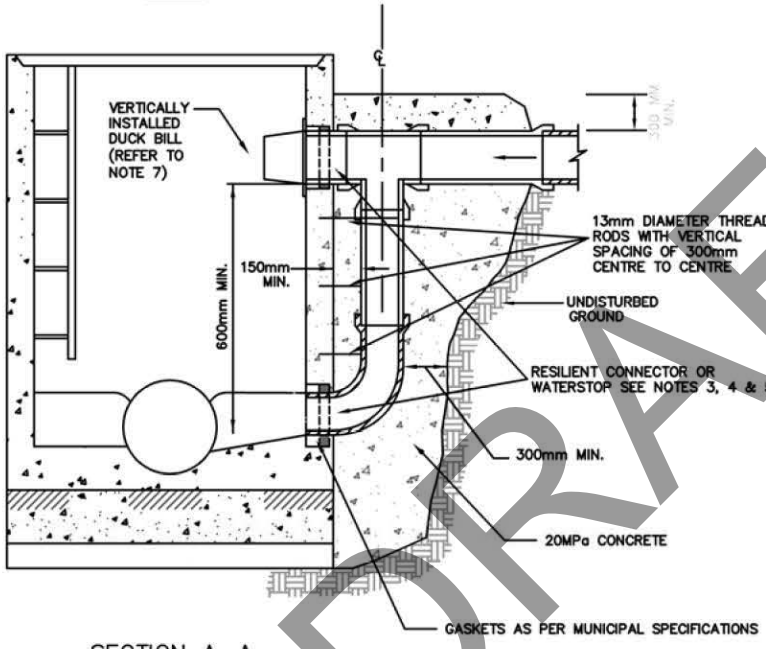
DRAWN-BY

DATE 10-29-21

STANDARD NO. I&I-107A



PLAN

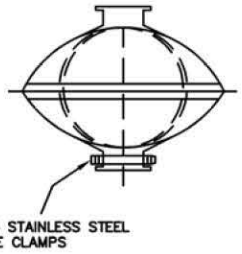


SECTION A–A

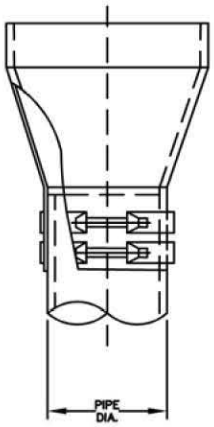
NOT TO SCALE

DETAIL

SLIP–ON DUCK BILL CHECK VALVE



FRONT VIEW



SIDE VIEW

NOTES:

1. DROP STRUCTURE TO BE COMPLETELY ENCASED IN 300mm OF 20MPa CONCRETE AND SECURED TO THE MAINTENANCE HOLE WITH 450mm LONG, 13mm ø THREADED RODS AND DRILLED EXPANSION ANCHORS DOWN BOTH SIDES OF THE DROP PIPE AT 300mm CENTRE TO CENTRE.
2. DROP PIPE TO BE ONE SIZE SMALLER THAN INCOMING MAIN LINE. DROP PIPE MINIMUM DIAMETER 200mm AND MAXIMUM DIAMETER 450mm.
3. FLEXIBLE SEWER PIPE DROP STRUCTURE CONNECTIONS TO NEW MAINTENANCE HOLES SHALL HAVE FACTORY INSTALLED RESILIENT CONNECTORS IN MAINTENANCE HOLE OPENINGS.
4. FLEXIBLE SEWER PIPE CONNECTIONS TO EXISTING MAINTENANCE HOLES SHALL HAVE RESILIENT WATERSTOPS INSTALLED AND ANNULAR SPACE FILLED WITH PRE–PACKAGED NON–SHRINK GROUT FLUSH WITH EXTERNAL WALLS OF MAINTENANCE HOLES. RESILIENT WATERSTOPS SHALL CONFORM TO ASTM C923.
5. RIGID SEWER PIPE DROP STRUCTURE CONNECTIONS TO MAINTENANCE HOLES SHALL BE MADE WITH A RESILIENT CONNECTOR FOR NEW INSTALLATIONS WHERE PIPE SIZES PERMIT. THE ANNULAR SPACE SHALL BE MORTARED WITH PRE–PACKAGED NON–SHRINK GROUT WHERE A RESILIENT CONNECTOR CANNOT BE INSTALLED OR FOR CONNECTIONS TO EXISTING MAINTENANCE HOLES. PRE–PACKAGED NON–SHRINK GROUT SHALL CONFORM TO ASTM C1107.
6. FOR ITEMS 4 AND 5 ABOVE, WATERPROOFING MEMBRANE SHALL BE INSTALLED AT THE CONNECTION OF THE PIPE TO THE MAINTEANCE HOLE EXTERNAL WALL. THE WATERPROOFING MEMBRANE SHALL EXTEND 0.3M BEYOND THE POINT OF CONNECTION AROUND THE PIPE AND ON THE MAINTENANCE HOLE EXTERNAL WALL.
7. MAINTENANCE HOLES LOCATED WITHIN AREAS SUSCEPTIBLE TO HIGH GROUND WATER OR FLOOD PLAINS SHALL HAVE WATERPROOFING MEMBRANES INSTALLED AT ALL SECTION JOINTS OR WHEN SPECIFIED , THE ENTIRE MAINTENANCE HOLE PER STD I&I–104.
8. OVERFLOW PIPE TO PROTRUDE SUFFICIENTLY BEYOND THE MAINTENANCE HOLE INTERNAL WALL FACE TO FACILITATE FULL INSERTION OF DUCK BILL CHECK VALVE.
9. PRE–CAST DROP STRUCTURES INTEGRAL WITH MAINTENANCE HOLE RISER SECTIONS ARE PERMITTED. WATERPROOFING MEMBRANE SHALL BE INSTALLED PER ITEM 6.
10. BENCHING DETAILS REFER TO OPSD 701.021

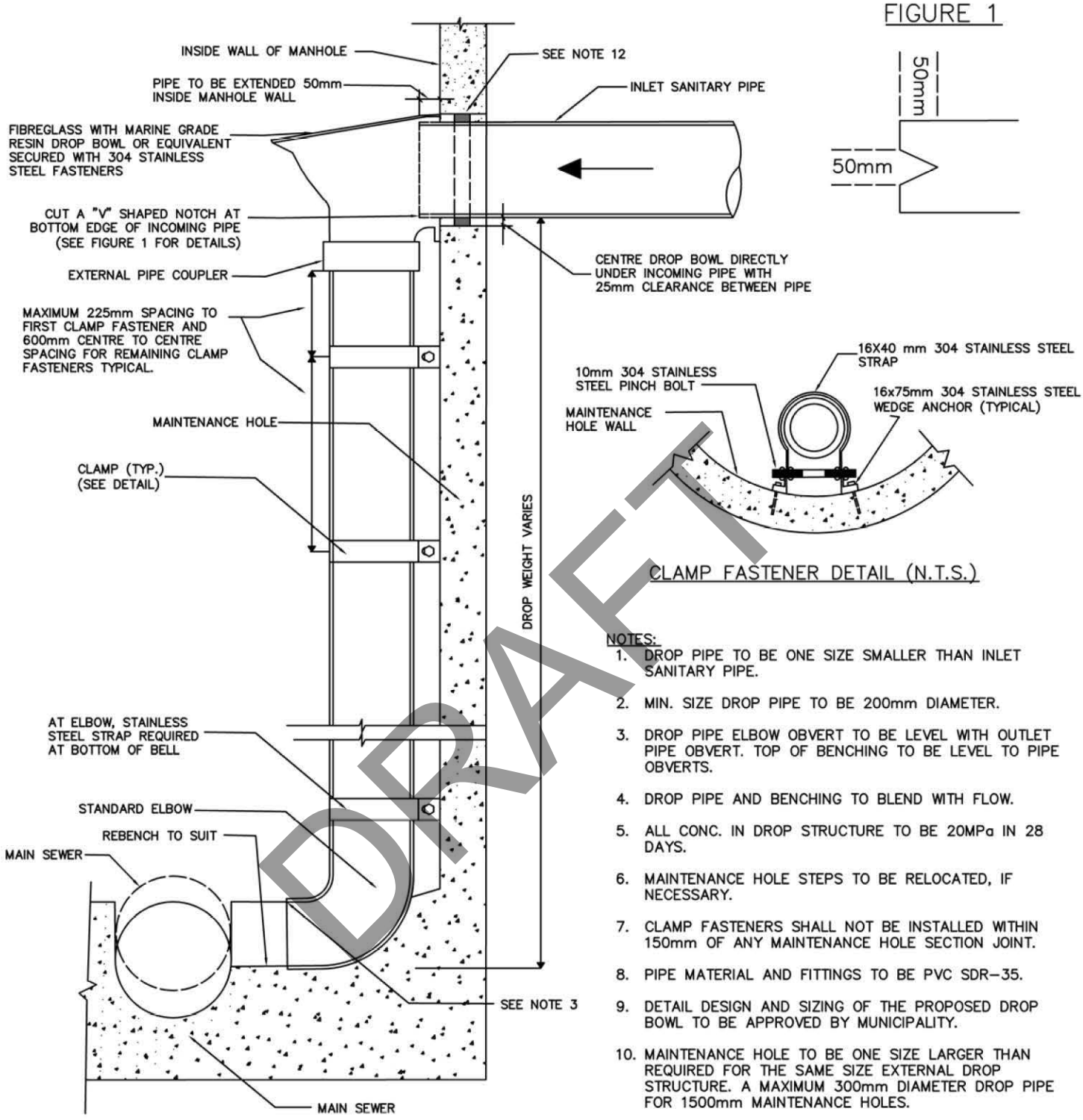
MAINTENANCE HOLE DROP STRUCTURE TYPE B

DRAWN–BY

DATE 10–29–21

STANDARD NO. I&I–107B

FIGURE 1



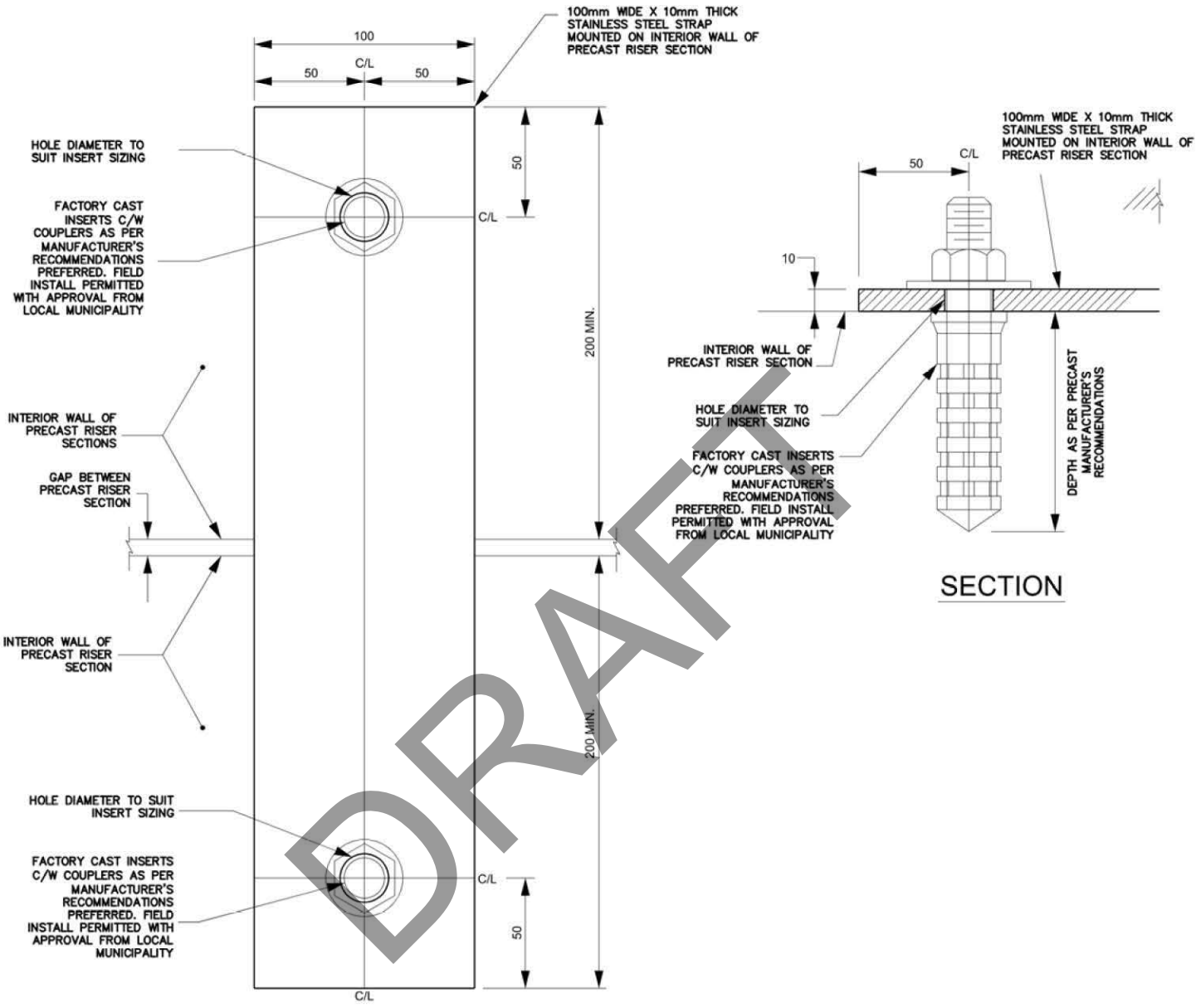
CLAMP FASTENER DETAIL (N.T.S.)

NOTES:

1. DROP PIPE TO BE ONE SIZE SMALLER THAN INLET SANITARY PIPE.
2. MIN. SIZE DROP PIPE TO BE 200mm DIAMETER.
3. DROP PIPE ELBOW OBVERT TO BE LEVEL WITH OUTLET PIPE OBVERT. TOP OF BENCHING TO BE LEVEL TO PIPE OBVERTS.
4. DROP PIPE AND BENCHING TO BLEND WITH FLOW.
5. ALL CONC. IN DROP STRUCTURE TO BE 20MPa IN 28 DAYS.
6. MAINTENANCE HOLE STEPS TO BE RELOCATED, IF NECESSARY.
7. CLAMP FASTENERS SHALL NOT BE INSTALLED WITHIN 150mm OF ANY MAINTENANCE HOLE SECTION JOINT.
8. PIPE MATERIAL AND FITTINGS TO BE PVC SDR-35.
9. DETAIL DESIGN AND SIZING OF THE PROPOSED DROP BOWL TO BE APPROVED BY MUNICIPALITY.
10. MAINTENANCE HOLE TO BE ONE SIZE LARGER THAN REQUIRED FOR THE SAME SIZE EXTERNAL DROP STRUCTURE. A MAXIMUM 300mm DIAMETER DROP PIPE FOR 1500mm MAINTENANCE HOLES.
11. ONLY ONE INTERNAL DROP STRUCTURE PER MAINTENANCE HOLE.
12. REFER TO STANDARDS NO. I&I-106A AND 106B FOR INLET SANITARY SEWER PIPE CONNECTION TO MAINTENANCE HOLE.
13. VORTEX FLOW UNITS SHALL BE INSTALLED FOR DROP HEIGHTS EXCEEDING 5.0m.

NOT TO SCALE

	SANITARY MAINTENANCE HOLE INTERNAL DROP STRUCTURE	DRAWN-BY
		DATE 10-29-21
		STANDARD NO. I&I-109



STEEL STRAP ANCHORED TO INTERNAL CHAMBER WALL

SECTION

NOT TO SCALE

NOTES:

1. ALL MATERIALS TO BE 304 STAINLESS STEEL
2. FOR REHABILITATION APPLICATION ONLY, INSERTS CAN BE FIELD INSTALLED AS PER MANUFACTURER'S SPECIFICATIONS

TYPICAL STEEL STRAP DETAILS FOR PRECAST MAINTENANCE HOLES

DRAWN-BY

DATE 10-29-21

STANDARD NO. I&I-111

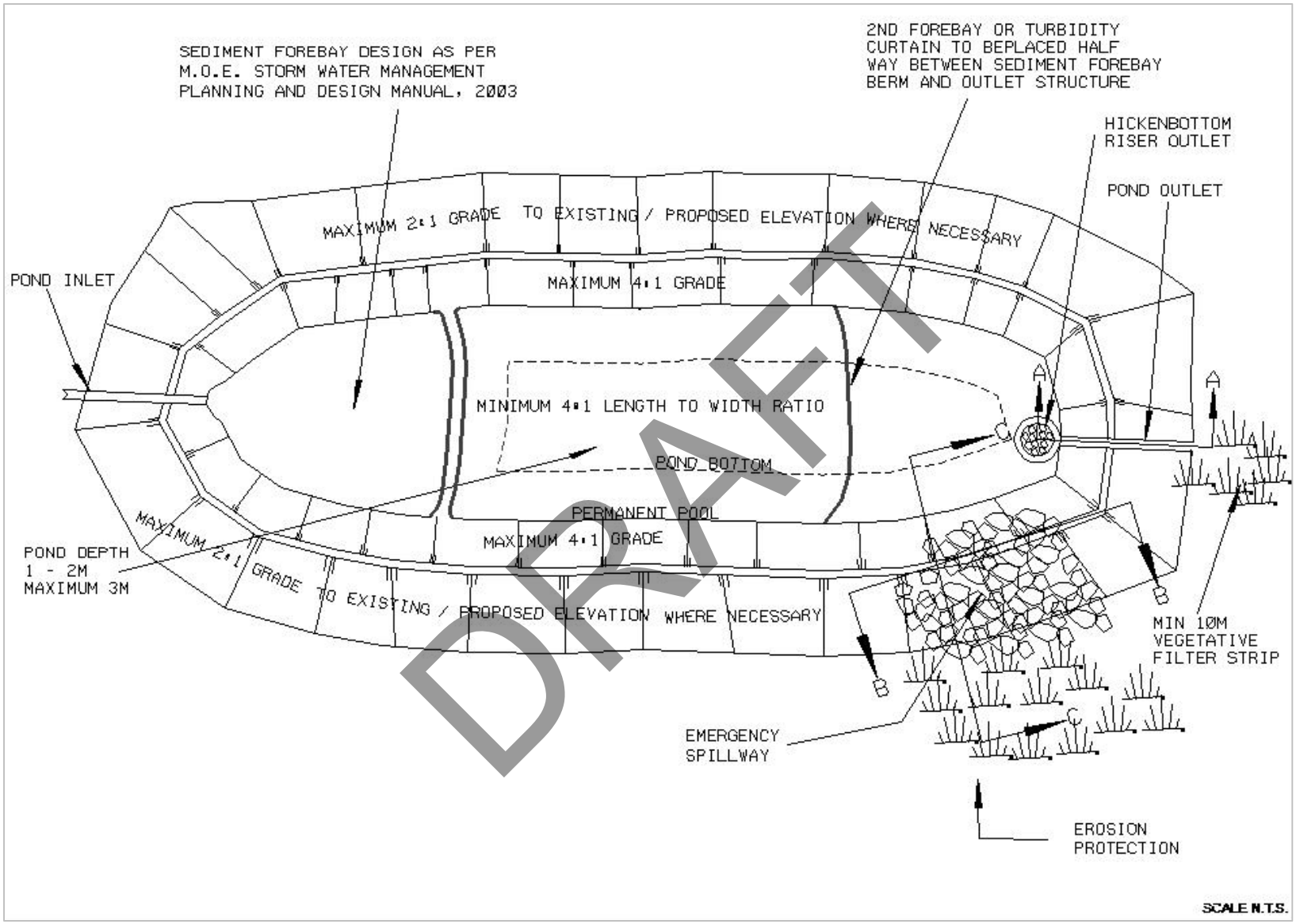


Figure B2-21: Plan view depiction of sediment control pond design specifications

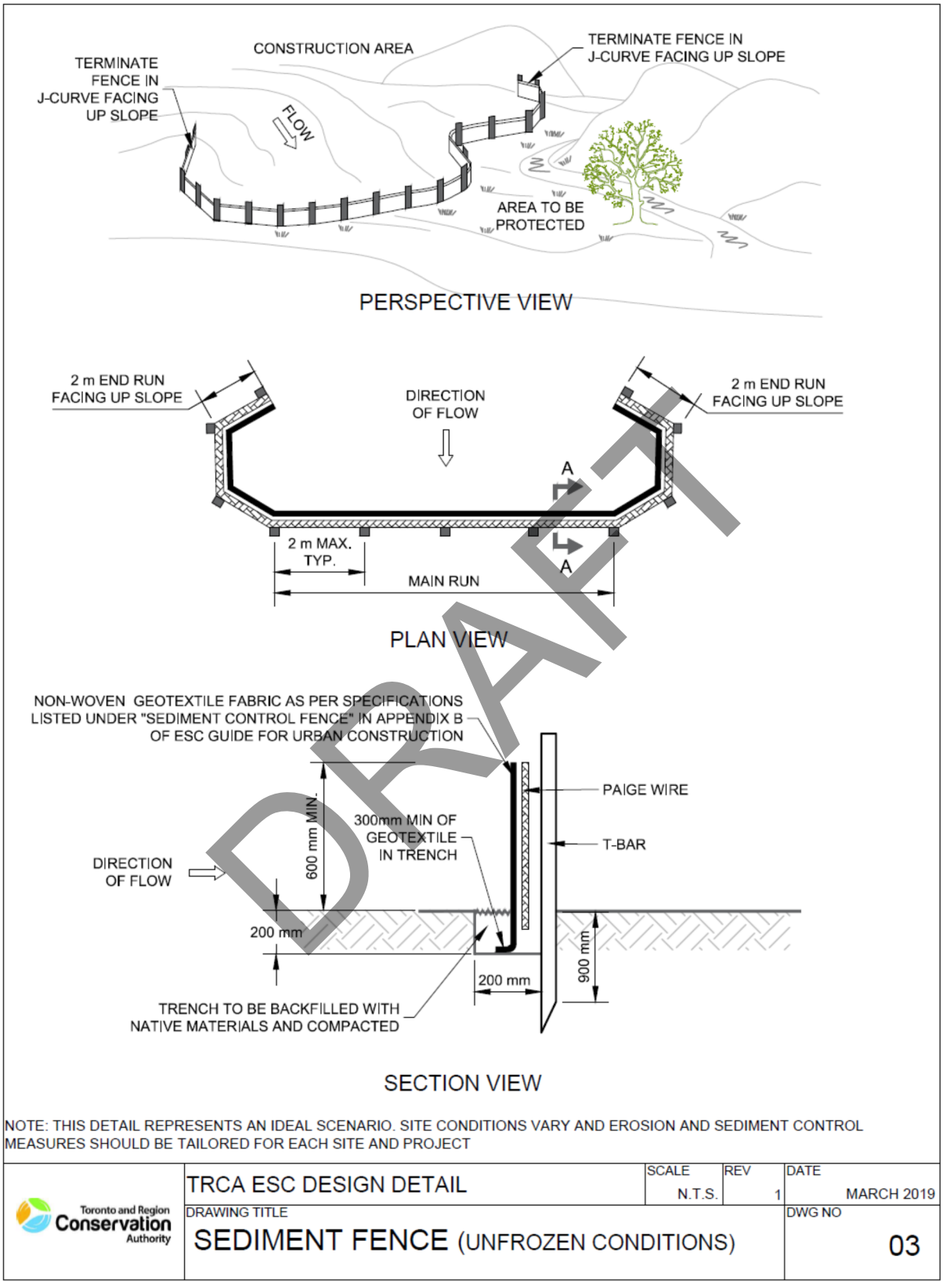


Figure B2-3a: Design detail for sediment control fence (unfrozen conditions).

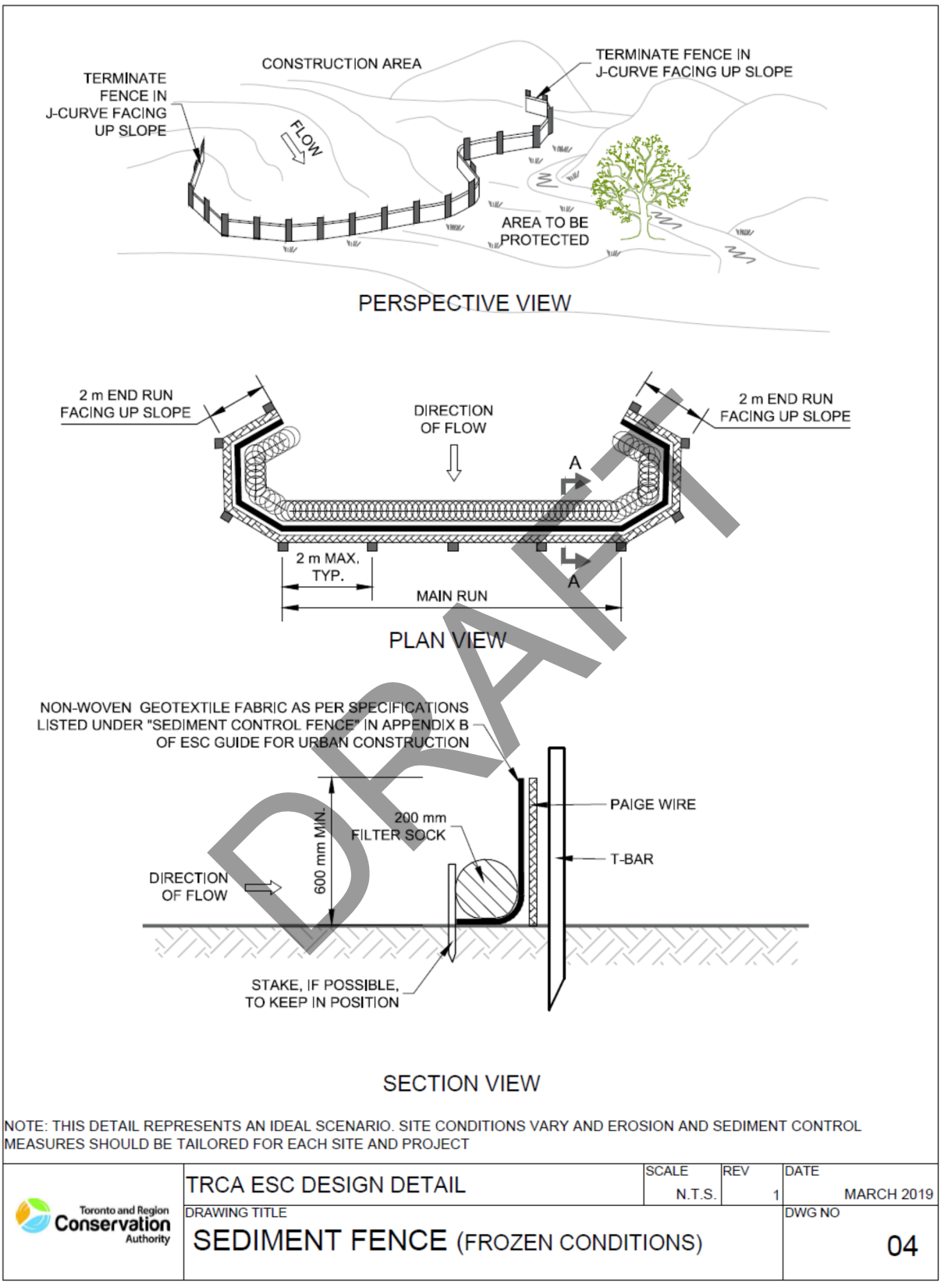
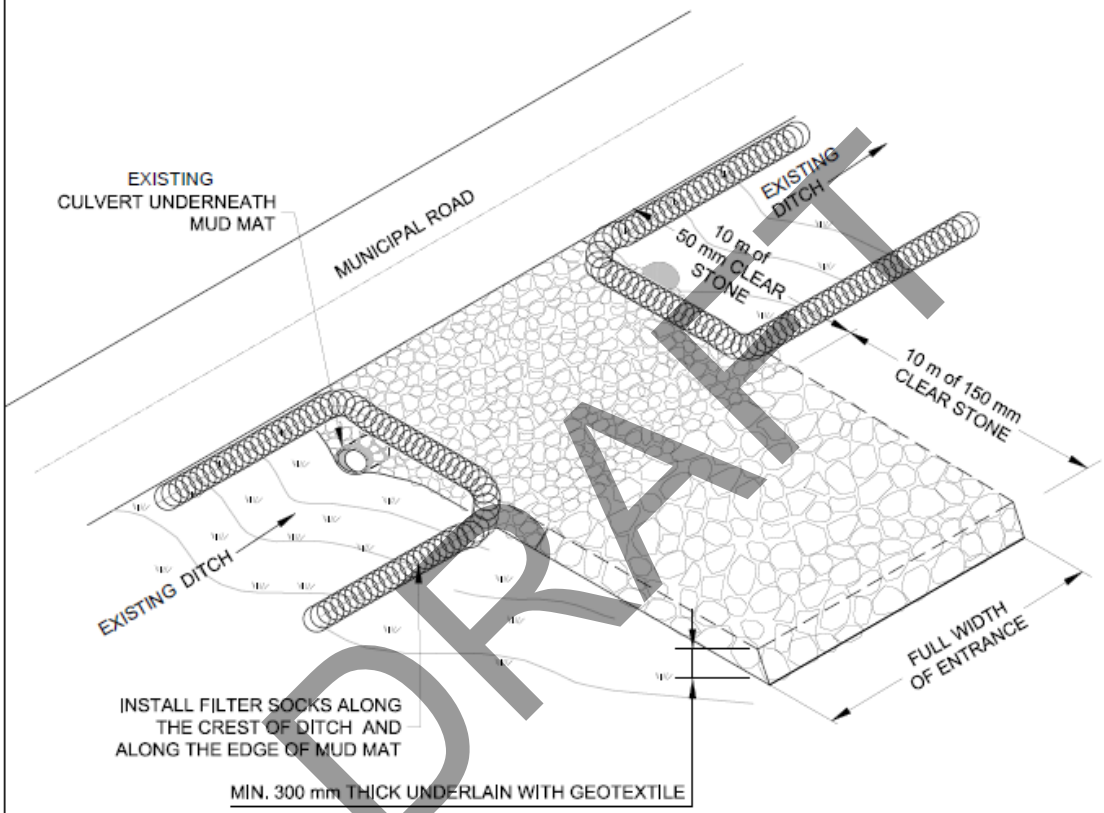


Figure B2-3b: Design detail for sediment control fence (frozen conditions).

MUD MAT DETAIL NOTES:

1. MUD MAT TO BE UNDERLAIN WITH A GEOTEXTILE CLOTH
2. SEDIMENT WILL BE CLEANED FROM PUBLIC RIGHT OF WAYS AS REQUIRED
3. STORM INLETS IN CLOSE VICINITY TO MUD MAT TO BE PROTECTED WITH INLET CONTROL MEASURES



NOTE: THIS DETAIL REPRESENTS AN IDEAL SCENARIO. SITE CONDITIONS VARY AND EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE TAILORED FOR EACH SITE AND PROJECT

Toronto and Region Conservation Authority	TRCA ESC DESIGN DETAIL	SCALE N.T.S.	REV 1	DATE MARCH 2019
	DRAWING TITLE MUD MAT			DWG NO 05

Figure B2-29: Design detail for mud mat for construction site vehicle access

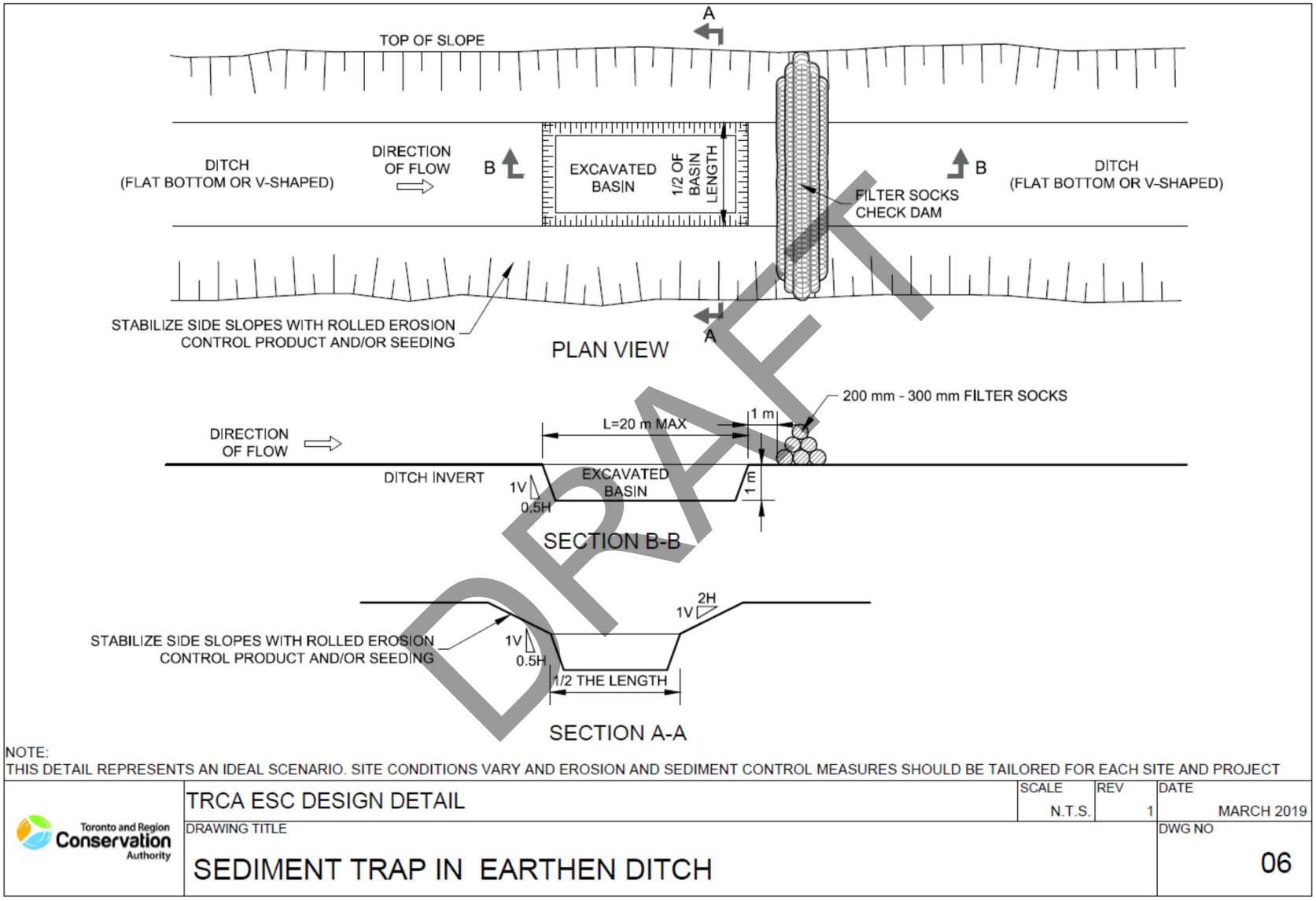


Figure B2-18: Design detail for sediment trap within an earthen ditch

APPENDIX 2

Water Commissioning

Township of King
Design Criteria and Standard Detail Drawings

Form No.	Title
Township of King Forms	
F-02	Commissioning Checklist
F-09	DWWP Alterations Checklist
F-17	New Watermains, Confirmation of Adequate Flow and Pressure and Continuity of Tracer Wire
SOP-2.1	Commissioning New Watermain Isolated from Existing Watermain
SOP-2.4	Chlorination of Watermains
SOP-2.5	Dechlorination of Watermains
SOP-2.6	Pressure Testing/Leakage
SOP-2.7	Foam Swabbing Watermains – New Watermain (By Contractor)
SOP-6.0	DWWP Alterations Procedure

Note – the above forms are included here for convenience only. It is the responsibility of the Developer's Consultant to obtain the latest versions of the documents from the Township for use in the development and commissioning of the water system.

MECP Forms	
Form 1*	Record of Watermains Authorized as a Future Alteration
--	Pipe Data Form
--	Watermain Design Criteria for Future Alterations Authorized under a Drinking Water Works Permit
MDWL 121-101**	Municipal Drinking Water Licence – Schomberg
MDWL 121-102**	Municipal Drinking Water Licence – Nobleton
MDWL 121-103**	Municipal Drinking Water Licence – King City
MDWL 121-104**	Municipal Drinking Water Licence – Ansnorveldt
DWWP 121-101**	Drinking Water Works Permit – Schomberg
DWWP 121-202**	Drinking Water Works Permit – Nobleton
DWWP 121-203**	Drinking Water Works Permit – King City
DWWP 121-204**	Drinking Water Works Permit – Ansnorveldt

* These forms and documents are available from the MECP Websites:
https://forms.mgcs.gov.on.ca/dataset/012-2202

https://forms.mgcs.gov.on.ca/en/dataset/6238

https://www.ontario.ca/page/watermain-design-criteria-future-alterations-authorized-under-drinking-water-works-permit

** These forms are available on the Township Website:
https://www.king.ca/township-services/water/water-permits-licences

APPENDIX 3

Approved Materials List

Township of King
Design Criteria and Standard Detail Drawings

Acceptable Water System Materials

Pipe

Mainline: Polyvinyl Chloride (PVC) pipe manufactured to AWWA C900, Class 235, DR18.	IPEX Inc. Westlake Pipe & Fittings
Molecularly Oriented Polyvinyl Chloride (PVCO) pipe manufactured to AWWA C909, Class 235, DR18.	
Services: Crosslinked Polyethylene Pipe – PEX, manufactured to CSA B137.10 Type K soft copper, manufactured to ASTM B88	IPEX Inc. Zurn CB Supplies

Fittings

Ductile Iron, cement lined, conforming to AWWA C110/C111.	Bibby-Ste-Croix Star Pipe Products Sigma Corporation
Ductile Iron, cement lined, conforming to AWWA C153.	SIP Industries

Gate Valves

Valves 75 mm to 300 mm: Resilient seat gate valves conforming to AWWA C509.	Mueller NRS A-2360 Clow F6100 AVK Resilient Seat

Glands, Plugs, Caps

Manufactured to CSA B131.9 and CSA B131.10.

Joint Retainer Glands

Use where required or specified for reinforcing mechanical joints.	Clow Canada EBAA Iron Romac Industries – Grip Ring Sigma – PV-Lok, One-Lok Ford – Uni-Flange – Series 400, 1300, 1350, 1360

Couplings

Couplings for mains to be per AWWA C219. Centre sleeves and end rings to be ductile iron, be shop coated and meet AWWA C219 requirements.	Ford – FC1, FC2A Robar – 1408 Romac – 501 Rockwell – 441
Couplings for mains to be per AWWA C111.	SIP Industries – EZ Grip; and EZ Grip PTP

Hydrants

Conforming to AWWA C502, base to be 150 mm mechanical joint, dry barrel.	Mueller – Century

Tapping Sleeve

Stainless steel saddles are to be used on PVC pipe.	Ford – FAST (SS) Mueller – H-615 (SS) Robar – 6606 (SS) Romac – SST304 Smith Blair – 622, 663

Valve Boxes

Slide type, 125 mm diameter, with 0.6 m adjustment	Bibby Mueller Domestic Foundry

Main Stops

Plug valve type, AWWA C800-89, compression joint. (Use stainless steel saddle on PVC pipes.)	Mueller – H15008 Cambridge – Series 102 Ford – F-1000-G A.Y. McDonald – 74701BQ, 7401BT A.Y. McDonald – 76100Q, 76100T

Curb Stops

Ball valves only, per AWWA C800-89, compression joints, stainless steel cotter pins.	Mueller – Oriseal, H15207, H15209 Ford – B44G Cambridge Brass – Century A.Y. McDonald – 76100Q, 76100T

Service Boxes

D1, No. 8 size, c/w stainless steel rods and pins.	Bibby Clow – D1 Mueller – A726-28

Residential Water Meters

Electromagnetic measurement, sealed unit, LCD display meters, complete with remote touchpad.	Sensus – Omni iPERL

Fire Service Meters

Ductile Iron body, ECR, LCD display, complete with strainer.	Sensus – Omni C2

Backflow Preventors

Double check valve assembly required.	Contact PW staff for confirmation

Couplings

Couplings for water services to be compression type per AWWA C800.	Mueller – D115403, H12940 Ford – C44G Cambridge Brass – 118 A.Y. McDonald – 7475Q

Insertion Meters

	Hydreka – Electromagnetic Insertion Probe Flowmeter (HydrINS 2)

Sampling Station

	Kupferle - Eclipse 24

Air Release Valve

	Contact PW staff for confirmation

Automatic Flushing Device

	Kupferle Foundries – #9700

Corrosion Protection:

Zinc Caps/Collars

Install caps on every bolt of a fitting. Install four collars per water service.	Protecto Caps, Sac Nuts Protecto Collars

Zinc Anodes

Install one No. 6 cad weld anode per watermain fitting. Attach one No. 6 anode per service using hydro clamp.	Rustrol, Corexco Erico

Anticorrosion Wraps, Coatings

Petrolatum Tape systems. Cover entire fitting per manufacturer's specifications.	Denso, Royston, Petroguard

Acceptable Sewer System Materials

Refer to Section C and Section E of the Design Criteria for storm and sanitary sewer and service connection specifications, respectively.	
Fabricated site-specific orifice, weir, etc. flow control plates.	Stainless steel materials

Catchbasin Stormwater Treatment Insert

EnviroBasin	Enviropod

Acceptable Swing Gate Product

Galvanized, lockable steel swing gate (maximum 3.2 m arm length).	Paris Equipment: 463-410 swing gate

APPENDIX 4

Submission Checklists

Township of King
Design Criteria and Standard Detail Drawings

Engineering Submissions:

The following materials are to be submitted to ensure a complete (initial) submission is made.

Drawings:

Cover Sheet
Index Sheet
Phasing Plan (if applicable)
General Notes Sheet
General Aboveground Services Plan(s)
General Underground Services Plan(s)
Sanitary Drainage Plan(s)
Storm Drainage Plan(s)
Water Distribution System Plan(s)
Grading Control Plan(s)
Plan and Profile Drawing(s)
Stormwater Management Plan(s)
Miscellaneous Detail Plan(s)
Standard Detail Plan(s)
Utility Coordination Plan(s) (typically at 2nd Submission)
Traffic Management Plan(s)
Erosion and Sediment Control Plan(s)
Tree Removal and Preservation Plan(s)
Landscape and Streetscape Plan(s) (typically at 2nd Submission)
Street Lighting and Photometric Plan(s) (typically at 2nd Submission)
(preferably in the above sequence)

Reports and Reference Materials*:

Draft Plan (as approved by Council)
Draft M-Plan
Draft (Easement) R-Plans (typically at 2nd Submission)
Sanitary and Storm Sewer Design Sheets (hard copy and Excel)
Stormwater Management Report
SWM Pond and LID Facilities Operations and Maintenance Manual
Water Distribution System Analysis Report

Traffic Impact Study (TIS)

Functional Internal Traffic Study (FITS)

Geotechnical Soils Report (final)

Hydrogeological Impact Report (where applicable)

Environmental Impact Study

Noise and Vibration Study

Archaeological Assessment Report (including clearance letters)

*Where copies of reports have been circulated during the Draft Plan Approval process, they will still be required to be submitted for a complete engineering submission. In any case, where details have changed, these are to be deemed “final” copies of the previous (possibly preliminary) documents.

	Yes	No	N/A	Comments
Drawing Format:				
standard Arch D sheets - 24" x 36"				
title sheet c/w Draft Plan No., key plan, Developer, Engineer				
Engineers stamp signed by a Professional Engineer				
standard signing block on all sheets for Township Engineer				
key plan on all sheets (Scale 1:10,000)				
north arrow reference on all sheets				
all elevations to be geodetic (reference to existing benchmark)				
General Plan of Services (Scale 1:1,000) c/w geodetic benchmark				
Plan & Profile Drawings (Scale H 1:500, V 1:50)				
Grading Plans (Scale 1:500)				
Detail Plans				
Storm Drainage Plans (Scale 1:1,000)				
Legal info., topo. survey and design info. to be geo-referenced per Township standards				
Sanitary Drainage Plans (Scale 1:1,000)				
Street Lighting Plans				
Composite Utility Plan				
Traffic Control, Pavement Marking Plan				
Landscaping Plans				
Standard Notes & Detail Plans:				
Township Standard Drawings and Notes used where applicable				
Ontario Provincial Standard Drawings where no other Stds				
Detail Plans & Specs required for all special features not covered				
minimum pavement design or specified alternative(s)				
General Plan of Services (1:1,000 scale):				
identify all lots, blocks/use (i.e., number, park, school, comm, ind)				
drawing index (c/w plan & profile drawing identification no.)				
road allowances, lots, blocks, easements & reserves				
proposed services (solid), existing services, utilities, etc. (dashed)				
manholes, catchbasins, valves, hydrants				
all sewers c/w size, type and direction of flow				
watermains c/w size				
curb & sidewalk including connections to paths, external, etc.				
all infrastructure to have asset ID's labelled				
existing floodplain, approved fill line & applicable flood line as req'd				

	Yes	No	N/A	Comments
Grading Plans (Scale 1:500):				
show & label existing contours (at 0.5 m intervals pending terrain)				
drainage - self contained (if not, justification req'd)				
accommodate external drainage areas				
identify tree preservation area and protection fencing				
show all fences, including labels (type, height)				
encroachment into EPA/Open Space Blocks (justification req'd)				
0.6 m wide strip along sloped edges of lots abutting other lands				
match existing grade at property boundary (or provide agreement)				
identify transition slopes along boundary and on lots				
minimize retaining walls				
retaining walls to be located on private property, provide details				
indication of drainage swales & direction				
existing & proposed elevations at lot corners				
elevations along swales, grade change points, top/bott of ret. walls				
specified grades at house				
road centreline/grades, street furniture (i.e., MH, CB, Hyd, Trans, etc.)				
specified catchbasin grate elevation				
driveway and sidewalk curb depressions (review width)				
Plan & Profile Drawings (Scale H 1:500, V 1:50):				
Watermain:				
standard location in ROW (i.e., 4.0 m o/s for 20 m ROW)				
dimensions for watermain depth & clearances				
minimum cover - (i.e., standard 1.8 m or 2.0 m at road x-ing)				
minimum clearances - (i.e., 0.3 or 0.5 m vertical, 2.5 m horizontal)				
looped system (i.e., no dead-end mains)				
temp. main dead ends with hydrant/valve or blow-off				
secondary feed for emergency				
50 mm loop for cul-de-sac, c/w valve & hydrant				
valve chambers (i.e., 300 mm & larger)				
sampling station(s) location & detail				
standard service location or o/s dimension to be specified				
larger service sizes indicated c/w valve location (control/check valve)				
air release chambers at high points				
insertion meter(s), location & detail				
Storm Sewer:				
standard location (i.e., 1.5 m south or west of pavement centerline)				
location within easements or blocks				
accommodate external areas - adequate depth				
minimum depth of cover 1.5 m (min. 2.7 m for house connections)				
specify pipe size, material type & class				
show 100 year HGL - finished basements 0.6 m above				
Storm Services:				
standard service connection location c/w test fitting				
minimum size (i.e., 150 mm dia. to property line)				
risers required when sewer invert exceeds 4.5 m depth				
identify lots with sump pumps (only where permitted)				
Storm Manholes & Catchbasin Manholes:				
maximum spacing based on pipe size (i.e., 100 m for 300 mm, etc.)				
size, type & specification (i.e., pipe size/OPSD No. or specified alt.)				
safety grate indicated when exceeding 5.0 m depth				
benching details provided (i.e., invert difference with large pipe size)				
specified frame & cover or grate elevation				

	Yes	No	N/A	Comments
Catchbasins & Ditch Inlets:				
catchbasin location (i.e., sidewalk crossing, driveway, rear lot)				
catch basin connection size (i.e., min. 250 mm for single)				
ditch inlet size, type, grate slope, erosion protection				
minimum grade on lead				
specified concrete encasement & location of rear yard lead				
Inlet/Outlet Headwalls & Structures:				
inlet & outlet grate design & details (specific designs as required)				
safety grates, handrail, erosion protection (i.e., rip rap, gabion, etc.)				
Sanitary Sewer:				
standard location (i.e., 1.5 m north or east of pavement centerline)				
location within easements or blocks				
accommodate external areas - adequate depth				
minimum depth of cover (i.e., 2.7 m below road grade in Res. areas)				
horizontal separation & vertical clearances				
minimum & maximum velocity (i.e., 0.60 m/s & 3.0 m/s)				
water proofing, lids, etc.				
specify pipe size, material type & class				
Sanitary Services:				
standard service location c/w surface clean-out				
minimum size (i.e., 125 mm dia. to property line).				
min/max grades (i.e., 2-8% for 125 mm)				
Sanitary Manholes:				
maximum spacing based on pipe size (i.e., 100 m for 200 mm, etc.)				
size, type & specification (i.e., pipe size/OPSD No. or specified alt.)				
maximum pipe connection 90-degree change (no acute angles)				
inspection manhole location (i.e., 1.5 m from P/L)				
Roads:				
conform to standard road sections c/w dimensions in plan view				
sufficient extension of roadway to confirm match existing				
intersection daylight triangles				
cul-de-sac and bulbs restrictions & criteria (i.e., length, radius, etc.)				
temporary turning circles criteria (i.e., signs, radius, etc.)				
horizontal & vertical geometric design elements				
horizontal curve data indicated in plan				
curb radii at all intersection (standard or specified as req'd)				
original & finished ground at centreline of road plotted in profile				
all vertical data for proposed/finished road (3 decimals)				
street name and traffic control signs				
erosion protection on steep grades (i.e., 6% or greater)				
Sidewalks & Walkways:				
pre-confirmed location(s) with Township				
typical road cross-section for local, collector, arterial location				
dimensions (i.e., 1.5 m wide for sidewalk)				
curb depressions indicated at intersections, AODA specs				
provide daylighting at sidewalk intersections				
Easements:				
minimum width for watermain & sewer (based on dia. and number)				
for rear yard catchbasin 250-450 mm dia. leads, min 3.0 m width				

	Yes	No	N/A	Comments
Stormwater Management, Report, Plans & Manual				
Stormwater Report				
incl. related report recommendations (FSR, MSP, Enviro, Geo, etc.)				
conforms to design standards (i.e., CA, MNR, MOE, MTO, Town)				
site location plan				
pre to post-catchment & drainage area plans				
sewer flow calculation sheets				
overland flow calculations/consideration of critical sections				
landscaping/restoration plans				
Pond and LID Drawing(s)				
Operations & Maintenance Manual				
Channels:				
minimum width (top of channel plus 6 m maintenance)				
Drainage Plans (Scale 1:1,000):				
Storm:				
show major system overland flow routes				
Blocks required for overland flow between lots				
manhole and area numbers indicated				
size & grade of sewers				
existing contours shown				
Sanitary:				
show tributary areas				
identify external, commercial, industrial & institutional areas				
manhole and area numbers indicated				
size & grade of sewers				
Erosion and Sediment Control Plan:				
identify stockpile location, height, volume, drainage and fencing				
sediment pond location, live & dead storage, drainage area/limits				
detail of temporary outfall structures				
site stabilization requirements				
construction access & protection detail (i.e., mud-mat)				
perimeter silt fencing and containment swales				
restoration of disturbed areas & schedule				
erosion protection at outfall locations				
schedule for sediment control, construction sequence & restoration				
Streetlighting Plan:				
standard poles/lights, type/location per consultation				
all LED fixtures, luminaire wattage				
photometric plans, indicate min/aver/max levels matrix				
details, supplier shop drawings				
Utility Coordination Plan:				
hydro, communications, gas, T.V., streetlights to be standard location				
street trees/plantings				
below ground structures				
dimension reduced sideyard setbacks or easements				
signing blocks - all utility companies with M.A. agreements				
- Electrical Consultant				
- Town Engineer				

	Yes	No	N/A	Comments
Landscape Plan:				
standard tree type/location (one each lot, sideyards, etc.)				
standard setback (pipes, hydrants, poles, driveways, etc.)				
streetscaping, fencing, entry features, etc.				
pond plantings				

Reviewed/Checked: *(signature)* _____

Design Engineer/Project Manager/P.Eng.

APPENDIX 5

Sewage Pumping Station Standards

Township of King
Design Criteria and Standard Detail Drawings

Part A – OVERVIEW

1.0 Introduction

1.1 The Township of King (King) has developed the Sewage Pumping Station (SPS) Design Standards for use by consulting engineers and Township staff involved in the implementation of capital works projects. This guideline provides design details and technical specifications typically required by the Township.

1.2 The focus of this document is to describe, in general terms, the design and construction requirements for the Township's Sewage Pumping Stations. It is considered to be both a "standard" and "guideline" for use by experienced designers. The designer is still responsible for the quality of their designs and meeting all regulatory requirements.

1.3 This guideline is intended for use on both new facilities and facility upgrades. Where some of the standards are not practical on facility upgrade projects, the designer must make the Township aware of deviations and receive Township approval.

2.0 Sewage Pumping Station Types

2.1 Sewage Pumping Stations shall meet the general requirements of three specific types shown in the following Sewage Pumping Station Design Table.

Table 1: Sewage Pumping Station Design Types

DESIGN / STYLE	FACILITY DESCRIPTION	GENERAL LAYOUT	WETWELL STORAGE CAPACITY	NUMBER OF PUMPS AND TYPE OF STARTER	STANDBY GENERATOR REQUIRED
TYPE I Small WWPS (<11 L/s)	No building. Wet well, valve chamber, outdoor generator with weatherproofing enclosure.	Submersible pumping station wet well with separate valve chamber and electrical panel above grade.	Minimum two-hour storage capacity based on peak flow.	Two constant speed pumps (one duty & one standby). May include soft starters.	Yes – Outdoor sized for all connected loads and 24hr fuel.

DESIGN / STYLE	FACILITY DESCRIPTION	GENERAL LAYOUT	WETWELL STORAGE CAPACITY	NUMBER OF PUMPS AND TYPE OF STARTER	STANDBY GENERATOR REQUIRED
TYPE II Medium WWPS (11-50 L/s)	Small building, wet well, and emergency generator.	Submersible pumping station wet well with separate building for controls, MCC, and standby generator with a drywell basement to house valves so confined space entry not required.	Minimum two hour wet well storage capacity based on peak flow.	Minimum of two pumps (One duty & one standby) Shall include VFDs.	Yes – Indoor sized for all connection loads and 24 hr fuel.
TYPE III Large WWPS (>50 L/s)	Building, emergency generator and odour control.	Wet Well / Drywell pumping station with separate building for controls, MCC, standby generator with a drywell basement to house pumps and valves so confined space entry not required.	Split wet well design. Minimum two hour wet well storage capacity based on peak flow.	Three or more pumps, one lead, one lag, and one standby. Shall include VFDs.	Yes – Indoor sized for all connection loads and 24 hr fuel.

2.2 Refer to *Figure 1: Pumping Station Types*, showing the typical layout for all three station designs.

3.0 Site Plan and Property Requirements

3.1 A new pumping station is expected to require a level of development approval process, such as Site Plan approval. The designer should confirm with Township Planning and / or Public Works staff to determine the development approval process and associated requirements needed.

3.2 All Site Plan and property requirements shall be identified at the earliest possible stage of the project.

3.3 All property negotiations, if required, shall be completed before commencing the design process. The designer is responsible for sizing the property required. A dedicated lot shall be provided for the sewage pump station.

3.4 The design and construction of most sewage pumping stations require review, inspection and approval by multiple municipal authorities (i.e., Planning Department, Environmental Services, Community Services, Building Department, etc.). The designer shall schedule a pre-application meeting with the municipality, prior to proceeding with the site plan design, to clarify and incorporate the municipal requirements for the following:

3.4.1 Separation and set back distance

3.4.2 Architecture

3.4.3 Traffic patterns and parking

3.4.4 Pedestrian traffic

3.4.5 Landscaping

3.4.6 Adjacent lands

3.4.7 Access road

3.4.8 Lighting

3.4.9 Lot grading criteria

3.4.10 Storm drainage and stormwater management

3.4.11 Perimeter fence and gates

3.4.12 Peak flow emergency storage

3.4.13 Sewage overflow

Part B – DESIGN REQUIREMENTS

4.0 General Sewage Pumping Station Layout and Design

4.1 The design of the sewage pumping station shall at a minimum, conform to the latest edition of the Ministry of Environment Conservation and Parks (MECP) Design Guidelines for Sewage Works. When the Township's design standards or requirements are enhanced and / or contain additional standards not included in the MECP guidelines, the design shall be based on the Township's design standards or guidelines. The Consultant shall observe all of the above considerations in executing design works for the Township.

4.2 The design of the sewage pumping station shall be completed in accordance with the latest editions of:

4.2.1 Ontario Building Code

4.2.2 Ontario Electrical Safety Code

4.2.3 National Fire Prevention Association (NFPA) 820 – Standard for Fire Protection in Wastewater Treatment and Collection Facilities.

4.3 Design configuration of the pumping station shall be based on one of the three "Types" of stations defined by a number of key factors such as design flow, facility type, land available, # of pumps, type of emergency generator, etc. (Refer to Table 1: Sewage Pumping Station Design).

4.4 The most efficient layout of pumps and equipment for safe and cost-effective operation and maintenance of the facility shall be considered.

4.5 The MECP Design Guidelines for Sewage Works – 2008, in Section 7.2.3. recommend that for determining required pump total dynamic head (TDH), that the following Hazen Williams friction factors be used:

- C=120, 130 and 140 with the pump duty point selected using a C of 130. These C values are to be used for forcemains larger than 300mm dia.

- From actual experience, friction factors for smaller diameter forcemains have a tendency tend to be lower. As a result, for forcemains 300 mm in diameter and smaller, the following C values shall be used:

    - C=110, 120, and 130 with the pump duty point selected using a C of 120.

4.6 Design for operation and to protect from damage to structures, electrical, and mechanical equipment at 100-year flood level. All electrical & control equipment shall be located above emergency overflow / flood line with the exception of emergency stops and local start stop push buttons which shall be located adjacent to the pump and rated for water tightness.

4.7 Provide lifting and lateral transfer devices for the removal and installation of equipment including removal from the station.

4.8 Provide a minimum of one (1) metre clear, unobstructed space around equipment for servicing.

4.9 Ensure backflow preventers are installed in accordance with the latest edition of Sewer Use By Law and Building Code. For reference, this includes isolation valves and testing ports. Do not install any of the related equipment in the wet well area.

4.10 In addition to Township's acceptance with the pumping station design, the designer shall be responsible in confirming the necessary permits or approvals from other agencies having jurisdiction (i.e., MECP, Conservation Authorities, etc.) and ensure their requirements are adhered to.

5.0 Buildings

5.1 To reduce the ongoing maintenance effort and costs, for the buildings, basements, dry wells, and wet wells, minimize or eliminate confined spaces as much as possible and minimize the activities within any confined spaces as much as possible. As part of the design process, identify all confined spaces and the equipment within these areas and the ratings therein.

5.2 Buildings shall be designed to post disaster importance requirements in accordance with the latest edition of the Ontario Building Code.

5.3 Buildings shall be designed to fit in with the aesthetics of the surrounding environment. The architectural design must comply with the applicable Township Urban Design Guideline and is subject to architectural control review by the Planning Department.

5.4 Where instruments and equipment must be installed in confined spaces, provide easy access via hatches, etc., where possible for ease of access without having to actually enter the confined space. For valves, in confined spaces, provide stem extensions and operating nuts at top of chamber ceiling slab level.

5.5 Provide an area within the building for storing drawings and manuals. For Type III (large) stations also provide an area for a minimum 1m x 2m desk and swivel chair to enable staff to easily review documentation.

5.6 For Type II (medium) and III (large) provide washrooms for staff.

5.7 For all buildings, including Type I (small) sites, provide signage that indicates the Township of King and the site name.

5.8 Adequate wall space must be provided to facilitate the free-standing control panels, communication panels, and instrument displays.

5.9 Install exterior lighting for illuminating the building exterior, man entrance doors, local control panels, and wet well and valve chamber areas. There shall be zero spill of light beyond the property line. The light switch is to be mounted inside the electrical panel.

5.10 All lighting (interior and exterior) shall be LED type.

6.0 Site Security

6.1 Provide DSC Power Series Security System and a dedicated telephone line for the pumping station. Intrusion, heat, and smoke alarms are to be wired to the DSC panel which is monitored by a Township dedicated third party.

6.2 Security fences around the entire site are required. Minimum 1.8 m (6 ft) height chain link and 4 cm opening or as directed by the Township architectural control requirements.

6.3 Provide locks on all fence gates, access hatches, and other potential entrance areas.

6.4 Door locks are to match the Township's standards and to be confirmed with Township staff.

6.5 A chain link entrance security gate, the width of the driveway and minimum 1.8 m (6ft) height is to be provided complete with a personnel man entrance gate 1m wide by 1.5 m minimum height within the main entrance gate.

6.6 The security design requirements should be reviewed with Township staff, as this can be a site-specific concern depending upon the site location, structures such as schools nearby, etc.

7.0 Type I Pumping Station (Small, <11 L/s)

7.1 These are generally small in-ground submersible pumping stations. Refer to the following figure:

Figure 2: Type I Pumping Station Arrangement

7.2 Provide on-site wet well storage capacity for two-hour retention based on peak flow.

7.3 Wet well design requirements:

7.3.1 The wet well design requirements are as per Section 11, as well as the points noted below.

7.3.2 The wet well shall be designed to permit the removal of the pumps without undue difficulties.

7.3.3 Flush mounted sockets shall be provided for portable davits to enable personnel retrieval.

7.3.4 Surface mounted socket posts shall be provided for portable davits to enable equipment hoisting.

7.3.5 The top slab of the wet well shall be located at least 200 mm above surrounding ground.

7.4 Design pumping station for operation with two constant speed submersible pumps to be removable using a guide rail assembly in a single wet well configuration with each pump sized for peak flow. Soft starters to be considered.

7.5 To address the situation when all pumps are out of service for repair, or in an emergency, provide a piping / valve arrangement that will enable staff to temporarily drop in spare pumps and connect the discharges to the existing forcemain. To address the similar situation where there is a problem with the downstream forcemain, provide a piping / valve arrangement that enables staff to use the existing pumps to either fill a truck or pump to a downstream manhole, beyond the forcemain failure. All piping, valves, etc. must be a minimum 150 mm. Refer to the following figure.

Figure 3: Piping Bypass Arrangement

7.6 Electrical Junction Boxes

7.6.1 To meet the code requirements and for ease of maintenance, all wiring from the wet well must be terminated in junction boxes that are located

outside the wet well, above or beside it, and outside the area of classification. The EYS seals and any other related components should be installed between this junction box and the control panel. EYS seals should not be installed between the wet well and junction boxes. Refer to the following figure.

Figure 4: Electrical Box Locations

7.6.2 Provide separate, lockable junction boxes for different voltages.

7.6.3 Provide a junction box equipped with terminal strip(s) to facilitate replacement of the float switches.

7.6.4 Provide a junction box with terminals for analog transmitters.

7.6.5 Include a separate junction box for pump power supply and to enable the removal and installation of the pump(s).

7.7 Electrical & process controls equipment to be above grade in a standalone control panel with the following design requirements:

7.7.1 Ensure that the panel is a minimum distance of 1.5 m away from the wet well entry or venting system, so that according to NFPA 820, the area is not classified.

7.7.2 Provide a weatherproof NEMA 4X, Stainless Steel, lockable enclosure to shield and protect from rain, wind and snow for outdoor panels. Enclosure to include LED lighting, as well as general-purpose receptacles. Heating, and cooling to be included for PLC and VFD panels.

7.7.3 The panel must be mounted a minimum of 450 mm height above the ground to preclude snow entry, while also providing good working height and complement the aesthetics of the location.

7.7.4 Size cabinet to facilitate maintenance work, as it must include the facility power feed and automatic transfer switch, pump controls, SCADA and networking hardware, plus a location for the hydro meter as coordinated with the local utility company. Cabinets shall be located to permit the removal of the pump without undue difficulties.

7.8 Provide emergency standby diesel generator. The generator shall be sized to run all connected loads. The generator is to be mounded outdoors on a concrete slab designed for the specific generator selected. The generator is to be housed in a factory built, acoustical, weatherproof enclosure with a double wall subbase fuel tank. Generator enclosure to be supplied with lighting, space heater and

maintenance receptacles. Provide space around the entire generator for access and maintenance. The generator is to either be located within the site fencing, or to have its own fencing encompassing the generator. Generator to have 24 hours of diesel fuel storage. Generator to be supplied with a second main line circuit breaker dedicated for load bank testing. Load bank breaker to be supplied with a shunt trip to disable breaker when a power outage is detected. The station is to be equipped with an automatic transfer switch for the generator located in the main outdoor electrical enclosure. In case the generator fails, provide wiring and devices including a receptacle and manual transfer switch for a plug in portable generator. Receptacle to be a 200A, 600V, Powertite Pin and Sleeve Receptacle set, 3W-4P, NEMA-4X, with spring door cover, Model ADJA20034-250 by Appleton.

7.9 Emergency standby diesel generator to be designed to meet air and noise emission and vibration requirements as per provincial regulations on a case by case basis taking into consideration neighboring residential areas and surrounding environments.

7.10 Vehicular access to the wet well and generator shall be provided. Provide a paved surface minimum 4.6 m wide with turnaround, able to sustain vehicular weight without damage and that permits the vehicle to be located entirely off the main road. Design must accommodate a fully loaded 22 m^3 sewage haulage truck to the wet well and a 17 m^3 diesel fuel truck to the generator fuel tank fill location. Site plan drawings shall include truck turning movements showing the above requirements are met.

7.11 The flow meter, isolation valves, and air relief valves shall be installed in a separate below grade concrete valve chamber.

7.12 A 50 mm dia. water service complete with yard hydrant shall be provided adjacent to the wet well for wash down purposes.

8.0 Type II Pumping Station (Medium, 11-50 L/s)

8.1 These stations are in general, mid-sized stations configured with a wet well containing two or more submersible pumps and a separate building containing a dry well or basement to house valves and at grade rooms housing control and electrical equipment including an emergency generator.

8.2 Provide a minimum two hour wet well storage capacity based on peak flow. Refer to the following figure.

Figure 5: Type II Pumping Station Arrangement

8.3 Vehicular access to the wet well and diesel fuel tank fill port shall be provided as described for Type I stations.

8.4 Design pumping station for operation with two or more variable frequency drive (VFD) controlled submersible pumps in a single wet well configuration. Design and size pumps such that firm peak capacity can be provided with the largest pumping unit out of service. Pumps to be removable using a guide rail assembly.

8.5 A 50 mm water service complete with high hazard backflow preventer shall be provided for flushing and cleaning purposes. For Type II and III stations, the water service shall be plumbed into the building and a non-freeze 38 mm non-freeze valved connection shall be provided on the exterior of the building.

8.6 Wet well design requirements:

8.6.1 The wet well design requirements are as per Section 11, as well as the points noted below.

8.6.2 The wet well shall be designed to permit the removal of the pumps without undue difficulties.

8.6.3 The top slab of the wet well shall be located at least 200 mm above surrounding ground.

8.7 Provide electrical junction boxes for all power and control cabling from the wet well to the building, as described for Type I stations.

8.8 Dry well design requirements:

8.8.1 Provide a "split" building with a wall separating the dry well from the generator area, and separate entrance doors for each area. For reference, this also means that each area has completely independent, permanent ventilation systems. A superstructure is required above the dry well with stair access.

8.8.2 No windows.

8.8.3 Provide exterior lighting to illuminate the dry well access area. There shall be zero spill of light beyond property line.

8.8.4 Within the basement include the pump isolation valves, check valves, discharge flow meter, and forcemain connection piping.

8.8.5 Provide a pressure gauge at each pump discharge pipe.

8.8.6 Air release piping from pump discharge pipes shall not be PVC.

8.8.7 Provide a crane or other approved device within the building, for lifting and removing the valves in the drywell area. Where the heaviest object to be removed is less than 226 kg and the total lifting height is less than six (6) m provide a trolley beam, manual trolley and manual hoist. For heavier equipment and larger lift heights provide a trolley beam with motorized electric trolley and motorized electric hoist.

8.8.8 Flush mounted sockets shall be provided for davits to enable personnel retrieval and equipment hoisting.

8.8.9 The dry well area is classified as Class I, Zone 2 hazardous environment by NFPA 820 and the Ontario Electrical Safety Code. **Do not** provide continuous ventilation for the purpose of reducing the classification of the area.

8.8.10 Permanent Hazardous gas monitoring equipment is not required in the dry well.

8.9 Provide emergency standby diesel generator and automatic transfer switch. The generator shall be sized to run all connected loads. In case the generator fails, provide wiring and devices including a receptacle and manual transfer switch for a plug-in portable generator. For service entrance sizes less than 200A receptacle to be a 200A, 600V, Powertite Pin and Sleeve Receptacle set, 3W-4P, NEMA-4X, with spring door cover, Model ADJA20034-250 by Appleton.

8.10 The emergency generator, electrical, and process controls equipment to be located in a building with the following design requirements:

8.10.1 The building must be sized to permit safe maintenance work, including appropriate clearance around the generator. It must include the facility power feed and automatic transfer switch, pump controls, SCADA, and networking hardware, plus a location for the hydro meter. The building shall be located to permit the removal of equipment without undue difficulties.

8.10.2 The designer should ensure that any air flow between the wet well and the building does not create a problem with area classifications. A good design practice is to ensure that the wet well exhaust vent is not pointing towards the building, and any air intakes for the building are not near this exhaust. Ventilation for the building should be on the opposite of the building from the wet well so that fresh air can be drawn into the ventilation system. Consider the impact of the reduced pressure created by the intake of the ventilation system.

8.10.3 The building shall have no windows.

8.10.4 Provide variable frequency drive(s) and ensure the minimum speed is sufficient to produce minimum self-cleansing velocity of at least 0.6 m/s in the discharge forcemain.

8.10.5 The building shall have exterior lighting to illuminate the wet well access area. There shall be zero spill of light beyond property line.

8.10.6 Passive odour control is to be provided for this type of station in the wet well vent pipes. Ensure odour control equipment is located at a reasonable height for maintenance.

9.0 Type III Pumping Station (Large, >50 L/s)

9.1 The Type III stations are large and possibly complex stations characterized by three or more pumps in a split wet well / dry well configuration where the pumps will be controlled by variable frequency drives (VFDs). An emergency generator, process control, and dual stage carbon odour control system will be housed in a building.

9.2 Provide a minimum of two hour wet well storage capacity based on peak flow. Refer to the following figure.

Figure 6: Type III Pumping Station Arrangement

9.3 Design pumping station with two hydraulically connected wet wells and at least three VFD submersible type pumps located in a dry well. Design and size pumps such that firm peak capacity can be provided with the largest pumping unit out of service. The pump suctions are drawn directly from the wet well.

9.4 A 50 mm water service complete with high hazard backflow preventer shall be provided for flushing and cleaning purposes. For Type II and III stations, the water service shall be plumbed into the building and a non-freeze 38 mm non-freeze valved connection shall be provided on the exterior of the building.

9.5 Wet well design requirements:

9.5.1 The wet well design requirements are as per Section 11, as well as the points noted below.

9.5.2 Provide a split wet well with two isolation gates in the dividing wall. The top of the split wet well wall is to be located at least 200 mm above the station emergency overflow outlet elevation.

9.5.3 If no superstructure is considered, the well shall be designed such that the top of the wet well extends a minimum of 200 mm above finished ground.

9.5.4 If no superstructure is considered, a concrete ring with a minimum of 1 m width must be installed around the top of the wet well, so that it is wide enough to install a tripod for confined space entries. Flush mounted sockets shall be provided for davits to enable personnel retrieval and equipment hoisting. Flush mounted sockets shall be provided for portable davits to enable personnel retrieval. Surface mounted sockets/posts shall be provided for portable davits to enable equipment hoisting.

9.5.5 If no superstructure is considered, all operator access into the station shall be made through an access hatch with minimum dimensions of 915 mm by 762 mm. The access hatch cover shall be hinged and lockable by padlock and shall be made of non-corrosive material. The lock port shall be recessed and provided with drainage pipe. The cover shall be provided with the necessary hold open arm to keep the cover in the vertical position once it is opened.

9.5.6 If no superstructure is considered, install exterior lighting for illuminating the wet well access area. The light switch is to be mounted inside the electrical panel (or building).

9.6 Vehicular access to the wet well shall be provided as described for Type I stations but suitable for a 55 m^3 sewage haulage truck. Vehicular access to the generator fuel tank fill port shall be provided as described for Type I stations.

9.7 Provide electrical junction boxes for all power and control cabling from the wet well to the building, as described for Type I stations.

9.8 Dry well design requirements:

9.8.1 Provide a "split" building with a wall separating the dry well from the generator area, and separate entrance doors for each area. For reference, this also means that each area has completely independent, permanent ventilation systems. A superstructure is required above the dry well with stair access.

9.8.2 No windows.

9.8.3 Provide exterior lighting to illuminate the dry well access area. There shall be zero spill of light beyond property line.

9.8.4 Within the basement include the pump isolation valves, check valves discharge flow meter, and forcemain connection piping.

9.8.5 Air release piping from pump discharge pipes shall not be PVC.

9.8.6 Provide a motorized crane within the building, for lifting and removing the pumps and valves.

9.8.7 The design intent is to ensure that the pumps can continue to operate even when the dry well is flooded. All electrical devices (i.e., receptacles, plugs, controls, etc.) are to be located above the dry well flood level. The local pump control hand switches must be rated for submersible duty.

9.8.8 The dry well area is classified as Class I, Zone 2 hazardous environment by NFPA 820 and the Ontario Electrical Safety Code. Do not provide continuous ventilation for the purpose of reducing the classification of the area.

9.8.9 A permanent hazardous gas monitoring system is not required for the dry well or the building directly above the drywell.

9.9 Provide variable frequency drive(s) and ensure the minimum speed is sufficient to produce minimum self-cleansing velocity of at least 0.6 m/s in discharge forcemain.

9.10 Provide a pressure gauge at each pump discharge pipe.

9.11 Provide emergency standby diesel generator and automatic transfer switch. The generator shall be designed to run all connected loads. In case of failure of the permanent generator provide wiring and devices and a manual transfer switch for the plug in of a portable generator. For service entrance sizes less than 200A receptacle to be a 200A, 600V, Powertite Pin and Sleeve Receptacle set, 3W-4P, NEMA-4X, with spring door cover, Model ADJA20034-250 by Appleton.

9.12 The emergency standby generator, electrical, and process controls equipment to be located in a building meeting the requirements noted for Type II stations.

10.0 Emergency Storage

10.1 All designs are to provide two hours of emergency peak flow storage above the wet well standby pump start level but below the overflow level and lowest basement elevation in the serviced catchment area. The collection system sewers shall not be oversized to provide this storage. A minimum of 75% of the two hours of storage shall be provided on the sewage pumping station property.

11.0 **Wet Well**

11.1 Wet well shall be designed to suit the pump capacity which should in turn be matched to the station design inflow rate. The size of the wet well in relationship to the suction pipe(s) shall be in accordance with the Hydraulic Institute to prevent hydraulic interference. The depth of the wet well shall be sufficient to ensure adequate control bands for each pump.

11.2 In no case shall the wet well size be so small that it will result in the pump(s) cycling more than six (6) times per hour.

11.3 Wet well interior walls base slab and ceiling shall be lined with a protective corrosion resistant epoxy coating that is suitable for sewage immersion service. The coating shall be completely resistant to hydrogen sulfide and sulfuric acid. The coating shall be easily cleanable and sufficiently durable to be washed with a high-pressure water hose. Exposed, unprotected concrete of any kind shall not be used in the pump station wet well.

11.4 Protective coating to be installed as per coating manufacturer. Concrete to be sweep blasted to remove laitance prior to installation and tested for moisture content. Coating to include a pre-prime penetrating epoxy with a minimum one and half (1.5) mils dry film thickness and two coats of a surface tolerant, two-component chemically cured epoxy semi-gloss coating four (4) to eight (8) mils dry film thickness or as per manufacturers installation. Total film thickness of ten (10) to sixteen (16) mils dry film thickness

11.5 If no superstructure is considered, the well shall be designed such that the top of the wet well extends a minimum of 200 mm above finished ground level.

11.6 A concrete ring with a minimum of 1 m width must be installed around the top of the wet well, so that it is wide enough to install a tripod for confined space entries. Flush mounted sockets shall be provided for davits to enable personnel retrieval and equipment hoisting. Vehicular access shall be provided to the wet well.

11.7 All operator access into the wet well shall be made through an access hatch with minimum dimensions of 915 mm by 762 mm. The access hatch cover shall be hinged and lockable by padlock and shall be made of non-corrosive material. The lock port shall be recessed and provided with a drainage pipe. The cover shall be provided with the necessary hold open arm to keep the cover in the vertical position once it is opened. It must also be sized to permit the entry of personnel, wearing retrieval equipment harness, without undue difficulties. Design access for staff to move freely, without the need to disconnect their safety line.

11.8 Hatch access openings for pumps shall be sized for pump installation and removal.

11.9 The wet well area is classified as Class I, Zone I hazardous environment by the Ontario Electrical Safety Code. Do not provide continuous ventilation for the purpose of reducing the classification of the area.

11.10 Hardware (e.g., mounting hardware) inside the station shall be 316 stainless steel.

11.11 For Type III station designs, where an enclosed building is provided above the wet well, NFPA 820 indicates a combustible gas detection system is required for the wet well and the enclosed building above the wet well area. Install combustible and hazardous gas sensors and monitoring equipment in order to meet the legal requirements of the code. Combustible and hazardous gas monitoring equipment shall be monitored by SCADA. Also provide alarm beacons and audible horns as required by NFPA 820. To reduce the ongoing maintenance costs, the sensors should be accessible without having to enter a confined space. Therefore, the sensors should be installed near an access hatch, near the top of the wet well, which will hopefully also reduce the spurious alarms. Depending upon the site-specific details, there may also be other fire prevention measures that the designer should take into account, and all applicable codes should be consulted. Township's preference is to have a wet well without a building above.

11.12 All wet wells shall be provided with switched lights and water service to enable flushing or cleaning of the wet well. Water service shall be provided, with a backflow preventer and sized not smaller than 38 mm. The water service fixture used for washdown purposes shall be provided within 5 m of the wet well, above grade but not in the wet well itself.

11.13 Benching in the wet well shall be steep and close to the pump inlet to prevent sediment build-up on the wet well floor.

11.14 Where possible, provide benching at 60° slope or greater around the pump suctions to prevent the build-up of solids in the wet-well. As a minimum, adhere to the MECP standard of 45 degrees.

11.15 Benching of a lesser slope may be provided where additional means of solids re-suspension is provided such as a flush valve or alternate mixing systems.

11.16 For larger wet wells provide steps cast into the concrete benching at the bottom of the access ladder, to enable staff to safely get down to the level of the pumps.

11.17 Ensure that with the selected benching, the station still has sufficient vertical working space for the level transmitter.

11.18 All electrical equipment in the wet well shall be explosion-proof Class 1 Zone 1 in accordance with applicable codes and / or standards.

11.19 Provide adequate pump operating range within the wet well, as per the MECP guidelines.

11.20 Minimum distance between start and stop levels for each pump must be at least 0.3 m, for each pump, unless approved otherwise by the Township.

11.21 Pumps shall be controlled by levels sensed in the wet well. The primary means of pump control shall be via an ultrasonic level transducer and transmitter. Secondary pump control shall be provided through a hydrostatic level probe installed in a stilling well. An alarm float shall only be provided to sense and alarm level at the overflow.

12.0 Wet Well Inlet

12.1 The wet well inlet shall be designed to avoid air entrainment to reduce H2S generation, scum buildup and vortexing around pump suctions.

12.2 Influent pipe to in-ground pumping station shall be positioned to ensure that the sewage does not discharge directly over the pump(s). It shall be designed with a minimum distance of two volute diameters away from the pump centre line.

12.3 Gravity sewer entrances into the wet well shall be designed to minimize free fall and turbulence. Turbulence reduction measures can be used if adjustment of water level and sewer elevation are impractical. The wet well shall be designed so that free air movement through the sewer is not impeded by wet well water levels except at flows greater than peak dry weather flow.

12.4 For stations with split wet wells (Type III WWPS design) the inlet shall be designed to feed both wet wells evenly and shall contain an arrangement of gates to permit isolation of either one of the wet well cells for cleaning and maintenance.

13.0 Hatches and Guards

13.1 To ensure safe access, provide a minimum working area to install any lifting equipment and still have a walking area around openings for tanks and hatches.

13.2 All hatches must be aluminum with secondary aluminum or fiberglass reinforced polymer (FRP) hinged safety grating located immediately beneath the cover.

13.3 Provide portable removable safety railing around all hatches made of Aluminum or FRP to MOL requirements.

13.4 Hatches are never to be bolt down design.

13.5 All hatches are to be spring assisted.

14.0 Wet Well Vertical Access Ladders

14.1 Ladder for access to the wet well shall be mounted on the wall of the well and centered under the access hatch. The top of the ladder shall be 150 mm below the slab and the bottom shall not be more than 300 mm above the finished floor level.

14.2 Ladder for access to or through the service platform shall extend from the bottom of the well through the service platform with hinged platform grating to the underside of the upper access hatch.

14.3 There shall be no offsets in the ladder that would impede the removal of an entrant should he require emergency removal.

14.4 Provide ladder with assist rails or “ladder up” assembly that can extend above the top of the wet well for safe entry and can be lowered when not in use.

14.5 Ladders shall be of Aluminum or FRP construction. All other components such as mounting hardware shall be 316 stainless steel. While aluminum is susceptible to corrosion over time, it shall be considered for hatch covers only to benefit from the durability and light weight of aluminum.

15.0 Service Platforms

15.1 Service platforms shall be provided where ladder heights exceed 5 m.

15.2 Design service platforms for wet well at a maximum of 300 mm above the top of the influent sewer. All others shall be located to meet operating, servicing, or safety requirements.

15.3 Platform grating to be constructed of Aluminum or FRP.

15.4 Provide all opened edges of the service platform with one-meter-high aluminum or fiberglass handrail, complete with toe boards.

16.0 Grinder and Screens

16.1 Where dictated by the characteristics of the sewage flowing into the pumping station, provide immersible rated grinders and automated screens as appropriate.

16.2 If there is a significant quantity of large solids from deteriorated sewers or other sources consideration should be given to the use of screens for protection of pumps and to prevent collection of large solids in the wet well.

16.3 The grinders and screens shall be removable for maintenance and cleaning.

16.4 Provisions shall be made for the temporary installation of removable bar screens or trash baskets during times when the grinder is removed for service where automated screening does not exist.

17.0 Pump Design

17.1 Dry well pumps shall be provided with an inspection port on the pump volute and a cleanout port on the pump suction elbow to check impeller condition or to unclog pump.

17.2 Provide piping flushing connections to facilitate the cleaning of plugged lines or pumps.

17.3 Pump motors shall be close coupled to the pump and shall be mounted vertically.

17.4 Where submersible pumps are installed, the total number of installed pumps minus one (n-1) shall be equipped with a hydraulic flush valve to allow a portion of the pump flow to be recirculated in the wet well to provide agitation to minimize the formation of large deposits of fats, oils and grease.

18.0 Piping and Valve Design

18.1 Butterfly valves shall not be used for wastewater.

18.2 For pipes up to 600 mm diameter, plug valves with gear operators are preferred. For larger pipes, isolation valves shall be knife gate style.

18.3 Sluice gates shall be fabricated from 3l6L stainless steel. Operators shall be located at ground level.

18.4 Pump discharge piping shall be 3l6L stainless steel with a minimum wall thickness of Schedule 10.

18.5 All valves shall be installed in horizontal pipe runs unless station size and configuration makes it impossible.

18.6 Depending on size, all check valves shall be of the swing flex type with rubber flapper and check valve defeaters (manual backflow actuator with T handle).

18.7 Provide air release/ vacuum breaker or combination valves where required.

18.8 Provide flushing connections to facilitate cleaning of the piping, where required.

18.9 Provide isolation valve on the discharge header prior to it leaving the pumping station.

18.10 For Type I and II stations design for facility bypass pumping connections from the wet well to a downstream location.

18.11 For Type III stations provide recirculation piping and valves into the wet well to allow for maintenance and operations staff to performance testing, including the pump flow tests. This arrangement will also be used during the 14-day trial test at the end of construction. The piping and valves should also provide recirculation of pumped sewage into the wet well to stir up any solids on the bottom of the well and prevent sedimentation.

Figure 7: Type III Station Recirculation Piping

19.0 Station Overflow

19.1 An emergency gravity overflow pipe shall be provided for all sewage pumping station wet wells.

19.2 All overflows to have duckbill check valves on the outlets.

19.3 The wet well overflow shall be sized to discharge the peak station inflow without surcharging.

19.4 The overflow shall be located above the top of peak emergency storage volume but below the lowest basement elevation in the catchment area. The overflow shall outlet directly from the wet well and be piped directly into a nearby storm water management pond complete with a Tideflex type backflow preventer valve on the pipe outlet. Where a storm water management pond is not located in the immediate vicinity of the sewage pumping station, the overflow can be piped to a nearby storm sewer, but the storm sewer must be designed accordingly. As a last resort, the overflow can be piped directly to a nearby water course or where a water course is not available, alternatives to be considered.

19.5 Overflows shall be monitored, metered and alarmed using an appropriate open channel flow measurement device monitored by SCADA and overflows shall be equipped with a float and alarmed on SCADA when the sewage has risen within the wet well to the elevation of the overflow pipe invert.

20.0 Station Overflow Disinfection

20.1 The requirement for chlorination of overflows will be reviewed as a risk assessment, based on public health impacts, on a site-by-site basis as required by the approval agencies.

21.0 Forcemain Design and Maintenance

21.1 Design the forcemain in accordance with the MECP guidelines.

21.2 The forcemain shall be designed to accommodate the peak design flow produced by the pumping station pumps.

21.3 The maximum sustained operating pressure shall not exceed 700 kPa (100 psi).

21.4 Minimum cover over the forcemain shall be 1.8 m.

21.5 Forcemain pipe up to and including 300 mm diameter shall be Polyvinyl Chloride (PVC) pipe, manufactured in accordance with the latest edition of AWWA C900. A minimum Class 150, DR 18 pipe shall be used. This corresponds to the maximum allowable working pressure (operating pressure) to which the pipe can be subjected. Fittings shall be of cast iron or ductile iron, cement-lined and shall be manufactured to AWWA C110. All fittings shall be supplied with mechanical joint ends. Forcemains greater than 300 mm dia. shall be concrete pressure pipe.

21.6 Forcemain shall be installed as per OPSS 412. Forcemain bedding and cover material shall be per OPSD 802.010 using Granular “A” or approved equivalent (per OPSS1010 and precludes Recycled asphalt pavement (RAP) material).

21.7 The forcemain shall be designed to maintain a minimum self-cleansing velocity of at least 0.6 m/s at all times.

21.8 A tracer wire shall be provided along the top of all Polyvinyl Chloride (PVC) and Concrete Pressure Pipe (CPP) forcemains to permit future field tracing. These tracer wires shall be attached to the top of the forcemain. Tracer wires shall be No. 12 gauge stranded copper (TWH), complete with plastic coating. Tracer wire shall be connected to valves in chambers and the tracer wire is to be carefully extended along the bottom of the chamber, up the backside of the steps along the chamber wall and securely fastened to the top rung with fiberglass tape. Tracer wire is to be continuous with no joints. Where joints are needed (between

rolls) they are to be soldered together plus wrapped in dielectric tape over wrapped with vinyl tape. Confirmation of the continuity of the tracer wire installation is to be provided in writing by the Owner's Consulting Engineer as part of the commissioning of the forcemain system.

21.9 Mechanical joint restraints are to be installed on bell and spigot joints for all forcemains constructed in fill material and at all horizontal bends, vertical bends and valves. The use of concrete thrust blocks is generally discouraged, and they will only be permitted where deemed absolutely necessary by the Township. Restrained joints and granular thrust blocks shall be used for all PVC forcemains. The details and length of joint restraint shall be as specified on Standard Drawings KS 830. Where conditions warrant, additional forcemain restraints may be required. The Engineer may be required to provide calculations in support of the proposed restraint design and configuration. Mechanical restraints are to be identified on all plan and profile drawings. All mechanical restraint systems shall be installed with cathodic protection.

21.10 Gate valves shall be used on all buried forcemains 300 mm in diameter and smaller. All valves shall have mechanical joint ends and shall be wrapped in Denso tape or equivalent. All valves shall have a non-rising stem and a 50 mm square operating nut opening counterclockwise. Any valves deeper than 2.4 m require the operating nut to have a valve stem extension.

21.11 All valves shall be located with three piece, sliding type, size "D" valve boxes as per Standard Drawing KS 840.

21.12 Valves shall be placed in a chamber for any pipes being 300 mm diameter, or larger, as specified on Standard Drawing KS 841. The frame and cover shall be set flush to finished grade. The top of the roof slab of the chamber shall be at least 0.60 m below the profile of the finished pavement. Wherever possible, chambers shall be provided with a connection to a storm sewer system (sewer, manhole, or catchbasin). Said connection shall be a 100 mm (min.) PVC or HDPE pipe. Where a connection is not possible, the chamber is to be fully water-proofed, including all joints and adjustment rings. All chambers are to have the tracer wire extend from the valve along the bottom of the chamber up the backside of the steps along the chamber wall and securely fastened to the top rung with fiberglass tape.

21.13 Air relief and vacuum valves or combination valves shall be installed at all significant high points of the forcemain as required. Air relief valves shall be double-acting type, combination air release valve. Chambers are to be provided with drainage connections wherever possible. Air relief valves shall be housed within a chamber as specified on Standard Drawing KS 843 and drained to storm sewers where possible.

21.14 All ferrous forcemain, ferrous fittings and tracer wires connections shall have corrosion protection provided by means of sacrificial anodes. Cathodic protection shall be provided for all tracer wires on PVC and CPP forcemains. One 2.3 kg zinc anode is to be installed for every 500 m of tracer wire, as per the Standard Drawings. The location for the anodes shall be shown on the construction drawings. One 2.3 kg zinc anode is to be installed on every valve and fitting connected to a nonferrous forcemain. Fittings shall include bends, tees, crosses, sleeves, reducers, plugs, caps, joint restrainers, and couplings, etc. All thermite weld connections shall be coated with Roybond 747 Primer and Royston “Handy Cap” or approved equal. Alternatively, mechanical joint fittings may be cathodically protected by installing 175 g “Protector Caps”, or approved equal, on each mechanical joint bolt.

22.0 Heating & Ventilation Compliance

22.1 The requirements for NFPA 820 ventilation requirements are specified under each station Type.

22.2 Ventilation requirements for pumping stations are spelled out in various reference literature, including the MECP Design Guidelines, ASHRAE Standard 62 Ventilation for Acceptable Indoor Air Quality, and the WEF Manual of Practice 8 - Design of Municipal Wastewater Treatment Plants. Designers should reference these standards when designing facilities. However, it is important to note that NFPA 820 allows the use of increased ventilation rates to allow the de-rating of the electrical classification. Due to the additional operating costs, and the requirement to ensure continuous ventilation to achieve this de-rating, the Township will not permit this technique.

22.3 For Type III stations entry into the wet well for maintenance and / or other operation functions, provide positive ventilation in the wet well with 30 air changes per hour. The ventilation system in the wet well shall be started manually by a switch which will also turn on lights in the wet well.

22.4 For Type I, II, and III stations, continuous and intermittent forced ventilation of the wet well under normal operating condition is not mandatory. The need for forced ventilation shall be assessed on a case-by-case basis.

22.5 Ventilation ducts shall be maintenance free, and the material shall preferably be fiberglass or plastic with unpainted finished surface. All ventilation equipment such as dampers, fans, or motors shall be readily accessible for maintenance and servicing. Ventilation fans inside the duct are not acceptable.

23.0 Electrical Design

23.1 Consultant shall consult with local hydro authorities on the preferred location of the hydro meter.

23.2 Provide a junction box equipped with terminal strip on the exterior of the wet well to facilitate changes of the electrical equipment in hazardous locations. See standard figure (Figure 4) for location of EYS (Electrical Y Seal).

23.3 The process designer should review the benefits of Variable Frequency Drives (VFDs) and Soft Starters with King's staff and document the decision (in a project memo) on whether these are required.

23.4 E-stops to be provided for process equipment of Type II and Type III stations.

23.5 The station is to be provided with a Station Power Monitor connected to SCADA.

23.6 A Surge Protection Device (SPD) is required at the service entrance.

23.7 All lighting to be LED.

23.8 All exterior lighting to include photocells.

23.9 Lighting shall be provided in wet wells and valve chambers. The switches shall be provided at the outdoor electrical enclosure for Type I stations and inside the building for Type II and III stations.

23.10 GFCI receptacles near the wet wells for maintenance.

23.11 Provide arc resistant MCC design and Arc Flash Maintenance switches on MCC Main breakers.

23.12 Provide IR ports on MCC's for easier IR testing.

23.13 Provide short circuit, coordination and arc flash studies.

24.0 PLC and SCADA System

24.1 Refer to the Township of King SCADA Standards.

25.0 Odour Control System

25.1 In Ontario, odour is considered to be a contaminant under the Environmental Protection Act. The design must meet the guideline requirements of a maximum of one odour unit concentration based on the prediction at any receptor.

25.2 Type I and II Pump Stations will be equipped with passive odour control units. Passive odour control units are to be installed in the vent pipes at a level that will permit easy maintenance. Ensure passive odour control units are rated for an airflow equivalent to the peak capacity of the pumps. Larger stations will require more complex odour control unit located in a building.

25.3 Odour dispersion modeling will be required on a case-by-case basis depending on proximity to residential properties and expected level of odour.

25.4 The Odour Control System shall be designed to prevent or minimize production of odorous compounds, treatment of odorous compounds, containing and treating foul air, and enhancing dispersion of foul air. For Type III Pump Stations provide dual stage impregnated carbon units with mist eliminators.

25.5 For all odour control units, provide spare carbon filters or media for normal operations replacement for a period of one (1) year following substantial performance.

26.0 Aesthetic Design

26.1 Refer to the Township's Urban Design Guidelines based on the current or new surrounding subdivisions when designing the exterior of the Pump Station.

26.2 The Township's Architectural Control Analyst to be consulted.

27.0 Commissioning

27.1 Commissioning of equipment and pumping stations is to be supervised by the design consultant and shall require manufacturers representatives to inspect the installation of equipment, provide assistance during commissioning and to train operations personnel in operation and maintenance.

27.2 Commissioning is to be followed by 14 days of satisfactory operation before the station is put into operation. After the consultant has successfully proven out all operational aspects of the station shall a demonstration session be provided to the Township operators and engineering staff.

28.0 Asset and Maintenance Data

28.1 For all new equipment included within the design, the consultant must provide the Township's required asset and maintenance data in two excel spreadsheets.

28.2 The Asset Data requirements for each device include the following data fields- asset ID, manufacturer, make, model, serial number, year installed, forecasted asset lifetime, plus another 10 fields to be deemed at the time of design.

29.0 Final Deliverables

29.1 Prior to the Township allowing the stipulated maintenance period to begin and the Township assuming operational duties of the sewage pumping station, the following deliverables must be provided to the Township.

29.1.1 “As constructed“ drawings in a manner consistent with the requirements under the Subdivision Agreement for “as constructed” drawings in a digitized electronic format acceptable to the Township.

29.1.2 A facility operation manual for the Sewage Pumping Station. The format of the Operations Manual for the Sewage Pumping Station shall follow the Ministry of the Environment’s “Master Model Operations Manual for Water Supply Systems”, 1992 or approved equivalent. The Operations Manual shall be prepared in the latest version of Microsoft Word and two hard copies, and one electronic copy (in Microsoft Word format) shall be provided. A sample manual showing required format and content will be provided by the Township upon request.

29.1.3 An as built Process Control Narrative for the Sewage Pumping Station. The Process Control Narrative shall describe the operation, monitoring, and control of all equipment in the Sewage Pumping Station that is controlled or monitored by a process logic controller (PLC), SCADA (System Control and Data Acquisition) system, or autodialler. The Process Control Narrative shall be prepared in the latest version of Microsoft Word and two hard copies, and one electronic copy (in Microsoft Word format) shall be provided.

29.1.4 A complete set of final shop drawings for all material and equipment used in the construction of the Sewage Pumping Station. Two hard copies (in appropriately labelled) 3-ring binders and one digital copy (in pdf. format) shall be provided.

29.1.5 An Equipment Operation and Maintenance Manual for all equipment installed in the Sewage Pumping Station. Bind equipment maintenance data in vinyl hard covered, 3-ring loose leaf binder for 215 x 280 mm size paper. Organize contents into applicable sections of work to parallel project specification break-down. Mark each section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets. Include description, operation, and maintenance instructions for equipment and systems, including a complete list of equipment and spare parts list. Indicate nameplate information such as make, size, capacity, and serial number. Include the names, addresses, and phone numbers of subcontractors and suppliers. Include guarantees and warranties showing

name and address of project, guarantee commencement date and duration, and clear indication of what is being guaranteed and what remedial action will be taken under the guarantee. Include a list of all manufacturer's recommended spare parts and lubricants. Two hard copies (in appropriately labelled) 3-ring binders and one digital copy (in pdf. format) shall be provided.

29.1.6 A USB memory stick of all software and control programs for any SCADA, PLC, or HMI (Human Machine Interface) equipment.

SECTION A TOWNSHIP OF KING APPROVED PRODUCT AND EQUIPMENT LIST FOR SEWAGE PUMPING STATIONS

DISCLAIMER: Products are not necessarily listed in preferential order. The Township of King reserves the right to list manufacturer(s) for specialized equipment and applications outside the Approved Product and Equipment List.

Except where noted with (*) in the following list, the term " or approved equivalent" shall apply to the brand names specifically identified. The design may proceed with the brand names listed, however if an alternate product is proposed for equivalency it must receive specific Township approval prior to its inclusion in the project.

Those items identified with (*) are to be single sourced and no approved equivalents will be considered.

A1.00 Control and Instrumentation

Equipment Type	**Equipment Sub-Type**	**Brand Name**	**Owner / Supplier Name**	**Model**	**Code, Criteria, and Restriction**
Level Switch	Float	*Xylem	*ENM		
Liquid Level Transmitter	Hydrostatic Pressure Transmitter	Endress & Hauser		Water Pilot with RIA 452 Controller	**Note**: Sink weight or Stilling pipe Used in Wastewater applications only where either surface interference can possibly affect non-contact level detection (i.e., floating debris or steam / mist).
		KPSI			
Liquid Level Transmitter	Ultrasonic Transmitter	Siemens		Milltronics Multi-Ranger	
		Endress & Hauser		FDU9x * FMU90	
Flow Transmitter	Magnetic Flow Meter	Rosemount	Emerson	8712E & 8750	Hart capable
		Endress & Hauser		Promag 400W	
		Krohne	ACI	OptiFlux	
		Siemens		FM Magflo MAG 6000	
Pressure Transmitter		ABB	ABB		
		Rosemount	Emerson	2088 Series	
Pressure Gauges (Incl. Diaphragm Seal)	Liquid Filled	WIKA			Dual scales: kPa and PSI
		Ashcroft			
		Winters			
Thermostat	Low temperature thermostat	Honeywell			
Uninterruptible Power Supply	Continuous Online	APC	Schneider Electric		Minimum UPS capacity to be equal to150 per cent of system full load. 60 minute runtime.
		Powerware	Eaton		
		SOLAHD	Emerson		

Equipment Type	Equipment Sub-Type	Brand Name	Owner / Supplier Name	Model	Code, Criteria, and Restriction
Voltage and Current Transducer	Continuous Online	Phoenix Contact			
		Pribusin			
Autodialler		*RACO Verbatim			Cellular Based
Hazardous Gas Monitoring Equipment		Honeywell			
		MSA			

A2.00 Process Equipment

Equipment Type	Brand Name	Owner / Supplier Name	Model	Code, Criteria, and Restriction
Automatic Screen				
	Violia	John Muenier		
	Claro			
	Huber			
Grinder / comminutor	JWC		Muffin Monster / Channel Monster	
	Vogelsang			

A3.00 Emergency Standby Power

Equipment Type	Brand Name	Owner / Supplier Name	Model	Code, Criteria, and Restriction
Automatic Transfer Switch	Cummins / Onan			
	ASCO	Emerson		
	Eaton / Cutler-Hammer			
Engine / Generator	Cummins / Onan			Diesel with 24 hours of fuel storage
	Caterpillar			
Switchgear	ABB			

	Eaton			
Portable Generator Receptacle	Appleton	Emerson	Powertite Pin and Sleeve ADJA20034-250	200A, 600V with door cover

A4.00 Electrical

Equipment Type	Brand Name	Owner / Supplier Name	Model	Code, Criteria, and Restriction
Electric Motor	Baldor			For all applications Service Factor: 1.15 1. Frame and Bracket: Cast Iron 2. Enclosure >40ºC Ambient <90ºC, ODP >40ºC Ambient <80ºC, TEFC 4. Electric motor used for VFD application must be inverter duty rated 5. Guaranteed minimum full load efficiency. Typical efficiency values are now in the range of 92-95% depending on model selected. 6. The motor is to meet or exceed the following % Guarantee Minimum Full Load Power Factor: 88.3 7. Inverter duty motor rating. Motor meeting all applicable requirements of NEMA MG 1, Section IV, Parts 30 and 31 8. 75 kW and larger to be suitable for solid state reduced voltage starting
	TECO Westinghouse Motors			
	WEG	V. J. Pamensky Canada Ltd	Single Phase and Three Phase	
	U.S. Motors	Nidec Motor Corp.		
Motor Control Centre	Allen-Bradley	Rockwell Automation	Centerline 2100	All analog signals to be split out in a separate area of the panel. All pilot lights shall be green for running / energized, red for stopped.de-energized Arc Resistant per IEEE C37.20.7 Low voltage MCC IP20 Finger Safe
	Eaton Cutler-Hammer		Freedom 2100	
	Square D	Schneider Electric	Model 6	
Soft Start / Soft Stop Controls	Allen-Bradley	Rockwell Automation		All pilot lights shall be green for running / energized, red for stopped.de-energized
	Benshaw			
	Eaton Cutler-Hammer			
Surge Protection Device	Total Protection Solution Canada	Innosys Power		

Equipment Type	Brand Name	Owner / Supplier Name	Model	Code, Criteria, and Restriction
Variable Frequency Drives	Allen-Bradley	Rockwell Automation		All pilot lights shall be green for running / energized, red for stopped.de-energized
	ABB			
	Schneider			
	Square D			
	Eaton Cutler-Hammer			

A5.00 Pumps

Equipment Type	Equipment Type	Brand Name	Owner / Supplier Name	Model	Code, Criteria, and Restriction
Dynamic Centrifugal Pumps	Submersible Pump or Dry Pit Submersible Pump	*Flygt (Xylem)			For dry and wet pit vertically mounted motors. For submersible pumps,as a minimum, the total number of pumps minus one shall be be supplied with a hydraulic flush valve.

A6.00 Valves

Equipment Type	Equipment Type	Brand Name	Owner / Supplier Name	Model	Code, Criteria, and Restriction
Check Valves	Duck Bill / Inline	Tideflex	Red Valve		
		Tideflex Technologies	Syntec Process Equipment	Tideflex Checkmate Inline	
		EVR	Devine and Associates Limited		
	Flexible Disc	Val-matic	Syntec Process Equipment	Swing Flex Check Valve	Complete with manual backflow actuator
		Pratt	Devine and Associates Limited	RD Series	
Isolation Valves	Ball (PVC)	Ipex			PVC
Isolation Valves	Ball (Stainless Steel)	Watts			Stainless Steel
		Apollo			
Isolation Valves	Globe	Jenkins	Crane Co.		
Isolation Valves	Knife Gate	Dezurik		Styles KGC-BD & KGN- RSB	Non rising stem, stem extension and operating nut to be provided in valve chambers
		Orbinox			
		Stafsjo		MV-A	
		Trueline			
Isolation Valves	Plug	Dezurik			Complete with right angle gear drive and handwheel operator. Right angle gear drive, stem extension and operator nut required in valve chambers.
			Pratt/Milliken		
		Val-Matic			
Isolation Valves	Sluice / Slide Gate	Fontaine Aquanox			
		Orbinox	Devine and Associates Limited		

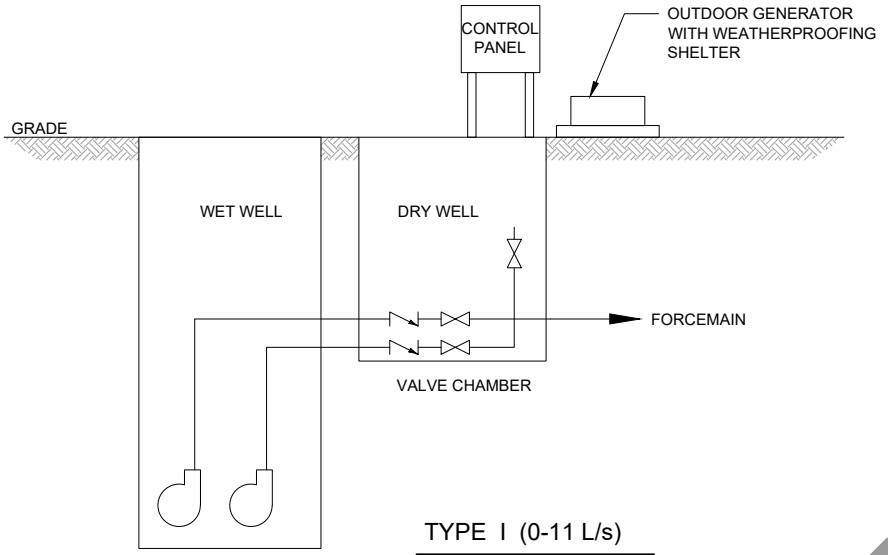
Equipment Type	Equipment Type	Brand Name	Owner / Supplier Name	Model	Code, Criteria, and Restriction
		Cla-Val	Devine and Associates Limited		
		Val-Matic	Syntec Process Equipment		
Miscellaneous Valves	Backflow Preventer	Watts			
		Zurn			
Miscellaneous Valves	Electric Valve Actuator	Rotork			Require manual bypass wheel
		Auma			
Miscellaneous Valves	Pressure / Surge Relief	*Singer			

A7.00 Ventilation / Heating Equipment

Equipment Type	Brand Name	Owner / Supplier Name	Model	Code, Criteria, and Restriction
Air Conditioning / Heating	Carrier	United Technologies		
	Trane	Ingersoll Rand		
	Engineered Air		FW / DJ	
Air Vent (Recirculation System)	Armstrong			
	Spirax-Sarco			
Custom Air Handling and Energy Recovery Ventilators	Engineered Air			
	Haakon			
Motorized Damper	Belimo			cUL (CSA 22.2) CSA Class 4813 certified
	Honeywell			

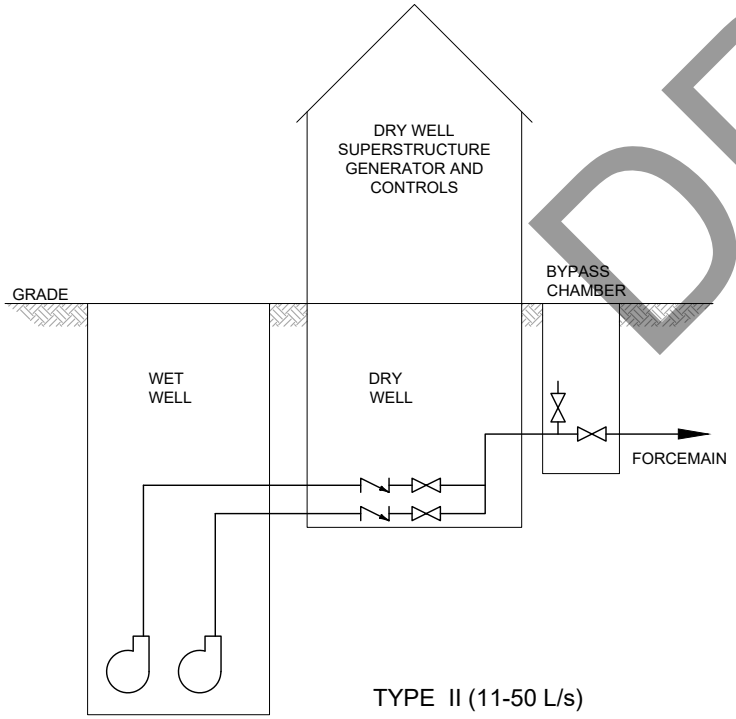
A8.00 Miscellaneous Equipment

Equipment Type	**Brand Name**	**Owner / Supplier Name**	**Model**	**Code, Criteria and Restriction**
Hatch Covers	Bilco		Type J-AL or JD-AL	Aluminum hatch with secondary grating made of aluminum or FRP. Spring loaded, not bolt down, lockable.
	MSU Mississauga Ltd.			
Trolleys, Hoist, Chain, and Controls		Demag		
		Richards-Wilcox		
		Zelus	Steelway Material Handling	
Mansafe Davit Sockets and Portable Davit	*DBI Sala			
Pump Removal Davit Posts and Portable Davit	*Easily Moved Equipment (EME)			Davit posts to be 1.1 m tall.



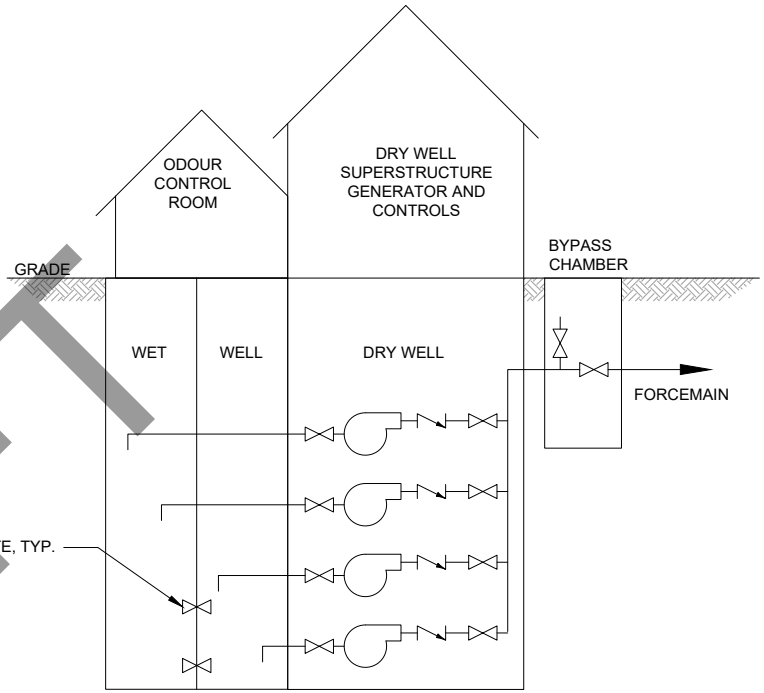
TYPE I (0-11 L/s)

SCALE N.T.S.



TYPE II (11-50 L/s)

SCALE N.T.S.



TYPE III (>50 L/s)

SCALE N.T.S.

NOTE:

1. BYPASS CHAMBER PIPING FOR TYPES II AND III MAY BE PROVIDED IN THE DRY WELL WITH CONNECTION PIPING EXTENDING/ OUTLETTING THE BUILDING ABOVE GRADE.

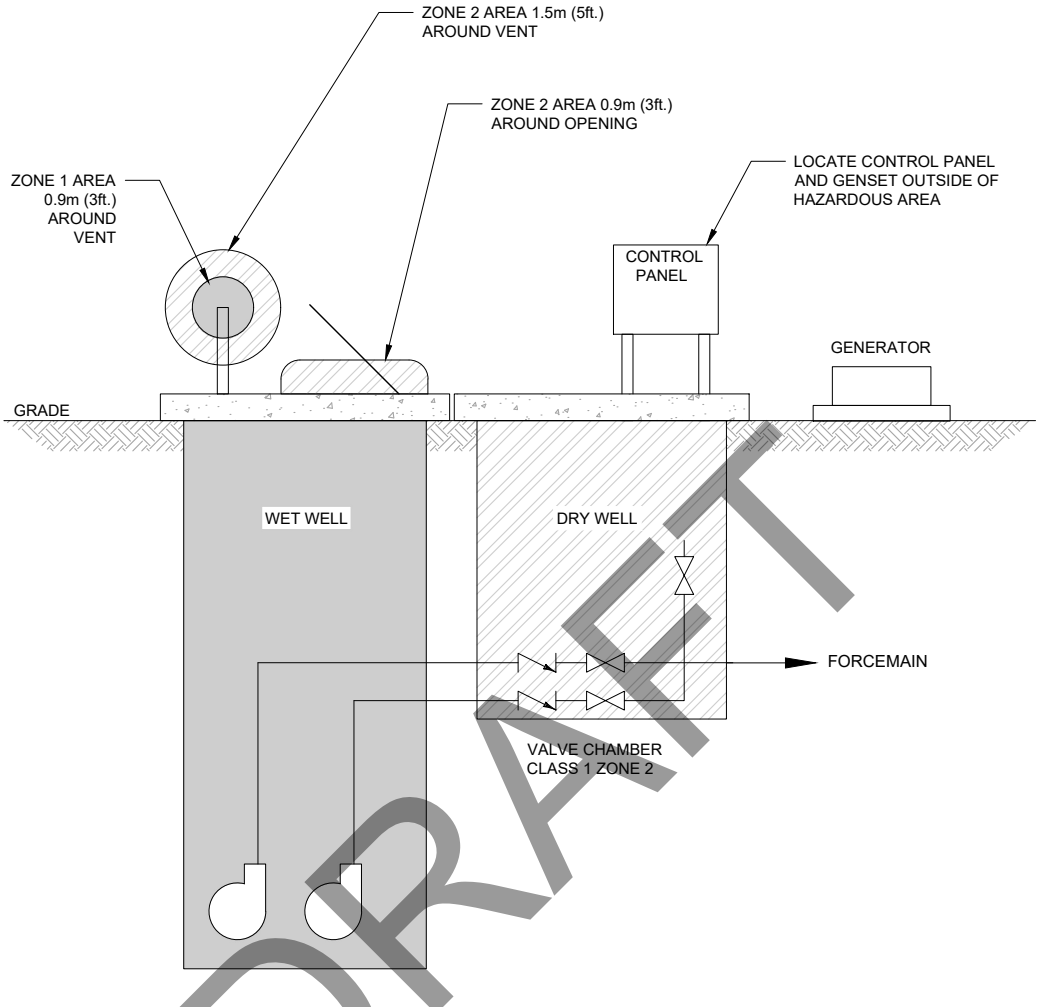
TOWNSHIP OF KING

Figure Title

KING SEWAGE PUMP STATION DESIGN STANDARDS

PUMPING STATION TYPES

Date	Figure No.
FEBRUARY 2024	1
Scale	
NOT TO SCALE	



NOTES:

1. AREA / SPACE CLASSIFICATIONS DEFINED AS PER THE CANADIAN ELECTRICAL CODE, NFPA 820 AND SECTIONS 18 AND 22 OF THE OESC.

HAZARDOUS AREA - CLASS 1 ZONE 1

HAZARDOUS AREA - CLASS 1 ZONE 2

TYPE 1 PUMPING STATION ARRANGEMENT

SCALE N.T.S.

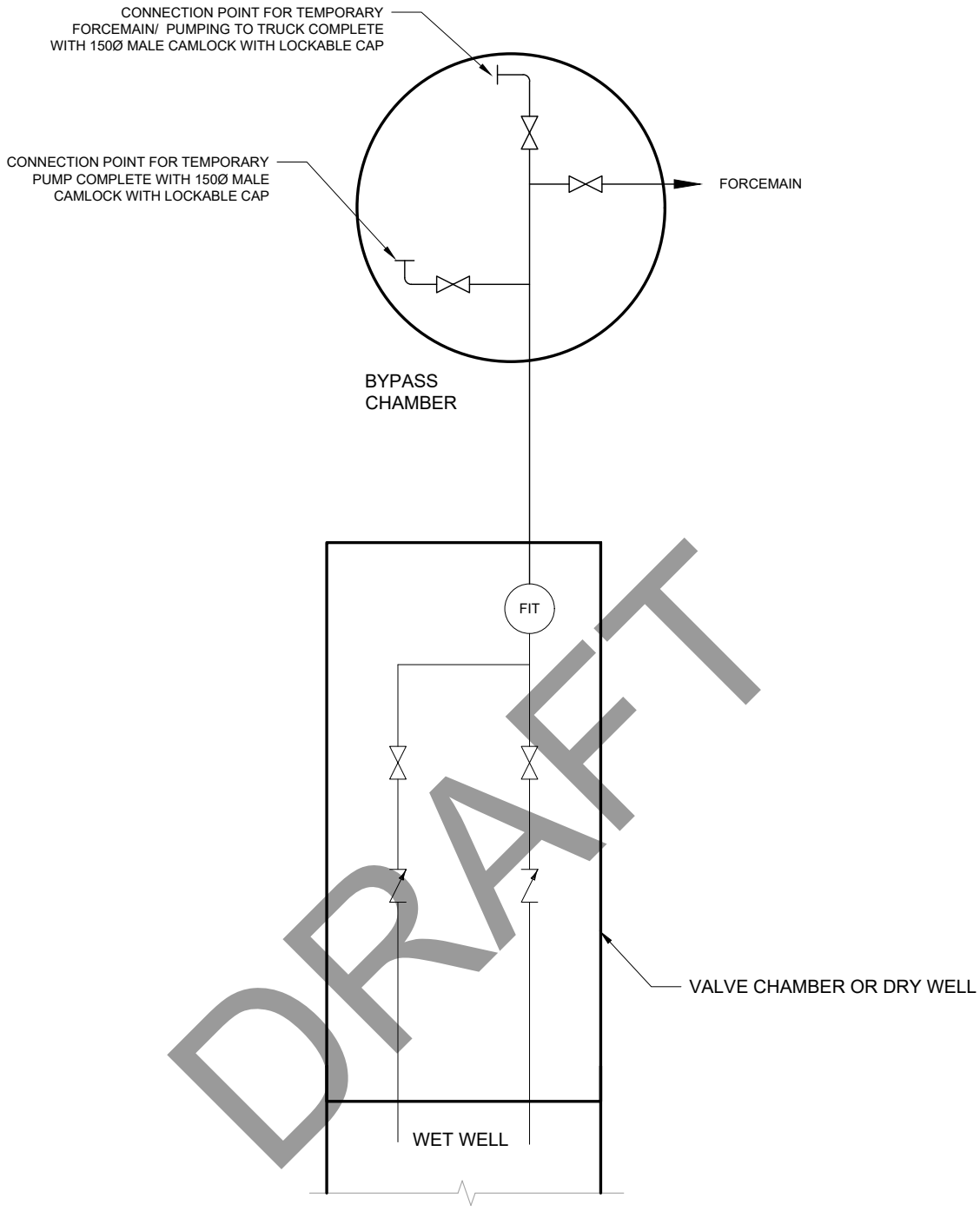
TOWNSHIP OF KING

Figure Title

KING SEWAGE PUMP STATION DESIGN STANDARDS

TYPE I PUMPING STATION ARRANGEMENT

Date	Figure No.
FEBRUARY 2024	**2**
Scale	
NOT TO SCALE	



PIPING BYPASS ARANGEMENT

SCALE N.T.S.

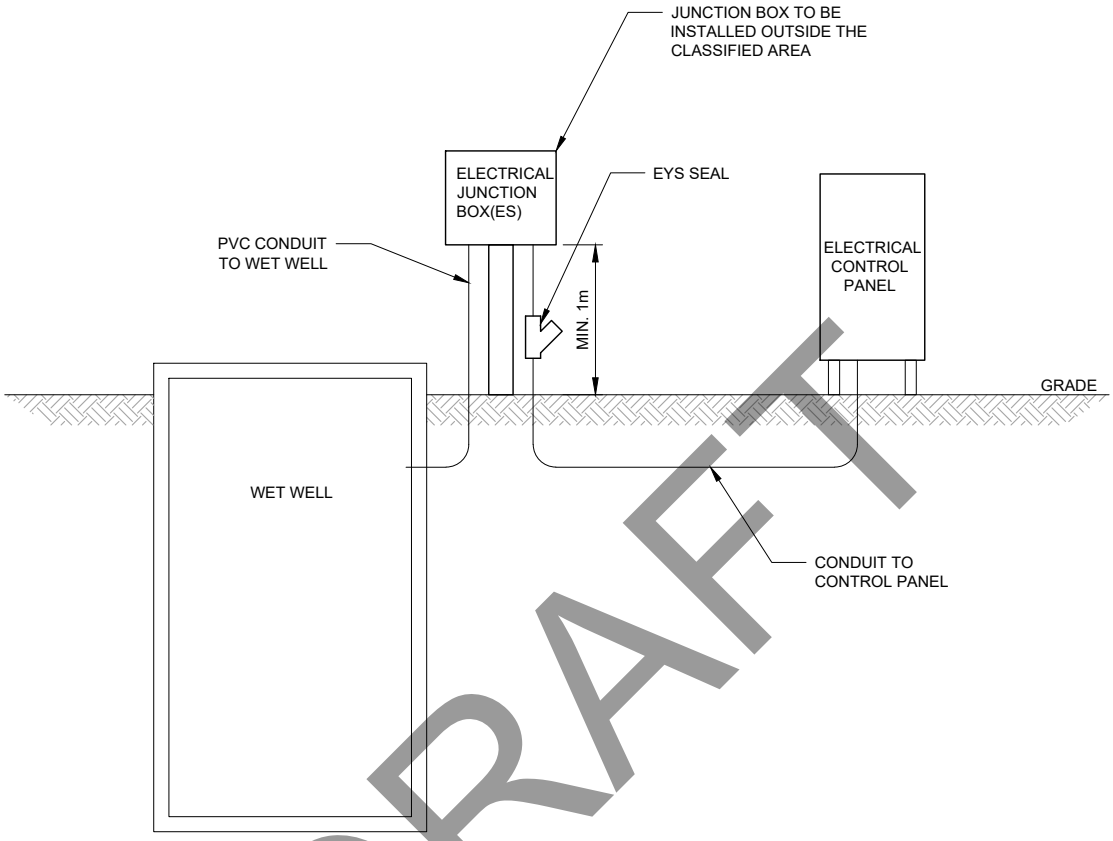
TOWNSHIP OF KING

Figure Title

KING SEWAGE PUMP STATION DESIGN STANDARDS

PIPING BYPASS ARRANGEMENT

Date	Figure No.
FEBRUARY 2024	**3**
Scale	
NOT TO SCALE	



ELECTRICAL BOX LOCATION

SCALE N.T.S.

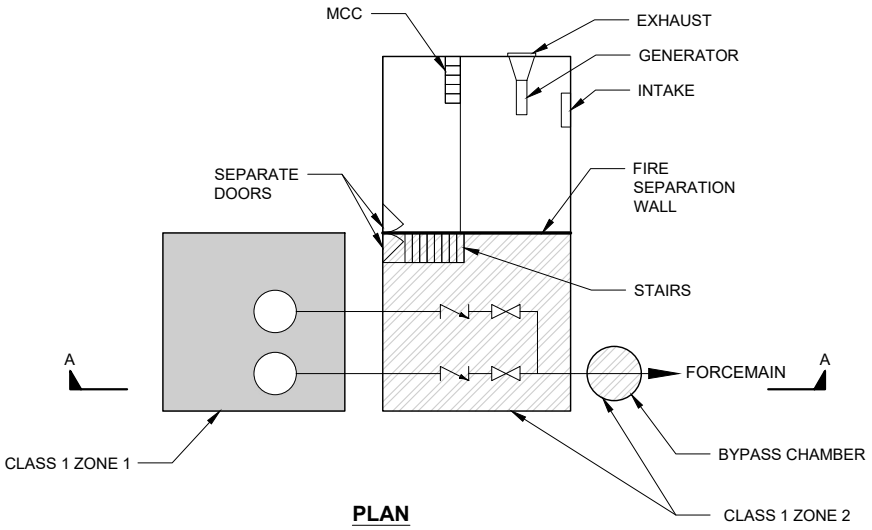
TOWNSHIP OF KING

Figure Title

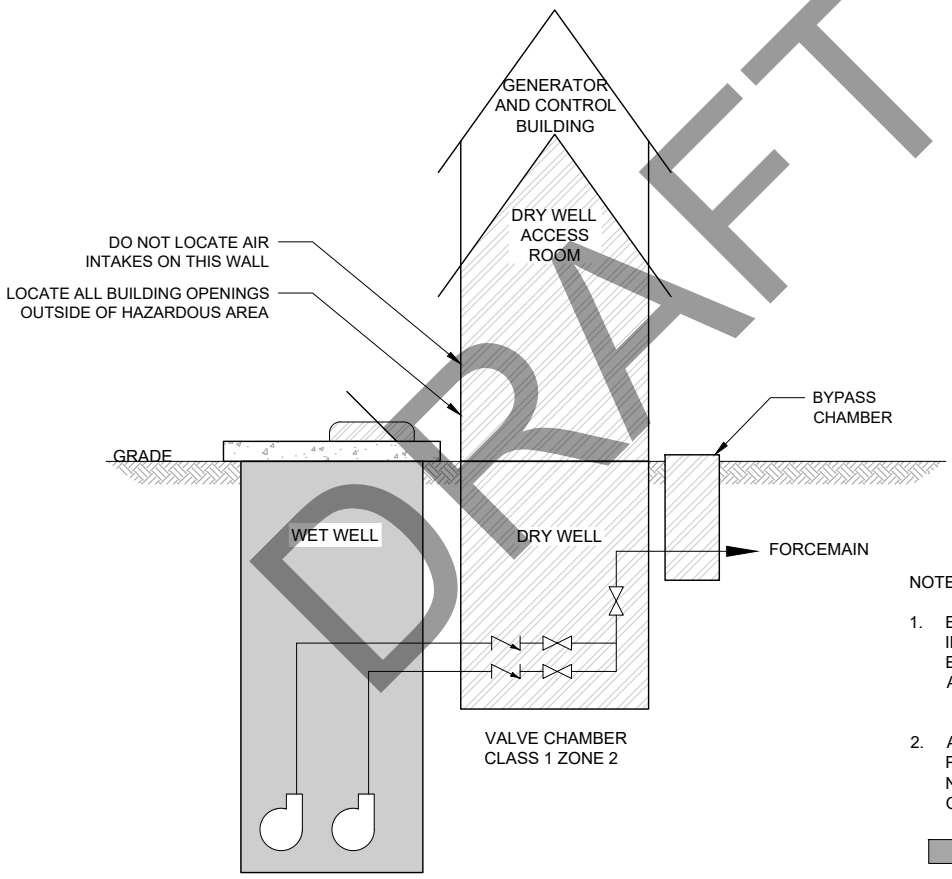
KING SEWAGE PUMP STATION DESIGN STANDARDS

ELECTRICAL BOX LOCATIONS

Date	Figure No.
FEBRUARY 2024	**4**
Scale	
NOT TO SCALE	



PLAN



SECTION A-A

NOTES:

1. BYPASS CHAMBER PIPING MAY BE PROVIDED IN THE DRYWELL WITH CONNECTION PIPING EXTENDING/ OUTLETTING THE BUILDING ABOVE GRADE.

2. AREA / SPACE CLASSIFICATIONS DEFINED AS PER THE CANADIAN ELECTRICAL CODE, NFPA 820 AND SECTIONS 18 AND 22 OF THE OESC.

HAZARDOUS - CLASS 1 ZONE 1

HAZARDOUS - CLASS 1 ZONE 2

TYPE 2 PUMPING STATION ARRANGEMENT

SCALE N.T.S.

TOWNSHIP OF KING

Figure Title

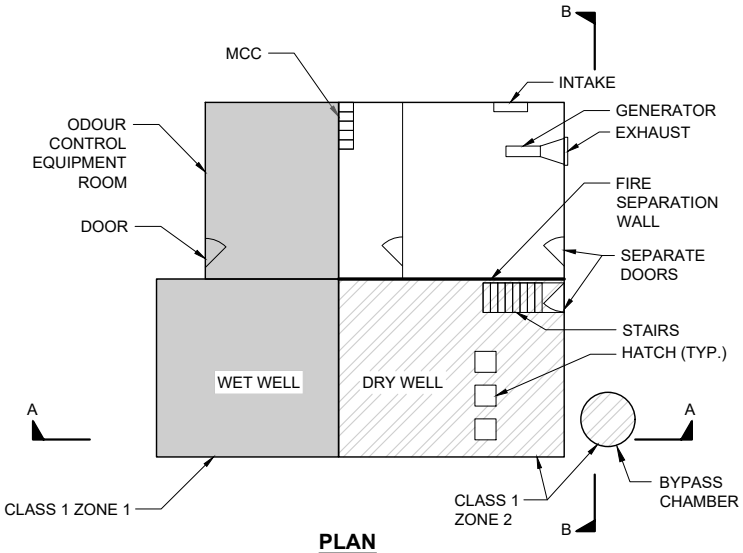
KING SEWAGE PUMP STATION DESIGN STANDARDS

TYPE II PUMPING STATION ARRANGEMENT

Date: FEBRUARY 2024

Scale: NOT TO SCALE

Figure No. **5**



PLAN

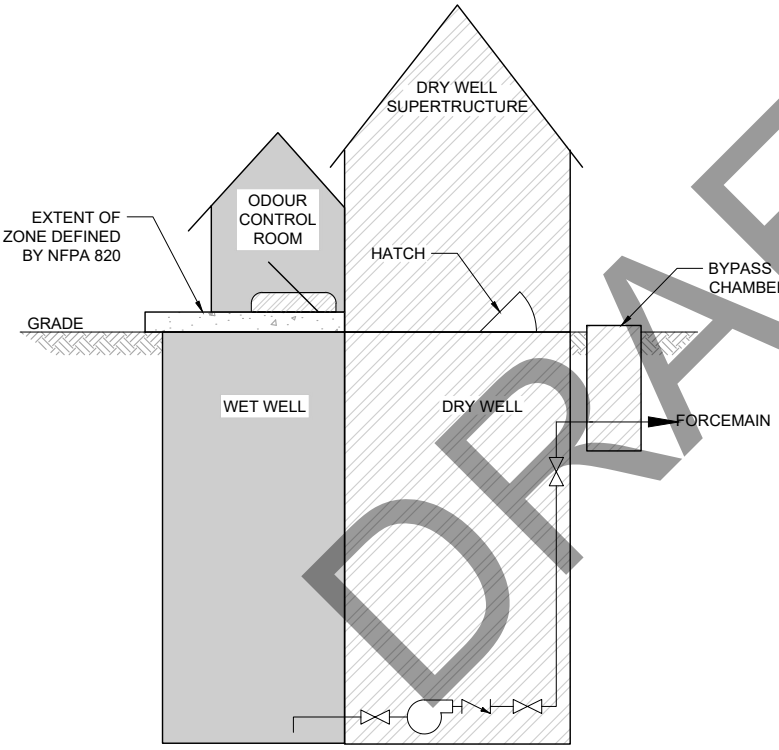
NOTES:

1. BYPASS CHAMBER PIPING MAY BE PROVIDED IN THE DRYWELL WITH CONNECTION PIPING EXTENDING/OUTLETTING THE BUILDING ABOVE GRADE.

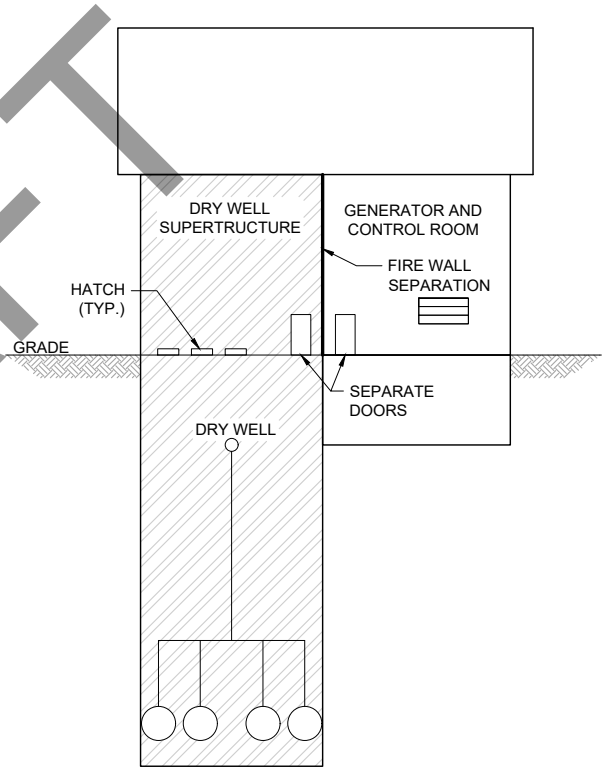
2. AREA / SPACE CLASSIFICATIONS DEFINED AS PER THE CANADIAN ELECTRICAL CODE, NFPA 820 AND SECTIONS 18 AND 22 OF THE OESC.

HAZARDOUS AREA - CLASS 1 ZONE 1

HAZARDOUS AREA - CLASS 1 ZONE 2



SECTION A-A



SECTION B-B

TYPE III PUMPING STATION ARRANGEMENT

SCALE N.T.S.

TOWNSHIP OF KING

Figure Title

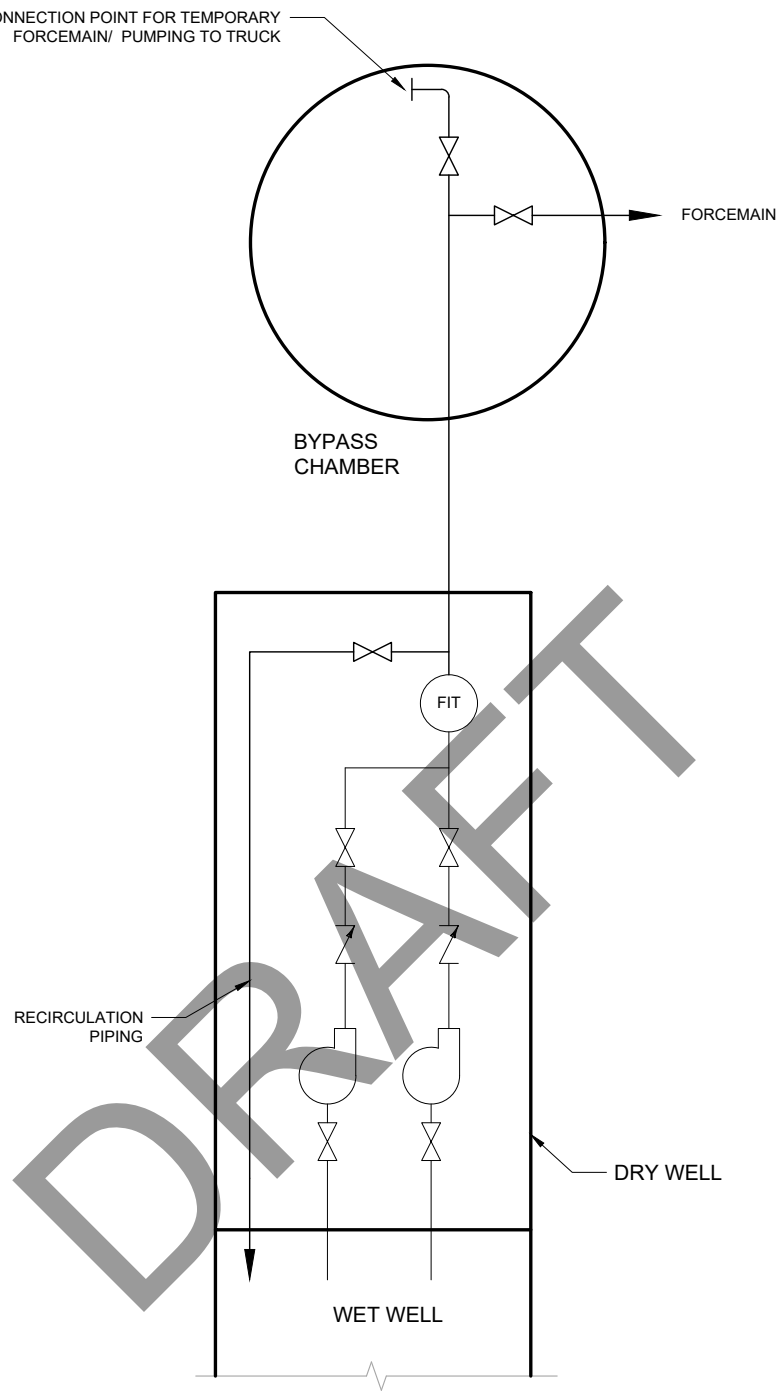
KING SEWAGE PUMP STATION DESIGN STANDARDS

TYPE III PUMPING STATION ARRANGEMENT

Date: FEBRUARY 2024

Scale: NOT TO SCALE

Figure No. **6**



WET WELL STATION RECIRCULATION PIPING

SCALE N.T.S.

TOWNSHIP OF KING

Figure Title

KING SEWAGE PUMP STATION DESIGN STANDARDS

WET WELL STATION RECIRCULATION PIPING (TYPE III)

Date	Figure No.
FEBRUARY 2024	**7**
Scale	
NOT TO SCALE	

APPENDIX 6

Sewer Design Sheets

Township of King
Design Criteria and Standard Detail Drawings

TOWNSHIP OF KING REGIONAL MUNICIPALITY OF YORK
SANITARY SEWER DESIGN SHEET

Project / Subdivision : _____

Consulting Engineer : _____

Project No.: _____

Prepared by: _____

Checked by: _____

Last Revised: _____

Design Parameters

Residential Density (Single+Semis) =	3.5	cap/unit	Residential =	370	L/cap/day
Residential Density (Town Houses) =	2.9	cap/unit	Industrial (Light) =	35	m^3/ha/day
Residential Density (Apartments) =	2.0	cap/unit	Industrial (Heavy)=	55	m^3/ha/day
Manning 'n' =	0.013		Institutional =	65	m^3/ha/day
Extran. Flow=	0.26	L/s/ha	Commercial =	65	m^3/ha/day

Design Equations

$$M(r) = \frac{1+\frac{14}{4}}{+(P)^{1/2}}$$

$$Q(i) = i \times_{cr} A$$

$$M(ind) = 6.6604 \times A^{-0.1992}$$

$$Q(r) = \frac{P * q * M}{86400}$$

NOTE: The pipe capacity is limited to maximum values according to Table E-3 of the Design Manual.

Notes/Comments:

Location					Individual Values									Cumulative Values									Flow Data							Sewer Data						
Street	From		To		Industrial Light Area	Industrial Heavy Area	Commercial Area	Institutional Area	Residential Area	Residential Units (Single+Semis)	Residential Units (Town Houses)	Residential Units (Apartments)	Residential Population	Light Industrial P.F.	Heavy Industrial P.F.	Industrial Light Area	Industrial Heavy Area	Commercial Area	Institutional Area	Residential P.F.	Residential Area	Residential Population	Light Industrial Peak Flow (L/s)	Heavy Industrial Peak Flow (L/s)	Commercial Peak Flow (L/s)	Institutional Peak Flow (L/s)	Population Peak Flow (L/s)	Peak Extraneous Flow (L/s)	Total Design Flow (L/s)	Length	Pipe Size	Type of Pipe	Grade	Full Flow Capacity	Full Flow Velocity	Actual Velocity
	MH #	Inv	MH #	Inv	(ha)	(ha)	(ha)	(ha)	(ha)	#	#	#	cap.	M(ind-L)	M(ind-H)	A(ind-L)	A(ind-H)	A(c)	A(ins)	M(r)	A(r)	P	Q(I-ind)	Q(h-ind)	Q(c)	Q(ins)	Q(r)	Q(i)	Q(d)	(m)	(mm)		(%)	(L/s)	(m/s)	(m/s)
Example	2A	S	3A	N	2.00	1.00	0.60	1.00	5.00	30	2	3	117	4.00	4.00	2.00	1.00	0.60	1.00	4.00	5.00	117.0	3.24	2.55	0.45	0.75	2.00	2.08	11.07	66.8	200	PVC	0.50	24.19	0.75	0.73

Location					Individual Values									Cumulative Values									Flow Data							Sewer Data						
Street	From		To		Industrial Light Area	Industrial Heavy Area	Commercial Area	Institutional Area	Residential Area	Residential Units (Single+Semis)	Residential Units (Town Houses)	Residential Units (Apartments)	Residential Population	Light Industrial P.F.	Heavy Industrial P.F.	Industrial Light Area	Industrial Heavy Area	Commercial Area	Institutional Area	Residential P.F.	Residential Area	Residential Population	Light Industrial Peak Flow (L/s)	Heavy Industrial Peak Flow (L/s)	Commercial Peak Flow (L/s)	Institutional Peak Flow (L/s)	Population Peak Flow (L/s)	Peak Extraneous Flow (L/s)	Total Design Flow (L/s)	Length	Pipe Size	Type of Pipe	Grade	Full Flow Capacity	Full Flow Velocity	Actual Velocity
	MH #	Inv	MH #	Inv	(ha)	(ha)	(ha)	(ha)	(ha)	#	#	#	cap.	M(ind-L)	M(ind-H)	A(ind-L)	A(ind-H)	A(c)	A(ins)	M(r)	A(r)	P	Q(I-ind)	Q(h-ind)	Q(c)	Q(ins)	Q(r)	Q(i)	Q(d)	(m)	(mm)		(%)	(L/s)	(m/s)	(m/s)

TOWNSHIP OF KING REGIONAL MUNICIPALITY OF YORK
STORM SEWER DESIGN SHEET

5 Year Storm Design Parameters

A = drainage area (ha)	A= 1184.300
C = runoff coefficient	B= 6.094
T_c = time of concentration	C= 0.825
(Refer to Section C6.06 of the design manual)	

100 Year Storm Design Parameters

A = drainage area (ha)	A= 2355.880
C = runoff coefficient	B= 7.500
T_c = time of concentration	C= 0.852
(Refer to Section C6.06 of the design manual)	

System to be Designed for: 5 Year Storm

Project / Subdivision :

Consulting Engineer :

Project No.:

Design Equations

$$I\ (mm/hr) = \frac{A}{(t + B)^C}$$

$$Q\ (m^3/sec) = 2.78 \times A \times C \times I$$

Prepared by:

Checked by:

Last Revised:

NOTES:
1. Rainfall design parameters are based on data from the Toronto City EC Station and the value of A is increased by 15% to account for future climate change.
2. Runoff coefficients and initial Tc values are to be according to section C6.06 of the Design Manual.
3. The pipe capacity is limited to the maximum values according to Table E-3 of the Design

Notes/Comments:

Location			Drainage Area Characteristics				Rainfall / Runoff			Sewer Data									Remarks
Street	From MH.	To MH.	Area (ha)	C	AC	Accum. AC	T_c (min)	I5 (mm/hr)	Q m^3/sec	Diameter (mm)	Length (m)	Slope (%)	Qmax (m3/s)	% Full	V (Full) (m/s)	V (Actual) (m/s)	Sect. Time	Accum. Time	
Sample Avenue	MH15	MH13	0.10	0.60	0.06	0.06	7.50	6.09	0.001	1200	66.8	0.50	2.876	0.0%	2.46	0.00	#DIV/0!	#DIV/0!	

APPENDIX 7

Traffic Impact Study (TIS)

Outline of Requirement for a Traffic Impact Study

1.0 Introduction

The main purpose of a Transportation Impact Study ("TIS") is to demonstrate that the transportation impacts of a proposed development or redevelopment will be manageable and that the transportation aspects of the proposal are consistent with the objectives of the Township. The TIS also provides the basis for the identification and evaluation of transportation-related improvements or measures to be included as conditions of approval for the development or redevelopment application. The TIS will also assess the impacts the development would have on the present and future transportation system.

The overall goals, objectives and benefits of TISs may include:

- Provide a rationale for evaluating whether the development scale is appropriate for the site;
- Identify future localized transportation system deficiencies requiring improvement;
- Demonstrate that the site access and circulation is sufficient;
- Address transportation issues that may concern neighbouring property owners;
- Provide a basis for negotiations for the funding of improvements through the planning process.

The onus is on the Developer to retain a qualified Consultant to conduct a TIS to address the transportation-related issues of the development and obtain approval of the study. The TIS must be dated, signed and sealed by a registered Professional Engineer in the Province of Ontario. The signing Engineer is verifying that appropriate assumptions and methodologies have been utilized in the completion of the TIS and they are the individual who is taking corporate/professional responsibility for the work. The Township has prepared these guidelines to streamline the approval process and provide a standardized framework for consultants to follow when submitting the TIS for review. The guidelines should be complemented with good transportation engineering judgment.

2.0 General Requirements

2.1 Need for a Traffic Impact Study

In general, a TIS is submitted in support of any proposed development which is expected to generate a total of at least additional (new) 50 vehicle trips (combined inbound and outbound) during the peak hour of the adjacent roadway or the peak hour of the proposed development.

A Traffic Impact Study may also be required even if there are less than 50 additional vehicles during peak hours when one or more of the following conditions are anticipated or present:

- The development is located in an area of high roadway congestion and/or a high expected rate of population or employment growth;
- The access or type of operation of the development is not envisaged by local land use or transportation plans;
- As part of the proposed development, a new traffic signal or other traffic control device(s) is proposed;
- Existing transportation issues in the local area, such as a high crash location, complex intersection geometrics, heavy traffic corridors;
- The development has the potential to create adverse operational and safety impacts on the local road network such as:
    - Inadequate horizontal or vertical sight distance at access points;
    - The proximity of the proposed access points to other existing driveways or intersections;
    - Lack of existing left or right-turn lane(s) on the adjacent roadway at the proposed access points; and
    - The vehicular traffic generated by the development would result in volume/capacity (v/c) ratios at a signalized intersection becoming critical (i.e., greater than 0.85 overall or for a shared through/turning movement, or greater than 0.90 for an exclusive turning movement).

2.2 Staff Consultant and Preliminary Investigation

Before commencing a TIS for a particular site, Developers or their Consultants are advised to discuss with Township staff in order to review the level of detail, verify the study scope and study area, determine data requirements, and to confirm assumptions used in the analysis.

The TIS should take into account the findings of previous studies and transportation system concerns pertaining to the study area. The study should also consider traffic generated from adjacent sites with the potential for developments within the time horizon being considered in the study, including coordination with works anticipated by such other developments.

3.0 Traffic Impact Study Outline

The Traffic Impact Study should contain the sections outlined below.

3.1 Description of the Proposed Development

This includes but not limited to the following elements:

- Municipal address;

- Existing land uses or permitted use provisions in an Official Plan, Official Plan Amendments, Zoning By-law etc.;
- Existing planning studies that may impact the development, including Transportation Master Plans and Active Transportation Plans;
- Proposed land uses and relevant planning regulations to be used in the study;
- Total building size and building location;
- Floor space including a summary of each type of use/number of residential units;
- Anticipated date of occupancy;
- Approximate hours of operations;
- Planned phasing of the developments;
- The location of access points and type of access (full movement, right-in-right-out, turning movement restrictions, etc.);
- Surrounding road networks, intersections and type of controls;
- Transit stops and services;
- Bicycle and pedestrian links and facilities;
- Nearby curb parking and off-street parking;
- Nearby developments and their access points;
- Proposed internal parking arrangement and circulations; and
- Internal provisions for traffic calming and speed control.

A composite site plan of a suitable scale should be provided for consideration in the review of the traffic impact study.

3.2 Study Area

The study area should extend far enough from the development to contain all Township, County or Provincial roadways that will be noticeably impacted by the site traffic. Typically, this will include the area that may be impacted as follows:

- An increase of 5% or more traffic volumes on an intersection approach;
- Volume/capacity (v/c) ratios for overall intersection operations, through movements or shared through/turning movements increased to 0.85 or greater;
- V/c ratios for exclusive turning movements increase to 0.90 or greater; or
- Locations where other traffic operational issues may be of concern.

The Township reserves the right to establish the study area as may be deemed necessary, including a requirement to provide sufficient traffic analysis to confirm whether the above-noted parameters are met or mitigation work may be required. It is recommended to consult with Township staff prior to initiating the study.

The Traffic Impact Study should contain a map that identifies relevant information such as the following:

- All adjacent roads including the road classifications, number of lanes, on-street bike lanes, posted speeds, traffic calming and pedestrian crossing facilities;
- All adjacent and affected intersections including type of control, lane configurations, lane widths, and any turning or similar restrictions;
- If appropriate, on-street parking spaces, stopping restrictions, and parking meters in the vicinity of the development site and those which would affect the operation of key intersections being analyzed;
- Transit routes, stops and terminals;
- Heavy vehicle prohibitions and restrictions; and
- Other transportation facilities such as trails and walkways, etc.

Potential future transportation improvements that are currently being considered and may facilitate the traffic demand produced by the development/redevelopment should be identified. These improvements should be described to a level of detail sufficient to assess their implications for travel to/from the development. In each case, identify the status and anticipated date of implementation.

3.3 Horizon Years and Peak Periods

3.3.1 Horizon Years

Identify horizon years for the analysis, which will be:

- The year of completion of the development;
- In general, five (5) years after the completion of the development. For very large developments that will be phased over longer periods, a five (5) and ten (10) year horizon may be used;
- If the development is to be carried out in phases, impact analysis for each phase should be undertaken; and
- Additional horizon years that may be required depending on the magnitude of the development, any major transportation system changes, or other planned significant land use changes.

3.3.2 Peak Periods

The critical time period is directly associated with the peaking characteristics of both the development related traffic and the nearby transportation system traffic.

Typically the AM and PM peak traffic period will constitute the “worst scenario” combination of site related and background traffic.

In the case of retail, entertainment, religious, institutional, sport facility uses or industrial uses, the Saturday, Sunday or site peak period may require analysis. As part of the consultation process with the Township prior to commencing the study, the Consultant should propose a peak period of time for analysis. Seasonal traffic variations may also be a consideration in determining the peak design period.

3.4 Existing Traffic Conditions

The Traffic Impact Study should provide exhibits showing the existing traffic volumes and turning movements for roadways and intersections in the study area, including pedestrian and cyclist volumes and heavy truck movements.

Typically, new traffic data will need to be collected by the proponent, unless recent counts are available from other sources. The traffic data must be based on the most recent traffic/transit counts available. The Consultant should take additional traffic counts where existing data is more than two (2) years old or where existing data appears to be inconsistent. The additional traffic counts should be collected for a minimum of two hours during the peak period at each affected intersection. A greater duration of count may be required depending on the type of development and its peaking characteristics.

The raw data collected by the consultant should be included in the appendices of the report and should include date, time, road surface and weather conditions. Any ongoing road constructions or detours should be identified if they affect the counts being collected.

3.5 Background Traffic

3.5.1 Background Traffic

The background traffic growth should be established in consultation with town staff through one of the following methods:

- Estimation of roadway growth factors from a calibrated traffic forecast model;
- Regression analysis of historical traffic growth; and
- A growth rate based on area transportation studies.

3.5.2 Other Area Developments

All significant developments under construction, approved, or in the approved process within the study area and are likely to occur within the same time horizons should be identified and recognized in the study. The land-use type and magnitude of the probable future developments in the horizon years should be identified in consultation with Township staff.

The trips that are expected to be generated by these developments should be included in the future background volumes.

3.5.3 Transportation Network Improvements

Changes to the present or planned transportation networks should be determined in consultation with Township staff. A realistic assessment of timing and certainty should be made. The impacts of the transportation system changes should be identified. In particular, diversions of volumes from other facilities to new or improved facilities should be estimated.

3.5.4 Transit Considerations

In areas with existing or potential transit services, these services should be identified and evaluated as having potential significant impact and possible changes in modal split.

3.6 Estimate of Travel Demand

All trip generation, trip distribution, trip assignment and modal split assumptions should be in accordance with standard/accepted techniques and be based on local parameters. Sources should be well documented and any assumptions which may be considered less than conservative must be justified.

3.6.1 Trip Generation

The method of determining trip generation rates should be clearly identified. Trip generation methods may include one or more of the following and will be a function of the proposed development and its intended operations:

- Trip generation surveys from similar developments in the Township or other comparable municipalities which have similar operating characteristics as the proposed development;
- Modifications should be made to the trip generation rates to account for difference in the surveyed and proposed development sites;
- ITE Trip Generation Manual (most recent edition) rates or equations, provided that difference in the site nature and size are accounted for; and
- “First principles” calculations of anticipated trips to/from site.

Where appropriate it may be justified to reduce the base trip generation rates of the proposed development to account for:

- Redundant Land Use – Trips which are generated by existing land use activity and reflected in current traffic volumes that have been collected and which will be replaced by the proposed development. Unless otherwise accounted for, these trips are normally subtracted from the trip generation estimates on the surrounding road network but not from the calculation of the trips generated to/from the proposed accesses;
- Pass-by trips – Trips that represent intermediate stops on a trip already on the road network, e.g., a motorist stopping into a retail store on their way home from work. It should be recognized that pass-by trips must be accounted for in the turning movements into/out of the site;
- Captive market effects/"Synergy" – Represents trips which are shared between two or more uses on the same site, e.g., a motorist visiting a retail store and a grocery store on the same site; and
- Travel Demand Management (TDM) strategies – Reductions in automobile travel to the site to account for travel to/from the site by public transit, walking and cycling. No reductions in the trip generation should be made for these alternative modes if they have already been accounted for in the methods/data that has been used to forecast the vehicular trip generation.

All trip generation assumptions and adjustments assumed in the calculation of "new" vehicle trips should be supported and documented. Sensitivity analysis should be undertaken where trip generation parameters have the potential to vary considerably and most probable values cannot be readily identified.

A table should be provided in the study report identifying the categories and quantities of land uses, with the corresponding trip generation rates or equations and the resulting number of trips. For large developments that will be phased in over time, the table should identify each significant phase separately.

3.6.2 Trip Distribution

The directions from which traffic will approach and depart the site can vary depending on several location-specific factors, including:

- Size of the proposed development;
- Type of proposed development;
- Surrounding, and in some cases competing land uses, population, and employment distributions; and
- Prevailing condition on the existing road network.

Trip distribution assumptions should be supported by one or more of the following:

- Transportation Tomorrow Survey (TTS) data;
- Origin-destination surveys;
- Comprehensive travel surveys;
- Proximity of adjacent employment and population centres;
- Market studies; and
- Existing/anticipated travel patterns.

Engineering judgements should be used to determine the most applicable of the above methodologies for each particular application.

3.6.3 Trip Assignment

Traffic assignments should consider logic routings, available and projected roadway capacities, and travel time. Traffic assignments may be estimated using a transportation planning model or "hand assignment" based on knowledge of the proposed/future road network in the study area.

The assumptions shall take into account projected "pass-by" trips, "diverted" trips and internal "Synergy" trips.

3.6.4 Summary of Traffic Demand Forecasts

A summary of the existing and future traffic demands should be provided in the form of exhibits/illustrations that summarize the following:

- Existing traffic;
- Future background;
- Site generated traffic;
- Pass-by or other diversionary traffic; and
- Future total traffic (future background plus site generated traffic).

In some cases, interim traffic conditions may need to be assessed to reflect phasing of developments, interim site access arrangements or planned transportation system improvements.

If there are significant numbers of large trucks, buses, and recreational vehicles, a typical adjustment factor of 2.0 Passenger Car Units (PCUs) may be used to convert these vehicles to equivalent passenger cars, particularly for inputs to queuing requirements.

3.7 Evaluation of Impacts of Site Generated Traffic

An evaluation of signalized and un-signalized intersections which will be affected by site generated traffic for all time horizons and scenarios is required and summaries are to be provided in a tabular format.

The objective should be to ensure that no new “problem” movements are created by the development and that “problem” movements which exist with the addition of site generated traffic are not worsened by this addition.

Documentation should be provided in an appendix to the traffic impact study of all assumptions used in the analysis concerning lane configuration/use, on-street parking, vehicle classification, pedestrian activity, saturated flows, traffic signal cycle length, phasing and timing, utilization of the inter-green phase and other relevant parameters. Existing signal timings should be used for existing intersection and signal timing modifications/optimization may be considered as a measure to address capacity or level of service deficiencies.

Supplementary surveys or analyses may be needed to assess saturation flows, gap availability, projected queue lengths and possible blocking queues.

3.7.1 Capacity Analysis at Intersections

The summary should include level-of-service including average vehicle delay and v/c ratios for overall intersection operations and individual critical movements for all analysis periods and time horizons. Full documentation of results of all level of service analysis should be provided in an appendix. The Township may require that a copy of the computer software model be provided for review and approval.

Analysis may be performed using the most current versions of *Highway Capacity Manual* (HCM) and *Canadian Capacity Guide* (CCG), using computer models that are currently used within the industry (e.g., Sychro, SimTraffic, Arcady, etc.).

The analysis should include the identification of signalized intersections where,

- v/c ratios for overall intersection operation, through movements or shared/turning movements increased to 0.85 or above;
- v/c ratios for exclusive movements increased to 0.90 or above; or
- Queues for an individual movement are projected to exceed available turning lane storage.

Identification of un-signalized intersections where,

- Level of service (LOS) based on average delay per vehicle, on individual movements at LOS “E” or “F”; or

- The estimated 95th percentile queue length for an individual movement exceeds the available queue storage.

Conventional signal timing plans should be used and all proposed adjustments to traffic signal timing, phasing and cycle lengths should be evaluated in terms of pedestrian crossing time, effects on queue lengths, adequacy of existing storage and effects on the existing signal coordination.

The need for a new traffic signal and/or underground provisions should be evaluated in conformance to the guidelines in "*Ontario Traffic Manual - Book 12*".

3.7.2 Site Operations

The TIS should provide a summary of operations that may affect the ability for vehicles to circulate on-site without impacting driveways and related adjacent road operations. Site operations described in the TIS will include:

- Driveway locations and confirmation that the driveways meet Township and TAC standards;
- Parking supply and layout;
- Pedestrian and cycling facilities; and
- Site circulation, drive-through requirements (if any), loading operations, access for waste vehicles, access for fire trucks.

3.7.3 Safety Analysis

Identification of potential safety or operational issues associated with the following, as applicable:

- Weaving;
- Merging;
- Corner clearances;
- Sight distances and sight triangle/daylight triangle as per Transportation Association of Canada (TAC) standards;
- Vehicle-pedestrian conflicts;
- Traffic infiltrations;
- Access conflicts;
- Cyclist and pedestrian movements;
- Heavy truck movements/conflicts;
- Transit operational conflicts;

- Internal circulation, if applicable; and
- Other safety issues that have been identified on a site-specific basis.

Where the proposed development is in the vicinity of an intersection or roadway with identified safety problems, existing collision data must be reviewed and an assessment of the impact of the proposed development provided.

3.8 Access Analysis

3.8.1 Access Geometrics

The number and location of access points must not adversely impact the flow of traffic along abutting roads. Access points should be located on minor roads where feasible and justifications for more than one access must be based on capacity of site traffic and not design preference.

The locations should be adequately spaced from adjacent streets and driveway intersections. The number of exit lanes, radii and vehicle storages should be appropriate to accommodate traffic demands placed on them. The throat lengths at the road should be sufficiently long to minimize conflicts with street traffic and within the site.

Access points should be evaluated in terms of capacity, safety and adequacy of queue storage capacity. Access points should be free of all encumbrances and provide appropriate sight distances/daylight triangles. Proposed truck loading facilities and access to these facilities should be evaluated to ensure that they are adequately sized, designed and provided with suitable access so that they will not adversely affect operations on municipal roads.

Access standards should be in conformance with those outlined in the "*Geometric Design Guide for Canadian Road,*" 2017 edition, issued by the Transportation Association of Canada (TAC) and the Ontario Traffic Manuals.

3.8.2 Turn Lane Requirements

The requirements for left-turn and right-turn lanes should be examined. Adequate spacing should be provided between access points to avoid potential turn lane overlaps. All design standards must be in conformance with those outlined in the TAC manual and the Ontario Traffic Manuals.

Where turning lanes are warranted or proposed the length of storage and taper must be documented.

3.9 Traffic Collision Analysis

Where the development is adjacent to an area with identified problems, existing collision data should be reviewed and an assessment of the impact of the proposed development provided. Such information may be helpful to minimize any additional problems through the design or location of access points.

3.10 Sight Distance Evaluation

At each access and at each intersection where a new road is proposed, the sight distance requirements should be determined based on appropriate standards (TAC Manual), and the availability of sight distance determined from actual field measurements.

3.11 Transportation System Mitigation Measures

The physical and operational road network deficiencies identified in the Traffic Impact Study must be addressed and feasible solutions to mitigate these deficiencies identified. Functional design plans or detailed design drawings may be required for identified improvements to all modes of transportation, to ensure their feasibility.

A preliminary cost estimate will be required for all identified infrastructure improvements.

3.12 TIS Recommendations

All reasonable attempts should be made to identify transportation improvements that mitigate the development proposal such that:

- Pedestrian and cycling needs are safety accommodated;
- The capacity of transit services or facilities is sufficient to accommodate site-generated transit demand, if required;
- Site-generated traffic does not have an unmanageable adverse impact on transit operations, where available;
- Transportation Demand Management (TDM) measures are identified that would mitigate the traffic or transit impacts from site generated travel demand; and
- Traffic calming measures are proposed to ensure that safety and speed-related issues have been adequately addressed.

It is important to structure recommendations for improvements within appropriate time perspectives. Recommendations should be sensitive to the following issues:

- Timing of short-range, and long-range network improvements that are already planned and their schedules;
- Anticipated time schedule of adjacent developments;

- Size and timing of individual phases of the proposed development;
- Logical sequencing of various improvements or segments;
- Right-of-way needs and availability of additional right-of-way within the appropriate time frames;
- Local priorities for transportation improvements and funding;
- Cost-effectiveness of implementation improvements at a given stage of development; and
- Necessary lead-time for additional design and construction.

3.13 Documentation and Reporting

The following is a suggested study structure:

- Executive summary;
- Study purpose and objectives;
- Site/development description;
- Study area;
- Existing conditions;
- Analysis periods;
- Background traffic demand including existing and future background;
- Site generated traffic (tables required);
- Trip distribution and modal split;
- Traffic assignment for site generated traffic;
- Pass-by trips and diverted trips;
- Total traffic demand including all trips mentioned above;
- Exhibits are required for:
    - Site Plan or Plan of Subdivision;
    - Study area;
    - Existing and future background conditions;
    - Existing lane configurations;
    - Existing traffic volumes;
    - Future traffic volumes after being adjusted by annual growth rates;
    - Other new development trip distributions (if applicable);
    - Trip distribution;
    - Trip assignment for site generated trips;
    - Pass-by and diverted trips (if applicable);
    - Total trips;

- Improvement alternatives required to mitigate traffic impacts;
- Traffic impacts for future background and total traffic with and without mitigation measures (tabular summaries);
- Access considerations;
- Conclusions and recommendations;
- Traffic reports;
- Signal warrant analysis (if applicable);
- Left turn lane warrant analysis (if applicable); and
- Sight distance and sight triangle/daylight triangle analysis (if applicable).

Two copies of the final Traffic Impact Study complete with engineer stamp and signature, supporting documentation, electronic analysis traffic files should be submitted to the Township for review. The study will be forwarded to the Town's consultant for Peer Review. The cost(s) associated with that review will be the responsibility of the proponent/owner.

All information submitted to Township staff in connection with any Traffic Impact Study will be considered to be in the public domain.

APPENDIX 8

Functional Internal Traffic Study (FITS)

Township of King
Design Criteria and Standard Detail Drawings

Outline of Requirements for a Functional Internal Traffic Study

The Functional Traffic Study is intended to balance appropriate urban design guidelines with a detailed assessment of internal transportation and traffic geometric design including opportunities for traffic calming, off-street or driveway parking issues, signalization warrants, roadway capacity, lane configurations, boulevard requirements (i.e., snow storage and utility corridors and buy-in from utilities), transit and pedestrian requirements, vehicle decision making criteria and intersection vehicle sight lines, medians and entrance features.

The information presented below is a check list which is to be followed during the subdivision review process. The transportation and traffic review process examines the details of such submissions and evaluates these details against the applicable standards.

The following items help to determine the ultimate vehicle demand flows, confirms the roadway network types and classifications, and ensures that the critical design elements of the road network are confirmed. The list is further complemented by items which deal with the provision of adequate parking, proper access for major attractors and generators, and formulation of satisfactory traffic control plans. Depending upon the circumstance, additional items can be added which deal with traffic calming measures and devices.

Associated with each item are specific criteria which require measurement, calculation and/or demonstration of adherence to standards and operating parameters. It is recognized that not all items may be applicable to all applications.

Items identified with an asterisk (*) indicate that this item must be completed at the initial stages of any Draft Plan submissions. Other items may be deferred, subject to the Township's concurrence, but it must be emphasized that a proper geometric and standards fit must occur. Otherwise, a significant number of conditions and red-lining of plans may occur.

Traffic Study Items

1. Road Network Layout and Design Volumes *

   The built-out traffic flows are to be determined on each internal road (especially collector roads) for the typical weekday AM and PM peak hours. In addition, if the development application contains a collector road which forms an intersection with another collector road or a bounding arterial road, the typical weekday AM and PM peak hour turning volumes must be identified. It is imperative that any associated exclusive turning lanes, particularly left-turns are provided with their ultimate storage and taper length dimensions. It is understood that collector roads at intersections with other collector roads and arterial roads may require a right-of-way widening to permit the introduction of necessary vehicle turning lanes and proper sight triangles, as determined through a Traffic Impact Study and/or to meet the requirements set out in the Official Plan or Zoning By-Law of the Municipality.

2. Internal Road Classification and Right-of-Way *

   Standards are available from accredited associations (e.g., Transportation Association of Canada, TAC) identifying the acceptable range of traffic flows that a type of road can satisfactorily accommodate, either in a 24-hour period or during the weekday roadway peak hours. The road type and classification being considered must be capable of serving the traffic flow demand within the identified level.

3. Horizontal and Vertical Geometry *

   Acceptable standards pertaining to horizontal curves, vertical curves, intersection angles and Safe Vehicle Stopping and turning decision criteria are contained in Manuals available from the Ontario Ministry of Transportation, the Transportation Association of Canada and Institute of Transportation Engineers. All road elements are to be evaluated and made to conform to the applicable criteria. The most conservative criteria should be used where these standards differ, unless analysis can be provided to justify otherwise.

4. Intersection Spacing *

   Standards are available from accredited associations that identify the minimum spacing of intersections from each other. The development application must meet these minimum standards.

5. Intersection Warrants – Turning Lanes, Traffic Signals, Traffic Circles or Roundabouts *

   The forecast demand volumes, intersection turning movements, Level of Service/Dealy and queuing requirements will dictate the appropriate traffic control device as well as the intersection lane configuration. The forecast demand volumes will be used to calculate required storage and taper lengths for any turning lanes. If a traffic signal is to be considered then signal warrant analysis must be conducted, in accordance with the requirements of Book 12 of the Ontario Traffic Manual. A neighbourhood traffic circle, mini-roundabout or full roundabout can be considered as an alternative to a traffic signal at collector road and collector road intersections. Functional design plans may be required to confirm the geometric requirements of intersections, with more detailed plans provided as part of the detailed design phase.

6. Street Elbows *

   Certain internal local roads may have centre line radii greater than 90 degrees in order to facilitate lot fabric. At these locations, pavement width analysis must be conducted to ensure that opposing vehicles (automobiles, as well as an opposing automobile and emergency service vehicle) can negotiate the manoeuvre without impacts. In addition, individual driveways must be located such that the road manoeuvring area and sidewalk are not compromised. Formation of land use patterns incorporating such street elbows are not encouraged.

7. Rear Laneways *

The laneway layout and operation must be thoroughly addressed. This includes pavement widths, shoulder treatments, garage (building) set-backs (including ability to manoeuvre one large and one mid-sized automobile into and out of the garage), automobile, emergency vehicle and garbage truck circulation and turning movement capability. The assessment must be undertaken along a typical cross-section of the laneway as well as at each intersection or bend formed by a laneway. Bends in laneways are discouraged.

8. Temporary Turn-Arounds and Cul-de-Sacs *

Any proposed temporary turn-around or cul-de-sac must be capable of satisfactorily accommodating service and emergency vehicle turning capability.

9. On-Street Parking *

Locating on-street parking must be carried out in a consultative manner with all disciplines involved in the preparation of the development application. The location of on-street parking will be guided by many factors including adjacent land uses, roadway geometrics and traffic demand flows. It is expected that there will be no parking in laneways. It is expected that parking will only be permitted on one side of local roads. It is expected that parking will be introduced in a sensitive manner on collector roads. Additional pavement on collector roads must not encourage speeding or diminish the operation of future transit. Consideration of parking bays (indent parking) with protected intersection conditions minimizing pedestrian walking distances are considered appropriate.

The development application must demonstrate through scaled plans that the required parking supply for residents and visitors can be achieved. On street parking must respect vehicle sight line requirements, parking space width and length, clearance to hydrants, emergency vehicle needs, snow storage and intersection setbacks. No portion of a vehicle parked in a driveway can protrude onto the curb or across a sidewalk.

10. Traffic Calming

Development applications must demonstrate how speeding has been addressed in design and be in accordance with the Township's *Traffic Calming Strategy (WSP, November 2022)* and *Active Transportation Strategy (October 2020).*

All roadway cross-sections must consider pavement widths that are conducive to reducing vehicle speeds. On-street parking should be strategically placed such that the additional pavement does not encourage greater vehicle speeds. If necessary, traffic calming devices can be considered excluding speed bumps or humps or other devices that are not acceptable to transit or emergency service vehicles. Should further traffic

calming features be desired, traffic tables, medians and boulevard treatments can be considered. The Developer may be accountable for traffic calming needs identified within the maintenance and warranty period of the development.

11. Headlight Screening

"Window Streets" or other internal roads may parallel a bounding arterial road. Vehicle headlight movements must be examined on the local road and preventative measures must be brought forth which prevent headlight glare from reaching the eye level of drivers on the bounding arterial road.

12. Service and Emergency Vehicle Circulation

All internal roads including any laneways must demonstrate that the available driving service is capable of efficiently accommodating the free flow movement of emergency and service vehicles.

13. Curb Radii

Curb radii can be introduced to reduce vehicle speeds and benefit pedestrians. The curb radii must demonstrate to scale that sufficient capacity is provided for vehicle turning demands and that all service and emergency vehicles can efficiently negotiate turns.

14. Corner Daylighting and Sight Distances

Each intersection must be examined to verify that the clear vehicle sight lines are available, to provide the required stopping sight distance, intersection turning sight distance and approach sight distance. Daylighting or rounding should be provided at the intersections to maintain acceptable sight distances. Any special circumstances must be justified.

15. Pedestrian and Handicapped Accommodation

Sidewalks must be available to serve primary pedestrian flows. At curb locations grading must be provided to accommodate wheelchair movements.

16. Surface Treatments

As part of traffic calming at intersections and in an effort to accommodate major pedestrian flows consideration can be given to providing alternative surface treatments. These surface treatments are meant to give textural and noise signals to drivers that increased awareness is necessary.

17. Roundabout and Traffic Circles

Neighbourhood traffic circles, mini-roundabouts or single lane roundabouts may be considered for intersection control, depending on design requirements and constraints. Any proposed roundabout must be designed to meet forecast traffic demands as well as the turning paths required for all municipal services including transit and emergency vehicles. Larger vehicles such as moving trucks should also be examined. Pedestrian crosswalks must be properly located to provide maximum visibility and safety to all users.

18. Driveway Locations

Driveways to individual uses must respect the adjacent traffic flow demands and resultant intersection lane configuration requirements. The driveway location must minimize impacts on the role and function of adjacent boundary lanes particularly turning lanes. At internal collector to collector road or collector to arterial road intersections, consideration should be given to a land use form that is served by rear laneways thereby reducing the impact on intersection lane functions. Similar considerations should be given to driveway locations where the collector road intersects with a bounding arterial road. Driveway locations should also provide for corner clearance requirements, as well as adequate stopping sight distance and intersection sight distance.

19. Sidewalks

The placement of sidewalks must conform to Municipal guidelines and the guidelines in Book 15 of the Ontario Traffic Manual. Continuity and connectivity are imperative to providing an environment which encourages walking. Special pedestrian crossing outside of intersection locations must be examined in detail and the justification for pedestrian actuated controls brought forward.

20. Bicycle Paths and Lanes

Bicycle paths and lanes must be in conformity with the Municipal goals and objectives and meet the guidelines in Book 18 of the Ontario Traffic Manual. Those bicycle routes whether lanes or paths must be clearly identified and the appropriate geometric standards incorporated into the roadway cross-sections or where bicycles cross a roadway.

21. Designated Car Pool Spaces

Upon defining the transit route network there could be numerous retail, commercial, office and institutional uses that are in close proximity to the transit service. An estimate of the number of parking spaces by use which can be provided to carpooling use is to be identified. If site plans are available, the preferred location of the car pool spaces can be denoted.

22. Transit Route Pattern

    Where directed by the Town, the primary transit route pattern to serve the development application will be identified and the following related items are to be addressed.

23. Bus Stop and Pedestrian Pad

    Major bus stop locations along each route will be identified. At these locations the necessary concrete pad to serve boarding and de-boarding passengers will be identified and included in the development application.

24. Development Integration

    Opportunities should be examined at significant locations where adjacent land uses can provide an integration opportunity with transit. This could range from integrated shelter/building conditions to a minor pick up and drop off area in the vicinity of the bus stop.

25. Major Public Generators & Attractors * – Driveway and Entrance Locations

    Within the development application there could be uses such as public schools, high schools and community centres, parks, etc. These land uses generate unique vehicle circulation and parking demands. The vehicle flow demands should be examined in the context of planning driveway and entrance locations which minimize impacts on bounding intersections and major pedestrian flows. Strategies should be provided to minimize traffic congestion and reduce the potential for safety issues developing along the roads located in the areas of these major traffic generators.

26. Major Public Generators & Attractors * – On Street Parking Assessment

    Many of these generators are also located next to parks. The bounding road network should be examined to determine if on-street parking can serve multiple parking demands. How the on-street parking is incorporated with the roadway cross-section should be examined in detail. However, creating a continuous widening of the asphalt surface area is discouraged, due to the potential to increase vehicle speeds.

27. Major Public Generators & Attractors * – Traffic Device Plan for Entrances Providing Direct Access

    An appropriate traffic control device plan is to be provided to maintain safe access to land uses that generate significant traffic demands from the public. The accommodation of pedestrian flows must also be identified.

28. Traffic Control Device Plan

The development application must provide the definition and location of all traffic control devices to be installed in accordance with the Ontario Traffic Manual and related specifications.

APPENDIX 9

Sample Asset Inventory Sheets

Township of King
Design Criteria and Standard Detail Drawings

The structure ID's contain a prefix and a sequence number in the format: [PREFIX]_[SEQUENCE].

Please contact Township of King's staff for the Current ID's Nomenclature table.

PREFIX

The prefix is a 4-digit alpha identifier where:

Digit	Description	Definition	
1st	Location of the Asset	A	Ansnorveldt
		B	Kettleby
		C	Cold Creek
		K	King City
		L	Lloydtown
		N	Nobleton
		O	all Other
		P	Pottageville
		S	Schomberg
		W	Snowball
		Y	Laskay
2nd	System the Asset is part of	B	Building
		F	Facilities
		P	Parks
		R	Roads
		S	Sanitary (Waste Water)
		T	Storm
		W	Water
		U	Utility
3rd and 4th	Type of Asset	AR	Air Release Valve
		AU	Above Utilities
		BC	Basketball Court
		BD	Ball Diamond
		BH	Ball Hockey Pad
		BK	Bridge Deck
		BL	Bleacher
		BN	Bench
		BS	Bridge Structure
		BV	Beach Volleyball Court
		CB	Catchbasin
		CD	Conduit
		CL	Catchbasin Leads
		CM	Catchbasin Manhole
		CO	Culvert (structural culverts)
		CP	Connection Point
		CS	Curb Stop
		CR	Curb
		CV	Culvert (small culverts)
		CW	Clean water Collector

		CX	Community Mailbox
		DB	Double Catchbasin
		DH	Dry Hydrant
		DI	Ditch Inlet
		EM	Easement
		ET	End Treatment
		EX	Exercise Equipment
		FB	Foot Bridge
		FD	Foundation Drain Collector
		FF	Facility Footprint
		FL	Fiber Line
		FN	Fence
		FT	Fitting
		GB	Geodetic Benchmark
		GL	Gas Line
		HH	Hand Holes
		HW	Headwall
		HY	Hydrant
		LW	Light Wiring
		MC	Meter Chamber
		MF	Major Closed Facility
		MH	Manhole
		ML	Municipal Lands (Open Spaces, Buffer Blocks)
		MS	Management System (Cistern)
		ND	Node
		OG	Oil Grid Separator
		OF	Open Facility (Kiosk, Gazeebo)
		PD	Pedestal
		PI	Pipe (Sanitary Main, Foundation Drain Collector Sewer Storm Sewer)
		PL	Pool
		PO	Pond
		PS	Pumping Station
		PT	Play Structure
		PU	Pump
		RB	Road Base
		RC	Rear Lot Catchbasin
		RS	Road Surface
		RW	Retaining Wall
		SA	Safety System
		SB	Sign Banner
		SC	Soccer Field
		SD	Subdrain
		SF	Secondary Closed Facility
		SG	Sign
		SK	Skate Park
		SL	Street Lights
		SM	Septic Maintenance
		SP	Splash Pad

		SS	Sampling Station
		SV	Service (Water Service, Sanitary Service, Foundation Drain Collector Lateral (Storm Lateral))
		SW	
		SY	Sidewalk
		TC	Spillway
		TF	Tennis Court
		TL	Trail
		TP	Transformer
		TR	Transit Pad
		UF	Tree
		UT	Utility Street Furniture
		VA	Utility Trench
		VC	Valve
		WM	Valve Chamber
			Watermain

SEQUENCE

Sequence Numbers are assigned by the Project Managers of Township of King for use.

Developer's consulting engineer will request a current Asset Identifier Tracking Sheet to which they will quantify the amount of each asset and provide the lump sum cost. Then this document will be returned to the Township of King staff member and required range of asset numbers will be assigned.

Figure 1 – Sample Asset Request Sheet:

Amount of each type of Cathbasins (**20** Catchbasins, **4** Double Catchbasins, **3** Ditch Inlets)

		Type		Phase						
Order	Flow	Short	Long	1	2	3	4A	4B	Total	# ID's Assigned
Storm (Catchbasins)										
1	T	CB	Catch Basin							
2	T	DB	Double Catchbasin							
3	T	DI	Ditch Inlet Catchbasin							
4	T	RC	Rear Lot CB							
	Total	**Catchbasins**		**0**	**0**	**0**	**0**	**0**	**0**	
Storm CL (Catchbasin Lead)										
1	T	CL	Catchbasin Lead							

Total amount of Catchbasins added **27**

Ranges of ID #'s assigned by the Township

		Type		Phase					
Order	Flow	Short	Long	1	2	3	4A	4B	Total
Storm (Catchbasins)									
1	T	CB	Catch Basin						
2	T	DB	Double Catchbasin						
3	T	DI	Ditch Inlet Catchbasin						
4	T	RC	Rear Lot CB						
	Total	**Catchbasins**		**0**	**0**	**0**	**0**	**0**	**0**
Storm CL (Catchbasin Lead)									
1	T	CL	Catchbasin Lead						
	Total	**T (CL)**		**0**	**0**	**0**	**0**	**0**	**0**
Storm CP (Connection Point)									
1	T	CP	Connection Point						
	Total	**T (CP)**		**0**	**0**	**0**	**0**	**0**	**0**
Storm (Culverts)									
1	T	CV	Small Culvert						
	Total	**Culverts**		**0**	**0**	**0**	**0**	**0**	**0**
Storm (Discharge Point)									
1	T	HW	Headwall						
2	T	SY	Spill Way						
	Total	**Discharge Point**		**0**	**0**	**0**	**0**	**0**	**0**
Storm (Manhole)									
1	T	MH	Manhole						
2	T	OG	Oil Grit Seperator						
3	T	CW	Clean Water Collector						
4	T	FD	Foundation Drain Collector						
5	T	MS	Management System(Cistern)						
Storm PO (Pond)									
1	T	PO	Pond						
	Total	**T (PO)**		**0**	**0**	**0**	**0**	**0**	**0**
Storm PI (Pipe)									
1	T	PI	Stormwater Mainline Pipe						
	Total	**T (PI)**		**0**	**0**	**0**	**0**	**0**	**0**
Storm SV (Lateral and Foundation Drain Collector)									
1	T	SV	eral and Foundation Drain Collector						
	Total	**T (SV)**		**0**	**0**	**0**	**0**	**0**	**0**
Storm SD (Subdrain)									
1	T	SD	Subdrain						
	Total	**T (SD)**		**0**	**0**	**0**	**0**	**0**	**0**
Sanitary MH									

		Type		Phase					
1	S	MH	Manhole						
	Total	**S (MH)**		**0**	**0**	**0**	**0**	**0**	**0**
Sanitary PS (Pumping Station)									
1	S	PS	Pumping Station						
	Total	**S (PS)**		**0**	**0**	**0**	**0**	**0**	**0**
Sanitary PU (Pump)									
1	S	PU	Pump						
	Total	**S (PU)**		**0**	**0**	**0**	**0**	**0**	**0**
Sanitary CP (Connection Point)									
1	S	CP	Connection Point						
	Total	**CP**		**0**	**0**	**0**	**0**	**0**	**0**
Sanitary FT (Fitting)									
1	S	FT	Fitting						
	Total	**FT**		**0**	**0**	**0**	**0**	**0**	**0**
Sanitary PI (Pipe)									
1	S	PI	Sanitary Mainline						
	Total	**S (PI)**		**0**	**0**	**0**	**0**	**0**	**0**
Sanitary SV (Service)									
1	S	SV	Lateral						
	Total	**S (SV)**		**0**	**0**	**0**	**0**	**0**	**0**
Sanitary VA (Valve)									
1	S	VA	Valve						
	Total	**S (VA)**		**0**	**0**	**0**	**0**	**0**	**0**
Water CS (Curbstop)									
1	W	CS	Curbstop						
	Total	**W(CS)**		**0**	**0**	**0**	**0**	**0**	**0**
Water HY (Hydrant)									
1	W	HY	Hydrant						
	Total	**W (HY)**		**0**	**0**	**0**	**0**	**0**	**0**
Water ND (Node)									
1	W	ND	Node						
	Total	**W (ND)**		**0**	**0**	**0**	**0**	**0**	**0**
Water SV (Service)									
1	W	SV	Service						
	Total	**W(SV)**		**0**	**0**	**0**	**0**	**0**	**0**
Water (Valve)									
1	W	AC	Air Chamber						
2	W	AR	Air Release						
3	W	VA	Valve						

		Type		Phase					
4	W	VC	Valve Chamber						
	Total	**Valves**		**0**	**0**	**0**	**0**	**0**	**0**
Water WM (Watermain)									
1	W	WM	Watermain						
	Total	**W(WM)**		**0**	**0**	**0**	**0**	**0**	**0**
Water EM (Easement)									
1	W	EM	Easement						
	Total	**W(EM)**		**0**	**0**	**0**	**0**	**0**	**0**
Water WS(Water Storage)									
1	W	WS	Water Storage						
	Total	**W(WS)**		**0**	**0**	**0**	**0**	**0**	**0**
Water SS(Sampling Station)									
1	W	SS	Sampling Station						
	Total	**W(WS)**		**0**	**0**	**0**	**0**	**0**	**0**
Utilities CD (Conduit)									
1	U	CD	Conduit						
	Total	**U(CD)**		**0**	**0**	**0**	**0**	**0**	**0**
Utilities GL (Gas Line)									
1	U	GL	Gas Line						
	Total	**U(GL)**		**0**	**0**	**0**	**0**	**0**	**0**
Utilities HH (Hand Hole)									
1	U	HH	Hand Hole						
	Total	**U(HH)**		**0**	**0**	**0**	**0**	**0**	**0**
Utilities SL (Street Lights)									
1	U	SL	Street Lights						
	Total	**U (SL)**		**0**	**0**	**0**	**0**	**0**	**0**
Utilities UT (Trench)									
1	U	UT	Trench						
	Total	**U(UT)**		**0**	**0**	**0**	**0**	**0**	**0**
Utilities FL (Fiber Line)									
1	U	FL	Fiber Line						
	Total	**U(FL)**		**0**	**0**	**0**	**0**	**0**	**0**
Utilities PD (Pedestal)									
1	U	PD	Pedestal						
	Total	**U(PD)**		**0**	**0**	**0**	**0**	**0**	**0**
Utilities TF (Transformer)									
1	U	TF	Transformer						
	Total	**U(TF)**		**0**	**0**	**0**	**0**	**0**	**0**

		Type		Phase					
Parks TR (Trees)									
1	P	TR	Trees						
	Total	**P(TR)**		**0**	**0**	**0**	**0**	**0**	**0**
Parks FN (Fence)									
1	P	FN	Fence						
	Total	**P(FN)**		**0**	**0**	**0**	**0**	**0**	**0**
Parks MF (Major Closed Facilities)									
1	P	MF	or Closed Facilities (major buildings)						
	Total	**P(MF)**		**0**	**0**	**0**	**0**	**0**	**0**
Parks ML (Municipal Lands)									
1	P	ML	Municipal Lands						
	Total	**P(ML)**		**0**	**0**	**0**	**0**	**0**	**0**
Parks OF (Open Facilities)									
1	P	OF	Open Facilities (Gazebos)						
	Total	**P(OF)**		**0**	**0**	**0**	**0**	**0**	**0**
Parks (Park Assets)									
1	P	BC	Baksetball Court						
2	P	BD	Ball Diamond						
3	P	BH	Ball Hockey Pad						
4	P	BL	Bleacher						
5	P	BN	Bench						
6	P	BV	Beach Volleyball Court						
7	P	EX	Exercise Equipment						
8	P	FB	Foot Bridge						
9	P	PL	Pool						
10	P	PT	Play Structure						
11	P	SC	Soccer Field						
12	P	SK	Skate Park						
7	P	SP	Splash Pad						
8	P	TC	Tennis Court						
	Total	**Park Assets**		**0**	**0**	**0**	**0**	**0**	**0**
Parks SF (Secondary Closed Facilities)									
1	P	SF	ary Closed Facilities (washroom, booths)						
	Total	**P(SF)**		**0**	**0**	**0**	**0**	**0**	**0**

APPENDIX 10

Long-Term Maintenance Policy for Decorative Landscape Features and Structural Elements

Township of King
Design Criteria and Standard Detail Drawings

ENGINEERING, PUBLIC WORKS AND BUILDING DEPARTMENT

POLICIES, GUIDELINES AND PROCEDURES

LONG TERM MAINTENANCE POLICY for Decorative Landscape Features and Structural Elements on Municipally owned and Private Lands	Policy No. EPW-P001/2013
Maintenance Responsibilities	Effective Date:
Revision No: 1 Date: Jan.2015	Approved by: Council Date: January 12, 2015
Repealed:	Scheduled for Review:

1. Policy Statement:

The Township of King identifies that certain works constructed by Developers on public lands or private lands must be maintained by the Municipality and in turn funding for these purposes is required.

2. Definitions:

2.1 "Decorative Landscape Features" (refer to the Appendix A Listing)

2.2 "Structural Elements" (refer to the Appendix B Listing)

2.3 "Works" shall refer to both Decorative Landscape Features and Structural Elements

2.4 "Long Term Maintenance Costs": All costs for the maintenance and eventual replacement of any installed decorative landscape feature and/or structural elements based on the equivalent value of replacing/reconstructing defined features at the end of its originally estimated useful life.

3. Procedures:

Decorative landscape feature and/or structural elements are typically constructed by developers to enhance their respective development projects or to address issues related to property location and grading. The installation of such works in new development projects may be considered for approval subject to guaranteed future access by the municipality and the provision of a financial contribution for long term maintenance being received from the applicant.

3.1 <u>Decorative Landscaping Features:</u>

i. Works shall be constructed according to approved designs

ii. Works shall be maintained by the Developer to be in good condition and repair; throughout their ownership until assumption by the municipality.

iii. Parcel blocks containing the works will be dedicated to the Township of King in co-ordination with the registration of the plan of subdivision or site plan;

iv. All temporary works, installed for the sole purposes of marketing, may be placed entirely within a dedicated parcel block on the plan of subdivision or within the public right-of-way provided:

   i. Prior approval is granted by the Director of Engineering, Public Works and Building;

   ii. Temporary works shall be placed as not to encroach onto utility infrastructure or traffic control devices, both above and below ground;

   iii. Temporary works shall be situated so to not cause a visual obstruction to the traffic lanes.

   iv. An agreed to program for removal has been approved

3.2 <u>Noise Walls/Barriers:</u>

   i. Works shall be constructed according to approved designs

   ii. Works shall be maintained by the Developer to be in good condition and repair; throughout their ownership until assumption by the municipality.

   iii. Noise Walls/Barriers including all decorative pillars and appurtenances shall be installed along municipal owned or placed entirely on a dedicated parcel block on the plan of subdivision.

   iv. Noise Walls/Barriers installed on private property shall require a registered easement in favour of King Township and the respective property owners to undertake any maintenance or repairs to the structure.

3.3 <u>Communal Retaining Walls:</u>

   i. Works shall be constructed according to approved designs

   ii. Works shall be maintained by the Developer to be in good condition and repair; throughout their ownership until assumption by the municipality.

iii. Communal retaining walls placed along municipal owned lands or lands conveyed to King Township shall be placed entirely on a dedicated parcel block on the plan of subdivision.

4.0 Right of Access:

In order to carry out maintenance on work not constructed on public lands, the property owner shall be required to:

1. Deed the parcel of land containing the entrance features to the municipality;

or

2. Grant the municipality right of access to undertake maintenance by registering an easement in favour of the Township which encompasses the full limits of the works.

4.0 Short Term Maintenance:

Until assumption of the development project is issued by the Township of King, the developer shall be responsible, as a condition in the development agreement, for all costs for the maintenance and repairs of the works.

5.0 Long Term Maintenance (Financial Contribution):

A discretionary reserve fund shall be created by King Township and shall be put forth for annual municipal budget consideration. A financial contribution equal to the present value of the construction costs including material and labour shall be implemented under the "Amounts Payable to The Township of King" Schedule in the development agreement for long term maintenance costs for the life of the permanent decorative landscaping as per the following:

5.1 Entrance Features:

The Developer shall be required to provide 100% of the construction costs including landscaping, labour and material for the life the structure

5.2 Noise Wall/Barriers:

Financial contribution for the perpetual maintenance shall be calculated as follows:

5.2.1 The Developer shall be required to provide 100% of the construction costs including landscaping, labour and material for the life of the structure.

5.3 Communal Retaining Walls:

For those communal retaining walls having potential municipal impacts, the Developer shall be required to provide 100% of the construction costs including labour and material for the life the structure.

6.0 Approvals:

4.1 All proposed entrance features as outlined above shall be submitted to the Director of Engineering, Public Works and Building for approval and shall be prepared in co-ordination with the overall Master Landscape Plan.

4.2 The proposed decorative landscaping shall comply to the design elements for the overall streetscaping plan.

4.3 The applications shall include proposals for the design of the structures and landscaping of features that are complimentary to the identified development and compatible with the adjacent neighbourhoods.

4.4 The proposed design shall be indicated with accurate dimensioning and elevations and shall be duly notarized by a registered landscape architect and approved by the developer's engineering consultant;

4.5 Upon receipt of all required documents for the said feature, the Director of Engineering, Public Works and Building shall render a decision identifying works the Township is prepared to accept including the approval or required modification or denying the proposal if the design is not in keeping with municipal standards.

7.0 Agreement Terms

Development agreements shall include but not be limited to conditions outlining the foregoing

8.0 Liability Insurance:

The developer shall indemnify and save harmless the Township from and against all claims, damages, debts, dues, suits, actions and causes of actions, costs or sums of money that the Township may suffer by reason of the placement, location or existence of the Entrance Feature, or anything done or omitted to be done by the developer in the operation, repair and maintenance or removal of the Entrance Feature and rehabilitation of the site, until assumption by the Municipality.

Appendix A DECORATIVE LANDSCAPE FEATURES

Subdivision Entrance Features

Entrance Features are be defined as any combination of decorative structures and landscape elements located within a development, created with the expressed purpose of identifying or drawing attention to the development. Entrance features have traditionally been installed in new developments as a marketing tool to advertise the respective sites, and are not a mandatory requirement. These features have typically been situated entirely on private property and the Developer transfers the responsibility to the home owner for maintenance once the development has been assumed by the municipality. In some instances, the entrance feature has been located partly or entirely on blocks of land transferred into Township ownership.

Traffic Islands and Roundabouts

Engineered traffic roundabouts provide for efficient movement of traffic through busy intersections because a full stop is not required in any direction. As a result, they have become more common in subdivision developments as a preferred alternative to four-way stops on busy collector roads. Typically, the centre of the island and the traffic splitting islands have been designed and installed with landscaping and enhance decorative features such as walls, pillars, and landscaping marketing information similar to entrance features.

Decorative traffic islands do not serve as engineered traffic control elements and are typically installed within the centre of cul-de-sac bulbs. They serve a decorative purpose and are typically landscaped with shrubs, vines and flowers. In addition to aesthetics, they provide benefit by reducing the total amount of impervious asphalt and therefore reduce stormwater runoff, and may also provide a cooling effect in the summer.

Maintenance of these features is required on a regular basis.

Other Decorative Landscape Features

Other Decorative Landscape Features include fences, gardens, landscaping, pillars, artwork, etc. that are installed by Developers on municipal property to enhance the aesthetic appeal of the development. Similar to decorative traffic islands, these features are not required , but may have been included in the development approval process to create an enhanced or “upscale” development as a community benefit. Typically, these features are commonly installed by the Developer for marketing purposes and can include materials such as:

- Masonry or Cut Stone Walls
- Decorative landscaping
- Fencing
- Decorative Lighting
- Engraved stone or concrete
- Landscape planting

These features also require regular maintenance or they quickly deteriorate and risk becoming a liability rather than a community benefit.

Appendix B STRUCTURAL ELEMENTS

Noise Attenuation Fences/Barriers

Noise Attenuation walls are installed when the location of the development lands require mitigative measures due to proximity to noise sources. Noise barriers are typically located along Regional Roads, highways, rail corridors or adjacent to industrial areas. The barriers are required to meet the Ministry of the Environment (MOE) criteria for noise levels within new developments. These barriers must be maintained wholly intact to remain effective. Any deterioration or gap can affect many properties. The Regional Municipality of York requires all noise attenuation walls adjacent to Regional Roads to be located on private property. In some instances Developers have incorporated large decorative pillars as part of the wall structure. These structures will also be the homeowner's responsibility to maintain. Failure to maintain them may cause the walls to fail.

Other Similar Features eg Engineered Communal Retaining Walls

Retaining walls located entirely on private property, installed to facilitate grading and drainage, are entirely the responsibility of the private property owner. These retaining walls are typically masonry walls and if installed correctly remain in stable condition for many years. Property owners tend to undertake maintenance and repairs individually.

Engineered communal retaining walls are typically located across numerous properties for grading, drainage and in conjunction with noise attenuation fencing/barriers. They are installed to permit the development of lots within a subdivision that would not otherwise have been possible due to grade differences and required engineered slopes. They are often located along the side or rear lots abutting municipal lands such as open spaces, valley lands and buffers, roads or corridors and serve to maximize the developed area without impacting the open space.

Maintenance or repairs on these types of retaining walls becomes complicated when each property may or may not wish to co-ordinate with neighboring properties. These types of retaining walls tend to be considerably larger and become very expensive to undertake maintenance or repair. This tends to lead to walls to remain in poor maintenance and in some cases, may lead to a failure in the retaining wall. In instances where these works are installed adjacent to publically owned lands, failure of the retaining walls represents a potential municipal impact.

ATTACHMENT "D"

Proposed Calculation Methodology for Long Term Maintenance Contributions

To determine adequate funds for long term maintenance, it is proposed that each respective entrance feature design be reviewed through the engineering review of the development project and that the developer be required to provide an analysis of the life cycle of the proposed entrance feature and to provide funds equal to the replacement cost of all intended hard and soft landscaping.

A solution to determining a long term maintenance amount would be the present value of the construction costs which would include both labour and material costs. This financial contribution would be collected at the time of approval of the development agreement and be placed in a Maintenance Reserve fund to offset maintenance costs.

The calculation to determine the financial value for long term maintenance is calculated utilizing the following formula:

$$C_t = C\,(1 + i)^{-t}$$

Where: C_t = Present Value = long term maintenance value
C = Construction Costs
t = Number of years of the life of the feature
i = The net interest rate or net rate of return

The long term maintenance takes into account the construction costs, including landscaping, labour and materials, and further assesses the life cycle of the structure. Material items such as concrete, brick and stones will typically have much longer life cycles than wooden material structures. The present value calculation provides us the long term maintenance value.

APPENDIX 11

Annual Rainfall Depth vs. Daily Rainfall Amounts Graph

(Excerpt from Wet Weather Flow Management Guidelines, Nov. 2006, City of Toronto)

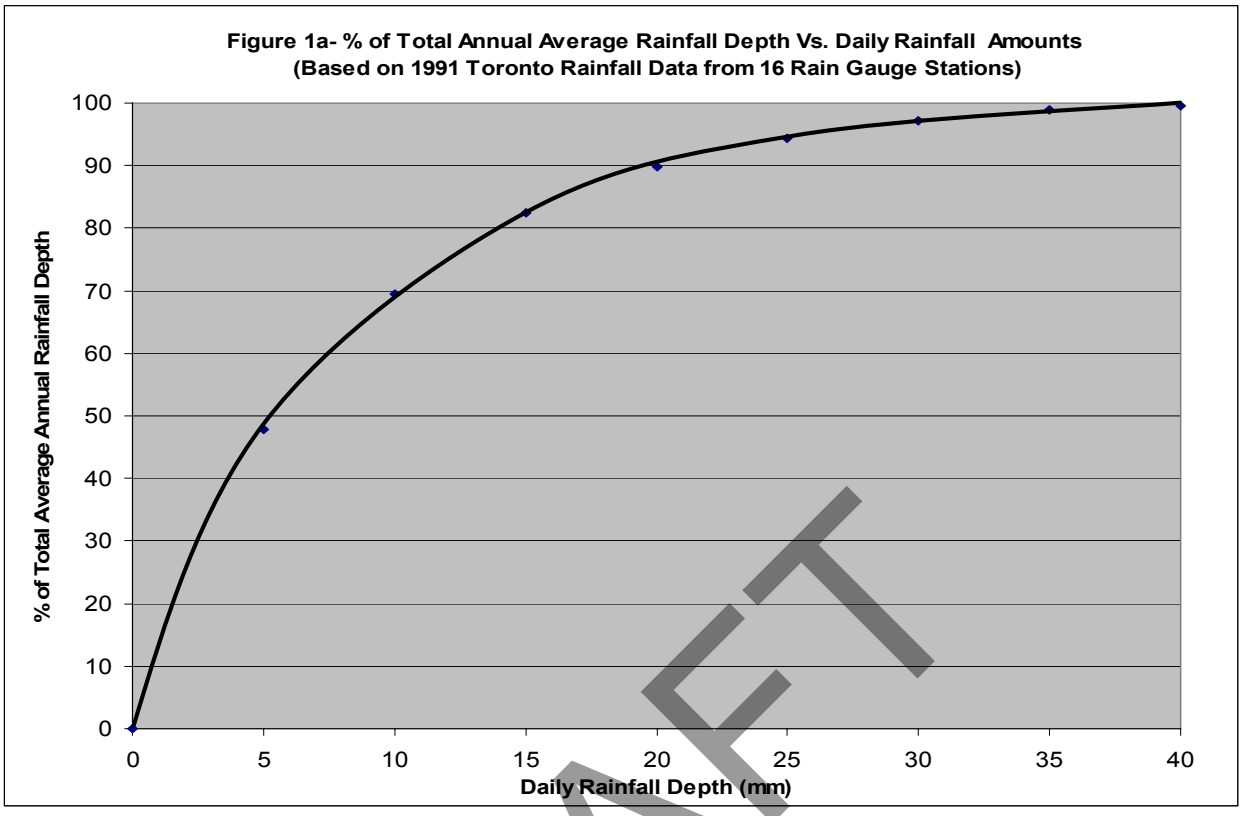


Figure 1a- % of Total Annual Average Rainfall Depth Vs. Daily Rainfall Amounts
(Based on 1991 Toronto Rainfall Data from 16 Rain Gauge Stations)
% of Total Average Annual Rainfall Depth
Daily Rainfall Depth (mm)
0
10
20
30
40
50
60
70
80
90
100
0
5
10
15
20
25
30
35
40

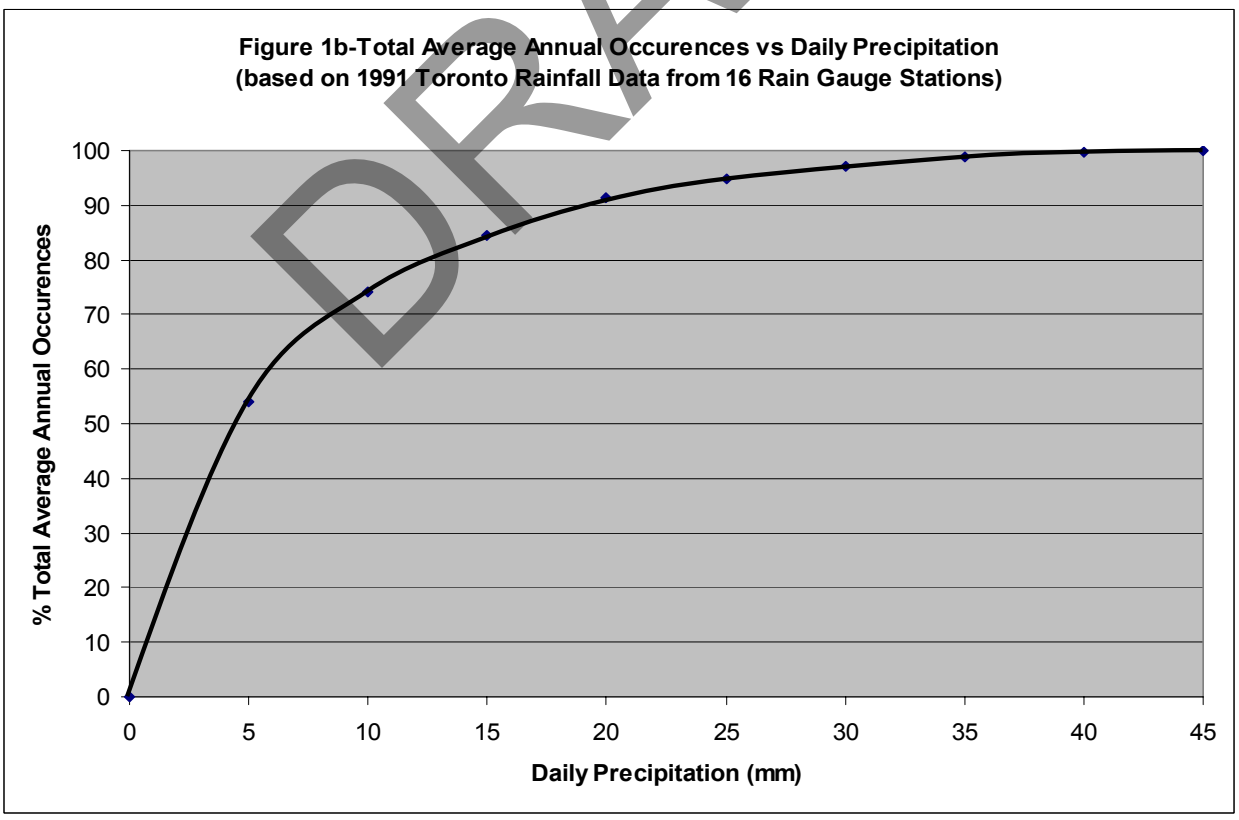


Figure 1b-Total Average Annual Occurences vs Daily Precipitation
(based on 1991 Toronto Rainfall Data from 16 Rain Gauge Stations)
% Total Average Annual Occurences
Daily Precipitation (mm)
0
10
20
30
40
50
60
70
80
90
100
0
5
10
15
20
25
30
35
40
45

APPENDIX 12

Residential Infill Development Requirements and Engineering Drawing Requirements

Township of King
Design Criteria and Standard Detail Drawings

12.1 General Requirements

Applications are to meet the requirements of Section M of the Township's Design Criteria which include but are not limited to the following:

1. Design Drawings are to be prepared, sealed, and signed by a qualified Professional (i.e., Professional Engineer, licensed Engineering Technologist, Architect, Landscape Architect, or an Ontario Land Surveyor) competent in grading and servicing design.

2. Provide a grading design that is in conformance with the applicable requirements from Section M and the requirements noted below.

3. Demonstrate how the proposed development sanitary and water service can be provided. For properties serviced by septic and wells, the septic and well design will not be reviewed by the Township Engineering Department. Septic system will be reviewed by the Building Department. For water wells, including but not limited to siting, installing, and abandoning wells, it is the Owner's sole responsibility to comply with O.Reg. 903.

4. Demonstrate how erosion and sedimentation during construction will be controlled. See section below for details.

5. Any existing trees within the municipal road allowance to be removed will require compensation by the Community Services Department. The Community Services Department (or Public Works on their behalf) will advise on the requirement.

6. Stormwater management measures may be required to mitigate changes in runoff and groundwater recharge quality and quantity. The requirements are dependent on the site location relative to Village boundaries and environmental areas and the proportion of impervious area or hard surface area on the lot and/or the total building area. Refer to the stormwater related requirements in Section M.

7. For developments within the Village boundary, the Site Alteration By-law requires the lot to contain no more than 60% hard landscaping for single-detached or semi-detached dwellings and no more than 80% for townhouse dwellings. Additional requirements and permitting will be required if the hard landscaping area exceeds these thresholds.

8. Properties within the Oak Ridges Moraine are subject to additional requirements per Oak Ridges Moraine Conservation Plan (2017).

9. A post-construction stamped certification by a qualified Professional that the works have been completed and function as approved.

12.2 General Drawing Requirements

1. Hand drawn sketches or photographs are not acceptable.

2. Drawings for urban or suburban development are to be drawn at 1:250 metric scale. The scale chosen for estate residential or rural property development drawings must present all information clearly. Detail Drawings, Cross-Sections and Plan/Profile Drawings are to be drawn to scale.

3. The north direction is to be indicated on the plans.

4. Title Blocks are to include the drawing title, municipal address, the Designer's name, date, revision block and the qualified Professional's signature/stamp block.

5. The legal property description is to be included on the drawings. The full extent of the property is to be shown on the plans with property line distances and bearings labelled. All adjacent boulevards and municipal roadway pavement, sidewalks, aboveground services, etc.

6. Street names are to be labelled on all drawings.

7. Provide the geodetic benchmark description, location and elevation used for vertical control.

8. The grading and servicing designs are to be acceptable to the Consulting Engineer where the subdivision has not been assumed by the Township. Correspondence is to be received by the Township that the Consulting Engineer has reviewed the proposed Grading Plan and Servicing Plan and that they are in general conformance with the overall subdivision grading and servicing design.

9. The following typical notes should be included on and adhered to in submission plans, where applicable:

    a) Top of foundation wall is to be minimum 0.15 m above finished grade.

    b) A minimum of 1.22 m frost protection depth should be provided for all footings.

    c) A 0.6 m wide strip is to remain undisturbed along the property line.

    d) Hard surfaces to be sloped between 2% to 5%.

    e) The maximum slope in landscape area or side yards should be 5.0% or else a 3:1 slope should be applied (4:1 if the top and bottom of slope difference exceeds 1.0 m).

    f) Swales shall have a minimum grade of 2% and maximum side slopes of 3:1.

g) Swales shall range in depth from a minimum of 0.15 m to a maximum of 0.45 m.

h) Downspouts should discharge to grade and not connect to the storm lateral.

i) Boulevard to be restored with a minimum of 200 mm of topsoil plus sod.

j) Erosion and sediment control measures and tree protection fencing are to be in place prior to beginning construction.

12.3 Grading Information Requirements

12.3.1 General

1. The grading design for residential infill development is subject to the requirements noted in Section M5.00. Refer to Standard Drawing KS-405 as a sample of a general infill development grading plan.

2. The estimated volume of earth expected to be imported or exported from a site is to be noted on the drawing if not provided in separate written correspondence to the Township. The estimate may be in terms of cubic meters of earth or the number of tandem dump truck loads in order for the Township to assess potential impacts to the condition of area roadways and potential disturbance to surrounding area land uses.

3. Show existing easements including the legal description. Copies of the easement documentation are to be submitted showing the purpose of the easement and the parties involved.

4. Add a note to the plan where a swimming pool is proposed that it is subject to a separate permitting process and is not approved as part of the grading design review.

5. Show all existing and proposed utilities, hydrants, poles, transformers, pedestals, chambers, valves, manholes, etc.

6. Show existing and proposed structures with dimensions. Label the function of accessory buildings. Identify all existing features or structures proposed to be demolished or removed.

7. Existing topographic elevations from a geodetic survey are to be shown including elevations at key locations on existing property lines and 10 m beyond the subject property lines to establish drainage areas and outlet locations. Contours may be shown in addition to surveyed spot elevations. Sufficient topographic detail is to be provided to interpret drainage patterns, swales, changes in slopes, existing structures, services or features, ground elevations at trees, catchbasins, maintenance holes, valve boxes, hydrants, retaining walls, etc.

8. Provide proposed finished grade design elevations at key locations including at drainage break points, swale inverts adjacent to grades at building foundations, where proposed grades match the 0.6 m wide undisturbed strip within the lot, driveways, entrances, etc., with directional slope arrows and the calculated percentage of slope.

9. Swales are to be located internal to the subject site, and adjacent to but not within the 0.6 m wide undisturbed strip along existing property lines.

10. Where multiple lots are being created as part of the development, internal swales are to be located on the common lot lines.

11. Label all existing trees including trunk diameter. Accurately show the extents of the canopy (dripline) relative to the proposed area of disturbance. Identify trees proposed to be preserved and those proposed to be removed.

12. Show all roof leader downspout locations with splash pads which are based on the Architectural Drawing roof design. Show roof leader collector pipe systems (if not shown on a Servicing Plan) connecting to LID facilities as part of the proposed SWM system. Roof leader overflows should be directed toward the street or large green space area and away from adjacent properties as much as possible.

13. Show all entrance locations, label the number of stair risers and elevation at entrance.

14. Provide building finished first floor, finished basement slab, underside of footing, and top of foundation wall elevations. Where extended footing depths are necessary to meet minimum frost cover requirements, the extents of the extra depth footings is to be shown on the plan with the underside of footing elevation noted.

15. Show the proposed driveway alignment, elevations, slope (i.e., from the garage to the street line and from the street line to the road) and construction materials.

16. Show walkways to entrances and proposed patios and auxiliary buildings.

17. A table showing lot coverage breakdown of the proposed impervious and hardscape areas on the plan.

18. Reversed sloped driveway will not be permitted without the specific approval of the Director of Public Works. Refer to Section M7.03.

19. Review the construction haul route and street frontage, and confirm if there is half-load restriction along the route in accordance to Township's website (https://www.king.ca/half-load-restrictions). Add a note on the drawings to read "XXX Road along the frontage is subject to half load restrictions limiting vehicle weights to 5,000 kg per axle from March 1st to May 31st or year-round (as applicable)."

20. For all retaining walls in excess of 1.0 m and within a distance to the property line equal to the height of the wall, a detail design drawing as noted below prepared, sealed, and signed by a Professional Engineer is to be provided to assure a proper design of the wall. The retaining wall design drawing is to include the following:

    a) A statement that “The wall has been designed in accordance with accepted engineering principles” is to be included on the drawing.

    b) A statement that “The wall is suitable for the geotechnical condition of the site and for the loading type” is to be included on the drawing.

21. The grading design for residential infill development is also subject to the requirements noted in Section M5.00.

12.3.2 Erosion and Sedimentation Controls

1. Show the construction entrance location with a mud-mat to reduce mud tracking.

2. Siltation control fencing is to be shown around the entire perimeter of the property.

3. Show the location (and dimensions where appropriate) of interceptor swales, rock check dams, sediment ponds/sediment basins, filter fabric under street catchbasin grates, etc.

4. Provide Standard Detail Drawings of ESC measures. The Designer should adopt the ESC Notes and Detail Drawings included in Appendix 1 from the TRCA standard ESC documentation.

12.4 Servicing Information Requirements

1. Provide the known location of existing storm and sanitary sewer services and the water service, if applicable. Service locations from available as-built drawings may be requested from the Township.

2. Show the proposed sanitary and storm services sizes and alignments, including existing invert elevations at the street line and proposed invert elevations at the building envelope.

3. Label design slopes on the sanitary and storm service connections.

4. Show the proposed water service size and alignment and new curb stop to be provided at the street line.

5. A fixture count calculation per OBC should be conducted to confirm if the proposed water service or existing water service to be re-used is adequately sized for the proposed dwelling.

6. For lots on private services, show the on-site well and septic bed locations including connecting pipes and pump chambers and treatment chambers as applicable. Note indicating if the existing services are to be re-used or abandoned should be included.

7. Include notes stating all required construction materials and specifications.

8. Sump pumps are discouraged. If the property is currently serviced by a storm lateral or other lots along the same street are serviced by storm laterals, a sump pump will not be permitted and the proposed foundation drain must be discharged via a storm connection.

9. Show the sump pump outlet location, where applicable. The discharge is to be directed toward the street and away from adjacent properties.

10. For developments that will be serviced by the municipal sanitary system, service connections shall be solely gravity-fed. Use of grinder or ejector pumps will be considered only where achieving minimum grade is not possible and is subject to specific approval of the Director of Public Works.

11. Proposed sanitary connections are to be installed with surface clean-outs equipped with steel caps per the Standard Drawings.

12. Section views of proposed service connections may be required.

13. New storm, water, and sanitary connections, and existing connections to be abandoned for residential infill development are also subject to the requirements in Sections M7.04, M7.05 and M7.06.

12.5 Stormwater Management Information Requirements

If stormwater management is identified to be required per Section 12.1 above and Sections M6.00 through M6.07, the following is required:

1. A Stormwater Management Report or Design Brief which describes the criteria and design methodology used in the analysis and includes figures, calculations, drawings and details based on the design requirements outlined in Sections M2.00 and M6.00 through M6.07 for infill developments.

2. Summarize the proposed development characteristics and the site location relative to the environmental areas noted in Sections M6.00 through M6.04 and state the Design Criteria that apply to the site.

3. Pre-development and post-development drainage area figures including internal and external drainage area boundaries based on topography and runoff coefficients or imperviousness for existing and proposed conditions. Figures showing complete external drainage areas are to be provided, where applicable.

4. Calculations of the weighted runoff coefficients and times of concentration for each drainage area based on the drainage area characteristics. Provide supporting information and summarize any other hydrologic parameters used in the analysis (i.e., hydrologic computer model input).

5. Confirm the Township's current rainfall design parameters have been used in a Rational Method or a hydrologic computer analysis.

6. Calculations of pre-development and post-development peak flows, retention and detention storage facility sizing based on hydrologic computer models or the Modified Rational Method. Calculations and documentation required as outlined in Sections M6.05 and M6.06. Digital and hard copies of spreadsheet and computer model input and output files are to be submitted.

7. Where required, prepare and submit Water balance calculations using an industry-recognized procedure. Support the input parameters selected for the analysis and provide background calculations. Document the infiltration deficit in comparison to storage required for peak flow and erosion control as a basis for infiltration LID proposals.

8. The post-development versus pre-development flow results for each drainage outlet are to be shown in a summary table.

9. Pipe sizing calculations to demonstrate conveyance capacity.

10. A plan showing proposed downspouts, swales, collection system piping and appurtenances, storage facilities, overflows and outlet locations, including the sizes, slopes, elevations and dimensions of proposed works.

11. Cross-sections and detail drawings as necessary to show the size, configuration and construction materials associated with the storm drainage, LIDs and SWM systems.

12. The location of proposed works relative to structures, septic systems, property lines, etc. are to be shown in plan and cross section views.

13. Flow control devices such as orifice plates, weirs or structures are to be shown and dimensioned.

14. Material specifications for the storm drainage and SWM systems are to be included on the drawings.

APPENDIX 13

CAD Conversion Standards for AutoCAD Drawings

Township of King
Design Criteria and Standard Detail Drawings

10/29/2019

TOWNSHIP OF KING
CAD Conversion Standards

For the production of AutoCAD Drawings

KING

Author Information

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Document Information

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Status:	Final

Document Approvals

Stephen Naylor Director of Growth Management Services	January 30, 2026 date
Rafique Turk Manger of Development Services	January 30, 2026 date

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Appendix

CAD Standards

For the production of AutoCAD Drawings

1. About this document

This document describes the standards and procedures used to develop a set of engineering contract drawings in AutoCAD for the Township of King. The Township of King's CAD Standard is intended as the minimum procedures when preparing contract drawing containing asset information. The objective of the Standard is to ensure that all drawings are provided to the Township in a way that is easy to understand and includes all necessary information.

Any comments or recommendations about this manual should be addressed to:

Public Works Department
The Township of King
2585 King Road, King City, ON L7B 1A1

2. Scope

This manual was developed to assist the designers responsible for the preparation of engineering contract drawings for the Public Works Department using AutoCAD software. Elements covered in this manual are drawing file folder structures, drawing set ups and layer definition.

The Township must be able to use the information supplied, not only for reproduction for internal use, but also to feed data to corporate wide systems and convert data from AutoCAD to shape file. Files supplied to the Township, must conform to the standards outlined in this manual.

This manual does not cover all possible conditions, but is meant to be used as a guide in the development of engineering contract drawings. Procedures presented in this document will produce drawings clear enough to be printed at scales 1:500 and 1:1000.

Over time the users producing drawings for the Township will become accustomed to using the CAD Standard and its practices. Until such a time that users become familiar with the practices outlined in this Standard it is expected that there will be frequent reference to the Standard.

3. Drawing Preparation

Definition

A base plan is a digital drawing (AutoCAD file), a scanned image, that shows all existing above and below ground information on plan view only (no profile information). Base plans form the base information to be used for all design-related activities. All base plans should be prepared in accordance with this manual.

Base Plan Preparation

Base plan drawings include all existing topographical data and existing assets with accurate location. Profile sections detailing the sub-surface section of underground features may also be included.

When used for design purposes base plan drawings must include all sub-surface, surface, and aerial (above ground) detail. Below ground details including but not limited to, sewers, water mains, gas mains, and other utilities should be located in their actual vertical location in the profile section of the drawing. Above ground detail including but not limited to phone lines and cable TV wires and electrical lines should also be identified. Base plans may also consist of digital aerial mapping and/or information obtained by topographic surveys carried out in the field. Common methods of obtaining base map data include total station, GPS (Global Position System) and LIDAR (Light Detection and Ranging) surveys of the project area.

Drawing Structure

There are two distinct working environments, or "spaces," in which you can create objects in a drawing. These are represented by the Model and Layout tabs. Typically, a model is composed of geometric objects that are created in a three-dimensional space called *model space*. A final layout of specific views and annotations of this model is created in a two-dimensional space called *paper space*. These spaces are accessible on two or more tabs near the bottom of the drawing area: the Model tab and one or more layout tabs.

Note: These tabs can be hidden, appearing instead as buttons on the status bar at the bottom-center of the application window.

Working on the Model tab, you draw a model of your subject at 1:1 scale. Working on a layout tab, you can create one or more *layout viewports*, dimensions, notes, and a title block to represent a drawing sheet. Each layout viewport is like a picture frame containing a "photograph" of the model in model space. Each layout viewport contains a view that displays the model at the scale and orientation specific for the project. You can also specify which layers are visible in each layout viewport.

After you finish arranging the layout, you turn off the layer that contains the layout viewport objects. The views are still visible, and you can plot the layout without displaying the viewport boundaries.

All digital drawings produced for Township of King are to be drawn in Model space using metres as the measurement unit and to a real scale (1:1).

Viewport Custom Scale Required	Custom Scale factor
1:1000	1
1:750	1.33
1:500	2
1:300	3.33
1:250	4
1:200	5
1:100	10

Table 1: Custom Scale Factors

Coordinate System

One continuous Model Space should be produced for each project. All drawings created under this standard should be drawn using the UTM (Universal Transverse Mercator) NAD 83 Zone 17N Coordinate System in Model Space. This system was chosen for its accuracy and ease of use. UTM coordinates are based on metre distances from a 0,0 origin. Typical UTM values for King Township Northings range from about 4 858 491 to 4 889 3386 and typical Eastings range from 593 852 to 622 363.

Drawing Format

All drawings shall be standard AutoCAD Release 2009 (or higher) drawing files. The Township uses AutoCAD (Civil 3D) by Autodesk for drafting and review purposes. At the time of the release of this document the earliest version supported by Autodesk is AutoCAD 2009.

All text entities to follow the styles outlined in Table 2, below. Standard text sizes have been defined to ensure conformity and legibility on all drawings for viewing and plotting. The model space size is dependent on the final plotting scale.

Text Style	Text Name	Plot Height		Model Space Size (m)			
		mm	inch	1:100	1:200	1:500	1:1000
D040	RomanS	1.0160	0.0400	0.1016	0.2032	0.5080	1.0160
D040B	RomanD	1.0160	0.0400	0.1016	0.2032	0.5080	1.0160
D050	RomanS	1.2700	0.0500	0.1270	0.2540	0.6350	1.2700
D050B	RomanD	1.2700	0.0500	0.1270	0.2540	0.6350	1.2700
D060	RomanS	1.5240	0.0600	0.1524	0.3048	0.7620	1.5240
D060B	RomanD	1.5240	0.0600	0.1524	0.3048	0.7620	1.5240
D080	RomanS	2.0320	0.0800	0.2032	0.4064	1.0160	2.0320
D080B	RomanD	2.0320	0.0800	0.2032	0.4064	1.0160	2.0320
D100	RomanS	2.5400	0.1000	0.2540	0.5080	1.2700	2.5400
D100B	RomanD	2.5400	0.1000	0.2540	0.5080	1.2700	2.5400
D120	RomanS	3.0480	0.1200	0.3048	0.6096	1.5240	3.0480
D120B	RomanD	3.0480	0.1200	0.3048	0.6096	1.5240	3.0480
D140	RomanS	3.5560	0.1400	0.3556	0.7112	1.7780	3.5560
D140B	RomanD	3.5560	0.1400	0.3556	0.7112	1.7780	3.5560
D175	RomanS	4.4450	0.1750	0.4445	0.8890	2.2225	4.4450
D175B	RomanD	4.4450	0.1750	0.4445	0.8890	2.2225	4.4450
D200	RomanS	5.0800	0.2000	0.5080	1.0160	2.5400	5.0800
D200B	RomanD	5.0800	0.2000	0.5080	1.0160	2.5400	5.0800
D240	RomanS	6.0960	0.2400	0.6096	1.2192	3.0480	6.0960
D240B	RomanD	6.0960	0.2400	0.6096	1.2192	3.0480	6.0960
D290	RomanS	7.3660	0.2900	0.7366	1.4732	3.6830	7.3660
D290B	RomanD	7.3660	0.2900	0.7366	1.4732	3.6830	7.3660
D350	RomanS	8.8900	0.3500	0.8890	1.7780	4.4450	8.8900
D350B	RomanD	8.8900	0.3500	0.8890	1.7780	4.4450	8.8900
D425	RomanS	10.7950	0.4250	1.0795	2.1590	5.3975	10.7950
D425B	RomanD	10.7950	0.4250	1.0795	2.1590	5.3975	10.7950
D500	RomanS	12.7000	0.5000	1.2700	2.5400	6.3500	12.7000
D500B	RomanD	12.7000	0.5000	1.2700	2.5400	6.3500	12.7000

Table 2: Text Styles

Colour Dependent Plot Style Tables

The Township of King will use the colour-dependent plot styles produced by the Developer to control how objects are plotted, and to ensure that all objects that share the same color are plotted the same way.

Drawing Scale

Drawing units are to be metric and set to real scale. i.e.1 unit in the drawing is equal to 1 metre in the field.

Layer Structure

Each Asset must be on its own layer. Mandatory layers.

TYPE OF ASSET
Amenity Area
Access Point
Water Valve
Park Asset (benches, bleaches, play structure, slide)

Bridge
Boundary
Building Entrance
Catchbasin
Common Element
Conduit
Contour
Casing
Catchbasin Leads
Structural Culverts
Connection Point
Curb Stop
Curb
Culvert (small culverts)
Clean water Collector
Community Mailbox
Ditch Inlet
Discharge Point
Driveway
Easement
End Treatment
Equalization
Foundation Drain Collector
Building Footprint
Facility Footprint
Fiber Line
Fence
Fitting
Flow Meter
Flow Meter Basin
Force Main
Gravity Main
Geodetic Benchmark
Gas Line
Hand Holes
Headwall
Hydrant
Light Wiring
Landscape
Meter Chamber
Manhole
Open Space
Buffer Blocks
Node
Oil Grid Separator

Open Facility (Kiosk, Gazeebo)
Other Elements
Odor Control Facility
Pedestal
Siphon Main
Sanitary Pipe (Sanitary Main, Foundation Drain Collector Sewer Storm Sewer)
Stormwater Pond
Pumping Station
Production Well
Parking Area
Parking Line
Parcel
Phase lines
Prevailing Environment
Road Base
Road Surface
Road Widening
Retaining Wall
Safety System
Subdrain
Sign
Street Lights
Septic Maintenance
Splash Pad
Sampling Station
Service (Water Service, Sanitary Service, Foundation Drain Collector Lateral (Storm Lateral))
Sidewalk
Snow Storage
Spillway
Streets
Street Centerline
Trail
Transformer
Tree
Treatment Plant
Utility Trench
Underground Enclosure
Water
Water Storage
Water Resource Recovery System
Watermain
Walkway

Table 3: Mandatory Layers

The layers have been broken down to the component (or feature) level in order to give more control to the draftsperson. This adds more layering options and functionality because similar objects can be controlled groups of smaller size. For example; the sanitary pipe is on a separate layer from the manhole it is attached to which allows for independent display.

The following layer must be able to convert using the table below.

CONDO

Source_Text_Layer	Target_Layer	Description
If there is a text layer that can be associated by proximity, add it here.	**DO NOT EDIT. Only to be edited by the Municipality.**	**For reference in understanding how to map the layers.**
	Boundary	Boundary Layer
	Units_P	Condo units, Lines or polygons showing the limits of each condo unit
	Units_txt_P	Condo units numbers
	Building_footprint_E	Building footprints (lines or polygons)
	Building_footprint_P	
	Curb_E	Curb lines or polygons
	Curb_P	
	Sidewalk_E	Sidewalk delimitation
	Sidewalk_P	
	Walkways_E	Walkway delimitation
	Walkways_P	
	Parking_area_E	Parking lot outline
	Parking_area_P	
	Parking_line_E	Parking spot lines
	Parking_line_P	
	Parking_Label_txt_P	Labels for commercial, visitor, handicap parking etc.
	Parcel_E	Parcel lines or polygons
	Parcel_P	
	Common_Elements_P	Several polygons with text to identify the common elements, e.g. gym, meeting room etc.
	Common_Elements_txt_P	
	Open_spaces	
	Amenity_area_P	Lines or polygons showing amenity area limits
	Amenity_area_txt_P	
	Streets_E	Street outline (polygon or closed polyline)
	Streets_P	
	Street_Centreline_E	Street centerline
	Street_Centreline_P	
	Driveway_E	Driveway delimitation (lines, polygons or hatch)
	Driveway_P	
	Driveway_access_P	Line drawn to the width of the driveway access
	Landscape_area_E	Lines or polygons showing landscaping features limits
	Landscape_area_P	
	Other_elements_P	Lines or polygons showing limits for loading area, electrical, garbage/ recycling, storage, mechanical room etc.
	Other_elements_txt_P	labels for loading area, electrical, garbage/recycling, storage, mechanical room, etc.
	Phase_line_boundaries_P	If the project is divided into phases each phase should have a boundary and be labeled
	Phase_line_boundaries_txt_P	
	Stairs_txt_P	Text

Table 4: Condo Conversion Table for Digital Data Upload

SUBDIVSION

Source_Layer	Source_Text_Layer	Target_Layer	Description
Add your CAD layer name for the appropriate Target_Layer.	**If there is a text layer that can be associated by proximity, add it here.**	**DO NOT EDIT. Only to be edited by the Municipality.**	**For reference in understanding how to map the layers.**
		Boundary	One closed polyline defining the boundary of the subdivision.
		Street_E	Street outline
		Street_P	
		Street_Centreline_E	
		Street_Centreline_P	Street centerline
		Street_Name_txt_E	Street names (Text)
		Street_Name_txt_P	
		Lot_Number_txt_P	Lot numbers (Text)
		Blocks_E	Lines delimiting street blocks (open space, uitility corridors, landscape area, part blocks, buffer blocks, walkways)
		Blocks_txt_E	Street block information (Text)
		Blocks_P	
		Blocks_txt_P	
		Parcels_E	Parcel lines or polygons
		Parcels_P	Parcel lines or polygons
		Lot_Frontage_txt_P	Lot frontage measurement (text)
		Lot_Depth_txt_P	Lot depth measurement (text)
		Building_Footprint_E	Building footprints (lines or polygons)
		Building_Footprint_P	
		Driveway_E	
		Driveway_P	Driveway delimitation (lines, polygons or hatch)
		Countour_Lines_E	
		Countour_lines_P	Elevation contour lines
		Sidewalk_E	Sidewalk delimitation
		Sidewalk_P	
		Walkways_E	Walkways delimitation
		Walkways_P	
		Road_widening_P	Road windening lines
		30cm_reserve_P	
		Phase_boundaries_P	If the project is divided into phases each phase should have a boundary and be labeled
		Phase_line_boundaries_txt_P	
		Water_E	Water delimitation
		Prevailing_Env_Feat_E	Prevailing environmental feature - woodlot, floodline, top of bank, wetland etc.
		Prevailing_Env_Feat_txt_E	
		Prevailing_Env_Feat_P	
		Prevailing_Env_Feat_txt_P	

Table 5: Subdivision Conversion Table for Digital Data Upload

SITE

Source_Layer	Source_Text_Layer	Target_Layer	Description
Add your CAD layer name for the appropriate Target_Layer.	**If there is a text layer that can be associated by proximity, add it here.**	**DO NOT EDIT. Only to be edited by the Municipality.**	**For reference in understanding how to map the layers.**
		Boundary	Boundary layer
		Lot_number_txt_P	Lot numbers (Text)
		Blocks_P	Lines delimiting street blocks (open space, uitility corridors, landscape area, part blocks, buffer blocks, walkways)
		Blocks_txt_P	Street block information (Text)
		Parcel_E	
		Parcel_P	Parcel lines or polygons
		Units_P	Unit divisions inside of individual parcels
		Building_footprint_E	Building footprints (lines or polygons)
		Building_footprint_P	
		Street_Centerline_E	Street centerline
		Street_Centerline_P	
		Street_P	Proposed road delimitation
		Street_E	
		Driveway_P	Driveway delimitation (lines, polygons or hatch)
		Curb_E	Curb lines
		Curb_P	
		Sidewalk_E	Sidewalk delimitation
		Sidewalk_P	
		Walkway_E	Walkways delimitation
		Walkway_P	
		Parking_area_E	Parking lot outline
		Parking_area_P	
		Parking_Lines_E	
		Parking_lines_P	Parking spot lines
		Parking_Label_txt_P	Labels for commercial, visitor, handicap parking.
		Pilon_sign_P	Pilon Sign
		Ramps_to_underground_txt_P	Ramps to underground delimitation
		Other_elements_P	Lines or polygons showing limits for loading area, electrical, garbage/recycling, storage, mechanical room etc.
		Other_elements_text_P	Labels for loading area, electrical, garbage/ recycling, storage, mechanical room, bike racks etc.
		Driveway_access_E	Line drawn to the width of the driveway access
		Driveway_access_P	
		Building_entrances_P	Lines showing the main building entrances
		Road_widenings_P	Road windening lines
		Light_post_E	Light post point locations

		Light_post_P	
		Landscape_areas_E	Areas delimiting landscaping features
		Landscape_areas_P	
		Fence_E	Fence lines
		Fence_P	
		Retaining_walls_E	Retaining wall lines
		Retaining_walls_P	
		Snow_storage_areas_P	Snow storage area delimitation
		Stairs_txt_P	TBD (Questioning whether this has a place here)
		Phase_line_boundaries_P	If the project is divided into phases each phase should have a boundary and be labeled
		Phase_line_boundaries_txt_P	Labels for each project phase

Table 6: Site Conversion Table for Digital Data Upload

ENG

Source_Layer	Source_Text_Layer	Target_Layer	Description
Add your CAD layer name for the appropriate Target_Layer.	If there is a text layer that can be associated by proximity, add it here	DO NOT EDIT. Only to be edited by the Municipality	For reference in understanding how to map the layer
		utcWAccessPoint	Water
		utcWCasing	Water
		utcWConnectionPoint	Water
		utcWEasement	Water
		utcFacilityFootprint	Water
		utcWFitting	Water
		utcWFlowMeter	Water
		utcWHydrant	Water
		utcWMain	Water
		utcWProductionWell	Water
		utcWPumpingStation	Water
		utcWStorage	Water
		utcWTreatmentPlant	Water
		utcWUndergroundEnclosure	Water
		utcWValve	Water
		utcWWAccessPoint	wastewater
		utcWWCasing	wastewater
		utcWWConnectionPoint	wastewater
		utcWWDischargePoint	wastewater
		utcWWEasement	wastewater
		utcWWEqualization	wastewater
		utcWWFacilityFootprint	wastewater

		utcWWFitting	wastewater
		utcWWFlowMeter	wastewater
		utcWWFlowMeterBasin	wastewater
		utcWWForceMain	wastewater
		utcWWGravityMain	wastewater
		utcWWManhole	wastewater
		utcWWOdourControlFacility	wastewater
		utcWWPumpingStation	wastewater
		utcWWSiphonMain	wastewater
		utcWWUndergroundEnclosure	wastewater
		utcWWValve	wastewater
		utcWWWaterResourceRecoveryFacility	wastewater

Table 7: ENG Conversion Table for Digital Data Upload

Additional Information

Sometimes it is necessary to identify features within the project area because some characteristics may not be identifiable from aerial photographs or previous projects. It is strongly recommended to carry out a field verification of:

- Driveway types (paved, gravel, etc.),
- Road Pavement Types,
- House numbers,
- Utility poles height and type (Electricity, Phone, etc),
- Manholes
- Valve chambers and valve boxes

In addition to the topographic data, a survey crew is requested to obtain precise field information relative to the location of all –above and below-ground- utilities and services (storm, sanitary and water mains). Information obtained by the survey crew must:

- Be acquired using '**Survey Grade**' GPS equipment to achieve the optimum accuracy possible.
- Be represented in an AutoCAD drawing file that follows the standards and procedures explained in this document. This drawing shall use a UTM NAD 83 Zone 17N coordinate system, using metres as the measure unit.
- Provide a coordinate list for all control points found or used for the project.
- Provide a list for all control points elevations.
- Provide a list of Water main valves and sanitary manholes numbers with invert elevations.

The majority of wastewater system assets (maintenance hole covers, chamber lids, valve box covers) and water system assets (chamber lids and valve box covers) have GPS coordinates with centimetre accuracy.

All GPS X, Y, Z coordinates will be obtained with respect to the following:

- GPS points must be provided in UTM Zone 17 NAD83 coordinates.
- GPS points must have a horizontal accuracy of 100mm or less.
- GPS points must have a vertical accuracy of 30mm or less.

Grids and Coordinate Systems

Coordinate System grids shall use real UTM NAD 83 Zone 17N coordinates, expressed in metres. In NO case shall the user coordinate system be modified in Model Space. Use of the commands "Rotate", "Align", "UCS", or any other command that changes the coordinate base will not be accepted. Grids shall conform to the following criteria:

- No local coordinate system should be used. Drawing coordinates shall be within the coordinate ranges previously presented.

All topographical information in plan view shall be registered to AutoCAD's World coordinate system and to the UTM NAD 83 Zone 17N coordinate system.

- Coordinate grid shall consist of a series of cross hairs drawn to the nearest 25-100 metres intervals.
- The northing and easting coordinates shall be shown at the intersection of the coordinate lines at
  - 25-100 metres intervals.
- All information related to the grid system (crosshairs, Northing and Easting) shall be on the specified layer.
- The cross hairs for the grid system shall be indicated outside of the road allowance. Locate cross hairs in an open area of the drawing and avoid overlapping other drawing data or line work.

Cover Sheet

King has developed standard cover sheets that must be used for all projects. Cover sheets contain a location map as well as various details about the project. An example of the cover to be used for all Township of King Water and Wastewater projects has been provided in Figure 1 below; items identified in Figure 1 can be found in Table 8, immediately following Figure 1.

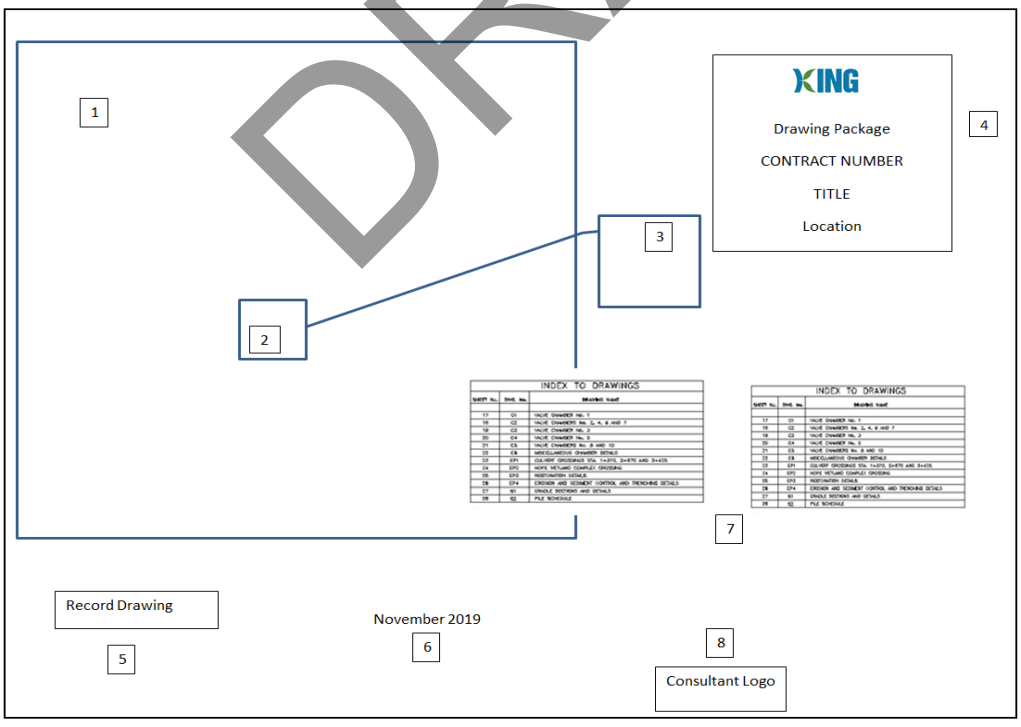


Figure 1: Township of King Cover Sheet

Cover Item Number	Cover Item Description
1	General Location (Township) Map
2	Project Extents
3	Project Extents Viewport
4	Project Identification Area
5	Drawing Status
6	Drawing Creation Date
7	Index to Drawings
8	Consultant Logo

Table 8: Coversheet Item Description

Working with Xreferences

You can attach an entire drawing to the current drawing as a referenced drawing (Xref). With Xrefs, changes made in the referenced drawing are reflected in the current drawing. Attached Xrefs are linked to, but not actually inserted in, another drawing. Therefore, with Xrefs you can build drawings without significantly increasing the drawing file size.

By using referenced drawings, you can

- Coordinate your work with the work of others by referencing other drawings in your drawing to keep up with the changes being made by other designers. You can also assemble a master drawing from component drawings that may undergo changes as a project develops.
    - All component drawings referenced within the project drawing must conform to the Township of King's CAD Standard.
- Ensure that the most recent version of the referenced drawing is displayed. When you open your drawing, each referenced drawing is automatically reloaded, so it reflects the latest state of the referenced drawing file.
- Keep the names of layers, dimensioning styles, text styles, and other named elements in your drawing separate from those in referenced drawings.
- Merge (bind) attached referenced drawings permanently with your current drawing when the project is complete and ready to be archived.

Note: Like a block reference, an Xref appears in the current drawing as a single object. However, you cannot explode an Xref without binding it first.

Use of referenced drawings (Xref) is allowed where drawing size affects computer performance. Follow

the recommendations below when using Xrefs:

- Provide information about all Xref drawings used in your project.
- Do not use a full path when attaching Xrefs. Always use Relative Path. It is recommended to keep the attached drawings in the same directory as the current drawing.
- Set to layer 0 (zero) and attach the referenced drawing to that layer using 0,0,0 as the insertion point, 1,1,1 for the scales, and 0 for the rotation.
- Do not edit the layer visibility by changing the referenced drawing. The preferred method for this is to change visibility at the current drawing.

Requirements

Pre Consultation Meeting Township of King Project Manager or Project Tech to inform Developer and Consulting Engineer of Geo reference Coordinate system for Auto CAD files, Unique identifier; King AutoCAD Standards, Conversion Tables, AutoCAD files review (at each appropriate milestone – 30%, 60%, Form 1, 90%, IFC and As Built)

Consulting Engineer AutoCAD files review (at each appropriate milestone – 30%, 60%, Form 1, 90%, IFC and As Built)

Township of King Project Manager or Project Tech review of AutoCAD

File Name Convention for Drawings

The naming convention for digital files should follow the following format:

"Designation" - "Contract Number" - "Sheet Number" - "Type of Drawing" - "Drawing Stage Abbreviation"

Designation: Can be either "W" for Water, "WW" for Wastewater, or "WWW" for Water and Wastewater (combined).

Contract Number: The contract number provided for the project.

Sheet Number: The sheet number of the drawing.

Type of Drawing: Identifies if the drawing is a:

P## - Plan and Profile Drawing

A## - Architectural Drawing

S## - Structural Drawing

M## - Mechanical Drawing

G## - General Plan Drawing

E## - Electrical Drawing

Drawing Stage Abbreviation: Identifies the drawing as one of the following drawings:

AT - As Tendered

AR - As Recorded

C - Construction

AC - As Constructed

CR - Construction Record

D - Draft

AB - As Built

A - Approval

S - Shop Drawing

File naming convention example:

W-T1096-001-G00-C.dwg

Drawing Submittals

During all phases of submittals, all electronic deliverables must be identical to the hard copy. If the CAD drawing files use references (Xref's), then the referenced file must be provided along with the CAD drawing. All files and their attached Xref's must be located in the same directory.

Colour Table file used to generate the plot file must be submitted during all phases of submittals. All drawing files shall be set so all that is necessary to plot a hard copy is to open the drawing and execute the plot command.

All digital submittals must include:

- Drawing file in .dwg format using the lowest supported version supported by Autodesk.
- CTB or STB file.
- Shape files.
- Font files.
- Line definition files.
- Metadata file.
- Conversion Tables for Digital Data Upload.
- Unique Identifiers form.

Metadata

Metadata refers to descriptive information regarding data (or drawings containing data). Metadata allows users to understand the data they are working with as well as its limitations (e.g. currency, accuracy, projection, etc.). Metadata must accompany all drawings submitted to the Township. Project metadata is stored within the METADATA attribute definition block and must be located on the METADATA layer at coordinates 0,0,0 in the model space. The mandatory metadata fields (where applicable) are as follows:

- Title – The project or drawing title
- Drawing file name – The name of the drawing file.
- Project number – The project number for the project.
- Units – The units that the drawing was created in.
- Author – The consultant/contractor responsible for the drawing.
- Coordinate system – Projection and Datum used to create the drawing. By default should be UTM NAD 83 Zone 17N.
- The drawing status – As built/tendered, etc

Quality Assurance/Quality Control

Review Milestone

30% AutoCAD review
60% AutoCAD review
Form 1 AutoCAD review
90% AutoCAD review
Issued for Construction AutoCAD review
As Built AutoCAD review

Detailed AutoCAD Review Process

Consulting Engineers check AutoCAD file for completion of mandatory layers, correct conversion tables, Geo reference coordinate system, Unique identifiers, completion of .ctb file, completion of Metadata and a complete set of drawings (electrical, landscape, plan and profile, quantity sheets)

Form 1 Submission mandatory check is for water and wastewater assets.

4. Topology Rules

A topology is a set of integrity rules that define the behaviour of geographic features. A topology enables you to have one common set of lines to represent the geometry of many feature classes that share geometry. Topologies have rules about how the features share geometry. Topology can be built for any vector spatial data type and certain data conditions will prevent topology from being built without corrective editing. Topology allows GIS professionals to answer questions about adjacency, connectivity, proximity, and coincidence. Therefore topology is necessary for all polygonal and linear data sets submitted to the Corporate GIS.

To create and maintain coverage topology, the following must be met:

- Correct arc directionality must be maintained on streets, facility data, and any dataset with flow.
- All features must be connected or snapped to its connecting feature using the precision editing commands in AutoCAD.
- Pseudo nodes must only exist where 1) a line closes on itself 2) only two lines intersect 3) there is a change in attribution along a line 4) to maintain the shape and measurements of an arc.
- Lines, polygons, points and annotation must not be duplicated.
- Streets and facility data do not break at overpasses and underpasses.
- Polygons must have only one label per feature.
- Polygons must edge match without slivers.

Figure 2 outlines some of the typical problems drawings can contain and followed by solutions to these problems.

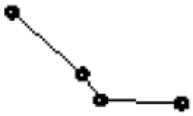
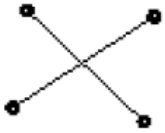
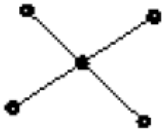
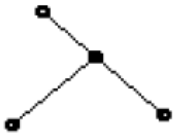
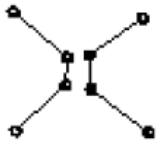
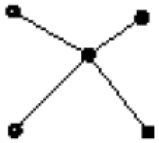
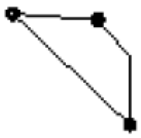
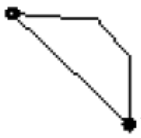
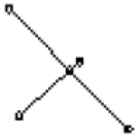
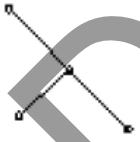
Incorrect	Correct	Description of Problem
		Duplicate objects
		Short objects
		Crossing objects
		Undershoots
		Node cluster
		Pseudo-nodes
		Dangles or over-shoots
		Zero-length objects

Figure 2: Examples of Drawing Problems

Duplicate Objects

The duplication of objects cannot occur; lines which are a duplication of another line should be removed in order to accurately reflect the features in reality. Refer to Figure 2 for a graphic example of the discussed problem.

Short Objects

A short object is one that has a plotted length of less than 0.5mm; lines shorter than 0.25m at a scale of 1:500 or 0.5m at a scale of 1:1000 should be removed from the drawing. Refer to Figure 2 for a graphic example of the discussed problem.

Crossing Objects

Whenever features within the same network (water, wastewater, etc.) a node must be present at the crossing point. Crossing features from different networks (i.e. a watermain crossing a sewer main) do not require a node to be present. Refer to Figure 2 for a graphic example of the discussed problem.

Undershoots

Undershoots are often caused by inaccurate digitizing or when converting scanned data. They are composed of objects that come within the specified tolerance radius of each other, but do not meet.

If one object can be extended to cross the other, it will be extended (while maintaining the same direction) and snapped to a point on the object. If no node exists, one shall be created at the intersection.

If two objects pass within the specified tolerance and can be snapped without changing their direction, they shall be snapped together. If no node exists at that point, one will be created.

Refer to Figure 2 for a graphic example of the discussed problem.

Node Cluster

Node clusters should be avoided; features which share a common end point should be snapped together using the precision editing commands available in AutoCAD. Refer to Figure 2 for a graphic example of the discussed problem.

Pseudo-nodes

Pseudo-nodes are those which occur on a linear or polygonal feature which do not represent the case in reality. For example a single piece of flex pipe in a sanitary sewer network should be digitized as one polyline with multiple vertices instead of multiple lines or polylines broken by one or more nodes. Refer to Figure 2 for a graphic example of the discussed problem.

Dangling Objects

A dangling object is often caused by inaccurate digitizing where an object extends beyond its intended intersection with a target object. Object intersections should be created using the precision editing commands within AutoCAD. Refer to Figure 2 for a graphic example of the discussed problem.

Zero Length Objects

Zero length objects are those lines which have been created (usually through improper digitizing) that have no length. These lines serve no purpose and should not be present in drawings presented to the Region. Refer to Figure 2 for a graphic example of the discussed problem.

Overlapping

Overlapping polygons are usually created by improper digitization; polygons in the same layer should never overlap one another. Overlapping polygons in the same layer creates sliver (or spurious) polygons

when polygon topology is created. Figure 3 shows an example of improperly digitized polygons within the same layer. If two polygons share the same boundary edge, only one line should be digitized.

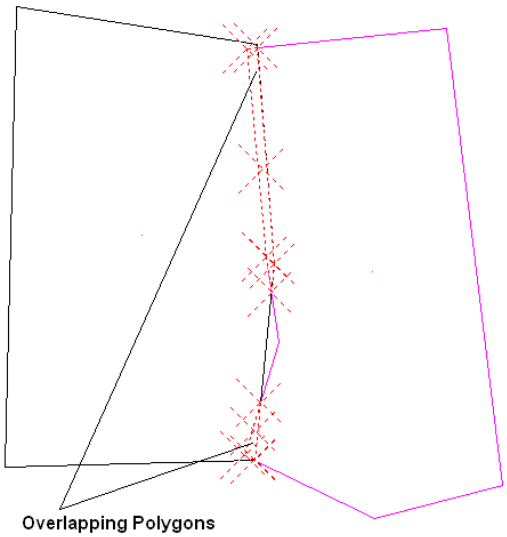


Figure 3: Overlapping Polygons

Break Lines

Do not break lines to include labels, instead use the linetypes provided within the seed file. Text for sanitary sewers and watermains is placed within the linetype definition for those lines. This allows the line to automatically generate text as part of the line and eliminates the need to break the line to insert labelling text within it. Linetypes were designed to use LTSCALE values of 1 if the plot scale is 1:500 and 2 if the plot scale is 1:1000. Remember to set the PLINEGEN system variable equal to 1 for linear assets. Examples of existing sanitary and water mains using the linetype definition created for the Township's seed
file are shown below in Figure 4.

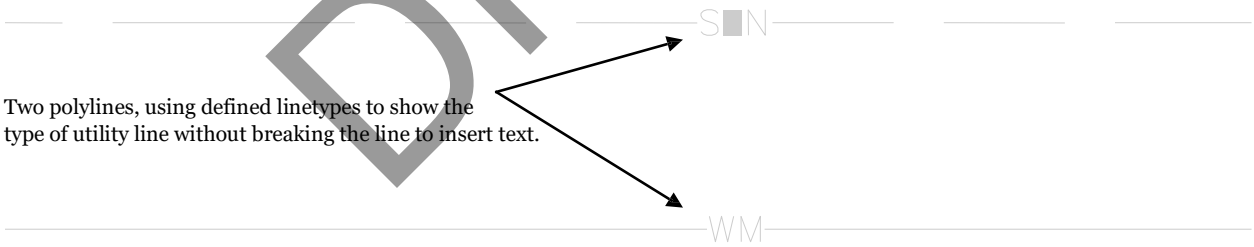


Figure 4: Linetype Definition Showing Text on the Line.

Inserting Blocks

In order to ensure connectivity with network features all blocks should be connected to linear features at the insertion point. Figure 5 shows the incorrect means for digitizing features within a linear network, the linear features appear to connect to the block (an existing valve chamber), but are only attached to the edge of the symbol.

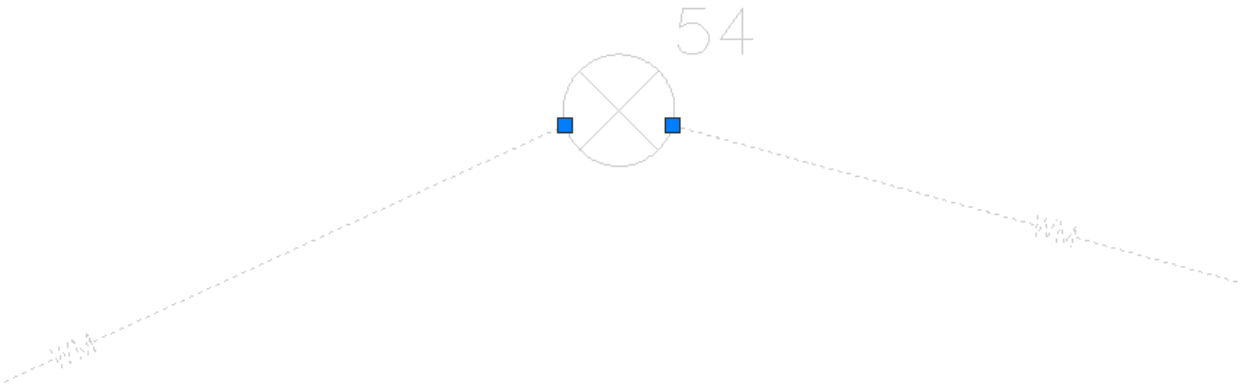


Figure 5: Incorrect Insertion of Block Connected to Linear Features

Make sure all blocks are connected to linear assets at the block insertion point. Using the precision editing commands in AutoCAD allows for the proper connection of blocks to linear features; Figure6 shows the correct method for connecting blocks to linear features.

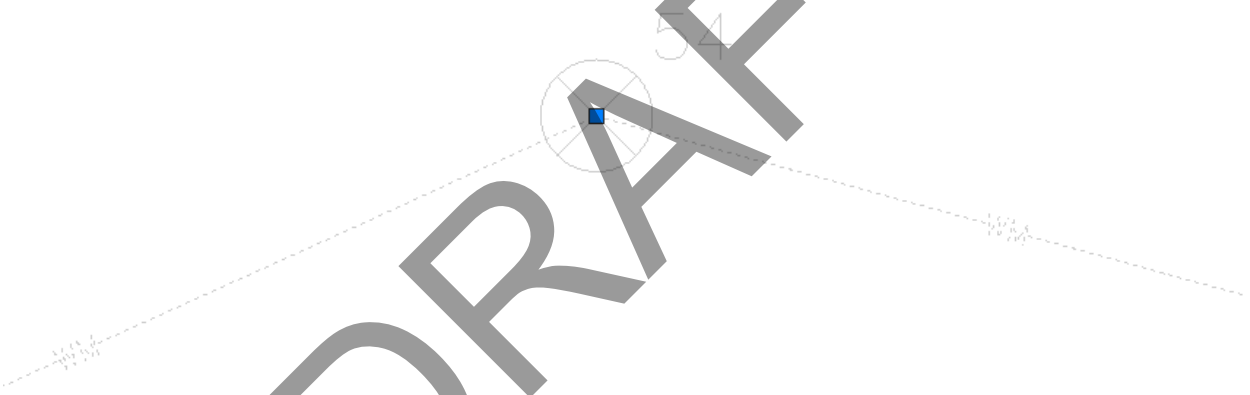


Figure 6: Correct Insertion of Block Connected to Linear Features

Insert Blocks with attributes for linear entities

Include the block with attributes that belongs to the linear object. Make sure to include one block with attributes for each line segment. The block included with each line segment should be inserted at the mid point of every line segment. Figure 7, below, shows the proper method for insertion of a linear asset attribute block.

Figure 7: Proper Insertion of Attribute Data Block on Linear Features

Insert Blocks with attributes for polygon entities

In order to ensure that polygon information can be attributed to the proper polygon, each polygon must be closed and include the block with attributes that belongs to that object. An example of including polygon attribute blocks is shown in Figure 8, below.

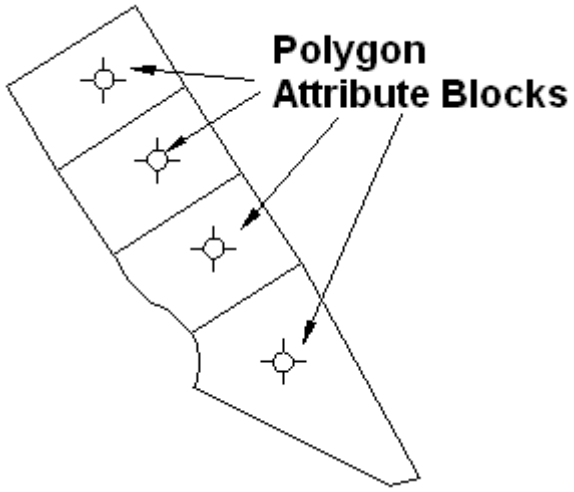


Figure 8: Polygons Including Attribute Block

Appendix A: List of Acronyms

Acronym	Description
CAD	Computer Aided Drawing
CTB	Colour Dependant Plot Style Table
ENG	Engineering
GIS	Geographic Information System
GPS	Global Positioning System
LIDAR	Light Detection and Ranging
NA	Not Applicable
NAD	North American Datum
STB	Style Table
UTM	Universal Transverse Mercator
XREFS	X Reference