

## JOB DEMANDS ANALYSIS

## **Company:** City of Burnaby

Location: Works Yard

Job Title: Labourer – Water Works Construction Classification: Regular Duty

## Purpose of Activities

The Labourer is responsible for water main and hydrant installation and repair; service connection, transfers and repairs and ensuring the work site is kept clean and hazard free.

## Tools and Equipment

The Labourer will use the following tools and equipment to perform his duties:

- 1. One-ton Gruman van
- 2. Hand tools shovels,(square and round mouth), pry bars, pipe wrenches, wrenches, brooms, bench vise, hand saw, rakes, pipe cutters, hammers, buckets, sledge hammer
- 3. Power tools jackhammer (41-kg), pumps (two man lift), electric grinder, power saw, cad welder
- 4. Valve keys, tapping machine (30-kg)
- 5. PVC, plastic and or Asbestos Clay, cast iron pipe (15 61 cm, six-24 inch), Elbows, T's, fittings, gaskets, hydrants (two man or machine lift)
- 6. Bags of powered cements (23-kg)
- 7. Step and extension ladders

Usual Methods

Expose Service by Hand

- 1. Drive to the work area in the morning.
- 2. Exit the vehicle, check the work order and set up the barricades and signs to close the street if necessary.
- 3. Gather the required tools for the job from the back of the truck.
- 4. Check for pre-marked services on the ground (paint).
- 5. Use a shovel, bar or jackhammer to dig the earth away to expose the service. Throw the dirt and debris out of the ditch onto the street or curb. Note: Water services located approximately one metre or less from the surface are usually dug by hand by the Labourer.
- 6. Once the service has been exposed and debris cleared away, climb out of the ditch and gather the required tools, equipment and parts to make the installation or repair.
- 7. Carry the tools, equipment and parts to the ditch from the truck. Lower the tools, equipment and parts into the ditch by hand or rope.
- 8. Climb into the ditch.



- 9. Perform installation or repair task on the service using hand and/or power tools. Depending on the type of installation or repair, the water line may be live and under pressure or it may have been turned off and drained.
- 10. Lift and carry tools, equipment and excess parts out of the ditch to the surface.
- 11. Climb out of the ditch after the installation or repair.
- 12. Use a shovel to backfill the ditch.
- 13. Clean the area of excess dirt and debris.
- 14. Load the truck with tools, equipment and parts.
- 15. Remove barricades and signs from the roadway if required.
- 16. Drive or walk to the next work area.
- 17. Repeat steps 2-16.

#### Expose Service by Backhoe

- 1. Drive to the work area in the morning.
- 2. Exit the vehicle, check the work order and set up the barricades and signs to close the street if necessary.
- 3. Gather the required tools for the job from the back of the truck.
- 4. Check for pre-marked services on the ground (paint).
- 5. Assist the Backhoe Operator as required with hand signals and verbal communication to expose the service.
- 6. Using a shovel or broom the Labourer keeps the edges of the ditch clear of dirt and debris.
- 7. Once the service has been exposed, the Labourer will climb into the ditch (ladder) and expose the immediate area that requires the installation or repair.
- 8. Climb out of the ditch
- 9. Carry the tools, equipment and parts to the ditch from the truck. Lower the tools, equipment and parts into the ditch by hand, rope or Backhoe.
- 10. Climb into the ditch.
- 11. Perform installation or repair task on the service using hand and/or power tools. Depending on the type of installation or repair, the water line may be live and under pressure or it may have been turned off and drained.
- 12. Water main installation requires the Labourer to use a bar to push the male end of the pipe into the female end to complete the connection.
- 13. Lift and carry tools, equipment and excess parts out of the ditch to the surface.
- 14. Climb out of the ditch after the installation or repair.
- 15. The Backhoe Operator will use the Backhoe to backfill the ditch.
- 16. Clean the area of excess dirt and debris with a shovel or broom.
- 17. Load the truck with tools, equipment and parts.
- 18. Remove barricades and signs from the roadway if required.
- 19. Drive or walk to the next work area.
- 20. Repeat steps 2-19.

#### Administrative Issues

The Labourer works from Monday to Friday 0700 to 1530 with a ten-minute rest period in the morning, a 30-minute lunch break and a ten-minute rest period in the afternoon. There are seven crews in the City of Burnaby made up of three Labourer's and a Foreman. Services less than one metre below grade are usually exposed by hand (shovel, bar and/or jack hammer). In this instance the Labourer will spend his day digging to expose the service, repairing or installing the service, and back filling the service up to all day. When



using Backhoe, the Waterworks Construction Crew will lay approximately 122 metres (400 feet) of water line for main installation per day.

#### Activity Demand Variables

These variables are tasks that must be carried out by the employee and are implicitly or explicitly required as objectives of the job.

- Shovel or dig around pipe and/or utilities (gas, water, sewer, electric) in the ditch
- Shovel by hand to one metre deep by one metre wide to expose service
- Climb up and down a ladder into the ditch that can range from one to seven metres deep
- Climb in or out of the ditch without a ladder
- Shovel and/or sweep debris from edge of ditch when working near a Backhoe
- Raise and lower tools and equipment by hand or rope into a ditch that can range form one to seven metres deep
- Lift and carry tools, equipment and parts (elbows, T's, fittings, etc.) from the truck to the ditch (usually get truck as close as possible to the ditch or work area)
- Work in a confined area when installing or repairing water service
- Repair or install pipe/service on a live water line
- Kneel, crouch, bend, stoop in a ditch while installing or repairing water line, hydrant, etc.
- Push and/or pull tools and equipment in or out of the ditch
- Two ten minute rest periods (one in the morning and one in the afternoon) and a 30 minute lunch break
- Work in all weather conditions including prolonged periods of rain or heat

#### Worker Decision Variables

These variables are the sub-routines and cognitive/physical decisions made by the worker in carrying out the objectives of the job.

- Choose posture when able to perform tasks (lifting, shoveling, pushing, pulling)
- Ask for assistance when required and others are around

#### Accommodative Considerations

- 1. People with injuries to the spine, in any region, may have difficulty with the static and dynamic movements required during the labouring duties of this position.
- 2. People with shoulder injuries such as rotator cuff tendonitis, bursitis and instability may have difficulty with dynamic and static loading and reaching activities required to install and repair water/service lines and components.
- 3. People with forearm and elbow injuries such as tennis elbow may have difficulty with the repeated jarring and the static grip forces required to shovel, dig and power tool use including the jackhammer.
- 4. People with nerve compression injuries in the upper extremities may have difficulty with the repeated and prolonged use hand and power tools (compression and vibration).
- 5. People who do not work well in confined areas will not do well with this position.
- 6. People with injuries to the lower extremities will have difficulty walking and standing on uneven ground and climbing in and out of the ditch as well as producing enough force to shovel or pick the ground to expose a service.

Prepared By:

Jeffrey J. McGinn, Kinesiologist



# **Summary of Stresses**

#### Metabolic Stresses

The aerobic energy systems will be the major source of energy requirement while performing the duties and responsibilities of the Labourer - Waterworks. This energy system will be utilized during the installation and repair of the water service lines. The anaerobic energy systems may be required to supply energy for brief intense periods of work, which may include heavy or sustained lifting or carrying; or towards the end of the day when the aerobic energy system has been depleted. In this last instance the anaerobic energy system becomes the primary energy source

#### Structural Stresses

**Spine** –Significant loading of the spinal structures are likely in this position. Prolonged loaded and unloaded forward flexion, extension, lateral flexion and rotation of the spine are all movements required by the Labourer. Forward flexed postures require no activity from the torso musculature, but increase asymmetrical disc compression and passive stretch on the posterior spinal ligaments and disc fibres. This can contribute to disc integrity problems as well as contributing to deconditioning of the torso support musculature. Lateral flexion and/or rotation with or without forward flexion (loaded or unloaded) will significantly increase the shear forces encountered by the discs, fibres and spinal ligaments. The Labourer will handle loads from less than one to 41 kilograms in extreme positions.

**Neck, Shoulders and Upper Extremity**– the Labourer will often perform prolonged and repeated static and dynamic movements. These static and dynamic movements through the shoulder and upper extremity require the rotator cuff muscle groups, upper trapezius and scalene muscles of the neck to maintain a significant load. Static loading of the of the forearm flexors, extensors, supinator, pronator teres and the pronator quadratus during tool use (shovel, hand and power tools, etc) will increase the risk of injury to these areas. Power and air tool use (saws, jackhammers, etc) will also increase the vibration, jarring and compressive forces from the grip to the elbow and shoulder that may lead to over use tendon or nerve injuries.

**Hips and Lower Extremities** – Standing and walking on concrete, asphalt, mud and dirt for the entire shift increase the compressive forces through the ankles, knee, hips and spine. The awkward positions required to access pipe and component parts do not allow the Labourer to perform the required work from a stable base of support. This in turn will increase the risk of injury for all of the other structures.

## **INTERVENTIONS**

Recommendations that could be implemented to increase productivity and lessen the risk of injury are listed below:

- 1. Encourage the Labourer to maintain an increased level of fitness away from work that will focus on cardiovascular endurance, muscular strength, muscular endurance and flexibility.
- 2. Provide kneepads for the Labourer for any work where kneeling is required, specifically in an open excavation.



- 3. Provide regular education in effective use of the body and neutral joint positions for this type of work. This education component should go way beyond the standard back care and lifting techniques (bend knees, keep the back straight, etc.)
- 4. Encourage the Labourer to ask for assistance (co-worker or backhoe) when handling heavy and/or oversized parts or pieces
- 5. Exposing a service by hand (one metre deep by one metre wide by one metre long) could be performed more efficiently and with less risk of injury to the Labourer if a Backhoe or a HydroVac Truck was used.

Referral: Lana Ho   Organization: City of Burnaby   Title: Labourer     Dapt: Engineering   Division: Wateworks   Contact: Grant Tesar     Dapt: Engineering   FREQUENCY   Date: April 30, 1999     PHYSICAL DEMANDS   D   D   Image: April 30, 1999     PHYSICAL DEMANDS   D   E   I   Sel   Max.   Usual     Lifting - Knuckle to Waist   X   E   X   41   1-8   pipe fittings, tools, equipment, lumber     Lifting - Knuckle to Waist   X   E   X   41   1-8   pipe fittings, tools, equipment, lumber     Lifting - Variation Shoulder   X   E   X   41   1-8   pipe fittings, tools, equipment, lumber     Lifting - Variation Shoulder   X   E   X   41   1-8   pipe fittings, tools, equipment, lumber     Citting - Upper Extremity   X   E   X   41   1-8   shovel, py tar, fit pipe together, tool use     R   Puling - Upper Extremity   X   E   X   41   shovel, py tar, fit pipe together, tool use     R   Puling - Upper Extremity   X   E   X   41 <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>											
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PHYSICAL DEMANDS     FREQUENCY*     Date: April 30, 1999       PHYSICAL DEMANDS     F     I     Set     Max.     Usual       Lifting - Floor to Knuckle     X     E     X     41     <1-8	Dep	ot.: Engineering	Division: Waterworks								Contact: Grant Tesar
PHYSICAL DEMANDS   Fe i l 2   Set Low Mod High Weight (kg)   COMMENTS     Uting - Floor to Knuckle   X   E   X   41 <t-8< td="">   pipe fittings, tools, equipment, lumber     Lifting - Knuckle to Waist   X   E   X   41   <t-8< td="">   pipe fittings, tools, equipment, lumber     Lifting - Knuckle to Waist   X   E   X   41   <t-8< td="">   pipe fittings, tools, equipment, lumber     Lifting - With Handles   X   E   X   41   <t-8< td="">   pipe fittings, tools, equipment, lumber     Scarrying - With Handles   X   E   X   41   <t-8< td="">   pipe fittings, tools, equipment, lumber   100 m     Scarrying - With Handles   X   E   X   41   <t-8< td="">   shovel, pip bar, fit pipe together, tool use     Pulling - Upper Extremity   X   E   X   41   <t-8< td="">   shovel, pip bar, fit pipe together, tool use     Reach - Sho, or Above extind   X   E   X   41   <t-8< td="">   shovel, pip, pipe, fittings     Reach - Bel: Shoulder or Above extind   X   E   X   41   <t-8< td="">   shovel, pip, pip, pip, pip     Reach - Bel: Should</t-8<></t-8<></t-8<></t-8<></t-8<></t-8<></t-8<></t-8<></t-8<>					FR	EQU	ENC	Y*			Date: April 30, 1999
PHYSICAL DEMANDS     Sel     Low Model High Weight Weight (kg)     COMMENTS       Lifting - Floor to Knuckle     X     E     X     41     c1-8     pipe fittings, tools, equipment, lumber       Lifting - Knuckle to Wast     X     E     X     41     c1-8     pipe fittings, tools, equipment, lumber       Lifting - Vort Head     X     E     X     41     c1-8     pipe fittings, tools, equipment, lumber       Carrying - With Handles     X     E     X     41     c1-8     pipe fittings, tools, equipment, lumber       Carrying - Without Handles     X     E     X     41     c1-8     pipe fittings, tools, equipment, lumber     100 m       Carrying - Without Handles     X     E     X     41     c1-8     shovel, pry bar, fit pipe together, tool use       Publing - Upper Extremity     X     E     X     41     c1-8     shovel, pry bar, fit pipe together, tool use       Publing - Upper Extremity     X     E     X     30     c1-8     from ditch to grade to tools, equip, pipe       Paneah - Sho. or Above axtnd     X     X     41			R	S					Max.	Usual	
PHYSICAL DEMANDS   O   D   I   2   3   4   (kg)   (kg)   COMMENTS     Lifting - Knuckle to Waist   X   E   X   41   c1-8   pipe fittings, tools, equipment, lumber     Lifting - Knuckle to Waist   X   E   X   41   c1-8   pipe fittings, tools, equipment, lumber     Carrying - With Handles   X   E   X   41   c1-8   pipe fittings, tools, equipment, lumber     S Carrying - With Handles   X   E   X   41   c1-8   pipe fittings, tools, equipment, lumber     S Carrying - With Handles   X   E   X   41   c1-8   pipe fittings, tools, equipment, lumber   100 m     S Carrying - With Handles   X   E   X   41   c1-8   shovel, pry bar, fit pipe together, tool use     Pulling - Upper Extermity   X   E   X   41   c1-8   shovel, pry bar, fit pipe together, tool use     Rushing - Hip/Leg Assist   X   E   X   41   c1-8   shovel, pry bar, fit pipe together, tool use     Rushing - Hip/Leg Assist   X   E   X   41   c1-8   sh			E	Ι	Sel	Low	Mod	High	Weight	Weight	
Lifting - Floor to Knuckle   X   Image: A state of the state of t	PHYSICAL DEMANDS			D				5	(ka)	(ka)	COMMENTS
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Lifting - Waist to Shoulder   X   E   X   41   File   Fil		Lifting Knuckle to Waist	$\overline{\mathbf{v}}$				~	v	-+ I // 1	<10	pipe fittings, tools, equipment, lumber
Lifting - Valist Osholuder   X   41   <1-8		Lifting - Maist to Chaulder	$\hat{\mathbf{\nabla}}$				v	^	41	<1-0	pipe fittings, tools, equipment, lumber
Ling - Over nead   X   E   X   41   -16   pipe fittings, tools, equipment, lumber to 100 m     S   Carrying - With Handles   X   E   X   41   <1-8		Litting - Waist to Shoulder	$\left  \begin{array}{c} \\ \\ \end{array} \right $			V	^		41	<1-0	pipe intings, tools, equipment, iumber
Carrying - Without Handles   X   E   X   41   <1-8		Lifting - Over Head	X	E		X			30	<1-8	pipe fittings, toois, equipment, iumber
S   Carrying - Without Handles   X   E   X   41		Carrying - With Handles	X	E				Х	41	<1-8	pipe fittings, tools, equipment, lumber to 100 m
T   Pushing - Upper Extremity   X   E   X   41   <1-8	S	Carrying - Without Handles	X	E			Х		41	<1-8	pipe fittings, tools, equipment, lumber to 100 m
R   Pushing - Hip/Leg Assist   X   41   <1-8	T	Pushing - Upper Extremity	X	E			Х		41	<1-8	shovel, pry bar, fit pipe together, tool use
E   Pulling - Upper Extremity   X   E   X   41   <1-8	R	Pushing - Hip/Leg Assist	X	Е			Х		41	<1-8	shovel, pry bar, fit pipe together, tool use
N   Pulling - Hip/Leg Assist   X   E   X   41   <1-8	E	Pulling - Upper Extremity	X	Ш			Х		41	<1-8	shovel, pry bar, fit pipe together, tool use
G   Reach - Shoulder or Above XX   E   X   30   <1-8	N	Pulling - Hip/Leg Assist	X	Е			Х		41	<1-8	shovel, pry bar, fit pipe together, tool use
T   Reach - Sho. or Above extind   X   E   X   41   <1-8	G	Reach - Shoulder or Above	X	Е			Х		30	<1-8	from ditch to grade for tools, equip., pipe
H   Reach - Below Shoulder   X   E   X   41   <1-8   lift, carry, tool use, install/connect fittings     H   Reach - Bel. Shoulder extnd   X   E   X   41   <1-8   lift, carry, tool use, install/connect fittings     Gripping   X   E   X   41   <1-8   lift, carry, tool use, install/connect fittings     Gripping   X   E   X   41   <1-8   lift, carry, tool use, install/connect, install fittings, tapping machine     A crobic (percent)   X   To   Install & repair water lines from grade (to 1 m X 1 m X 1m)     R   High Energy Expenditure   X   X   shovel to expose water lines from grade (to 1 m X 1 m X 1m)     R   Low Energy Expenditure   X   Install & repair water lines (main and to property), hydrants, fittings     Neck - Static Neutral   X   X   shovel to expose water lines from grade (to 1 m X 1 m X 1m)     O   Neck - Static Extension   X   work above shoulders from bend, stoop, crouch, kneel     Neck - Static Extension   X   X   dig to expose service, install, connect service in ditch     Throwing   X   E   X   dig to expose buried service	T	Reach - Sho, or Above extrd	X	E		Х			30	<1-8	from ditch to grade for tools, equip, pipe
Instruction   Notice   Notice   Notice   Name     Reach - Bel. Shoulder extnd   X   E   X   41   <1-8	Ь	Beach - Below Shoulder	X	F				X	41	<1-8	lift carry tool use install/connect fittings
Handling   X   E   X   41		Reach Bol Shoulder extrd	Ŷ	Ц		Y			/1	<1-8	lift carry tools equip pipe lumber
Initial data for the second		Handling	$\left  \stackrel{\wedge}{\mathbf{\nabla}} \right $			~		v	41	<10	tools shovel equip, pipe, further
Store   A   A   A   B   A   B   A   A   A   A   B   A   B   A   B   A   B   A   B   A   B   A		Cripping	$\left  \begin{array}{c} \\ \end{array} \right $						41 50	<1-0	tools, shovel, equip., pipe, ittings
Fine Finger Movements   X   D   X   max   Low (connect, install fittings, tapping machine)     E   Aerobic (percent)   X   70   install & repair water lines (main and to property), hydrants, fittings,     N   Anaerobic (percent)   X   30   shovel to expose water lines from grade (to 1 m X 1 m X 1m)     R   High Energy Expenditure   X   X   shovel to expose water lines from grade (to 1 m X 1 m X 1m)     G   Low Energy Expenditure   X   X   install & repair water lines from grade (to 1 m X 1 m X 1m)     G   Low Energy Expenditure   X   X   install & repair water lines from grade (to 1 m X 1 m X 1m)     G   Low Energy Expenditure   X   X   install & repair water lines from grade (to 1 m X 1 m X 1m)     G   Low Energy Expenditure   X   X   install & repair water lines from grade (to 1 m X 1 m X 1m)     M   Neck - Static Extension   X   X   work above shoulders to shovel, make connection, install fittings     N   Neck - Rotation   X   E   X   dig to expose service, install, connect service in ditch     Throwing   X   Z   X   possibly in ditich to install/ronnect service and fittings <tr< td=""><td></td><td>Gripping</td><td></td><td></td><td></td><td></td><td>X</td><td>X</td><td>50</td><td>&lt;1-8</td><td>toois, shovel, equip., pipe, ittings</td></tr<>		Gripping					X	X	50	<1-8	toois, shovel, equip., pipe, ittings
E   Aracrobic (percent)   X   70   install & regari water lines (main and to property), hydrants, fittings, N     N   Anaerobic (percent)   X   30   shovel to expose water lines from grade (to 1 m X 1 m X 1m)     High Energy Expenditure   X   X   shovel to expose water lines (main and to property), hydrants, fittings     Neck - Static Flexion   X   X   work below shoulders to shovel, make connection, install fittings     P   Neck - Static Extension   X   X   work above shoulders from bend, stoop, crouch, kneel     Sheck - Static Extension   X   X   Work above shoulders from bend, stoop, crouch, kneel     Neck - Rotation   X   X   work above expose buried service     U   Sitting   X   X   possibly in ditch to install/connect service and fittings     R   Standing   X   X   to 100 m from truck to service/ditch     +   Running/Jumping   X   X   to 100 m from truck to service/ditch     +   Running/Jumping   X   X   down into ditch from grade to 1 m     Climbing - Legs Only   X   X   in/out of shallow ditch     B Bending/Stooping   X   X   dig wit			X	D			X		max.	IOW	connect, install fittings, tapping machine
N   Anaerobic (percent)   X   30   shovel to expose water lines from grade (to 1 m X 1 m X 1m)     R   High Energy Expenditure   X   X   shovel to expose water lines from grade (to 1 m X 1 m X 1m)     G   Low Energy Expenditure   X   X   shovel to expose water lines from grade (to 1 m X 1 m X 1m)     Neck - Static Flexion   X   X   work below shoulders to shovel, make connection, install fittings     Neck - Static Neutral   X   X   Vark above shoulders from bend, stoop, crouch, kneel     S   Neck - Rotation   X   E   X   dig to expose service, install, connect service in ditch     O   Neck - Rotation   X   E   A   dig to expose buried service     U   Sitting   X   X   possibly in ditch to install/connect service in ditch     Hanning/Jumping   X   X   X   to 100 m from truck to service/ditch     H   Running/Jumping   X   X   Iadder/banks to enter/exit ditch     O   Climbing - Arms and Legs   X   X   Iadder/banks to enter/exit ditch     O   Climbing - Legs Only   X   X   Iadder/banks to enter/exit ditch     O	E	Aerobic (percent)	X					70	install &	repair w	ater lines (main and to property), hydrants, fittings,
R   High Energy Expenditure   X   shovel to expose water lines from grade (to 1 m X 1 m X 1 m)     G   Low Energy Expenditure   X   install & repair water lines (main and to property), hydrants, fittings     Neck - Static Flexion   X   X   work below shoulders to shovel, make connection, install fittings     P   Neck - Static Extension   X   X   work bolow shoulders to shovel, make connection, install fittings     P   Neck - Static Extension   X   X   work bolow shoulders to shove, make connection, install fittings     S   Neck - Static Extension   X   X   work bolow shoulders to shove, make connection, install fittings     Neck - Static Extension   X   X   X   work bolow shoulders to shove shoulders to shove, make connection, install fittings     Neck - Static Extension   X   X   X   Watking on grade, in ditch, asphalt, concrete, mud, dirt, water     U   Sitting   X   X   A   X   Inform truck to service/ditch     R   Glinning/Jumping   X   X   X   Inform truck to service/ditch     G   Climbing - Arms and Legs   X   X   Inforut of shallow ditch     B   Bending/Stooping <th< td=""><td>  N</td><td>Anaerobic (percent)</td><td>X</td><td></td><td></td><td></td><td>30</td><td></td><td>shovel</td><td>to expos</td><td>se water lines from grade (to 1 m X 1 m X 1m)</td></th<>	N	Anaerobic (percent)	X				30		shovel	to expos	se water lines from grade (to 1 m X 1 m X 1m)
G   Low Energy Expenditure   X   install & repair water lines (main and to property), hydrants, fittings     Neck - Static Flexion   X   work below shoulders to shovel, make connection, install fittings     P   Neck - Static Extension   X   work above shoulders from bend, stoop, crouch, kneel     S   Neck - Rotation   X   E   X   dig to expose service, install, connect service in ditch     T   Throwing   X   E   X   dig to expose service, install, connect service and fittings     S   Neck - Rotation   X   E   X   dig to expose service, install, connect service and fittings     Throwing   X   E   X   on grade, in ditch to install/connect service and fittings     R   Standing   X   X   to 100 m from truck to service/ditch     +   Running/Jumping   X   X   to 100 m from truck to service/ditch     M   Climbing - Arms and Legs   X   X   in/out of shallow ditch     B   Bending/Stooping   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     L   Crouching   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant	R	High Energy Expenditure	X				X		shovel	to expos	se water lines from grade (to 1 m X 1 m X 1m)
Neck - Static Flexion     X     X     work below shoulders to shovel, make connection, install fittings       P     Neck - Static Neutral     X     Image: State Content of the state in t	G	Low Energy Expenditure	X					Х	install &	repair wa	ater lines (main and to property), hydrants, fittings
P   Neck - Static Neutral   X   X   stand, walk on grade, in ditch     O   Neck - Static Extension   X   work above shoulders from bend, stoop, crouch, kneel     S   Neck - Rotation   X   E   X   dig to expose service, install, connect service in ditch     Throwing   X   E   X   dig to expose buried service   U     U   Sitting   X   X   possibly in ditch to install/connect service and fittings     R   Standing   X   X   possibly in ditch to service/ditch     H   Running/Jumping   X   X   to 100 m from truck to service/ditch     +   Running/Jumping   X   X   down into ditch from grade to 1 m     Climbing - Arms and Legs   X   X   in/out of shallow ditch     O   Climbing - Legs Only   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crowhing   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawhing   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawhing   X   X   <		Neck - Static Flexion	X					Х	work be	low shou	Iders to shovel, make connection, install fittings
O   Neck - Static Extension   X   work above shoulders from bend, stoop, crouch, kneel     S   Neck - Rotation   X   E   X   dig to expose service, install, connect service in ditch     T   Throwing   X   E   dift from shovel to expose buried service     U   Sitting   X   X   possibly in ditch to install/connect service and fittings     R   Standing   X   X   on grade, in ditch, asphalt, concrete, mud, dirt, water     E   Walking   X   X   on grade, in ditch, asphalt, concrete, mud, dirt, water     E   Walking   X   X   down into ditch from grade to 1 m     M   Climbing - Arms and Legs   X   X   down into ditch from grade to 1 m     M   Climbing - Legs Only   X   X   in/out of shallow ditch     B   Bending/Stooping   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crouching   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling	P	Neck - Static Neutral	X					Х	stand, v	walk on	grade, in ditch
S   Neck - Rotation   X   E   X   dig to expose service, install, connect service in ditch     T   Throwing   X   E   dirt from shovel to expose buried service     U   Sitting   X   X   possibly in ditch to install/connect service and fittings     R   Standing   X   X   possibly in ditch to install/connect service and fittings     R   Standing   X   X   to 100 m from truck to service/ditch     Hunning/Jumping   X   X   to 100 m from truck to service/ditch     +   Running/Jumping   X   X   to 100 m from truck to service/ditch     Hunning/Jumping   X   X   to 100 m from truck to service/ditch     Hunning/Jumping   X   X   to 100 m from truck to service/ditch     Hunning/Jumping   X   X   in/out of shallow ditch     B   Bending/Stooping   X   X   in/out of shallow ditch     B   Bending/Stooping   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crouching   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I	0	Neck - Static Extension	X					Х	work at	oove sho	oulders from bend, stoop, crouch, kneel
Throwing   X   E   Initial of the service of the service of the service     U   Sitting   X   X   possibly in ditch to install/connect service and fittings     R   Standing   X   X   possibly in ditch to install/connect service and fittings     R   Standing   X   X   possibly in ditch to install/connect service and fittings     R   Standing   X   X   on grade, in ditch, asphalt, concrete, mud, dirt, water     E   Walking   X   X   to 100 m from truck to service/ditch     +   Running/Jumping   X   X   down into ditch from grade to 1 m     M   Climbing - Arms and Legs   X   X   down into ditch from grade to 1 m     M   Climbing - Legs Only   X   X   ladder/banks to enter/exit ditch     O   Climbing - Legs Only   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crouching   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crouching   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   <	S	Neck - Botation	X	F				Х	dia to e	xpose s	ervice install connect service in ditch
Information   Image of the information of the capedo durated service and fittings     Image of the information of the capedo duration of the capedo duratis duration of the capedo duratis duration of th	Τ	Throwing	X	F					dirt fror	n shovel	I to expose buried service
Binding   X   Image of the product of the statute of t	l ii	Sitting	Ŷ	-		x			noesibl	v in ditch	h to install/connect service and fittings
N   Statisting   X   X   Ori grade, in dicti, aspirati, concrete, indu, dirt, water     E   Walking   X   X   to 100 m from truck to service/ditch     +   Running/Jumping   X   X   down into ditch from grade to 1 m     M   Climbing - Arms and Legs   X   X   Iadder/banks to enter/exit ditch     O   Climbing - Legs Only   X   X   Iadder/banks to enter/exit ditch     O   Climbing - Legs Only   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crouching   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     L   Kneeling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant		Standing	$\overline{\mathbf{\nabla}}$			~		v	on grac	y in unor	ab apphalt apparete mud dirt water
E   Walking   X   It is 100 m from fruck to service/difference     +   Running/Jumping   X   X   down into ditch from grade to 1 m     M   Climbing - Arms and Legs   X   X   ladder/banks to enter/exit ditch     O   Climbing - Legs Only   X   X   in/out of shallow ditch     B   Bending/Stooping   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crouching   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     L   Kneeling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crouching   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     L   Kneeling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   X   In dich to expose or access service     T   Twisting   X   X   In didder, edge of ditch, on dirt, in mud, water     Y   Balancing   X   <		Standing	$\left  \begin{array}{c} \\ \\ \end{array} \right $				V	^	Un grac		ch, asphail, concrete, muu, uiri, water
+   Hunning/Jumping   X   X   I down into ditch from grade to 1 m     M   Climbing - Arms and Legs   X   X   I ladder/banks to enter/exit ditch     O   Climbing - Legs Only   X   X   in/out of shallow ditch     B   Bending/Stooping   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crouching   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     L   Kneeling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   on ladder, edge of ditch, on dirt, in mud, water     T   Twisting   X   X   on ladder, edge of ditch, on dirt, in mud, water     Y   Balancing   X   X   on ladder, edge of ditch, on dirt, in mud, water     Taveling   X   X   on ladder, edge of ditch, on dirt, in mud, water     Real   X   X <th< td=""><td></td><td></td><td><math>\left  \begin{array}{c} \\ \\ \\ \end{array} \right </math></td><td></td><td></td><td>V</td><td>^</td><td></td><td></td><td></td><td></td></th<>			$\left  \begin{array}{c} \\ \\ \\ \end{array} \right $			V	^				
M   Climbing - Arms and Legs   X   X   Iadder/banks to enter/exit ditch     O   Climbing - Legs Only   X   X   in/out of shallow ditch     B   Bending/Stooping   X   X   in/out of shallow ditch     B   Bending/Stooping   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crouching   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     L   Kneeling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crouching   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   X   on ladder, edge of ditch, on dirt, in mud, water     Y   Balancing   X   X   possibly when digging a service by hand     Interact with Public   X   X   possibly when digging a service by hand     Interact with Public   X <td< td=""><td>  +</td><td>Running/Jumping</td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td>down ir</td><td>ito altch</td><td>from grade to 1 m</td></td<>	+	Running/Jumping	X			X			down ir	ito altch	from grade to 1 m
O   Climbing - Legs Only   X   X   in/out of shallow ditch     B   Bending/Stooping   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crouching   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     L   Kneeling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   X   dig with shovel, tool		Climbing - Arms and Legs	X		X				ladder/l	banks to	enter/exit ditch
B   Bending/Stooping   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crouching   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     L   Kneeling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   in ditch to expose or access service     T   Twisting   X   E   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   E   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   E   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   E   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   X   Induction on ladder, edge of ditch, on dirt, in mud, water     Traveling   X	0	Climbing - Legs Only	X			Х			in/out o	f shallov	<i>w</i> ditch
I   Crouching   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     L   Kneeling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   in ditch to expose or access service     T   Twisting   X   E   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   E   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   E   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   E   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   X   In ditch to expose or access service     Y   Balancing   X   X   Intedex to install/repair service, hydrant     G   Work Alone   X   X   Interact with Public   X     N   Operate Equip/Machinery   X   X   Interact with Public   X   Interact with Public     Y   N   Operate Equip/Machinery   X   X <td>  B</td> <td>Bending/Stooping</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td>X</td> <td>dig with</td> <td><u>shovel,</u></td> <td>, tool use, etc. to install/repair service, hydrant</td>	B	Bending/Stooping	X					X	dig with	<u>shovel,</u>	, tool use, etc. to install/repair service, hydrant
L   Kneeling   X   X   dig with shovel, tool use, etc. to install/repair service, hydrant     I   Crawling   X   X   X   in ditch to expose or access service     T   Twisting   X   E   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   E   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   E   X   on ladder, edge of ditch, on dirt, in mud, water     Y   Balancing   X   X   It to work location within city     Mork Alone   X   X   It to work locations in community     N   Operate Equip/Machinery   X   X   It work locations in community     N   Operate Equip/Machinery   X   X   It work locations in community     Irregular/Extended Hours   X   X   It work locations in community     * Frequency Legend   1 = Seldom; Not Daily   2 = Low Daily Activity; < 1hr		Crouching	X				Х		dig with	n shovel,	, tool use, etc. to install/repair service, hydrant
I   Crawling   X   X   in ditch to expose or access service     T   Twisting   X   E   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   X   on ladder, edge of ditch, on dirt, in mud, water     Y   Balancing   X   X   on ladder, edge of ditch, on dirt, in mud, water     G   Traveling   X   X   to work location within city     G   Work Alone   X   X   possibly when digging a service by hand     Interact with Public   X   X   at work locations in community     N   Operate Equip/Machinery   X   X   pumps, jack hammers, power saws, tapping machine     Irregular/Extended Hours   X   X   0700-1530, Monday to Friday, OT often     * Frequency Legend   1 = Seldom; Not Daily   2 = Low Daily Activity; < 1hr	L	Kneeling	X			Х			dig with	shovel,	, tool use, etc. to install/repair service, hydrant
T   Twisting   X   E   X   dig with shovel, tool use, etc. to install/repair service, hydrant     Y   Balancing   X   X   On ladder, edge of ditch, on dirt, in mud, water     Balancing   X   X   X   on ladder, edge of ditch, on dirt, in mud, water     G   Traveling   X   X   V   Vork location within city     G   Work Alone   X   X   Vork locations in community     N   Operate Equip/Machinery   X   X   at work locations in community     N   Operate Equip/Machinery   X   X   Pumps, jack hammers, power saws, tapping machine     Irregular/Extended Hours   X   X   0700-1530, Monday to Friday, OT often     * Frequency Legend   1 = Seldom; Not Daily   2 = Low Daily Activity; < 1hr	1	Crawling	X		Х				in ditch	to expo	se or access service
Y   Balancing   X   X   X   on ladder, edge of ditch, on dirt, in mud, water     G   Traveling   X   X   on ladder, edge of ditch, on dirt, in mud, water     G   Work Alone   X   X   possibly when digging a service by hand     Interact with Public   X   X   at work locations in community     N   Operate Equip/Machinery   X   X   pumps, jack hammers, power saws, tapping machine     Irregular/Extended Hours   X   X   0700-1530, Monday to Friday, OT often     * Frequency Legend   1 = Seldom; Not Daily   2 = Low Daily Activity; < 1hr	Т	Twisting	X	Е				Х	dia with	shovel.	tool use, etc. to install/repair service, hydrant
Traveling   X   X   X   Intradult, orgeneration, orgenerati	Ý	Balancing	X			Х			on ladd	er edae	e of ditch on dirt in mud water
Individual of the work location within city     G   Work Alone   X   X   possibly when digging a service by hand     Interact with Public   X   X   at work locations in community     N   Operate Equip/Machinery   X   X   pumps, jack hammers, power saws, tapping machine     Irregular/Extended Hours   X   X   0700-1530, Monday to Friday, OT often     * Frequency Legend   1 = Seldom; Not Daily   2 = Low Daily Activity; < 1hr     3 = Moderate Demand; Repetition 1 - 3 hrs daily   4 = High Frequency Demand; Repetition > 3 hrs daily     The following shading denotes a   HIGH RISK TASK:   Modifications should be considered	<u> </u>	Traveling	X			X			to work	location	within city
Contraction   X   X   X   Possibly when digging a service by hand     E   Interact with Public   X   X   at work locations in community     N   Operate Equip/Machinery   X   X   pumps, jack hammers, power saws, tapping machine     Irregular/Extended Hours   X   X   0700-1530, Monday to Friday, OT often     * Frequency Legend   1 = Seldom; Not Daily   2 = Low Daily Activity; < 1hr		Work Alono	$\frac{1}{2}$		Y	~			nossibl	whon	digging a service by hand
N   Operate Equip/Machinery   X   X   X   pumps, jack hammers, power saws, tapping machine     Irregular/Extended Hours   X   X   0700-1530, Monday to Friday, OT often     * Frequency Legend   1 = Seldom; Not Daily   2 = Low Daily Activity; < 1hr		Interact with Dublic	$\left  \begin{array}{c} \\ \end{array} \right $		^	v			possibi		
N   Operate Equip/Machinery   X   X   pumps, jack nammers, power saws, tapping machine     Irregular/Extended Hours   X   X   0700-1530, Monday to Friday, OT often     * Frequency Legend   1 = Seldom; Not Daily   2 = Low Daily Activity; < 1hr			$\left  \begin{array}{c} \\ \\ \\ \end{array} \right $						at work	location	
Irregular/Extended Hours   X   X   I   0700-1530, Monday to Friday, O1 often     * Frequency Legend   1 = Seldom; Not Daily   2 = Low Daily Activity; < 1hr	N	Operate Equip/Machinery	L X			X			pumps,	јаск па	mmers, power saws, tapping machine
* Frequency Legend   1 = Seldom; Not Daily   2 = Low Daily Activity; < 1hr		Irregular/Extended Hours		_	X	L			0700-1	530, Mo	nday to Friday, OI often
3 = Moderate Demand; Repetition 1 - 3 hrs daily   4 = High Frequency Demand; Repetition > 3 hrs daily     The following shading denotes a   HIGH RISK TASK:   Modifications should be considered	* Fr	equency Legend	1 =	Sel	dom;	Not [	Daily	2 = L	ow Dail	y Activit	y; < 1hr
The following shading denotes a HIGH RISK TASK: Modifications should be considered	3 =	Moderate Demand; Repetition	<u>1 - 3</u>	<u>3 hr</u> s	s daily	/		<u>4 =</u> ⊦	ligh Fre	quency	Demand; Repetition > 3 hrs daily
		The following shading denotes	sa		HIG	H RIS	SK TA	SK:		Mo	difications should be considered

**REQD** is marked with an X if the particular demand or category is relevant to the purpose of the job.

**SIDE** refers to the side or limb required to execute a task. If it is marked E, it indicates either side, the most common choice is listed first. **D** refers to dominant and **B** to both sides.

#### PJDC-Labourer Waterworks

Referral:		Org	jani:	zatior	า:			Title: see 1st page header	
Dept.:		Div	isior	า:				Contact:	
•				FREQUENCY*			Y*	Date:	
PHYSICAL DEMANDS		R E Q D	S I D E	Sel. 1	Low	Mod. 3	High 4	COMMENTS	
	Hearing - Conversations	X		-		X		crew, Truck Driver, Equipment Operator, Foreman, public	
Р	Hearing - Other Sounds	X					X	trucks, equipment, vehicles, pumps, power saw, jackhammer	
Е	Vision - Far	X					X	install and repair water lines, services, hydrants	
R	Vision - Near								
С	Vision - Colour								
Е	Vision - Depth	X					X	dig with shovel, make connections, walk in/around ditch/equipment	
Р	Perception - Spatial	X						dig with shovel, make connections, walk in/around ditch/equipment	
Т	Perception - Form								
I	Feeling (Tactile)	X					X	static grip on shovel, jackhammer use	
0	Reading								
Ν	Writing								
	Speech	X				Х		crew, truck driver, equipment operator, Foreman, public	
	Inside Work	X			X			drive to next work location in Gruman Van	
	Outside Work	X					X	at work location in all weather conditions	
	Hot Conditions >25 deg. C	X		Х				possibly in spring, summer or fall	
	Cold Conditions <10 deg.C	X		X				possibly in fall, winter or spring	
	Humid	X		X				during wet weather conditions	
W	Dust	X		X				digging to service at work site	
0	Vapor Fumes	X					X	diesel from trucks, backhoe, excavator	
R	Hazardous Machines	X				X		Jackhammer, power saw, tapping machine	
ĸ	Proximity to Moving Object	X					X	trucks, backhoe, excavator, traffic	
_		X					X	trucks, backhoe, excavator, traffic, jackhammer, power saw	
	Electrical Hazard	X			X			possibly buried services, overnead wires	
	Sharp Tools			v			X	snovels, pipe cutters, power saw	
	Radiani/ Thermai Energy							SUN	
	Vibration and Polated	<b>_</b>		~				in wet ditches, wet weather	
	Chomical Irritante							Jackhammer, power saw, tapping machine	
	Organic Substances								
M	Medical Waste								
F	Blood Products								
	Congested Worksite	x					x	in ditch, around service, near traffic	
Т	Lighting - Direct	X					X	day light sun light	
	Lighting - Indirect	X		x				day light	
	Lighting - Adjustable								
	Lighting - Fluorescent								
	Lighting - Incandescent								
	Lighting - Shadows etc.	X					X	depends on time of day, weather and location of work	
* Fr	equency Legend	1 =	Sel	dom:	Not I	Dailv	2 = L	Low Daily Activity; < 1hr	
3 =	3 = Moderate Demand; Repetition 1 - 3 hrs daily 4 = High Frequency Demand; Repetition > 3 hrs daily								
	The decide behaving repeated in the day in the requeries behaving repeated in the day								

The following shading denotes a HIGH RISK TASK: Modifications should be considered

**REQD** is marked with an X if the particular demand or category is relevant to the purpose of the job.

SIDE refers to the side or limb required to execute a task. If it is marked E, it indicates either side, the most common choice is listed first. D refers to dominant and B to both sides.

For detailed descriptions of each of the different categories, please refer to the reference guide or inquire with Human Effort at 1-888-4EFFORT